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CYCLOPEDIA OF AMERICAN HORTICULTURE



Plate XII. The American Grape, product of breeding from native species within a century

CYCLOPEDIA OF AMERICAN HORTICULTURE

COMPRISING SUGGESTIONS FOR CULTIVATION OF HORTICULTURAL PLANTS, DESCRIPTIONS OF THE SPECIES OF FRUITS, VEGETABLES, FLOWERS AND ORNAMENTAL PLANTS SOLD IN THE UNITED STATES AND CANADA, TOGETHER WITH GEOGRAPHICAL AND BIOGRAPHICAL SKETCHES

AND

A SYNOPSIS OF THE VEGETABLE KINGDOM

BY

L. H. BAILEY

ASSISTED BY

WILHELM MILLER, PH.D.

Associate Editor

AND MANY EXPERT CULTIVATORS AND BOTANISTS

Illustrated with nearly Three Thousand Engravings
and One Hundred and Forty-five Full-page Half-tones

IN SIX VOLUMES—VOLUME III
FLOW.—LYTH.

FOURTH EDITION

New York

DOUBLEDAY, PAGE & COMPANY

1906

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Mount Pleasant Press
J. Horace McFarland Co.
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FLOWER-DE-LUCE. The origin of the Fleur-de-lis of the French coat of arms is not known. By some it is supposed to represent the head of a spear, by others the flower of a lily. It has also been derived from the points of a crown and from several animal forms, as bees and loads. Apparently the Iris has nothing to do with the heraldic Fleur-de-lis. This name as applied to Iris is of later origin and of a purely botanical significance, referring chiefly to *I. Germanica*. See under "Fleur," Larousse, Dictionnaire du XIX Siècle, 8:450.

H. HASSELDRING.

FLOWER-FENCE, BARBADOES. *Poinciana pulcherrima*.

FLOWER-OF-AN-HOUR. *Hibiscus Trionum*.

FLOWERING MAPLE. See *Abutilon*.

FLY POISON. See *Zygadenus*.

FOLIAGE PLANTS. A term used to designate plants which are grown for the general effect of their foliage rather than for their flowers. The term is indefinite. In some cases, and more correctly, it is used for plants with unique or interesting leaves—usually colored—as colons, Rex begonia, peperomia, calathea, farguigum. In other cases it is used to designate plants of full foliage and graceful habit,—plants which are prized for their general habit quite as much as for the characters of the individual leaves. Of this latter class, ferns, palms, grevillea, screw pine, araucaria are leading examples. The latter class contains the most popular commercial subjects, and they are much used in room and table decorations. The plants are often rented for use in temporary decorations. For the culture of Foliage Plants, refer to the various genera.

FONTANÈSIA (after René Louiche Desfontaines, prominent French botanist, 1752-1833, director of the botanical garden at Paris). *Oleæceæ*. Ornamental deciduous shrubs, with opposite, rather narrow, entire lvs. and whitish fls. in short, terminal panicles. They retain the foliage unchanged until late in fall, and are well adapted for shrubberies, growing in any good garden soil. *F. Fortunei* is nearly hardy North, *F. phillyræoides* only half-hardy. Prop. readily by greenwood cuttings under glass in early summer; also by layers, by grafting on privet, and by seeds. Two species from W. Asia and China. Glabrous shrubs, with slender, quadrangular branches; fls. perfect; calyx lobes and petals 4; stamens 2, exceeding the petals; fr. a flat, winged nutlet.

Förtunéi, Carr. (*F. Californica*, Hort.). Shrub, to 15 ft.: lvs. lanceolate or ovate-lanceolate, acuminate, shining, quite entire, 2-4 in. long; fls. in axillary and terminal clusters, forming a narrow, leafy panicle; fr. broad, oval or ovate, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. May, June. China. R. H. 1859, p. 43.—Sometimes united with the following, to which it is superior by its more vigorous growth, the darker and larger foliage, and by the greater hardiness.

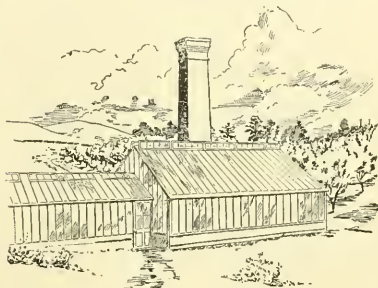
phillyræoides, Lab. Shrub, to 10 ft.: lvs. ovate-lanceolate or narrow-elliptic, mostly with rough, minutely denticulate margin, $1\frac{1}{2}$ - $2\frac{1}{4}$ in. long; fls. almost like the former. W. Asia. L. E. C. 14:1308. Var. *angustifolia*, Rehder (*F. angustifolia*, Dipp.). Lvs. narrow-lanceolate or oblong-lanceolate. ALFRED REHDER.

FORAGE PLANTS are treated only incidentally in this work, as they belong to agriculture rather than to horticulture. They are mostly grasses and leguminous plants, and have a very large special literature, much of which can be obtained free from the U. S. Department of Agriculture, Washington, D. C. Write to the Division of Publications.

FORBIDDEN FRUIT. See *Citrus Decumana* and G. F. 9:163.

FORCING. The word Forcing is variously used. Properly, it should designate the growing of plants outside their usual or normal season. This distinguishes Forcing from the ordinary purpose of the glass-house, which is to imitate the usual season in which

plants grow. For example, begonias are not forced; we endeavor to protect them and to give them the season and the conditions under which they grow in the wild. Carnations when flowered in the winter are forced, because we transpire their seasons. Chrysanthemums blooming in October and November are not forced; they are only protected. Sometimes the word Forcing is used

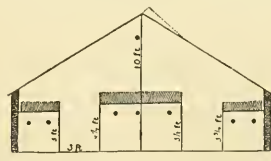


838. House constructed without rafters.

in a very special sense, to denote the production of flowers from bulbs or tubers in a very short time under the influence of a very high temperature. Thus, the lily-of-the-valley may be placed in a temperature of 90° or above, and the large bulb be forced to throw out their flowers before the plant obtains a firm foot-hold on the soil.

A Forcing-house is a building in which plants are forced; but the term has come to denote a simple glass-house in which plants are grown only for sale, in distinction from private conservatories, or more elaborate structures which are used for the display of plants. See *Greenhouse*.

The Forcing industry in America is very large. Heretofore it has confined itself mostly to Cut-Flowers (which see), but pot-plants, vegetables and fruits are receiving more and more attention. The staple forced flowers are the rose, carnation, violet, lily-of-the-valley, and various bulbs. These are treated under their respective names. Of vegetables, the most important Forcing species is lettuce. This is followed by tomato, cucumber and radish. Other vegetables are of very minor importance as Forcing products. The growing of fruits under glass

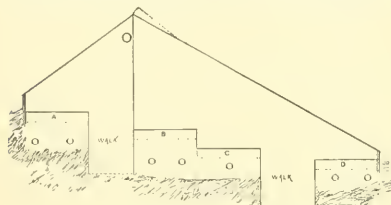


839. Even span Forcing-house, 20 ft. wide, heated by steam.

is receiving increasing attention in this country. Very little of this fruit-raising is really Forcing, however, since the glass inclosure is used chiefly to protect the plants and to enable better care to be given; the fruit does not ripen much ahead of its normal season. Of this category are glasshouse grapes. Strawberries are really forced, however, the whole period of vegetation and bloom being greatly forwarded. Much attention is now given by florists to the Forcing of hardy plants; and this is one of the most delightful of horticultural operations for the amateur. Many of our native plants can be forced with the greatest satisfaction, but the business is usually confined to imported stock of florists' plants.

The Forcing-house should be of the simplest construc-

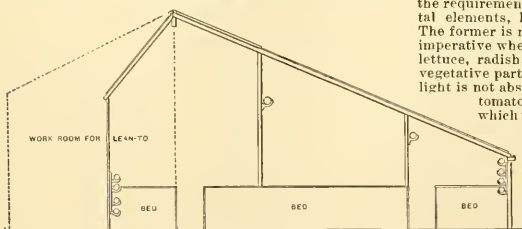
tion. The plan should secure the greatest amount of light, economy of space and of heating, and directness and simplicity in every operation. The simple sash-bar frame, without rafters (Fig. 838) is the most satisfac-



840. Uneven span Forcing-house, 20 ft. wide, on a side hill. Heated by steam.

tory when properly constructed. The side walls should be low and the roof comparatively flat. Usually there is no glass on the side walls. Under most conditions, the house should run north and south, particularly if even in span (Fig. 839), but the lay of the land and the location of existing features usually determine the direction. If the house runs east and west, or if it stands on sloping land (Fig. 840), an uneven or broken span is usually advisable. The widely different opinions respecting the merits and demerits of the different spans are proof that each is good under certain circumstances. It is the prevailing opinion that, in broken spans, the long roof should be to the south; yet some of the best newer houses have the short span—which is then very steep—facing the south (Fig. 843).

In America, all Forcing-houses are heated by means of small wrought-iron pipes, which fit together with threads. The old-time cast-iron flues may be employed for conservatories, but they are too bungling for Forcing-houses. They do not admit of sufficient modification in lay-out to adapt them to the long and often crooked runs of Forcing-house establishments. The wrought-iron pipes are heated either by steam or water. Each system has its advocates, which means that each has its merits. Steam is less costly to install, since less pipe is required. It also admits of greater variation in the lay-out. Crooks and obstacles are more easily overcome. In a large establishment, the place may be heated up sooner. Hot water gives a milder heat because the pipes are less



841. Uneven span Forcing-house, 30 ft. wide. Hot water.

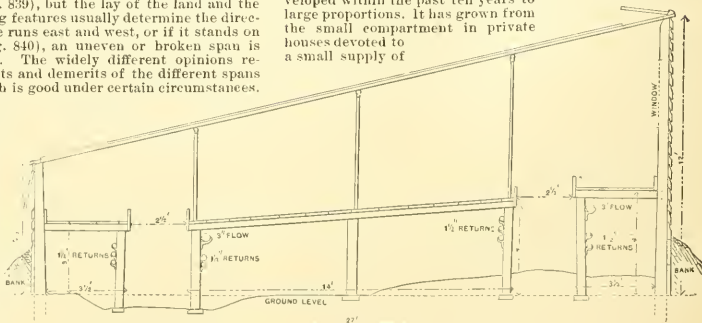
hot. Of itself, it is less liable to fluctuations. Theoretically, it is less expensive in fuel; but in practice, the cost of running is found to depend more on the character of the particular system and the operations of the fireman than on the medium itself. When properly installed, steam is as uniform in action as water, and it is adapted to larger areas and to higher temperatures.

The ideal shape for a Forcing-house is probably in the proportion of breadth to length as 1 is to 4 or 5. The best houses are rarely less than 18 or 20 ft. wide, and rarely more than 20 to 35 ft. From 400 to 500 ft. is considered to be the greatest profitable length. Houses of greater length are now building, but they must be considered an experiment. Parallel houses are often "nested" with good results,—the adjoining houses resting on a common wall. When the various houses are to be used for one kind of crop, the partitions between them may be omitted; a very large space may then be covered with practically one house without the necessity of rearing a high roof.

The accompanying illustrations (Figs. 838-843) show various current styles of American Forcing-houses. For further discussion of glass houses, see *Greenhouse*.

L. H. B.

THE WINTER FORCING OF VEGETABLES.—The growing of vegetables under glass for the winter market has developed within the past ten years to large proportions. It has grown from the small compartment in private houses devoted to a small supply of



842. Lean-to lettuce house, 26 ft. wide. Hot water.

lettuce and radishes to entire ranges of modern houses, in which are grown almost the entire list of tender vegetables. The special crops, however, are usually confined to four, the management of which is here discussed,—lettuce, radishes, tomatoes and cucumbers. The forcing of any winter crop is a matter of principles rather than practice, since local conditions have everything to do with the methods of culture and the kinds of vegetables forced. It frequently happens that the same vegetable is grown with equal success in soils of widely different character by different cultivators. Skill in management and close attention to details are the requirements necessary to success. Two fundamental elements, however, are essential: heat and light. The former is needed by all crops; the latter is almost imperative when fruit is wanted. With such crops as lettuce, radish, rhubarb and asparagus, in which the vegetative part only of the plant is wanted, bright sunlight is not absolutely necessary; but with such crops as tomatoes, cucumbers, melons and beans, in which the fruit is the aim, no amount of heat will prove a substitute for sunlight in ripening the pollen, which is often the critical factor in the results. Therefore, a situation where the maximum of sunshine may be had should be selected if such crops are to be grown.

The construction of the house is not a matter of the first importance. The three-quarter span house perhaps

furnishes as nearly as possible the best condition for forced crops. However, an even-span or shed-roof house grows many crops to a high degree of perfection. As to the inside arrangement of the house, the crops to be grown will have much to do in the matter. Cool-house crops, as lettuce, radish, and the like, are well grown in solid beds; while heat-loving plants, as tomatoes, cucumbers, melons, etc., should be planted on benches built over the pipes. This means that the cost of building a greenhouse depends very much on what crop one expects to grow. The saving in benches and heat in houses devoted to cold crops is considerable, while the ease with which such crops may be grown recommends them to the beginner.

The best paying crops are probably cucumbers and tomatoes; the most exacting, melons. The demand for melons, however, is limited, and the cost of producing good flavored, well ripened fruits in winter is high. Having stated what we conceive to be underlying principles in the winter Forcing of all vegetables, we may consider each of the important crops separately.

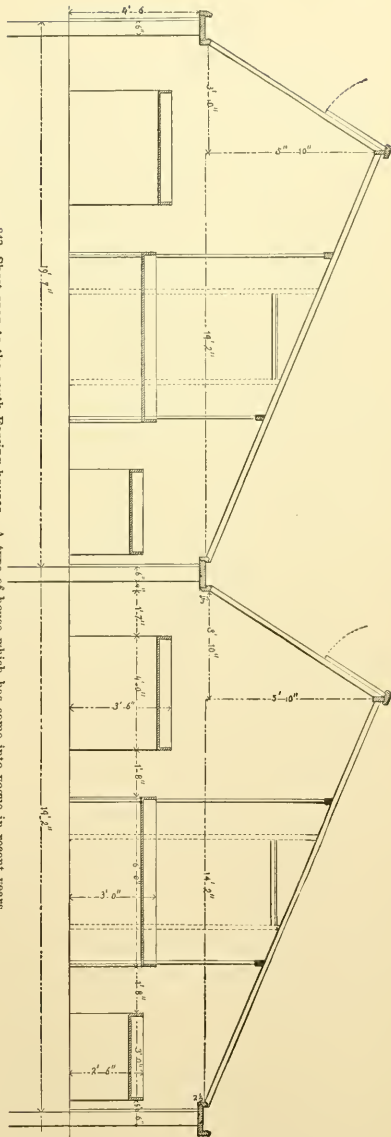
Lettuce.—The ideal soil for lettuce would be a well drained gravelly or sandy loam, but with care in watering a soil of heavy texture may be made to produce excellent crops of the loose, open varieties. The heading or cabbage lettuce is more exacting if a fine quality is desired. The first crop of lettuce from the houses should be ready to use by the middle of November. For this crop seed should be sown in September, allowing on an average from 6 to 8 weeks for the crop to mature. A temperature of 55° – 60° through the day, with a drop to 40° or 45° at night, will suit all varieties, but in the case of the heading varieties a rise of 5 to 10° at the time of heading will finish off the crop more uniformly.

Radishes require the same general treatment as lettuce and may be grown in the same house. As radishes mature in about half the time lettuce does, the radish seed may be sown between the rows of young lettuce plants, and the product is out of the way when the lettuce begins to need the entire space.

Tomatoes being a hothouse crop, require a temperature of 75° by day, with a drop of about 5° – 10° at night. This is one of the crops which is dependent on the sun, because the pollen must be dry and light in order to pollinate the pistils and produce fruits. The soil for tomatoes may be on the heavy order, and contain a large proportion of fibrous loam, with well rotted manure. As to chemical fertilizers, the best results are to be obtained not from those rich in nitrogen, but from potash and phosphoric acid, as these elements are largely responsible for a slower growth of plant and fruit and a firmer texture and higher flavor of marketable product. To obtain a good yield of fruit through the winter months, it will be necessary to pollinate each flower. This may be done very rapidly. The pollen is jarred into a spoon-like receptacle, and the end of the pistil is touched with the accumulated pollen. As spring approaches and the sun becomes stronger, a simple jarring of the plants is all that is needed. As to training, the single-stem method has been found to be the best, as the plants can be set much closer and still allow plenty of room to work around each one. This method consists in the pinching out of all lateral growths. Train the stem to a cord, and support the heaviest clusters by strings (Fig. 814). Plants from seeds sown in August will ripen fruits about the first of January, and should continue in bearing until May. A succession may be had by growing fresh lots in pots or boxes to take the place of exhausted plants. The season of forced tomatoes may be thus continued until the outdoor product fills the market.

Cucumbers are much forced in the eastern states. Cucumbers are a very exacting crop, and need special care in growing. The White Spine type is perhaps more generally grown in this country than the long Forcing cucumber of the Old World, which has been grown and selected for its Forcing qualities for many years. One of the reasons why the former is the more generally grown is its adaptability to relatively unfavorable conditions. It grows in the full sunlight, is more able to resist attacks of mildew and red spider, and sets its fruit with more freedom than the Old World types. One other reason may be that the people of this country

813. Short-span-to-the-south Forcing-houses. A type of house which has come into vogue in recent years.



have not become accustomed to the long, thin fruit of the English varieties. The English or forcing varieties require partial shade through their season of growth.



844. Strand of winter Tomatoes.

must be grown in heat without the slightest check. They should be planted on the bench in a strong, loamy soil, which is retentive enough to hold moisture at the roots but not heavy enough to become sour. No shading of the glass is required, but air should be given freely on all days when possible. The plants are trained as are cucumbers, except that the central shoot should be pinched out as soon as the plants are well established in the bench, allowing 3 or 4 lateral branches to grow to the height of 4 or 5 feet, when these in turn should be pinched back. In setting the fruits, it is best to wait until a number of pistillate blossoms are open on a plant and pollinate them at the same time, as it often happens that if one fruit starts into growth some time before other flowers are pollinated, the other fruits fail to set until the first one reaches considerable size. Pollination is accomplished in the same manner as with cucumbers, and should be done on sunny days, when the houses are dry. Except during the time of setting the fruits, the house should be moist and the leaves sprayed frequently. The temperature of the melon house should run

at least 5° higher than for cucumbers. Hang the fruits in slings (Fig. 845). Melons ripening in fall or spring are more easily managed.

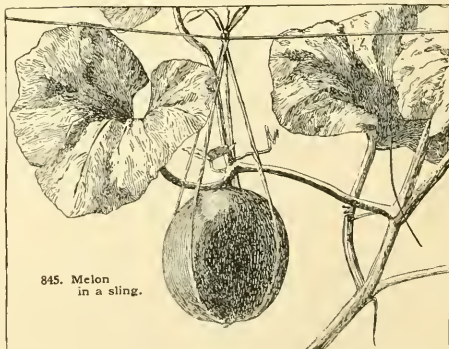
Beans may be easily forced in houses where cucumbers or melons are growing, using rich, moist soil and strong bottom heat. They are usually grown in pots, 3 or 4 plants in a 6-inch pot. They make a very rapid growth, and the green pods are fit to use in from 8 to 10 weeks from the time the seed is sown. While growing the plants should be sprayed with water frequently, as they are very subject to attacks of red spider. The bean is self-fertile, and need not be pollinated (Fig. 846).

Asparagus and *Rhubarb* are forced from old roots brought in from the garden, and subjected to a gentle heat. The crop is made from the material stored up in the old roots, few new roots growing through the forcing period. The old roots are thrown away after being forced, and others brought in for the next crop. Both these crops may be grown in out-of-the-way places, — under the benches, in corners of the potting shed, or in fact anywhere where heat and moisture may be had. One method of forcing rhubarb is to grow it entirely in the dark. This produces a very tender stalk with very little foliage.

C. E. HUNN.

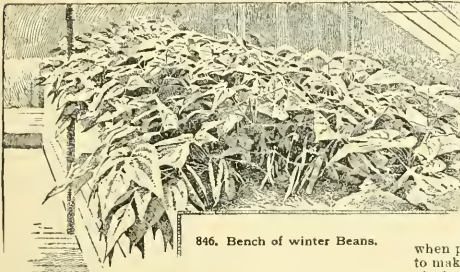
FORCING OF FRUITS.—The house best adapted for fruit-growing is one running north and south, span roof curvilinear, with ventilation both sides, top and bottom. It is important to be able to give a large quantity of air, especially for ripening the wood after the growth is done. The next thing to be considered is the borders. To produce high-class fruit, perfect drainage is necessary. For very early forcing an inside border will answer the purpose, but the most satisfactory way is to have both outside and inside borders. A depth of 3 ft. of prepared soil is sufficient, with 9 in. of drainage material on the bottom. Should there be a natural outlet for the drainage water, well and good, otherwise artificial means must be resorted to. The width of the outside border should be 15 ft. An outside border is particularly advantageous for vines and peach trees, which will last much longer in a healthy, vigorous condition if allowed a root-run outside the greenhouses. A sod cut from the pasture, suitable for growing roses, would be ideal for the borders. The writer does not recommend making a border very rich, for too often young vines are poisoned with food at the start. A sprinkling of coarse crushed bone and charcoal should be mixed with the soil. In the use of charcoal one should be governed by the nature of the soil; if the soil is extra heavy, use charcoal more freely. A top-dressing of cow-manure mixed with soil is a good thing when starting a house. A medium loam, neither stiff nor too heavy, answers the purpose.

The trees also may be grown in pots and tubs. One advantage is that a special fruit house is not necessary. Many a house is going idle during the summer months that would grow fruit to perfection. Any light house



845. Melon in a sling.

with plenty of air will grow fruit satisfactorily. One of the main points is in the watering. Should the trees get too dry, or on the other hand saturated, the chances are that the fruit will turn yellow and drop, but with good judgment and a certain amount of care success is as-



846. Bench of winter Beans.

sured. The trees should be repotted every fall, as they need so much water during the summer months that the soil becomes depleted. However, one should be careful not to overpot. A compost suitable for potted trees is a fairly heavy loam, and say three parts of soil to one of well rotted manure, with a little wood ashes and bone meal worked in. Potted trees are interesting, as there can be a considerable variety of fruit grown in this way. Figs. 847 and 848 illustrate the method of pruning.

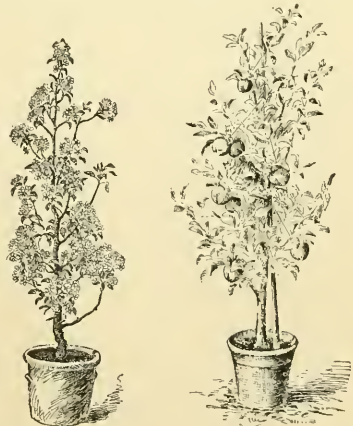
Grapes.—In planting grape vines, 2-year-old canes should be set. Plant the canes 3 or 3½ ft. apart. There is nothing gained by crowding, and in planting young vines, cut them down to about 18 in., to insure good, established vines from the bottom. There can be no hard and fast lines laid down as to how long the vines will bear profitably. With good treatment they should be profitable for 15 or 20 years. A grapery should be started with a night temperature of 45-50° F. and a rise of 10° or 15° with sun heat in the day. The temperature should be raised 5° every two weeks, until a night temperature of 65° is reached. After the grapes are set, a night temperature of 70° will be the right thing. The vines should be syringed three times a day until they are started into growth; then twice a day until the foliage gets heavy, and thereafter once every bright day is all that is necessary, mornings preferred. After the grapes commence to color, syringing should be stopped. Foliage is another thing to be considered. With our hot sun a fairly good covering is necessary. The shoots should be stopped at the second or third leaf beyond the bunch, and all laterals pinched at the first leaf. The aim should be to have a nice covering of foliage over the house, but avoid severe crowding. Grape thinning requires good judgment. Always make it a practice, if possible, to thin the bunches all that is necessary the first time, as going over the bunches the second time is not so satisfactory. A bunch must be so thinned that each berry has room to develop without crushing. Water also plays a prominent part in finishing a crop of grapes. While grape vines are moisture-loving plants, it is poor policy to give them a heavy watering after the grapes begin to color. If the plants receive a heavy watering when the grapes start their second swelling, it should be enough until the grapes ripen. After the crop is off the treatment is simple: keep full air on top and bottom; syringe the foliage if red spider makes its appearance, and water the border when dry. Vines that are not intended to be started until February or March should be pruned when the wood is thoroughly ripe. The canes should be brought down and wrapped in burlap to keep the sun off them, and then a matter of 5° or 6° of frost in the house will do no harm. In severe weather it pays to turn a chink of heat in the house. As on all other fruits, there are many varieties, but only a limited number of standard sorts. For an early grape there is no better than the old stand-

ard Black Hamburg, which is easy to handle and a very satisfactory variety. A companion to it is Buckland Sweetwater, a white grape ripening at the same time, though of second-rate quality. Its earliness, however, makes it worthy of a place.

Muscats of Alexandria should have a house to itself. To finish this noble grape to perfection requires more heat than ordinary. It can be grown with fair results in a mixed house, but where there are three compartments for early, midseason and late varieties, the midseason compartment should be planted to Muscats. Madresfield Court is also a grape of fine quality. Unfortunately it is difficult to handle, although it is usually planted in a house with such easily handled varieties as Gros Maroc, Gros Colmar, Barbarossa, Mrs. Prince, Alicante. For another view, see *Grape*.

Peaches and Nectarines.—The same depth of border recommended for the grape vines will be all right for the peach. These, also, must have perfect drainage or the trees will soon get into a sickly condition. The peach and nectarine have a tendency to rank growth when planted in the border. Care should be taken not to make the border too rich. It is an easy matter to apply food when the trees need it. The writer has found a light application of wood ashes two or three times in the season a capital thing. Crushed bone is also beneficial. When starting the house, a top-dressing of soil and cow-manure, say two of soil to one of manure, should keep the trees in a healthy condition. One important point in starting a peach house, especially early in the season, say the first of January or earlier, is to start easy. Nothing is gained by rushing. There are numerous varieties of peaches and nectarines adapted to forcing. The following is a selection of the best that the writer has grown under glass: Peaches, *Early*—Hale Early, Alexander, Condor, Mountain Rose, Haine's Early; *Midseason*—Foster, Bellegarde, Noblesse, Oldmixon Free; *Late*—Crawford's Late, Sea Eagle, Princess of Wales, Lady Palmerston.

Nectarines, *Early*—Cardinal, Early Rivers, Advance, Lord Napier; *Midseason*—Improved Downton, Dryden,

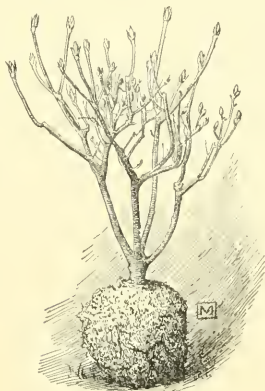


847. Pot-grown Pear Tree in bloom.

848. Pot-grown Apple Tree in bearing.

Byron, Elrnge, Milton; *Late*—Chaucer, Newton, Spencer, Stanwick, Humboldt, Victoria. Trees for planting in the house should be especially prepared for the work. A year would be lost with such trees as are usu-

ally offered for sale. For planting in the border, choose fan-trained trees, 2 or 3 years old, providing they have been properly transplanted. (See *Pruning*.)



849. Azalea, received from Europe, now pruned for forcing.

Indoor peaches and nectarines, with proper care, are profitable for 10 years after planting. The following temperatures for the peach house are suitable for early Forcing: for the first two weeks, 40° by night and 50° by day; then a rise to 45° by night and 55° or 60° by day, with the sun, which should carry them until their blooming period; then 50° by night and 60° to 70° by day, with sun heat; after the fruit is set, a rise of 5° or 10° on mild nights would be all right, with the day temperature correspondingly increased. Peaches delight in fresh air; therefore air should be given at every opportunity. Syringe the trees twice a day in bright weather; hold off while the trees are in blossom; after the fruit is set, syringe again twice every bright day, and once a week with whale-oil soap, using enough soap to just color



850. Rhododendron, received from Europe, ready for forcing.

the water. This is a good remedy for greenfly, spider, etc., and produces a fine, glossy foliage. It is better to disbud by degrees rather than to remove a large quantity of foliage at once, which would naturally cause a check to the tree. Disbudding requires good judgment.

The shoot, if not needed, should be pinched, leaving three or four leaves to develop the fruit. Trees that are properly cared for during the summer months need little pruning in the winter. Probably the hardest task of all to the grower is thinning the fruit, but this must be done. There cannot be any set number for a tree to carry. Judgment must be used in that respect. Nectarines can be cropped more heavily than peaches. After the crop is gathered, all the useless wood should be cut away to allow plenty of light and sunshine around the wood that is intended for the following season. When the wood is thoroughly ripened it is in condition to stand zero weather. The temperature of peach houses can go down below zero without a bud being killed. In fact, it is not necessary to use any artificial heat until starting the house. Close the house down frosty nights; open up in the morning before the temperature rises much, and avoid exciting the buds. Sometimes one has warm days during the winter months. On such days it is well to keep doors as well as ventilators open.

All the peaches and nectarines recommended for the peach house are admirably adapted for pot work.

Other fruits may be added to these, as apples, pears, plums, cherries, figs, apricots, etc. (see articles under these headings). The following are some of the best varieties the writer has grown: *Plums*—Golden Esperin, Jefferson, Denniston Superb, Green Gage, Grand Duke, The Czar, Early Transparent; *Pears*—Magnet, Princess, Souv. du Congres, Louise Bonne de Jersey, Pitmaston Duchess, Beurre Die!; *Apples*—Williams Favorite, Benoni, King of the Pippins, Washington, King of Tompkins County, Belle de Pontoise, Bismarck, Peasgood Nonpareil, Lady Henniker, Thomas Rivers, Alexander, Cox Pomona. W. L. TURNER.

FORCING HARDY PLANTS.

—An economical method of obtaining large quantities of flowers in winter; extensively used by commercial florists for cut-flowers and flowering plants. Plants usually forced are hyacinths, tulips, narcissus and other

Dutch bulbs, lily-of-the-valley, astilbe, dicentra, hybrid perpetual roses, *Deutzia gracilis*, hybrid rhododendrons (*R. Sincensis*, i.e., *Azalea mollis*), and Ghent azaleas, and lilacs. For other plants, see A. G. H.: 462 (1893).

This mode of procuring flowers at small cost has always been more or less in vogue among plantmen, and of late years has received fresh impetus, owing to the heavy demands for decorative plants at Easter. It is not only an inexpensive method of getting flowers, but with most plants, after a little experience, the time of blooming can be easily calculated. The process has limitations, at any rate with our present knowledge of the matter, inasmuch as, with the exception of "retarded plants" and a few bulbs, it is not practicable in late autumn and early winter. It is possible, however, that by using "retarded plants," i.e., plants held over their natural time of flowering by keeping them in cold storage at a temperature sufficiently low to prevent growth, this difficulty may eventually be overcome. Except, however, with lily-of-the-valley, which is admirably adapted to this practice, we know little of the possibilities of this form of Forcing; it is hoped that other plants, equally useful, may be treated in this way. It is evident that, on account of the cost of storage, bulky plants could not be handled.

The requirements for successful Forcing are: (1) a



851. Lilac pruned for forcing.

good knowledge of the plants; (2) proper preparation; (3) a period of rest; and (4) proper care after the plants are brought into heat.

Those plants force most easily which bloom in spring and early summer. Late-blooming kinds, like *Rhododendron maximum*, *Clethra* and *Hydrangea paniculata*, var. *grandiflora*, do not give good results. No success is obtained with asters and goldenrod, unless they are retarded. These points must be studied out by the grower.

Trees and shrubs should be specially prepared for Forcing by careful cultivation for 1 or 2 years before use. They can be planted out of doors, with plenty of room to develop, or they can be grown in pots; the latter method being used with vigorous plants, which are apt to run to growth without developing flower buds. Close pruning is necessary, and root-pruning is helpful. Grafting, which has a tendency to dwarf and hasten maturity, is also used with strong growers. Sometimes both growing in pots and grafting are employed, as in lilacs. Query: Could we learn anything in these particulars from the Japanese method of dwarfing plants?

A plant fit for Forcing must be compact, both top and roots; economy in space is essential. It is now possible to obtain from the French, Dutch and Belgian nurseries many plants grown for this purpose. A few come potted, but most of them are from the open ground; very little of this work is done in American nurseries. Figs. 849-851 show the methods of preparing woody plants for Forcing.

Herbaceous plants should be prepared for Forcing with equal care, and the process may require several years.

The removal of the lower buds and growth, under high cultivation, in close, compact clumps, apparently produces the same results that pruning and grafting accomplish for trees and shrubs. Fig. 852 shows the root-clump of an herb prepared for Forcing.

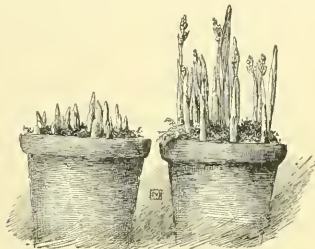
Plants that have once been forced are commonly thrown away. It is generally cheaper to buy new stock, but lilacs, azaleas, etc., can be planted out and will recover sufficient strength in 2 years for a second Forcing, or for other use. Some species,

like *Uiburnum plicatum*, *staphylea*, *colchicum*, etc, if grown on in pots after Forcing, may be again forced, and seem to do better the second year. This is probably explained by the fact that insufficient preparation was given for the first trial, the first Forcing being really "proper preparation" for the second Forcing.

Hardy plants must have a period of rest for successful Forcing, the time required varying in different species. One cannot tell, except by experiment, that Paper White narcissus will force easily in November and December, while the double Von Siou will not; the individual equation of each kind is an element which must be considered. There is a popular notion that freezing will shorten the time for resting, or, at any rate, is conducive to the welfare of the plant. This idea does not seem to stand any practical test. After potting, do not subject the plants to severe frosts (10 or 12° F.), or else the roots, now much exposed, may suffer. The large buds of lilac and rhododendron may also be injured if frozen hard.

Pot the plants as soon as they ripen their growth in autumn, beginning in September with herbaceous stock, and continuing until severe frost. It is possible, but not desirable, to lift some things after the ground is frozen hard. Plants received from abroad are potted on arrival, or, if furnished with a ball like azaleas (Fig. 849), they can be stored and not potted until brought into heat. Dutch bulbs are boxed or potted as they are received, and buried in the earth or piled in stacks and covered with enough leaves and litter to exclude frosts. Lily-of-the-valley, astilbe and dicentra are kept in their pack-

ing cases in a cool pit until ready for use. Large plants in tubs and boxes can be covered with leaves and kept out of doors, but most plants should be stored in a cool cellar, pit or frame kept at a temperature of 35° F.; a temporary variation of 5° either way does no harm. It is well to delay this storage until as late in the season as possible, but it must be done before severe weather.



853. Forcing Lily-of-Valley in pots.

They can be stowed compactly, in several tiers if necessary. It must be remembered that no growth is to be allowed while stored; it is their period of rest, and this must be enforced. Good ventilation must be given on bright days and every precaution taken against an accumulation of moisture; if the plants are well watered when put away very little will be required afterwards. Dampness is most serious with evergreens, like *Kalmia*, and such things as *Phlox subulata*. This stock should have the airiest positions, or it can be placed in shallow frames 2 ft. deep, which are drier than deep pits. In severe weather the pits are often covered with snow a week or more, but the plants will not suffer if this happens but once or twice during the winter. At such times mice and squirrels will make trouble unless trapped or poisoned.

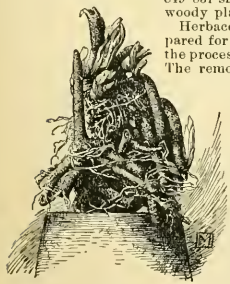
Nothing except retarded plants, a few bulbs and one or two kinds of prunus should be brought in before November. December 15 to January 1 is as early as it is safe to begin Forcing most hardy plants; it will be found that as the days lengthen the results will be more satisfactory. At first the plants must be kept cool, 45° F. or thereabout. Syringe twice a day until the buds swell; after growth starts the treatment is the same as that



854. Forced Trillium.

given greenhouse plants, and they can be put in a much warmer house if so desired. It is at this time that care in handling, particularly in the matter of heat, makes it possible to time the period of blooming so accurately, but it is impossible to give any general rules to satisfactorily cover these matters.

A few plants, like lily-of-the-valley, can be placed di-



852. *Dicentra* roots prepared for forcing.

rectly in a Forcing-box or pots, generally made over the pipes in the hottest house, where a temperature of 80° to 95° F. can be maintained. They are first soaked in water for a day or two and then kept in this heavy heat until flower buds are well developed (Fig. 853). Tulips, hyacinths and other bulbs, sometimes an azalea or lilac, can also be hurried up in

such a box, but it is dangerous, and not good practice; better and more lasting flowers come with ordinary treatment. Trilliums (Fig. 854) and various early-flowering wild plants may be forced with satisfaction.

Although no rules can be given for the time required in Forcing, it is knowledge not hard to acquire with even surprising exactness. Nothing is likely to require more than three months in houses ranging from 45° to 55° F.—i. e., after bringing in from the pits. A month or six weeks is good time to allow in February

855. *Forsythia suspensa*, var. *Sieboldii* ($\times \frac{3}{4}$).

and March, but with the same plants and temperatures, more time would be needed earlier; with the advance of the season, the work is quicker and less uncertain. There is great difference in plants. Rhododendrons (the hybrids) require eight weeks or more, but one species will often bloom in March, within twenty-four hours. Plants like the rose, which must make a growth before the buds form, take more time than azaleas. The difference between dull and bright weather is an important factor, but with extra firing, or the use of the Forcing-box, these matters even up, and the average time of flowering is wonderfully even. In this work, a man with good plant sense is most likely to succeed.

B. M. WATSON.

FORESTIÈRE (after Forestier, a French physician). Syn. *Adelia*. *Oleacea*. Deciduous, rarely evergreen trees or shrubs, with opposite, entire or serrate, generally rather small lvs., inconspicuous yellowish fls. and small black or bluish berries; without much decorative value, and but rarely cultivated. They cannot be grown North, except *F. acuminata* and *F. ligustrina*, which are tolerably hardy in New England. They grow in almost any soil, and are propagated by seeds and layers. About 15 species in N. Amer., from Illinois south; also in Mex. and W. Indies. Fls. dioecious, apetalous, with or without calyx, in small, axillary clusters in early spring, before the lvs.; stamens 2-4; fr. a small, mostly black, 1- or 2-seeded berry.

acuminata, Poir. (*Adelia acuminata*, Michx.). Deciduous shrub, to 10 ft. high, sometimes spiny, glabrous; lvs. slender petioled, ovate-oblong or ovate-lanceolate, remotely serrate, $1\frac{1}{2}$ -4 in. long; staminate fls. in dense clusters; pistillate fls. in short panicles; fr. narrow, oblong or cylindrical, falcate, acute, $\frac{1}{2}$ in. long. W. Illinois to Texas. Michx. Fl. Bor. Amer. 2:225. B.B. 2:603.

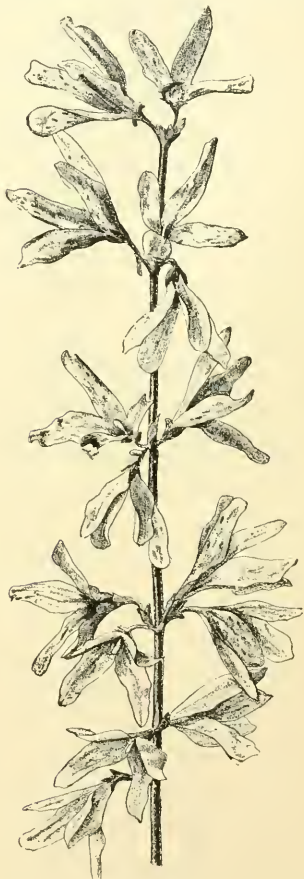
ligustrina, Poir. (*Adelia ligustrina*, Michx.). Deciduous shrub, to 6 ft., pubescent; lvs. elliptic-obovate to oblong, obtuse, appressed-serrulate, about 1 in. long; fls. in fascicles; fr. sessile, short-ovoid, obtuse, $\frac{3}{4}$ in. long. Tenn. to Fla. and Ala.

F. Neo-Mexicana, Gray. Shrub, to 10 ft.; lvs. spatulate, al-

most entire, usually glabrous, grayish green and rather small; fr. ovate or short-oblong, obtuse, $\frac{3}{8}$ in. Texas to N. Mex. and Colorado.

ALFRED REIDER.

FORESTRY is the rational treatment of forests; this treatment may vary with the object in view. Forests may subserve various objects, giving rise to three classes of forests: they furnish wood materials for the arts—*supply forests*; they furnish a soil cover, which prevents the blowing of the soil and formation of sand dunes, or which retards the erosion and washing



856. Flowers of *Forsythia suspensa*, var. *Fortunei*.
Natural size.

of the soil and regulates the waterflow, or which acts as a barrier to cold or hot winds, and exercises other beneficial influences on climate and surroundings—*protection forests*; or finally, they furnish enjoyment to the

esthetic and sporting elements in man, as game preserves and parks—*luxury forests*. Any two or all three objects may be attained simultaneously in the same forest. In the end, and in a more limited sense, Forestry is the art and business of making money from the growing of wood crops, just as agriculture and horticulture are finally concerned in producing values from food crops. In the economy of agriculture, wood crops may be grown on land which is too poor for field crops.

This art is divided into two distinct and more or less independent branches, namely silviculture, the technical branch, and forest regulation, the business branch.

Silviculture is a branch of the larger subject arboriculture, and comprises all the knowledge and skill applied in producing the wood crop, relying mainly on natural sciences. While horticulture and silviculture have both to deal with trees, their object and with

their treatment of trees are totally different: the orchardist works for the fruit of the tree, the landscape gardener for the pleasing form; in both cases the object is attained by the existence of the tree and its single individual development; the forester is after the substance of the tree, the wood; his object is finally only attained by the removal of the tree itself. He deals with masses of trees rather than individuals: it is logs in quantity and of desirable quality, clear of knots, not trees, that he is working for; hence, his treatment differs from that of the horticulturist. Since his crop takes many years to mature, some times a century and more, in order to carry on a continuous Forestry business, from which to secure annual returns, special arrangements peculiar to this business must be made: these arrangements, naturally influenced by the economic conditions of the country, form the subject of forest regulation.

The horticulturist, as such, is mainly interested in the rational treatment of such forests as have a protective value, influencing climatic, soil and water conditions in general and locally.

B. E. FERROW.

FORGET-ME-NOT.
Myosotis.

FORSYTHIA (after William Forsyth, prominent English horticulturist, director of the royal garden at Kensington, 1737-1804). *Oleacea*.

GOLDEN BELL. Highly ornamental, free-flowering shrubs, with opposite, simple or ternate lvs. and showy yellow fls., borne in great profusion along the slender branches in early spring. One of the showiest early-flowering shrubs,

with handsome, clean foliage, remarkably free from insects or fungi, and remaining unchanged until late in fall. The upright forms are well adapted for the borders of shrubberies and the pendulous form for covering walls, fences, arbors or porches. They grow in almost



857. Flowers of *Forsythia viridissima*. Nat. size.



858. *Forsythia viridissima* ($\times \frac{1}{2}$).

any kind of garden soil, and are hardy North. Prop. readily by greenwood and hardwood cuttings; also by seeds. The branches of the pendulous form often take root at the tips when touching the ground, and send forth vigorous shoots, like some brambles or the walking fern. Two species in China, much cult. in Japan, and one recently discovered in southeastern Europe. Low shrubs, glabrous throughout, with slender, quadrangular branches and opposite, serrate lvs.: fls. 1-3, axillary, pedicelled; calyx and corolla deeply 4-lobed, lobes of the corolla oblong, longer than the campanulate tube; stamens 2, included; fr. a 2-celled, dehiscent capsule, with many winged seeds.

suspensa, Vahl. Shrub, to 8 ft., but the branches often lopping on the ground and taking root; lvs. broad-ovate or oblong-ovate, serrate, 3-4 in. long; fls. 1-3, about 1 in. long, golden yellow, tube striped orange-yellow within; calyx about as long as tube; capsule ovate, about 1 in. long. China. S.Z. 3.—Two varieties can be distinguished. Var. *Sieboldi*, Zabel (*F. Sieboldi*, Dipp.). Fig. 855. Low shrub, with very slender, pendulous or trailing branches; lvs. mostly simple, broad-ovate or ovate. B.M. 4965. F.S. 12:1253, Gu. 33, p. 563. A.G. 13:94. G.F. 4:79. Var. *Fortunei*, Rehder (*F. Fortunei*, Lindl.). Fig. 856. Of more vigorous growth, with upright or arching branches; lvs. often ternate, ovate or oblong-ovate; corolla with more narrow and twisted segments. R.H. 1861:291. *F. suspensa* is an excellent shrub for the margins of groups, because it finally rolls over and meets the greensward. It can also be trained over an arbor. Less common than *F. viridissima*, but better.

intermedia, Zabel (*F. suspensa* \times *viridissima*). Shrub, with slender, erect or arching branches; lvs. ovate-lanceolate, sometimes 3-lobed or ternate, coarsely serrate, 3-4 in. long; fls. almost like those of *F. suspensa Fortunei*. Gt. 1885:1182 and 40; p. 397.—Often confounded with forms of *F. suspensa*. In foliage it resembles much the following, which has the lvs. narrower, always simple, usually serrate only above the middle, with smaller teeth. It is as hardy as *F. suspensa* and very floriferous.

viridissima, Lindl. Figs. 857, 858. Shrub, to 10 ft., with green, erect branches; lvs. oblong-lanceolate or

lanceolate, always simple and generally serrate only above the middle, very dark green, 3-6 in. long; fls. about 1 in. long; corolla with rather narrow, twisted lobes of bright, somewhat greenish yellow; calyx about half as long as tube. B.M. 4587. F.S. 3:261. B.R. 33:39. — Less hardy and graceful than the other species.

F. Europæa, Deg. & Bald., from Albania, has small, ovate-lanceolate, quite entire lvs.

ALFRED REIDER.

FOTHERGILLA (after John Fothergill, eminent English physician, who introduced and cultivated many new plants, 1712-1780). *Hamamelidaceæ*. Hardy ornamental shrubs, with alternate, deciduous, simple, dull green lvs. and showy spikes of white fls. in spring with the lvs.; the distinct foliage resembles somewhat that of the alder, or more that of *Hamamelis*, and turns yellow late in fall. They grow best in moist, peaty or sandy soil. Prop. by seeds, not germinating until the second year, or by layers, which take two years to root; the first species also by suckers and root-cuttings. Two closely allied species in the S. Alleghanies: low shrubs, with the branches densely stellate-pubescent; lvs. stipulate, dentate-crenate; fls. in terminal spikes, perfect, apetalous; calyx can-

majör, Lodd. (*F. monticola*, Ashe. *F. alatifolia*, var. *majör*, Sims). Bushy shrub, with upright branches, to 6 ft.; lvs. broadly obovate or roundish, oval, cordate or truncate, coarsely crenate or undulate even to the base, sometimes nearly glabrous beneath, 2½-5 in. long; spikes 1½-3 in. long, with 1-3 lvs. at the base; stamens ½ in. long, white. B.M. 1342. L.B.C. 16:1520. — This species is superior to the former on account of its dense, pyramidal habit, larger lvs. and showier fls.

ALFRED REIDER.

FOUNTAIN PLANT. *Amarantus salicifolius*.

FOUQUIÈRIA Pierre Ed. Fouquier, professor of medicine at Paris). *Tamariscæ*. CANDLEWOOD. Four species of plants from the deserts of Mex. and New Mex., of which one is cult. in the larger rockeries of Calif., and is interesting as being an example of an order far removed from the *Caetaceæ* in fls. and fr., but reduced to something of their habit by the desert. It is often cult.



859. *Fragaria Chiloensis*.

panulate, 5-7-lobed; stamens numerous, with the filaments thickened toward the end; capsule dehiscent, 2-celled and 2-seeded.

Gårdeni, Murr. (*F. alatifolia*, Linn. f. *F. Carolina*, Britt.). Low shrub, with generally spreading branches, to 3 ft.; lvs. oblong or obovate, rounded or cuneate at the base, coarsely dentate above the middle, pubescent and pale or glaucous beneath, 1-2 in. long; spikes ovate or oblong, 1-2 in. long, leafless at the base; stamens ½-¾ in. long, sometimes pinkish. B.M. 1341. L.B.C. 16:1507.



860. *Fragaria Virginiana*.
Showing the profuse runners.

by the Mexicans to make an impenetrable, spiny hedge. The plant has small and comparatively few lvs., borne in clusters in the axils of the spines. Fls. with a funnel-shaped tube 1 in. or more long, and 5 spreading lobes.

spléndens, Engelm. COACH-WHIP. VINE-CACTUS. JACOB'S STAFF. OCOTILLO. Shrub, 6-10, or even 20 ft. high, branching near the base; branches long, gray, furrowed, erect; lvs. obovate, rounded at apex, wedge-shaped at base, ½-1 in. long; inflo. racemose, thyrsoid; fls. scarlet or brick-red; stamens 8-12, exserted; seeds white, with a long fringe of spirally thickened hairs. W. Tex. and Ariz. to S. Calif. A.G. 13:759.

F. FRANCESCHI and W. M.

FOURCROÏA. See *Furcraea*.

FOUR-O'CLOCK. See *Mirabilis Jalapa*.

FOXGLOVE. *Digitalis*.

FRAGARIA (Latin *fragrare*, fragrance, from the smell of the fruit). *Rosacea*. STRAWBERRY. A small genus of low perennials in the north temperate zone and along the American Cordilleran region. The lvs. are palmately 3-foliolate and toothed, all from the crown of the plant; fls. white or yellow, in corymbose racemes on slender, leafless scapes, sometimes lacking stamens; calyx deeply 5-lobed and reinforced by 5 sepal-like bracts; petals 5, obovate; stamens many, short; pistils many, on a conical receptacle, becoming small and hard akenes and persisting on the enlarging receptacle. The enlarged receptacle becomes pulpy and edible in the Strawberry, or *Fragaria* proper, but it remains small in *Duchesnea*. See Figs. 826, 827. *Fragarias* propagate naturally by means of runners.

The *Fragarias* are exceedingly variable. About 130 specific names have been applied to them, but there are probably not more than a dozen forms which are distinct enough to be clearly distinguished as species. Bentham and Hooker would reduce them all to three or four species. Of the true *Fragarias*, four species-types

white below, blunt-toothed; fl.-clusters forking and long-rayed, the peduncle short, soon lopping on the ground; runners mostly appearing after the fruit is gone; berry large and firm, dark-colored, more or less musky in flavor, reinforced by a very large calyx or hull. Pacific coast region of S. Amer. A common wild Strawberry of the Pacific slope of N. Amer. is referred to this species, but it is a question whether it is identical with the S. American form.

Var. *ananássa*, Hort. (*F. ananássa*, *F. tineta*, *F. calyculata*, Duchesne. *F. grandiflora*, Ehrh.). PINE STRAWBERRY. COMMON GARDEN STRAWBERRY. Taller growing; lvs. larger and thinner, mostly lighter green on both sides; fr. larger, running into very many kinds.

Virginiana, Duchesne (*F. Iowaensis* and *F. Illinoisensis*, Prince). SCARLET or VIRGINIAN STRAWBERRY. Figs. 860, 861, 862. More slender; lvs. thinner, light green above and below, the upper surface with suken veins; fl.-clusters small, with a few hanging fruits at the top of a rather long peduncle; runners usually appearing with the fruit; berry

small, light scarlet, globular or oblong-conical, usually with a constriction or neck underneath the moderate-sized calyx or hull. E. North Amer.—Variable. The larger and more hairy forms have been separated as var. *Illinoisensis*, Gray, but it is difficult to define them from the type; and the same is true of the boreal forms, which have been detached as *F. Canadianensis*, Michx. A few early varieties of Strawberries, as Crystal City, seem to be wholly or partly of *F. Virginiana* origin.

BB. Lvs. normally shorter than the fl.-clusters; akenes usually not sunken in the flesh of the berry.



862. Fruit of *Fragaria Virginiana*. Nat. size.

vesca, Linn. (*F. semperflorans*, Duchesne). ALPINE and PERPETUAL STRAWBERRIES.

Erect and dark green, only sparsely hairy, the lvs. thin and light green as compared with the foregoing species, very sharp-toothed; fl.-cluster small, forking, erect; berry firm, small, usually oblong-conical, the akenes very prominent; hull spreading. Eu.—The American representative of this species—common in woods N.—is thought by some to be a distinct species, and it has received the name *F. Americana*, Britt.; but it is doubtful if it can be separated. See Figs. 863, 864. The true *F. vesca* is thought to be sparingly naturalized eastward. The native plant often bears white fruit. The cult. forms are rarely seen in this country, but the quality is high, and they are deserving of more attention in home grounds. Variable in cult. There is a form with leaflets reduced to one (*F. monophylla*, Duchesne, B.M. 63). This type of Strawberry bears more continuously than *F. Chiloensis* and *F. Virginiana*. The so-called Mexican or Everbearing Strawberry which has been introduced at times is *F. Mexicana*, Schlecht., which is another form of the vescan type. On the Pacific slope, the type possibly may be represented by *F. Californica*, Cham. & Schlecht.

moscháta, Duchesne (*F. elatior*, Ehrh.). HAUTOIS. Taller, usually dioecious, more pubescent, the calyx or hull strongly reflexed from the fruit; berry dull red, musky. Eu.—Cult. forms rarely seen in Amer.

AA. DUCHESNEA. Receptacle less fleshy, tasteless; habit trailing; fls. yellow.

Índica, Andr. Neat trailing plant with small obovate crenate-dentate leaflets, solitary long-pedicelled fls., and calyx bracts toothed. India. Naturalized E.—Very useful as a basket trailer. L. H. B.

FRAGRANT BALM. *Monarda didyma*.



861. *Fragaria Virginiana*.

are interesting to the horticulturist as the parents of the garden Strawberries.—*F. Chiloensis*, the original of the ordinary cultivated Strawberries of America; *F. Virginiana*, which was early domesticated, and of which some trace still remains in cultivated varieties; *F. moschata*, the Hautois, and *F. vesca*, the alpine and perpetual Strawberries, which are little cultivated in this country. Aside from these, the Indian Strawberry, or Duchesnea, is cultivated as a basket and rock plant. For a sketch of the evolution of Strawberries, see Essay 23, Bailey's "Survival of the Unlike." The classical work on Strawberries is Duchesne's "Histoire Naturelle des Fraisières." 1766. See Strawberry.

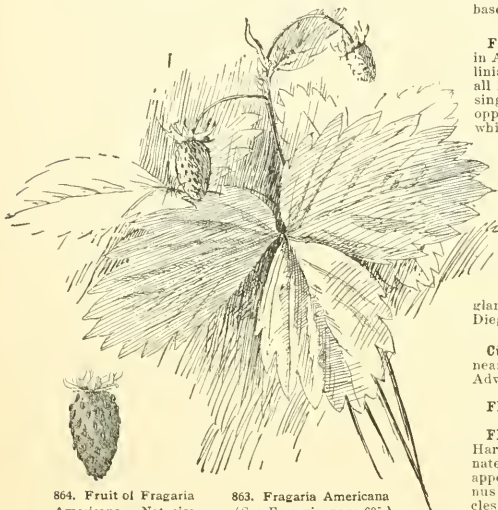
A. TRUE STRAWBERRIES, bearing an edible "berry" (or receptacle), and with a more or less upright habit; fls. white.

B. Lvs. normally overtopping the fls. and fr.: akenes mostly sunken in the flesh of the berry.

Chiloensis, Duchesne. Fig. 859. Low, but stout in all its parts; lvs. thick, more or less glossy above, bluish

FRAME. Fig. 865. A box without permanent top or bottom which is designed, when covered with glass or other transparent material, as a place in which to grow plants. When supplied with artificial bottom heat, the frame is part of a hotbed; when supplied only with sun

constantly kept in a greenhouse, especially if it be planted in the open soil, where it can be freely exposed to light and air, without which the beautiful spots of its petals are scarcely developed." His plate shows 4 pretty red spots near the base of each petal. L.B.C. 19:1864 erroneously named *F. sonchifolia*, has the midveins and bases of the side veins of the petals dark red. W. M.



864. Fruit of *Fragaria Americana*. Nat. size.

863. *Fragaria Americana* (See *Fragaria*, page 605.)

heat, it is part of a coldframe. The frame may be of any size, but the normal size is 6 x 12 ft., an area which accommodates four 3 x 6 ft. sashes; and this 6 x 12 area is understood when one speaks of "a frame." See *Hotbed*.

L. H. B.

FRANCISCEA. Included with *Brunfelsia*.

FRANCÒA (Fr. Franco, Valencia, sixteenth century). *Saxifragaceae*. Three species of Chilean perennial herbs, with turnip-like (lyrate) lvs. and terminal, dense racemes of white or pink fls. borne in summer. They are interesting as having points in common with *Crasulaceae*, *Rosaceae*, *Galax* and even *Dionaea*. They grow about 2 ft. high, and in the North could perhaps be wintered in a coldframe. Scape-bearing, glandular-pilose or tomentose; rhizome thick, many-headed; lvs. glandular-dentate; fls. 1 in. across, as many as 36 in racemes 6 in. long; floral parts in 4's, rarely 5's; petals obovate, clawed.

A. Fls. white.

ramosa, D. Don. Taller, woodier and more branching than the others, and distinguished by pubescent inflorescence. Leaf-stalks not margined; fls. smaller. Hardy at Washington, D. C., according to J. Saul, with spikes 2 ft. long and 1 in. thick.

AA. Fls. mostly pink.

B. Leaf-stalks broadly winged at the base.

sonchifolia, Cav. Lower lobes continuous with the broad margin at the base of the leaf-stalk; petals deep rose, dark-spotted. B. M. 3309.

BB. Leaf-stalks not winged at the base.

appendiculata, Cav. Lower lobes distant from the base of the stalk; petals pale rose, rarely spotted. B. M. 3178 (shows a white longitudinal band on petals). B. R. 19:1645, where Lindley said (1833), "It thrives better if

FRASERA (John Fraser, English botanist, collected in America 1785-96 and published Walter's *Flora Caroliniana*). *Gentianaceae*. Colorado. Large, stout herbs, all North American, and all but one far western with a single stem from thick, bitter, mostly biennial roots, opposite or whorled lvs., and cymose clusters of dull white, yellowish or bluish fls. which are commonly dark-spotted; calyx deeply 4-parted; corolla wheel-shaped, 4-parted, persistent.

A. Lvs. in whorls of 4-6, not white-margined.

speciosa, Dougl. Fls. greenish white or barely tinged bluish, dark-dotted; 2 glands on each corolla lobe.—Cult. by D. M. Andrews, Boulder, Colo.

AA. Lvs. in 2's or 3's, white-margined.

B. Height 2-3 ft.; fls. whitish, dark-dotted.

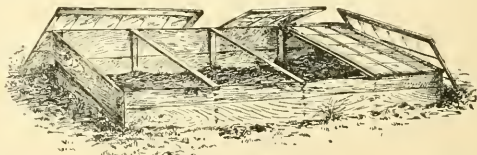
Parryi, Torr. Lvs. opposite or in 3's; 1 notched gland on each corolla lobe.—Int. 1891 by Orcutt, San Diego.

BB. Height 3-8 in.; fls. bluish.

Chsickii, Gray. Lvs. opposite; 1 gland reaching from near the base to near the middle of each corolla lobe.—Adv. 1889 by F. H. Horsford, Charlotte, Vt. W. M.

FRAXINELLA. See *Dictamnus*.

FRAXINUS (ancient Latin name). *Oleaceae*. Ash. Hardy ornamental trees, with deciduous, opposite, pinnate, rather large lvs. and small fls. in panicles, either appearing before the lvs. and greenish, or in the subgenus *Ornus* after or with lvs. and whitish in showy panicles: the winged fr. is insignificant. They are valuable as street and park trees, and grow mostly into tall, pyramidal or broad-headed trees, with rather light green foliage, which turns yellow or dark purple in fall or remains green, as in *F. excelsior* and *Ornus*. The Ash is seldom severely injured, though a number of insects and fungi prey on the lvs. and wood, of which two borers, and a fungus attacking the lvs., are perhaps the most obnoxious. Most of the species are hardy North except those from the southern states, southern Europe and Himalayas; of the sub-genus *Ornus*, *F. Bangueana* and *F. longiceps* seem to be the hardiest. The Ashes are important forest trees, and the straight-grained and tough wood is much used for handles of tools, in the manufacture of carriages and wagons, for the interior finish of houses, and for furniture, for baskets and also for fuel. From *F. Ornus* manna is obtained as an exudation of the trunk, and some Chinese species yield the Chinese white wax. The Ashes grow in almost any moderately moist soil, *F. nigra* being somewhat more moisture-loving, while *F. oxycarpa*, *F. Ornus*, *F. Sogdii*



865. A Frame.

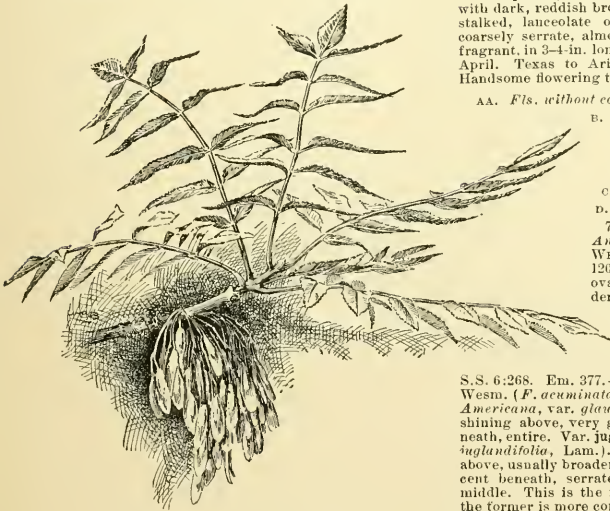
It accommodates four sashes.

ana and *F. cuspidata* grow well even in drier situations. They are generally readily transplanted and grow rapidly when young. Prop. by seeds gathered in fall and sown immediately, or stratified and sown in spring, covered about 1 in. high with good soil; sometimes remain dor-

mant until the second year. The varieties and rarer kinds are budded in late summer or grafted in spring on the seedlings of any of the common species. About 40 species in the temperate region of the northern hemisphere south to Cuba; about 15 of the species grow in N. Amer. and nearly as many in E. Asia. Trees or shrubs, with odd-pinnate, rarely simple, opposite lvs. without stipules; fls. in panicles, dioecious or polygamous, with or without calyx or with calyx and a 2-6-parted corolla with generally linear segments; stamens generally 2; ovary 2-celled; fr. a 1-seeded, winged samara.

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866. *Fraxinus excelsior* ($\times \frac{1}{2}$).

A. Fls. with calyx and corolla perfect or polygamous. (Subgenus *Ornus*.)

B. Winter-buds gray.

1. *Ornus*, Linn. (*F. floribunda*, Hort., not Wall.). Small tree, becoming 25 ft.: lfts. generally 7, stalked, oblong-ovate or ovate, irregularly serrate, rufously pubescent on the midrib beneath, 2-3½ in. long; fls. whitish, fragrant, in dense, terminal panicles 3-5 in. long; fr. erect, narrow-oblong, truncate or emarginate at the apex, about 1 in. long. May, June. S. Eu., W. Asia. Gn. 48, p. 286.—Var. *latifolia*, Ait. (*F. rotundifolia*, Hort., not Lam.). Lfts. roundish ovate or broadly ovate-oblong.

2. *Bungeana*, DC. Small tree, to 15 ft., or shrub; lfts. generally 5, stalked, ovate, obovate or roundish, obtuse to short-acuminate, serrate, glabrous, 1-1½ in. long; panicles to 2½ in. long, many-fl'd. fr. narrow-oblong, obtuse or emarginate. May. China. G.F. 7:5.—Var. *parvifolia*, Dipp. Lfts. about 1 in. long, broadly rhombic or roundish.

BB. Winter-buds brown or nearly black.

C. Corolla divided to the base; stamens with rather long filaments.

3. *longicuspis*, Sieb. & Zucc. Slender tree, to 30 ft., with rufously pubescent winter-buds; lfts. 5-7, stalked, oblong-lanceolate, long-acuminate, obtusely serrate, almost glabrous, 2-4 in. long; fls. in rather slender, narrow panicles, to 4 in. long; petals linear, acute; fr. ob-lanceolate. May, Japan.

4. *Sieboldiana*, Blume. Small tree; winter-buds mostly glabrous and often almost black; lfts. 5-7, almost sessile, elliptic or oblong-lanceolate, acuminate, serrate, usually pubescent along the midrib beneath, 2-4 in. long; panicles like the former; petals linear-spatulate, obtuse; fr. ob-lanceolate. May, Jap., Corea.

5. *pubinervis*, Blume. Small tree; lfts. 7-11, ovate or ovate-oblong, acute or acuminate, serrate, pubescent on the veins beneath, 1½-4 in. long; panicles less narrow than in the former; petals small and caducous. Jap.—Probably *F. serratifolia*, Hort., belongs here.

CC. Corolla with short tube; anthers almost sessile.

6. *cuspidata*, Torr. Shrub or small tree, to 20 ft., with dark, reddish brown buds; lfts. usually 7, slender stalked, lanceolate or oblong-lanceolate, acuminate, coarsely serrate, almost glabrous, 1½-2 in. long; fls. fragrant, in 3-4-in. long panicles; fr. spatulate-oblong. April. Texas to Arizona and N. Mex. S.S. 6:260.—Handsome flowering tree for temperate regions.

AA. Fls. without corolla, appearing before the lvs.

B. Fls. dioecious, with the calyx persistent on the fr.: anthers linear or linear-oblong; lfts. generally 5-7; buds brown. (Subgenus *Leptulix*.)

C. Fr. ob-lanceolate or lanceolate.

D. Branches and petioles glabrous.

7. *Americana*, Linn. (*F. Novae-Angliae*, Mill. *F. alba*, Marsh.). WHITE ASH, Fig. 867. Tall tree, to 120 ft.: lfts. generally 7, stalked, ovate to ovate-lanceolate, entire or denticulate, dark green above, glaucous beneath, 3-5 in. long; fr. linear-oblong, with terete body, the wing not decurrent, 1½ in. long. From Canada to Fla., west to Minnesota and Texas.

S.S. 6:268. Em. 377.—Very variable. Var. *acuminata*, Wesm. (*F. acuminata*, Lam. *F. epiptera*, Michx. *F. Americana*, var. *glauca*, Hort.). Lfts. dark green and shining above, very glaucous and almost glabrous beneath, entire. Var. *Juglandifolia*, Rehd. (*F. Juglandifolia*, Lam.). Lfts. less shining above, usually broader, more or less pubescent beneath, serrate at least above the middle. This is the northern form, while the former is more common in the southern states. Var. *albo-marginata*, Hort. Lfts. edged white.

8. *lanceolata*, Borkh. (*F. viridis*, Michx. in part. *F. Pennsylvanica*, var. *lanceolata*, Sarg.). GREEN ASH. Tree, to 60 ft.: lfts. 5-9, short-stalked, ovate to oblong-lanceolate, irregularly serrate, green on both sides, almost glabrous, 2-5 in. long; fr. ob-lanceolate, with decurrent wing, hence body margined, about 1½ in. long. Canada to Fla., west to Rocky Mts. S.S. 6:272.

DD. Branches, petioles and lvs. beneath pubescent, at least when young.

9. *Pennsylvanica*, Marsh. (*F. pubescens*, Lam.). RED ASH. Tree, to 60 ft.: lfts. 5-9, stalked, ovate to oblong-lanceolate, acuminate, crenately serrate or entire, pubescent beneath, 3-6 in. long; fr. linear-spatulate, about 2 in. long, with somewhat decurrent wing. Canada to Fla., west to Dakota and Mo. S.S. 6:271.—Var. *acubæfolia*, Hort. Lvs. blotched yellow, less pubescent. Var. *Bosci*,

867. Fruit or key of *Fraxinus Americana*. Nat. size.

Hort. With dark green, shining foliage. Var. *pannosa*, Hort. Similar to the former, but lvs. larger and narrower.

10. *velatina*, Torr. (*F. pistaciifolia*, Torr.). Tree, to 40 ft., with velvety pubescent, rarely glabrous branches; lfts. 5-9, sometimes reduced to 3 or even 1, short-stalked, oval to lanceolate, entire or remotely serrate, yellowish green, firm and thick at maturity, pubescent or nearly glabrous beneath, 2-4 in. long; fr. spatulate, with marginless body. Texas to Arizona and N. Mexico. S.S. 6:267.—Not hardy North.

11. *Oregona*, Nutt. Tree, to 80 ft.; petioles sometimes glabrous at length; lfts. 7-9, almost sessile or short-stalked, oblong or elliptic, acuminate, entire or obscurely and remotely serrate, light green, 2½-6 in. long, thick and firm at maturity; fr. oblong-ovate, with decurrent wing, about 1½ in. long. Wash. to Calif. S. S. 6:276.

cc. *Fr. elliptic or broadly spatulate, body compressed with the wing all around.*

12. *Caroliniana*, Lam. (*F. platycarpa*, Michx.). WATER ASH. Tree, to 40 ft., with pubescent or glabrous branches; lfts. 5-7, stalked, ovate or oblong, acuminate, serrate, rarely entire, pubescent or glabrous beneath, 2-5 in. long; fr. 1-2 in. long, with minutely veined wing, often 3-winged. Virginia to Fla., west to Arkansas and Texas. S.S. 6:274-75.

BB. *Fls. without calyx (only No. 13 has a deciduous minute calyx); anthers cordate, rarely broadly oblong; lfts. generally more than 7, nearly glabrous. (Subgenus Fraxinaster.)*

c. *Branches 4-angled and usually winged.*

13. *quadrangulata*, Michx. BLUE ASH. Tree, to 80, rarely 120 ft.; lfts. 7-11, short-stalked, ovate to lanceolate, acuminate, sharply serrate, yellowish green on both sides, 3-5 in. long; fls. perfect; fr. oblong, emarginate, winged all around, 1-2 in. long. From Michigan to Arkansas and Tennessee. S.S. 6:263.

cc. *Branches terete or nearly so.*

d. *Bloom dioecious: rachis at the base of lfts. with thick rufous tomentum.*

14. *nigra*, Marsh. (*F. sambucifolia*, Lam.). BLACK ASH. Fig. 868. Tree, to 80 ft.; lfts. 9-11, sessile, oblong-lanceolate, rounded at the base, acuminate, sharply serrate, green on both sides, dark above, 3-6 in. long; anthers broadly oblong; fr. narrow-oblong, with decurrent wing. From Canada to Virginia, west to Mo. S.S. 5:264-65. Em. 382.

15. *Mandschurica*, Rupr. Tree, to 100 ft., with obtusely quadrangular branches and dark brown buds; lfts. 9-11, almost sessile, ovate to oblong-lanceolate, sharply serrate, pubescent or hispid on the veins beneath, 3-6 in. long; fr. oblong-lanceolate, 1-1½ in. long. Manchuria, Corea, Saghalin, Japan. Valuable tree of vigorous growth.

DD. *Bloom perfect or polygamous: rachis without conspicuous rufous tomentum.*

E. *Buds black.*

16. *excelsior*, Linn. Fig. 866. Tall tree, to 120 ft.; buds black; lfts. 9-13, almost sessile, oblong-ovate or ovate-lanceolate, acute or acuminate, serrate, dark green above, paler beneath, 2-5 in. long; fr. oblong, often emarginate, about 1½ in. long. En., W. Asia. Many different varieties are cultivated, some of the most distinct being the following: Var. *albo-marginata*, Hort. Lfts. edged white. Var. *albo-variegata*, Hort. Lfts. blotched white. Var. *aurea*, Loud. With yellow branches. Var. *aurea pendula*, Loud. With pendulous yellow branches, but a somewhat weak grower. Var. *asplenifolia*, O. Ktze. (var. *scelopendrifolia*, Hort.). Lfts. very narrow, almost linear. Var. *crispa*, Willd. (var. *atrovirens*, Hort., var. *eucallata*, Hort.), with very dark green curled and twisted lvs.; of slow growth. Var. *diversifolia*, Ait. (*F. heterophylla*, Vahl. *F. simpliciifolia laciniata*, Hort.

F. rufa, Hort., not Bosc). Lvs. simple or 3-parted, usually incisely dentate. Var. *monophylla*, O. Ktze. (*F. monophylla*, Desf. *F. simpliciifolia*, Willd.). Lvs. simple, ovate, serrate, rarely with 1 or 2 small lfts. at the base. Var. *nana*, Loud. (var. *potamoniifolia*, var. *globosa*, Hort.). A compact, slow growing, dwarf form with very small lvs. Var. *pendula*, Ait. With pendulous branches. One of the best pendulous trees for forming arbors and shady seats.

EE. *Buds brown.*

17. *parvifolia*, Lam. (*F. lentiscifolia*, Desf.). Shrub or small tree, to 15 ft., with slender, often purplish branches; lfts. 7-13, sessile, obovate or obovate-lanceolate, acute, serrate, 1-2 in. long; fr. oblong, obtuse or acute. W. Asia, S. Europe. Var. *pendula*, Dipp., with pendulous branches, forming a graceful small weeping tree.

18. *potamophila*, Herd. Small tree, to 30 ft., with rather stout, upright branches; lfts. 7-13, stalked, rhombic-ovate or ovate-lanceolate, serrate, acute or acuminate, 1-2½ in. long; fr. linear-oblong, Turkistan, Songaria.

F. angustifolia, Vahl. Allied to *F. parvifolia*. Lfts. oblong-lanceolate or lanceolate, serrate, to 3 in. long. S. En., N. Afr., W. Asia.—*F. anomala*, Wats. Small tree, to 20 ft., with quadrangular branches; lvs. simple or pinnate, roundish or roundish ovate, 1½-2 in.; fr. obovate. Colo., Utah. S.S. 6:266.—*F. argentea*, Loisel. is a var. of *F. rotundifolia*, but in gardens often other Ashes, especially variegated forms, are cult. under this name.—*F. Bertlandieriana*, DC. Allied to *F. lanceolata*. Tree, to 70 ft.; lfts. 3-5, ovate or obovate, serrate, downy along the veins beneath, to 4 in. long. Texas to Mexico. S.S. 6:273.—*F. Biltmoreana*, Beadle. Allied to *F. Americana*. Tree, to 50 ft.; branches pubescent; lfts. 7-9, oblong-lanceolate, pubescent beneath, 3-6 in. long; fr. 1½-2 in. long, emarginate, with elliptic,



868. Key of Fraxinus nigra.

Nat. size.



869. *Freesia refracta*, var. *Leichtlinii*.

marginless body. N. Carolina.—*F. dimorpha*, Coss. & Dur. Allied to *F. xanthoxyloides*. Shrub; lfts. 5-7, roundish ovate to oblong, crenately serrate, ½-1 in. long. N. Africa. Tender.—*F. dipetala*, Hook. & Arn. Allied to *F. cuspidata*. Shrub; lfts. 5-7, elliptic or ovate, serrate or entire, ½-2 in. long; fls. with 3 obovate petals. Calif., Mexico. S.S. 6:261. Tender.—*F. Hortibunda*, Wall. Allied to *F. longispinus*. Tree, to 40 ft.; lfts. 5-7, ovate-lanceolate, serrate, reticulate beneath, 2-4 in. long; panicles large, to 10 in. long; petals oblong. Himalayas. Tender.—*F. Griggsi*, Gray. Allied to *F. cuspidata*. Small tree; lfts. 3-7,

oblong-ovate, crenately serrate, or entire, $\frac{1}{2}$ -1 in. long; fr. linear-oblong, emarginate. S.S. G.F. 2:431.—*F. Maritima*, Hook. f. Allied to *F. Bungeri*. Shrub; fls. 5, almost sessile, obovate to ovate-lanceolate, entire or serrate, acute, 1-3 in. long. China. B.M. 6678.—*F. oxycarpa*, Willd. (*F. oxyphylla*, Bieb.). Allied to *F. parviflora*. Tree, to 60 ft.; fls. 5-11, lanceolate, serrate, pubescent along the midrib beneath, $1\frac{1}{2}$ -3 in. long; fr. oblanceolate, acute. S. Ea. W. Asia.—*F. profunda*, Bush. Allied to *F. Pennsylvaniae*. fls. 7-9, oblong-lanceolate, acuminate, entire, 3-6 in. long, tomentose beneath; fr. 2-2 $\frac{1}{2}$ in. long, with decurrent wing. Ark. Mo.—*F. raibocarpa*, Regel. Shrub; fls. 3-7, oblong or oblong-ovate, usually entire, obtuse, 1-2 in. long; fr. strongly falcate, with obovate not decurrent wing. Turkestan, Buchar.—*F. Regelii*, Dipp. Probably only var. of *F. potanophila*, with darker green, broader and less acute fls. Turkestan.—*F. rhynchophylla*, Haene. Large tree; buds large, thickly covered with rufous tomentum; fls. 5, oblong-ovate, remotely crenate-serrate, 2-4 in. long; fr. perfect, apetalous, with a calyx. China. G.F. 6:485.—*F. rotundifolia*, Lam. Allied to *F. Ormus*. Small tree, to 25 ft.; fls. 5-9, roundish or roundish obovate, irregularly serrate. S. Europe.—*F. Sogdiana*, Bge. Allied to *F. angustifolia*. Small tree. Fls. often in 3's and rather crowded; fls. 3-5, lanceolate, serrate, 2-4 in. long. Turkestan.—*F. tamariscifolia*, Vahl. Allied to *F. parviflora*. Small tree; fls. 9-11, short-stalked, oblong-lanceolate, serrate, 1-3 in. long. W. Asia.—*F. Texensis*, Sarg. Allied to *F. Americana*. Tree, to 40 ft.; fls. 5, broadly oval or ovate, rounded at apex at the apex, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long. Texas. S.S. 8:270.—*F. Theophrasti*, Nouv. Dnh., is a var. of *F. Ormus*, but in gardens other forms are sometimes cult. under this name.—*F. Turkestanica*, Carr.—*F. Sogdiana*.—*F. xanthoxyloides*, Wall. Shrub or small tree, to 25 ft.; fls. 5-9, oblong, crenulate-serrate, 1-2 in. long. Himalayas. Belongs to the subgenus *Sciandanthus*, having perfect apetalous fls. with calyx.

ALFRED REIDER.

FREESIA (the author of this genus never explained the name). *Iridaceae*. *Freessias* (Fig. 869) are amongst the dozen most popular bulbous plants for fall planting and winter blooming, and next to the Chinese narcissus, which can be grown in pure water, they flourish in home windows with less care than most other bulbs. They have tubular fls., white or pale yellow, borne in a pretty fashion that makes them amongst the most highly individualized of all garden plants. The 5-7 fls. are upright and strung along a jointed axis which is suddenly bent back almost at right angles to the vertical peduncle. This habit is an accentuated detail of *Fritonia*, from which *Freessia* is essentially distinguished by the 2-ant style.) Of the splendid and almost numberless bulbs from the Cape of Good Hope (including the iris, amaryllis, and lily families) *Freessias* are, next to gladioli, the most popular, though not so variable as *Ixias*. This popularity is a growth of the last quarter century or less, though *Freessias* have been in cultivation since 1816 or earlier. Conservative botanists now suppose that the *Freessias* are all originally of one stock, which species should be called *F. refracta*. The extremes of variation in form are shown in Figs. 869 and 870, from the long and slender tube of var. *alba* to the short and broader tube of var. *Leichtlinii*. One of the earliest pictures of the plant is that in the Botanical Register for 1816 (Plate 155, as *Triphala refracta*), a part of which is reproduced in Fig. 870 to show the great irregularity of the corolla lobes at that early period, and the straggling habit of the fls., some pointing down and others up. The colors in the plate are unattractive, almost repulsive, being a sickly green throughout, with a strong orange color on the tips of the 3 lower lobes. The garden evolution of the *Freessias* has proceeded along two lines. The greatest effort has been expended to produce a pure white flower, and in the best strains the white color is mostly associated with a long and slender tube. The ideal of a yellow flower is less popular, and is mostly associated with the shorter and broader tube. In both cases the forms with straggling inflorescence and irregular corolla lobes have been relentlessly suppressed. One may easily see how strongly 2-lipped and gaping were the flowers of 1816, and how strongly the tube was bulged upon one side. Any tendencies toward such forms in modern bulbs are signs of degeneration or carelessness somewhere. In pedigree plants the lobes are beautifully rounded and the flowers symmetrical. Perhaps the most charming picture of the two prevailing ideals is Plate 347 of the Garden, vol. 22, 1882. One of the earliest pictures of the short- and broad-tubed yellow type is that in L.B.C. 19:1820, published in 1832 as *Triphala odorata*. The

probable course of evolution and degeneration in *Freessias* is pictured in Gng. 7:197 and A.F. 14:1179. In the pursuit of either ideal, the yellow spots have been considered objectionable. The original stock seems to have varying intensity, sometimes in spots or lines, sometimes in a suffused tint. Lately some fine effects are said to have been secured with this minor color, but it is doubtful if the violet hue will ever produce anything of the first importance. Less important pictures of *Freessias* are in Mn. 8, p. 87, A.G. 17:539. Gu. 51, p. 304. G.C. III. 3:588; 19:391, 392, 397. The writer has not seen the older figures in *Forc. Ic. t. 241*. Redouté, Lil. t. 419 and Gt. 808. For garden monographs, see Gng. 7:196, and Gn. 22, p. 94.

870. *Freessia refracta*.

As it was in 1816, with a modern flower of var. *alba* at the left.

The following points are taken with only trifling changes from F. A. Waugh's review of *Freessias* in Gng. 7:196: "As a florist's flower the white *Freessias* are most valuable, the whiter the better. The original type of *Freessia refracta* evidently had a strong tendency toward the yellow color; this keeps turning up with great persistence in *F. refracta alba*. There is always a certain per cent of yellow mixture, even in the finest strains. Sometimes it is only 2-3 per cent; sometimes it is 50 per cent; usually it runs about 5-10 per cent. The causes of this are not certain. A Californian makes a quasi admission of the allegation that American grown stock shows more yellow than the European grown, and suggests that the strong sunlight of his state accounts for the tendency toward yellow fls. Experiments by V. A. Clark show that the yellow color is formed under the direct oxidizing influence of sunlight. In general it seems that the greater amount of yellow is correlated with stronger growth. Plants which grow very vigorously show darker green leaves and more of the peculiar sulfur color. White flowers are often, like white leaves, a sign of weakness in the plant. This makes it difficult to keep a stock of *Freessias* vigorous and at the same time selected to a high degree of purity as regards the flowers."

Freessias are much forced by florists, chiefly for cut-flowers at Christmas. If cut when only 2 fls. are out, the rest will open. They can be had in flower from Christmas until June by successional plantings from Aug. to Feb. For the best results the largest and highest priced bulbs should be planted as early as Aug. One of the strong points of *Freessias*, however, is that planting may be delayed longer than with many other bulbs. Bulbs may be dried off gradually in the pots and kept dry during summer. Report; the larger bulbs will bloom, but will not give so good results as medium size imported bulbs not previously forced.

In the home window *Freesias* will flower in 6 weeks after growth starts. Their fragrance is delightful. They are not so particular as the other important bulbs about being potted long before they are wanted for forcing and stored in a cool place, where the tops are held back while the roots develop. Be careful to have good drainage. There is danger of overwatering until the plants are in flower.

The wholesale production of *Freesia* bulbs is an important industry. The Channel Islands have long been known as one of the most favored localities for growing Cape bulbs. *Freesias* are comparatively little grown in Holland. The centers of the industry seem to be shifting. The Bermuda Islands now have a small share of the trade, and California has the largest share of any of the American states at present.

A. *Fls. distinctly 2-lipped: inflorescence straggling: colors dull; spots prominent.*

refracta, Klatt. Fig. 870. The original type no longer in cultivation. Lvs. linear: spathe-valves small, oblong-lanceolate, scariosus.

AA. *Fls. and inflorescence more nearly regular: colors purer; spots not prominent.*

B. *Tube typically long, slender and gradually narrowed.*

Var. *alba*. Fig. 870. Lvs. and spathe-valves as in var. *odorata*.

BB. *Tube typically short, broad, suddenly constricted.*
c. *Color pale yellow.*

Var. *Leichtlinii*. Fig. 869. There is a subvariety *major* int. by Sutton.

cc. *Color bright yellow.*

Var. *odorata*. Lvs. broader and less rigid than in the type: spathe-valves broader and more obtuse. Subvarieties with various colors are *detecta*, *ilacina*, *formosa* and *Klatteana*.

ccc. *Color orange.*

Var. *aurea*. Odorless, later than the rest and more uncertain.

Other kinds of less importance are *crispa*, *tricolor*, *xanthospica*, *purpurascens* and *xanthospila*. These names do not appear in American catalogues. *Bella* is a variety highly praised by some.

W. M.

FREMONTIA (after John Charles Fremont, distinguished western explorer, who discovered it in 1846). Syn. *Fremontodendron*. *Sterculiacea*. Beautiful free-flowering shrub, with alternate, rather small, palmately-lobed lvs. and large yellow fls. appearing in great profusion in June. It is not hardy North, and in cool regions it should have a sunny and sheltered position, preferably against a wall of southern aspect; it prefers well-drained, rather dry soil, and dislikes, especially during the winter, an excess of moisture. Prop. by seeds or by greenwood cuttings under glass in summer. One species in California, allied to the Mexican *Cheiranthodendron*: shrub or small tree, with stellate pubescence: lvs. alternate, slender-petioled: fls. solitary on short, lateral branchlets, apetalous; calyx large, deeply 5-parted, with 3 small bracts at the base; stamens 5-connate toward the base into a tube: fr. a 5-celled, dehiscent capsule with many seeds.

Californica, Torr. To 20 ft.: lvs. generally roundish ovate, cordate or rounded at the base, obtuse, 3- to 5-lobed or almost entire, whitish or ferruginous pubescent beneath, $\frac{3}{4}$ - $1\frac{1}{2}$ in. long; calyx $1\frac{1}{2}$ -3 in. across, deep yellow, with stellate hairs outside, villous at the base within; lobes orbicular: capsule densely beset with hispid hairs, 1 in. long. S.S. 1:23. B.M. 5591. Gn. 3, p. 55; 29:525 and 33, p. 566. F.S. 22:2349. R.H. 1867:90. I.H. 13:496. B.H. 17:13.

ALFRED REHDER.

FRINGE TREE. *Chionanthus Virginica*.

FRITILLARIA (Latin *fritillus*, commonly understood to be a checker-board, but may have meant dice-box). *Liliacea*. This genus includes the Crown Imperial and

the *Fritillaries*, hardy, bulbous plants, mostly low-growing and spring-blooming, with drooping or nodding fls. which are often checkered or tessellated with dark purple and green, but some also have brighter colors. They resemble lilies in having drooping or nodding fls., but their anthers are fixed at the base, while those of the lilies are fastened on the back but are free to swing about. Lilies, too, have funnel-shaped fls., while *Fritillaries* and tulips have bell-shaped fls., and tulip fls. are erect. Nearly all the Old World *Fritillaries* resemble tulips in having coated bulbs, while all the American *Fritillaries* resemble lilies in having scaly bulbs. It is a curious fact that the Cape of Good Hope, which has supplied the world with so many excellent bulbous plants, has no lilies, tulips or *Fritillaries*.

By far the most popular kinds are the Checkered Lily



871. Common Snake-head or Checkered Lily.

(*Fritillaria Melegris*.)

Faithfully redrawn from Besler's Hortus Eystettensis, published in 1613. (Incorrect as to stamens and pistil.)

and Crown Imperial, Figs. 871, 874. These are the hardiest, the easiest to cultivate and the most variable. The Crown Imperial is one of the most characteristic plants of old-fashioned gardens, but it has been banished from many modern gardens because of its strong fetid odor. It is the most robust of all the species, and until 1897 was supposed to be the only one with its fls. in umbels, all the others being solitary or in racemes. It is a truly imperial plant, and rejoices the children early in every spring by its marvelous pearly drops of nectar, which seem never to fall. *F. Melegris*, the most popular of the purple kinds, is the common Snake's Head or Checkered Lily, so called from the tessellation of purple and green, which is prettiest when as sharply and regularly defined as possible. This plant grows wild in moist English meadows, and can be naturalized in large quantities in such situations. It is the only kind that can be used for all the purposes mentioned below and for cut-fls. Other ancient inhabitants of European gardens are *F. latifolia*, *lutea* and *Persica*, for the last of which we are indebted to "Mr. Nicholas Lete,

a lover of all fair flowers," by whose "procurement," Parkinson says, it was secured through Turkey. All the remaining kinds are rarer.

As a rule, the kinds that are chiefly purple or green, or mixtures of both colors, are dull, unattractive and curious compared with the few kinds that have brilliant yellow or red. Of the duller and purple kinds, 2 of the choicest, next to *F. Meleagris*, are *F. tulipifolia* (which is flamed like a tulip and never checkered) and *F. Camschatcensis*, great masses of which in Alaska make one of the "summer sights" remembered by the tourists. The white in Fritillaries is perhaps always more or less greenish, and the white color in *F. Meleagris* is as good as in any species. By far the most brilliant of the genus is *F. recurva*, which is also the most difficult of culture. Next in brilliancy come *F. lutea*, *aurca*, *Moggridgei* and *pubica*, all highly individual and all yellow, some checkered, others not.

The culture of Fritillaries is rather complicated, 2 kinds capable of being naturalized, some cult. in borders, some in rockeries and others in pots. The Crown Imperial, being exceptionally vigorous, requires the deepest planting, richest soil and most room. The earth should be trenched. Well rotted manure may be worked into the soil 6 in. below the bulbs and the bulbs set on a level 6 in. from the surface of the ground. This species has the largest fls. in the genus. If possible it should be shaded from the midday sun, as southern exposures are said to make the fls. smaller and shorter lived.

In border cultivation the essential peculiarities are a sheltered, shady site, early fall-planting, division every 2 or 3 years, and as a rule a warm, deep, sandy loam, which is not too cold or too retentive of moisture. Bulbs of the taller kinds may be planted 3-4 in. deep; bulbs of the dwarf kinds may be set at half that depth. As all Fritillaries increase rapidly by offsets, it is desirable to lift and divide the plants at least every 3 years, or the small bulbs will rob the big ones. For the same reason Fritillaries are rarely prop. by seeds.

The dwarf and rare sorts require more care and deserve some leaf-mold in their soil. "E. J." in Gn. 52, pp. 242-244, says that such plants require an evergreen carpet through which they may spring, and recommends *Sedum Hispanicum* or its var. *glucum* as the most perfect carpet possible, taking the least from the soil and giving the least possible resistance to the plants below. "Such carpets must of necessity be plants of very dwarf, creeping growth, such as some of the smaller, mossy saxifrages or anubietias, that do not mind frequent disturbance and are easily replaced." For the principles of culture in rockeries and pots, see *Alpine Gardens* and *Bulbs*.

Our native Fritillaries, which include the bright-fl. *recurva* and *pubica*, are confined to the Pacific coast. Of these Carl Purdy makes 2 cultural groups, based on the character of bulb, the kind of soil and the conditions of shade. The first group contains *F. biflora*, *lillicea* and *pluriflora*; the second *F. atropurpurea*, *coccinea*, *lanceolata*, *parviflora*, *pubica* and *recurva*. The former grow in open fields in heavy clay soils; the latter in shady woods, in well drained soils, but *F. pubica* does not need as much shade as the others of its group, and must have sandy loam and slight shelter. It is a native of the sandy sage brush region, east of the Sierra Nevada and Cascade Mts. The bulbs of the first group are composed of thick, heavy scales attached to a thin, rhizomatous base; in the second group the bulbs are of one piece, and low-conical in form, their sides thickly covered with small, round, white rice-like offsets. For the first group Purdy recommends a rich loam, and a slight shade to draw out the stems and prolong the bloom; for the second group a light, loose soil, rich in mold, a sheltered place and considerable shade. At the best these are not profuse in their bloom. E. J. advises that the bulbs of *F. recurva* should be planted with the least possible delay.

The key to the various subgenera given below is essentially Baker's in his monograph in Latin in Jour. Linn. Soc. 14:251 (1875); it rarely happens that the botanical and horticultural interests agree in using such simple and obvious characters as those of the bulb and style. The nectaries or glands are less useful and

reliable, but they help to give a sense of the natural groups in this large genus.

- A. *Bulbs tunicated* (i.e., coated).
 B. *Style 3-cut*.
 D. *Glands distinct and prominent, equal*. Species Subgenera
 E. *Glands long*..... 1. EUFRIILLARIA
 EE. *Glands wide*..... 2-14. MONOCODON
 DD. *Glands obscure, equal, long*..... NOTHOLIRION
 BB. *Style undivided*.
 C. *Glands equal, obscure*.... 15-17. AMBLIRION
 CC. *Glands unequal, prominent*
 D. *Glands long*..... 18. KOROLKOWIA
 DD. *Glands short*..... RHINOPETALUM
 AA. *Bulbs scaly*.
 B. *Style undivided*..... 19-24. THERISIA
 BB. *Style 5-cut*.
 C. *Capsules acutely angled*.
 D. *Fls. solitary or racemose*..... 22-23. GONIOCARPA
 DD. *Fls. in umbels*..... 26. PETILICUM
 CC. *Capsule obtusely angled*... 27-30. LILIORHIZA

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1. *Meleagris*, Linn. Figs. 871-873. Distinguished from No. 2 by the glands 5-6 lines long and stigmas half as long as the style. Typically 1-fl. England and Norway, through central Eu. to Caucasus. Gn. 32:626; 47, p. 330; 52, p. 243.—In the English leaved varieties whitish and purplish forms are found which are more or less checkered. The Dutch bulb-growers keep at least 10 kinds distinct. The extremes of color-range are (1) a greenish white, (2) a sufficient degree of purple to make the checkering as distinct as possible, and (3) an approach to yellow. Some kinds bear 2-3 fls.; some are double; some fls. spread so widely as to be almost funnel-shaped.

Var. *comforta*, an old monstrosity, instead of segments free all the way, and a shouldered base, has the lower third of the perianth united into a funnel-shaped tube. The yellow of some fls. is conjectured to be the result of a cross with *F. lutea* made before Gerard's time, say 1630. In England the species flowers toward the end of April. It is the best "all-round" species.

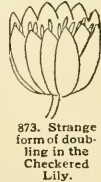
2. *Whittallii*, Baker. Height 1 ft.; stem 1-fl.: lvs. linear, glaucous; fls. checkered green and brown. Mt. Taurus. Int. 1893.

3. *tubeformis*, Gren. & Godr. (*F. delphinensis*, Gren.). Distinguished by the glands 3-4 lines long and very short stigmas. Alps. Baker gives the same color range as for *F. Meleagris*, but "D.K." in Gn. 32, p. 537, regards as the typical color a purplish brown, faintly marked with yellow, belonging to a plant that fls. in July. However, the most desirable form is var. *Moggridgei*, Boiss. (*F. Moggridgei*, Hort.), with its bright yellow, checkered inside with bright red or reddish brown. This is a dwarfier form from the maritime Alps with wider lvs. (6-9 lines), longer stigmatic cusp, ap. proaching *F. lutea*, and essentially yellow-fl. G.C. II. 13:332. Gn. 18:244. F.M. 1880:405.—It blooms in mid-April. Var. *Burnati*, Planchon, bright plum, checkered



872. Stamens and pistil of *Fritillaria Meleagris*.

From Flora Danica, showing the 3-cut stigma, an important character in this genus.



873. Strange form of doubling in the Checkered Lily.

Pictured as early as 1613.

greenish yellow; has a broadly bell-shaped, smaller fl. which is even earlier and has smaller glands.

4. *verticillata*, Willd. (*F. leucantha*, Fisch.). This and No. 5 are distinguished from Nos. 6-10 by the greater height of the former and their lvs. curled at the tips into tendrils. Height 1½ ft.; stems often 1-, sometimes 2-5-fld.; fls. white or yellow, never checkered or spotted.



874. Crown Imperial—*Fritillaria imperialis*.

Altai Mts. B.M. 3083.—In the type the lvs. are numerous, 20-40; anthers barely half as long as the filaments; style no longer than the ovary, but in var. *Thunbergii* (*F. Thunbergii*, Miq.) the upper lvs. are often sparse; anthers as long as the filaments; style 1½-2 times as long as the ovary. G.C. II. 13:532. It is doubtful if the yellow-fld. form is cult.

5. *Walujewi*, Regel. Probably belongs here, as its lvs. have tendrils. It is the only kind that is silver-white outside and crimson-brown spotted white or yellow inside. Turkestan. Gn. 52. 1137.

6. *Ranthénica*, Wickst. Height 1-2 ft.; stem 1-3-fld.; lvs. 6-20; fls. livid purple, obscurely checkered. Caucasus.

7-9. *latifolia*, Willd., and its allies *F. lutea*, Miller, and *F. aurea*, Schott. These three names may be taken as representing the 3 well-marked types of color: *F. latifolia* representing the extreme of dark purple and green without yellow; *F. aurea*, at the other extreme, being essentially yellow, the checker marks smaller and more sharply defined, and the colors of the brightest; *F. lutea* an intermediate form, essentially yellow, but greenish, and with the purple checker-marks duller in color and not so sharply defined and regular. In this sense the pictures may be referred to the types as follows: B.M. 853 and 1207 to *F. latifolia*; B.M. 1538 to *F. lutea*; B.M. 7374, R.H. 1878, p. 287, Gn. 42:867, J.H. III. 28:357, and probably Gt. 840, Fig. 1 (not seen by the author) to *F. aurea*. *F. latifolia* represents the extreme width of lvs., and *F. aurea* is said to differ in having the lower lvs. often whorled. All these grow ½-1 ft. high. One of the most anciently cultivated of all Fritillaries is *F. lutea*, which is found promiscuously mingled with the wider-leaved form, both wild and cult. At present the most popular of the three is probably *F. aurea*, which began a new era of prosperity about 1894 with its reintroduction by Leichtlin. All flourish in the Caucasus region. The Dutch bulb-growers advertise 10 varieties of *F. latifolia*.

10. *pallidiflora*, Schrenk. Allied to 1 and 12, but with more numerous, broader lvs., and larger fls. Height 6-15 in.; lvs. 8-25; fls. 1-6. Siberia. B.M. 6725 (green, with a few dark purple spots). Gt. 1857:209. R.H. 1880, p. 215. G.C. II. 19:573.—"Pale yellow." Van Tubergen.

11. *meleagroides*, Patrim. (*F. minor*, Ledeb.). Height 1-2 ft.; stem very slender, mostly 1-fld.; lvs. 3-6, narrowly linear; fls. dark purple, spotted green; anthers a third the length of the filaments. W. Siberia. B.M. 3280.

12. *Pyrenæica*, Linn. Height 1-1½ ft., mostly 1-fld.; lvs. 6-10, linear, glaucous; fls. dark purple, spotted green; anthers two-fifths the length of the filaments. Pyrenees. B.M. 664, not 952 or 1216.

13. *Oranensis*, Baker. Height 1-1½ ft.; lower lvs. lanceolate; upper lvs. linear; fls. dark purple, obscurely checkered green. Mt. Oran. G.C. II. 13:341.

14. *Elwesii*, Boiss. Lvs. 5-6; fls. green, flushed purple on back and tips, not checkered. Lycia. B.M. 6321, erroneously, as *F. acmopetalata*.

15. *tulipifolia*, Bieb. One of the choicest and daintiest kinds. Very distinct. Foliage glaucous blue; fls. resembling a tulip in shape, and with a chalky look outside. Height 2-8 in.; stem 1-fld.; lvs. 3-4, elliptic, concave, nerveless, 1½-2½ in. long; fls. solitary, inside rusty brown-purple, not checkered, outside dark glaucous blue, streaked with the same purple. Caucasus. B.M. 5909.

16. *Armèna*, Boiss. Height 6-12 in.; stem 1-fld.; lvs. 4-5, lower lanceolate, upper linear; fls. between funnel- and bell-shaped, dark purple, not checkered. Armenia. B.M. 6365. J.H. III. 35:83. Var. *fusco-lutea*, Hort., tawny yellow.

17. *pudica*, Spreng. Lvs. 3-6, lower ones strap-shaped, often opposite (while in *F. tulipifolia* and *Armèna* they are alternate), upper ones linear; fls. pale or dark yellow, rarely purple, never checkered. N.W. Amer. Gn. 13:133. R.H. 1895, p. 229. G.C. III. 19:403. J.H. III. 32:295. Mn. 4:49.—The stamens (as in Nos. 14 and 15) are nearly as long as the perianth. "Deep orange yellow, fragrant." Van Tubergen.

18. *Sewérzowi*, Regel. Height 1-1½ ft.; lowest lvs. lorate-lanceolate, 1 in. wide, often opposite, upper lvs. lanceolate, 6-7-nerved, 3-4 in. long; pedicels 3-6 lines long; fls. 6-10, green, not checkered, but with a few purple spots outside; filaments purple; anthers green.

Turkestan. Gt. 760. B.M. 6371. J.H. III. 30:319. G.C. III. 1:457.

19. *Persica*, Linn. Robust, 2-3 ft. high: lvs. 40-60, glaucous, linear, 4-6 in. long, 6-9 lines wide: raceme 10-50 fld.: fls. small, bell-shaped, slightly odorless, lilac-purple, sometimes chalky outside and lined with purple but never checkered; stamens a trifle shorter than the perianth. Orient. Fls. end of April or beginning of May. B.M. 1537. Var. *minor*, Sims, B.M. 962 (excluding synonymy), has smaller fls. and anthers barely exserted.

20. *Libanotica*, Baker. Closely resembling No. 19, but with 6-30 strongly odorless fls., pale lilac, with darker vertical veins; stamens a third shorter than the perianth; anthers purplish. Palestine, rocky and shady parts of Mt. Lebanon.

21. *pluriflora*, Torr. Height 1-1½ ft.: lvs. 8-12, lowest often opposite, oblanceolate, the rest narrower: raceme 4-12 fld.: fls. rose purple, not checkered. Calif. G.C. III. 21:23 (a central band of purple down each segment).—"Pale reddish purple." *Van Tubergen*.

22. *lanceolata*, Pursh. This and Nos. 23-25 are natives of W. N. Amer., and grow 1-1½ ft. high. Stem 1-3 fld.: lvs. 4-10, lanceolate, whorled: fls. pale purple, mostly distinctly checkered. Var. *gracilis*, Hort., dark purple.

23. *parviflora*, Torr. Stem 5-20 fld.: lvs. about 9, linear: fls. purple, suffused green, not checkered.

24. *atropurpurea*, Nutt. Stem 1-6 fld.: lvs. 12-20: fls. dark purple obscurely checkered with green. Recent. —Said to rival *F. recurva*.

25. *coccinea*, Greene. Stem 1-4 fld.: lvs. 4-12 in 2 or 3 whorls at middle of stem: fls. yellow and scarlet. checkered.

26. *Imperiális*, Linn. (*Imperiális coronata*, Dum. Cour.). CROWN IMPERIAL. Fig. 874. Height 2-3 ft.: lvs. numerous, crowded, ascending, ½-1 in. wide, highest often in whorls of 8-10; fls. end of March. B.M. 194 and 1215. Gn. 46, p. 101 and 52, p. 243. A.G. 13:488. R.B. 20:196. —There are single and double forms in yellow and red, and kinds with foliage striped white, and with gold. The Dutch growers also advertise Aurora, Maximus, and William Rex, red; Sulphureus, sulfur yellow; and Crown upon Crown. American dealers add Couronne Orange and Red Slagwaard. Var. *longipetalá*, Hort. Gn. 56:1247. Formore than a century *F. Imperialis* has been the popular species in cult. with fls. in umbels, but Max Leichtlin writes to G.F. 7:177 (1897), that *F. Raddeana* belongs to the same group, blooms earlier, and has straw-colored fls. of a different form from *F. Imperialis*, and adds: "This is likely to cause a revolution in the *Imperiális* strain when once it has been carefully hybridized."

27. *recurva*, Benth. This has stamens only a little shorter than the perianth, while in the next 3 species they are only half the length of the perianth. Utterly distinct from all other Fritillaries by the color of the fls., which are bright red outside without a trace of purple, and brilliant yellow inside, spotted with red. Height 6-24 in.: stem 2-8 fld., purple, mottled green: lvs. 6-12, lower ones in whorls of 3-4. Linear, ascending: fls. narrow, bell-shaped. Calif. B.M. 6264. Gn. 18:257. Var. *pluriflora*, Hort., is perhaps the best strain.

28. *lilíacea*, Lindl. Height 6-12 in.: stem 1-6 fld.: lvs. 9-15: fls. between funnel- and bell-shaped, whitish, veined green, not checkered. Gt. 1871:1-5.

29. *hiílora*, Lindl. Height 6-9 in.: stem 1-2 fld.: lvs. 4-8: fls. same shape as in *F. lilíacea*, pale purple, suffused green, scarcely checkered.

30. *Camtschaténsis*, Ker-Gawl. Mostly written *Kamtschaténsis* and variously misspelled. (*Lilium Camtschaténsis*, Linn.). BLACK LILY. Height 6-18 in.: stem 1-3 fld.: lvs. 10-15, dark purple. Siberia, Alaska to Calif. Gn. 25:432; 52, p. 242. F.S. 12:1232.

F. citrina is cult., but little known. See Gn. 52, p. 243.

W. M.

FRÉLÍCHIA (J. A. Frélich, physician of Ellwangen, monograph Gentiana, 1796, died 1841). *Amarantácea*. Eight species of woolly or hairy North American

annuals, found chiefly in West Indies, Mex. and Brazil. Lvs. opposite: spikes opposite, terminal: fls. perfect, 3-bracted; calyx tubular, 5-cleft, hardened and spiny crested in fr. **F. Florida**, Moq., has been advertised for sale only rarely in America. It is cult. abroad. Height 1-3 ft.: lvs. linear to oblong: spikes 2 in. long or more: fls. white and woolly, set off by small blackish bracts. July-Sept. B.M. 2603, as *Opliothea Florida*. W. M.

FROG-BIT in America is *Limnóbium*; abroad *Hydrocharis Morsus-ranae*.

FROST. The hoar Frost which injures plants is frozen dew. An object cools at nightfall and the moisture of the air condenses upon it, forming dew. If the temperature then falls below the freezing point, Frost results. Frost is a local phenomenon. It ordinarily occurs in the lower places where the cold air settles; also when the sky is clear, since radiation of the earth's heat is then more rapid. It occurs in still nights when currents of air of varying temperatures are not set in motion. Frosts must be distinguished from freezes. The latter are wide-area disturbances. They are associated with storm centers. They often occur over a wide range. They frequently accompany high winds. Frosts can often be prevented, but freezes are usually beyond the control of man.

Frost is prevented when the temperature is not allowed to fall below the freezing point. The temperature is usually controlled by indirect means. The greatest immunity is to be expected when an artificial cloud can be spread over the area. This cloud prevents the radiation of the earth's heat, and thereby prevents the rapid fall of temperature. The basis of this artificial cloud is usually smoke, but if the smoke carries with it a large amount of vapor of water, it will afford a more complete protection. The best material for making the smoke-cloud is something which will burn with a slow, smouldering fire and afford quantities of smoke. Materials which burn quickly not only afford little smoke, but they are likely to cause upward currents of air which may be injurious. The actual heat of the fire counts for nothing except in the immediate vicinity. Compounds which contain much tar are usually efficient. Of home resources, damp straw or hay, loose manure, prunings of trees, and other litter are among the best. It is essential that the piles be comparatively small and rather numerous. On level lands it is best to have these piles on all four sides of the area at a distance apart of not more than 10 to 30 feet. On somewhat steep slopes the piles may be placed on the upper side, since there usually is a slow current of air moving down the hillside which will carry the smoke over the plantation. The piles should be as wet as possible and yet burn. Usually Frost occurs in the latter part of the night. It is important, therefore, that the smudges be kept up all night if full protection is secured. It is best for a man to sit up and devote himself to the business. Brush piles made of dry trimmings are inefficient for Frost protection. Moist litter of some kind which burns very slowly should be mixed with them. Of late years various preparations of petroleum and tar have been proposed for the making of smudges, and when one has large areas to protect, these are the most efficient and economical materials to use.

In small areas, Frost may be prevented by sprinkling the plantation with water at nightfall. Any device which keeps the air in motion will also tend to prevent Frost; but such devices are impracticable except on a very small scale. In cranberry bogs Frost may be prevented by completely flooding the plantation.

Frosted plants may be recuperated by keeping them cool and rather dark for a day or two and syringing the tops with cold water. Do not let the sun strike them while they are frozen. Extract the Frost very gradually.

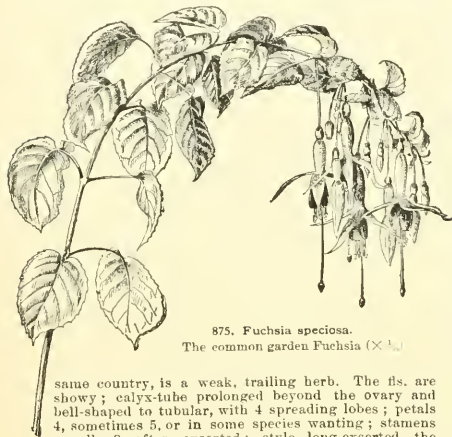
Farmer's Bulletin 34, of U. S. Dept. Agric., has 24 pages devoted to Frost.

L. H. B.

FROSTWEED. *Helianthemum Canadense*.

FRUIT-GROWING. Treated under *Pomology*.

FUCHSIA (Leonard Fuchs, 1501-1565, German professor of medicine, and a botanical author). *Omygdreæ*. Sixty or 70 species, the greater part in tropical America, but three or four in New Zealand. They are very variable in character. The common Fuchsias are known to us as small herbs, but some of them are shrubs in their native countries. *F. excorticata*, of New Zealand, is a tree 30-40 ft. high, whereas *F. procumbens*, of the



875. *Fuchsia speciosa*.
The common garden Fuchsia (X40)

same country, is a weak, trailing herb. The fls. are showy; calyx-tube prolonged beyond the ovary and bell-shaped to tubular, with 4 spreading lobes; petals 4, sometimes 5, or in some species wanting; stamens usually 8, often exserted; style long-exserted, the stigma prominent; fr. (seldom seen under glass) a 4-locul'd soft berry. Of the many species, less than half a dozen have entered largely into garden forms. The common garden kinds have come mostly from *F. Magellanica*. This species was introduced into Great Britain from Chile in 1788, or about that time. It is variable in a wild state as well as in cultivation, and plants subsequently introduced from South America were so distinct as to be regarded for a time as distinct species. Even at the present day some of the forms of *F. Magellanica* are commonly spoken of as species, so much do they differ from the type. As early as 1848, 541 species and varieties—mostly mere garden forms—were known and named (Porehr, "La Fuchsia, son Histoire et sa Culture"). The Fuchsia reached the height of its popularity about the middle of this century. At the present time it is prized mostly for window gardening and conservatory decoration. The garden forms of the present day are with difficulty referred to specific types. The long-tubed or so-called *speciosa* forms are probably hybrids of *F. Magellanica* and *F. fulgens* (Fls. 875, 876). Others are evidently direct varieties from the stem types. There are many full double forms. For the history and the garden botany of the Fuchsia, see Hemsley in the Garden 9:284 and 11:70; also Watson, the Garden 55:74.

Fuchsias are amongst the easiest of house plants to grow. The essential points are to have vigorous young plants and not to overpot; the plants bloom better if the roots are somewhat confined from the time that the plant reaches the required size. Any garden soil is suitable. Give the temperature of an ordinary living room, or that required for geraniums. Fuchsias grow readily from seeds, when these are obtainable, and blooming plants should be secured in less than a year. They are commonly grown from slips, or cuttings, of the nearly matured grown from slips, or cuttings, of one or two joints—preferably two,—allow two leaves to remain, but snip them in two to check loss from evaporation, and insert half their length in sand or washed gravel. In four or five months blooming plants should be obtained. For fall bloom, make cuttings in spring. For spring bloom, take cuttings in early fall or

late summer. After flowering, the plants may be kept cool and comparatively dry if they are to be bloomed again; but it is usually more satisfactory to start a new lot each year from cuttings. However, one or two old and large specimen plants, in tubs or large pots, may be a desirable addition to the conservatory. Old plants may be cut back severely, and the young growth which is thrown out will give profuse bloom. Screen from full sunlight, keep the atmosphere moist, syringe if insects become troublesome, and give a rich soil. Most of the Magellanica types may be left in the open in the South if protected with mulch. There are Fuchsia hedges in S. Ireland and parts of England belonging to this type. L. H. B.

One of the great merits of the Fuchsia is that of all the strong and robust-growing types make excellent outdoor decorative plants in summer, and are especially adapted for shady and half shady places where few other plants will answer. This is particularly true of plants which have been kept over winter and have been trained into large bush plants or standards. After the first year, they make fine specimens, and they can be kept and used in this manner and for these purposes for many years. They can be stored in a cool greenhouse, light cellar or any other cool, out-of-the-way place, where hydrangeas, oleanders and such stock is wintered, leaving them in their pot-bud, semi-dormant state all winter, giving just enough moisture to keep them alive. The latter part of March or the beginning of April in the North, the plants can be started into growth, and as soon as root action begins they can be repotted or retubbed, using rich, open loam, with plenty of good drainage, and can remain in those pots or tubs for another year. When in bud or bloom, frequent application of liquid manure is very beneficial. Fuchsias are great feeders. They flower best when plunged with their pots or tubs in the ground outdoors, and can be left out until very late in the season, as they are nearly semi-hardy, and stand a little frost without serious injury. Cult. by H. A. SIEBRECHT.

Various Latin names of horticultural forms occur in the trade, but the following represent all the important botanical types in cultivation in this country:

alba, 6.	<i>elegans</i> , 1.	<i>Magellanica</i> , 1.
<i>arborescens</i> , 7.	<i>Exoniensis</i> , 1.	<i>procumbens</i> , 8.
<i>coccinea</i> , 1, 3.	<i>fulgens</i> , 4.	<i>pumila</i> , 4.
<i>conica</i> , 1.	<i>globosa</i> , 1.	<i>Riccartoni</i> , 1.
<i>corallina</i> , 1.	<i>gracilis</i> , 1.	<i>speciosa</i> , 2.
<i>corymbiflora</i> , 6.	<i>hybrida</i> , 2.	<i>springatolia</i> , 7.
<i>decussata</i> , 1.	<i>Loeui</i> , 1.	<i>tenella</i> , 1.
<i>discolor</i> , 1.	<i>macrostemma</i> , 1.	<i>triphylia</i> , 5.

A. Fls. drooping.

B. Calyx-tube mostly shorter than the lobes (or in *F. speciosa* sometimes as long again); petals obovate and retuse, convolute in the bud.—LADIES' EAR-DROPS.

1. *Magellanica*, Lam. (*F. macrostemma*, Ruiz & Pav. *F. coccinea*, Curtis, not Aiton). Calyx tube little longer than the ovary, oblong or short-cylindrical; petals normally blue, and shorter than the red and oblong-lanceolate calyx lobes; stamens long-exserted; lvs. opposite or in 3's, lance-ovate, very short-petioled, dentate. Peru and S. to Terre del Fuego. B.M.97. The leading types are as follows:

Var. *globosa* (*F. globosa*, Lindl.). Fls. small and short, the bud nearly globular and the tips of the sepals coloring even after the flower begins to burst; calyx tube very short. A profuse bloomer, and a common type amongst old-fashioned Fuchsias. Probably of garden origin. B.R. 18:1556. Gn. 55, p. 75.

Var. *conica* (*F. conica*, Lindl.). Small-fl'd., the bud conical-oblong; calyx tube nearly as long as the lobes; petals nearly equal to the calyx lobes. Raised from seeds brought from Chile. B.R. 13:1062.

Var. *discolor* (*F. discolor*, Lindl. *F. Lbœvii*, Hort.). Dwarf and hardy; fls. small, with slender, short tube and wide-spreading, rather narrow calyx lobes, which are somewhat longer than the tube; branches deep purple; lvs. undulate-toothed. Falkland Isl. B.R. 21:1805.

Var. *gracilis* (*F. gracilis*, Lindl. *F. decussata*, Grab.). Very slender and graceful, the fls. drooping on very long pedicels: tube slender, nearly as long as the narrow, spreading lobes; lvs. narrow, strong-toothed. Chile. B. R. 10: 847; 13: 1052. B. M. 2507. Gn. 55, p. 74. Mn. 2, p. 186.—Possibly a distinct species.

With *F. Magellanica* may be classed *F. corallina*, Hort., *F. Exoniensis*, Hort. (G. C. II. 20: 565), *F. elegans*, Paxt., *F. Riccartoni*, Hort., *F. tenella*, Hort., and others. Some of these are probably hybrids with *F. Magellanica*.

The short-flowered Fuchsias are less popular than formerly, but many varieties are now in cult. Of this set the Storm King is a representative.

2. *speciosa*, Hort. (*F. hybrida*, Hort.). Figs. 875, 876. The greater part of present-day garden Fuchsias are of the long-tubed type shown in the illustrations. These are probably hybrid derivatives of *F. Magellanica* and *F. fulgens*. Amongst the named sorts every gradation will be found, from the short-tubed Storm King to the Earl of Beaconsfield with fls. 3 in. long.

3. *coccinea*, Ait. Not known to be cult. in America, and inserted here for the purpose of clearing up the synonymy of *F. coccinea*. This species appears to have been introduced before *F. Magellanica*, and it was named *F. coccinea* by Aiton. *F. Magellanica*, however,



876. *Theresa*, a form of *Fuchsia speciosa* ($\times \frac{3}{4}$).

"usurped its name and spread it to every garden in the kingdom, whilst the true plant lingered in botanic gardens, lastly surviving (greatly to the credit of the Baxters, father and son) in that of Oxford alone." The species was lost from its introduction in 1788 to its rediscovery in an Oxford garden in 1867; meantime forms of *F. Magellanica* passed as *F. coccinea*. "*F.*

coccinea is much more graceful than any of the varieties of *F. Magellanica*, flowers even more freely, and is readily distinguished by the almost sessile leaves with broad bases, and the hairy twigs and petioles; further, its foliage turns of a bright crimson when about to fall." —*J. D. Hooker*, B. M. 5740. Probably Brazilian.

BB. *Calyx-tube thrice or more the length of the lobes: petals pointed, nearly or quite as long as the calyx lobes.*

4. *fulgens*, Moc. & Sesse. Stem somewhat succulent, glabrous, often red-tinged; lvs. large and coarse, cordate ovate, soft, small-toothed; fls. in terminal, leafy clusters or racemes, the red long-tubular calyx-tube 2-3

in. long and very slender at the base; the calyx lobes short and pointed, greenish at the tip, not very widely spreading; petals deep scarlet, pointed; stamens only short exserted. Mex. B. M. 3801. B. R. 24: 1. Gn. 55, p. 75. R. H. 1881: 150 (var. *pumila*).— A brilliant plant, sometimes seen in choice conservatory collections. Evidently a parent of the *F. speciosa* tribes.



877. *Fuchsia triphylla* ($\times \frac{1}{2}$).

5. *triphylla*, Linn. Fig. 877. Low and bushy (18 in. high), pubescent; lvs. often in 3's, small, oblanceolate, petiolate, dentate, green above and purple pubescent beneath; fls. $1\frac{1}{2}$ in. long, in terminal racemes, cinnabar-red, the long tube enlarging towards the top; petals very short; stamens 4, not exserted. St. Domingo, West Indies. B. M. 6795. Gn. 41: 839. I. H. 43, p. 94.—Known in botanical collections and sparingly in the trade. The species has a most interesting history, for which see the citations made above. Upon this plant Plumier founded the genus *Fuchsia* in 1703, giving a rude drawing of it. Upon Plumier's description and picture Linnaeus founded his *F. triphylla*. Plumier's figure is so unlike existing Fuchsias that there has been much speculation as to the plant which he meant to portray. No *Fuchsia* was known to have four stamens or to be native to the West Indies. In 1877 Hemsley wrote of it: "The figure, however, is so rude that nobody, I believe, has been able to identify it with any living or dried plant. Possibly it is not a *Fuchsia* at all in the sense of the present application of the name, for it is represented as having only four stamens." But in 1873 Thomas Hogg, of New York, secured seeds of a St. Domingo *Fuchsia* which turns out to be Plumier's original, thus bringing into cultivation a plant which had been unknown to science for 170 years. It came to the attention of botanists in 1882. For a discussion of further confusion in the history of this plant, see Hemsley, G. C. II. 18, p. 263-4.

6. *corymbiflora*, Ruiz & Pav. Tall but weak grower, needing support when allowed to attain its full height, therefore excellent for pillars and rafters; lvs. large, ovate-oblong and tapering both ways, serrate, pubescent; fls. deep red, hanging in long brilliant corymbs; calyx tube 3-4 in. long and nearly uniformly cylindrical, the lobes lance-acuminate and becoming reflexed; petals deep red, lance-acuminate, about the length of the calyx lobes; stamens length of the petals. Peru. B. M. 4000. Gn. 11: 58; 55: 1203. F. J. 1841: 161. Var. *alba*, Hort., has white or nearly white calyx-tube and lobes. F. S. 6: 547. Gn. 55: 1208—A very handsome plant, but not common.

AA. *Flowers erect.*

7. *arborescens*, Sims (*F. syringifolia*, Carr.). A shrub; lvs. lance-oblong and entire, laurel-like; fls. pink-red, small, with a short or almost globose tube,

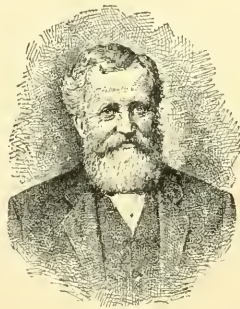
in an erect terminal naked lilac-like panicle; calyx lobes and petals about equal in length. Mex. B.M. 2620. — Little grown, but excellent for winter flowering.

8. *procumbens*, Cunn. TRAILING FUCHSIA. TRAILING QUEEN. Trailing; lvs. alternate, small ($\frac{1}{2}$ – $\frac{3}{4}$ in. across), cordate-ovate, long-stalked; fls. solitary and axillary, apertulous, the short calyx tube orange and the reflexing obtuse lobes dark purple, anthers blue; plant dioecious. N. Zeal. B.M. 6139. — A very interesting little plant, suitable for baskets.

Species which are not known to be in the Amer. trade are *F. amplifolia*, Benth. Fls. large, scarlet, long-tubed, drooping. Colombia. B.M. 6830. — *F. buettiana*, Lindl. Compact, with short-jointed branches; fls. very small, flaring-mouthed, rosy, drooping. Mex. B.R. 18:1480. — *F. cordifolia*, Benth. Fls. 2 in. long, slender, drooping, hairy, red, on very long pedicels. Mex. B.R. 27:70. — *F. Dominiána*, Hort. Garden hybrid with long drooping red fls. of the species type. F.S. 10:1604. — *F. macroantha*, Hook. Largest-fl. Fuchsia; 4–6 in. long, pink-red, in large, drooping clusters. Colombia, Peru. B.M. 4233. — *F. microphylla*, HBK. Dwarf, small-lvd., with deep red, small axillary, drooping fls.; pretty. Mex. B.R. 15:1299. — *F. serratifolia*, Ruiz & Pav. Fls. long-tubed, spicosa-like, on drooping pedicels from the axils of the woried lvs.; pink, with greenish tinge; handsome. Peru. B.M. 4174. — *F. simplicifolia*, Ruiz & Pav. Lvs. usually in 3's, entire; fls. crimson, long and slender-tubed, in drooping clusters; resembles *F. corymbifera*. Peru. B.M. 5096. — *F. spindens*, Zacc. Shrubby, hairy fls. drooping, with a short, thick red tube, short, greenish lobes and petals, and long-exserted stamens. Mex. B.M. 4082.

L. H. B.

FULLER, ANDREW S., horticultural writer, was born in Utica, N. Y., on August 3, 1828, and died May 4, 1896, at his home at Ridgewood, Bergen county, N. J. Fig. 878. When quite young he removed with his parents to Barre, N. Y., where his father tilled a small farm. At the age of 18 he went to Milwaukee, Wis., where he worked at the carpenter's trade, and became particularly skillful in the construction of greenhouses, and built a small one for himself on a city lot. Here he brought together a



878. Andrew S. Fuller.

varied collection of plants, the care of which founded the nucleus of his later attainments and renown as a horticulturist. While he lived in Milwaukee he married Miss Jennie Crippen, who survives him. They never had any children. In 1855 they moved to Flushing, L. I., N. Y., when William R. Prince offered Mr. Fuller the management of his greenhouses. But his ambition did not allow him to remain long in the employ of others, and in 1857 he removed to Brooklyn, N. Y., and engaged in grape and small fruit culture, which were then in their infancy. Here he gave particular attention to the improvement of the strawberry by cross-fertilization and selection of the best of the many thousands of seedlings raised by him. The most famous of these were Brooklyn Scarlet, Monitor and Colonel Ellsworth, the first of which was generally recognized as the highest-flavored strawberry in existence at the time, although too soft for market. The entire stock of 300,000 plants was purchased by the "New York Tribune," which sent

them out as premiums to its subscribers, in consequence of which they have been widely known as the "Tribune strawberries." It was during this period that Fuller wrote his first book, the "Strawberry Culturist." In this work he brought together and systematized all that was known about the subject at the time, combined with the results of his own practical experience. The principles underlying scientific strawberry culture, as well as the practical hints and directions for carrying on the work in the garden and field, are given in so thorough and admirable a manner that even now, after 40 years since they were written, it would be difficult to improve upon them. Realizing the necessity of having more ground for experimentation, and in order to escape the noise and turmoil of the city, he bought a large piece of land near Ridgewood, N. J. This, when he moved on it, early in the sixties, was little more than a barren waste, but under his constant care it was not long before it developed into one of the most charming homes and interesting and instructive garden spots in the country. Almost every species and variety of ornamental trees and shrubs hardy in the locality were represented, and his collection of small fruits was the most complete in the country. These furnished him unequalled means and material for observation, study and identification, the results and accounts of which he made known in the clear, concise, convincing style for which his writings have become famous. A. S. Fuller was an indefatigable worker, physically as well as mentally. Immediately after the publication of the "Strawberry Culturist," he commenced working on the "Grape Culturist." This was followed by the "Small Fruit Culturist," "Practical Forestry," "Propagation of Plants," and the "Nut Culturist." The last of them he was fond of calling his "monument," as he did not intend to write another book, and so fate decided that it should be. He died a few days after he had finished his manuscript, and never saw the completed book, of which he was perhaps more proud than of any other of his works, yet in the history of horticultural literature his "Small Fruit Culturist" will, no doubt, occupy the foremost rank. It was more instrumental in the development and building up of the great industry to which it is devoted than any other book written before or after, and in any land. It was translated into German and published in Weimar in 1868. His books contain but a small part of his writings. His editorial and other contributions to the "American Agriculturist," to "The Rural New-Yorker," of which he was part owner for a time, the "New York Sun," of which he was agricultural editor for 26 years, "American Gardening" and other periodicals would fill hundreds of volumes. He was also editor of the "Record of Horticulture," 1866–1867. While Mr. Fuller was principally known as a horticulturist, there was hardly a branch of natural science to which he had not devoted more or less attention. His entomological collection, especially that of coleoptera, was one of the most complete in the country; his mineralogical and archeological collections contained many rare specimens, and his horticultural library was one of the most complete in the United States. Personally, Mr. Fuller was a charming man, liberal and hospitable almost to a fault. He was a man of striking personality, of decided character and opinion, and an implacable foe to sham and deceit. In whatever he undertook he was always a leader, never a follower; he was always on the lookout for new grounds to traverse, and nothing made him happier than when a new problem presented itself for solution, but as soon as it was solved his interest in it ceased. During the later years of his life, although in good health, Mr. Fuller left his place but seldom, but in his earlier years he traveled considerably, and took an active and leading part in the meetings of the American Pomological Society, the American Institute Farmers' Club, the Fruit-Growers' Club, and many kindred societies, of which he was an active or honorary member.

F. M. HEXAMER.

FUMARIA (*fumes*, smoke). This genus includes the common Funitory, *F. officinalis*, formerly held in great repute for various ailments, but now practically banished from medical practice. Seeds are still rarely sold to those who have faith in old phisic gardens. The plant is fully described in our commonest botanies, and has a large literature, which is especially interesting to

those who delight in herbals. As an ornamental plant, it is far surpassed by *Adlumina*. The genus gives name to the family *Fumariaceae*.

FUMITORY. *Fumaria officinalis*.

FUNGICIDE (see *Spraying*) is a material used to destroy fungi or to prohibit their growth. The leading Fungicides are materials which contain sulfur or copper. Bordeaux mixture is the chief Fungicide in use at the present time. It is a mixture of blue vitriol (sulfate of copper) and lime, in water. The usual formula is

Copper sulfate	6 lbs.
Lime	4 lbs.
Water	35-50 gals.

The copper sulfate is dissolved in the water, and milk of lime is added. In spraying large areas, it is better to prepare stock solutions for the Bordeaux mixture rather than to make each batch in the quantities called for by the formula. The sulfate of copper may be put into solution and kept in this condition indefinitely, ready for use. A simple method is to dissolve 40 or 50 pounds of sulfate in as many gallons of water, pulverizing the material and hanging it in a coffee-sack in the top of the barrel. A gallon of water, therefore, means a pound of sulfate. The lime may also be slaked and kept in readiness for use. Slice it into the creamy condition familiar to masons, cover lightly with water, and then close the box or vessel to prevent the water from evaporating. When making the Bordeaux mixture, pour the requisite quantity of the stock solution of sulfate of copper into the barrel, and then fill the barrel half full of water. Now add the lime (which should be diluted with water), stir, and add enough water to satisfy the formula. In order to test whether the sulfate has been neutralized by the lime, a little ferrocyanide of potassium may be applied to the mixture. Place a spoonful of the Bordeaux mixture in a saucer or plate, and add a drop of the ferrocyanide. If a red color appears, the mixture needs more lime. If the test solution is added directly to a tank or barrel of the mixture, the color reaction is likely to be lost in the mass. An excess of lime insures the safety of the mixture.

The Bordeaux mixture is used for many parasitic fungus diseases. It is not only inimical to fungi, but it adheres to foliage and stems for a long time. Best results are secured when it is applied before the fungus has become established. Bordeaux mixture is usually more satisfactory when it has not stood long.

The sulfate of copper is the active fungicidal ingredient of the Bordeaux mixture, but if applied alone, in water, it is very caustic to foliage, and it does not adhere long. For the treatment of dormant trees and shrubs it may be very useful, since it can be used strong, and is thereby very destructive of fungi. For dormant wood it is often used 1 lb. to 10-15 gallons of water.

The greatest competitor of Bordeaux mixture is a mixture made by dissolving carbonate of copper in ammonia and then diluting the solution with water. It is sometimes used on ornamental plants and nearly ripe fruits, since the Bordeaux mixture renders them untidy. One ounce of copper carbonate will be dissolved by 1 pint or less of very strong ammonia. This concentrated liquid can be kept indefinitely. When to be used, dilute with 8-10 gallons of water.

Dry sulfur is a Fungicide. It is sometimes dusted on plants in glasshouses for surface mildews, and it is much used in California vineyards. It is oftenest used as a vapor in houses. If smeared on the heating pipes, the fumes will give a perceptible odor in the house, and will prevent the mildews of roses, cucumbers, and other plants. The sulfur must not be burned, for the fumes of burning sulfur are fatal to plants. L. H. B.

FUNGUS (plural, *Fungi*; adjective, *fungous*). The class *Fungi* includes all those plants which are popularly known as mushrooms or toadstools, puffballs, rusts, smut, molds and mildews. These, however, form but a small part of the total number. There are many others which are inconspicuous, like the yeasts, or which are of no special economic importance and hence have escaped popular notice. All the parts of a fungous

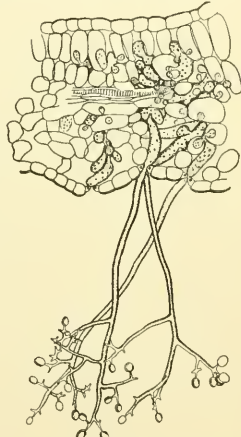
plant are seldom seen. That part which is usually exposed to view, and which is popularly designated as a *Fungus*, is merely the fertile or fruit-bearing part of the plant. A mushroom is the fruit of a *Fungus*. The vegetative part, that which supplies and elaborates materials for the growth of the plant, and which, in a way, corresponds to the roots and leaves of higher plants, is hidden away in the ground, in decaying wood and other organic matter, or within the tissues of other living plants upon which the *Fungus* feeds.

Both the vegetative and the fruiting part of all *Fungi*, excepting some of the yeasts, are made up entirely of microscopic threads, which are very much branched and divided into elongated cells by crosswalls at irregular intervals. These threads are called hyphae. The vegetative hyphae considered collectively are spoken of as the mycelium or spawn of the *Fungus* in the same sense in which we speak of the roots of a tree.

In the lower *Fungi*, such as molds and most of the parasitic species, the mycelium is comparatively simple, consisting of much branched threads which course through the nutrient material upon which they grow, or, in the case of parasitic *Fungi*, either among the cells, or, as mildews, on the surface of their hosts. At the fruiting time many threads grow out from the substratum to the light and air. These threads remain simple or become branched like the trunk of a tree, and finally bear spores at the ends of the threads or branches. Examples of these plants are the blue mold on jam, etc., the common bread mold, and nearly all the *Fungi* which form spots or a white coating on leaves. The mycelium of toadstools and other higher *Fungi* is of much greater extent and more highly developed than that of the molds. It is often seen as a cottony web forming white patches on posts and boards exposed in damp, dark places. It can always be found on sticks and on decaying leaves in the woods. The white threads in fire-fanged matre are also mycelium. Perhaps the best known form of mycelium is the spawn in bricks, commercially known as "mushroom spawn." In nature the mycelium of these plants often forms strands as much as an eighth of an inch in thickness. It grows for varying periods of time, sometimes for years, in the ground, in decaying organic materials, or in fallen and standing trunks, etc., until it is ready to fruit.

The fruit of these plants is not formed from a single, erect thread, but of many hundreds of threads which appear above the substratum as a thick bundle or as a tuberculiform mass. The threads increase in length and send out many branches which become closely interwoven, gradually bulding up the fleshy umbrella-like bodies, or the hard shelving masses, which we know as toadstools, mushrooms, etc. The spores are borne on the lower, protected side of the fruit bodies on gills or spines, within honey-combed pores, or directly upon the smooth, lower surface.

All *Fungi* grow on living or dead organic matter. They have no chlorophyll, and hence cannot assimilate carbon from carbon di-oxid.



879. A *Fungus*.

A mildew, showing the mycelium in the leaf tissue and the hanging spore-bearing threads. Much magnified.

A Fungus is a plant of very low organization consisting of one or more cells multiplying its kind by cell division and by spores. It contains no green substance (chlorophyll), and grows either as a saprophyte upon



880. Colonies of the rust Fungus on the leaf of a hollyhock.

non-living organic matter or derives its food directly from another living organism, and is then a true parasite. Fungi are very common, and range in size from the large hard-shell Fungus upon logs and the puff-ball and toadstool in the rich earth to the delicate moulds that infest bread and other foods, and the still more microscopic forms that produce fermentation, as yeast in dough and other species employed in making beer. Some of the toadstools are very richly tinted with red, yellow, brown and even blue, and a few are deadly poisonous, as the "death cup" and the "fly agaric," which grow upon the decaying organic matter in shaded places. Others are wholesome, and are grown as articles of food, the leading species of which is the mushroom, *Agaricus campestris*. More highly prized still is the truffle, which is produced under ground and hunted by hogs, which find them by their odor, and even muzzled hogs are trained to unearth them.

One of the parasitic species, ergot, infests the heads of rye, changing the grains into much enlarged horny purplish masses called "spurred rye" because of the resemblance of the fungous grains to a cock's spur. This is extremely poisonous, and when eaten by live stock with the hay or grass has been known to destroy whole herds. This Fungus furnishes one of the most valuable in the whole long list of drugs. Many other fungi grow in the heads of grain, the most conspicuous being the corn smut, which changes the whole ear possibly into a large mass of dark slime when wet, and brown dust when dry. This dust is the myriads of spores which the Fungus produces to secure its reproduction. In a similar manner other smuts destroy the oats, wheat and very many kinds of grasses and other plants.

The rusts are similar Fungi which thrive upon the juices of plants and produce patches of orange or yellow upon leaf or stem, the discolored portion being usually swollen and the skin more or less broken.

There is another group of Fungi known as the mildews, and these usually produce a fine whitish coating to the diseased part, due to the fine stalks that come from the surface of the plant and bear the spores.

Fungi love warmth and moisture for their greatest activity, and therefore they are more in evidence in midsummer when wet weather prevails than at other times. The spores are so small and light that they float in the air, and it is only when substances like canned goods have these spores excluded by first killing those

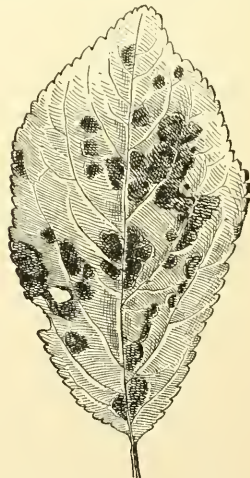
present and preventing access of others, that they will keep unattacked,—that is, sweet and edible. Substances can be easily inoculated by introducing the germs, as mold into potatoes, rust into a tree, or yeast into dough. The number of kinds of Fungi is high among the thousands, and new species are being found each month, but they are so small that only specialists can understand the microscopic differences that separate one kind from another. Many Fungi have certain forms which are assumed in the cycle of life, and in this they resemble insects with their larval, pupal and imago stages. This polymorphic nature has made the study of the Fungi very puzzling. While a few of these plants are poisonous, and many destructive to life, the greatest majority are scavengers, reducing the waste products to simpler and harmless forms. We could not get on well without this minute and humble race of plants.

For further discussion, see *Diseases*.

BYRON D. HALSTED.

FUNKIA (Ludwig P. Funke, 1755-1807, and H. C. Funk, 1771-1839, German naturalists). *Liliaceae*. DAY LILY. PLANTAIN LILY. Five or six Japanese perennial herbs, producing attractive clumps of foliage and interesting blossoms. Fls. in terminal racemes or spikes, white or blue; perianth funnel-form, 6-parted and more or less irregular, the lobes not widely spreading; stamens 6, the filaments filiform, the anthers long-oblong and versatile; pod oblong and angled, many-seeded, splitting into 3 valves (Fig. 884); seeds flat and black, winged at the apex. Monogr. by Baker, Jour. Linn. Soc. 11:266. See also, Mottet, R.H. 1897, p. 114.

Funkias are hardy and of the easiest culture. Their dense stools or clumps of foliage are in place along walks or drives and in the angles against buildings. A continuous row along a walk gives a strong and pleasing character. Make the soil rich and deep. The clumps improve with age. The large-leaved kinds grow vigorously in moist, shady places. Of some varieties



881. Colonies of a Fungus on a plum leaf.

The dead tissue sometimes falls out, leaving a shot-hole effect.

the lvs. are strikingly variegated. Bloom in summer. Foliage is killed by frost. Prop. by dividing the clumps; some species produce seeds freely, and seedlings can be grown readily if seed is sown as soon as ripe.

A. Fls. white, ascending; fl.-bract very large, with a smaller one inside.

subcordata, Spreng. (*F. álba*, Sweet. *F. liliiflora*, Hort. *F. Japónica*, Hort., at least of some. *F. macrantha*, Hort. *F. cordata*, Hort., not Sieb.). Fig. 882. Lvs. large, broadly cordate-ovate, with a short, sharp point, green, many-ribbed; fls. large, 4-6 in. long, with an open bell-shaped perianth, waxy white, the base of the tube surrounded by a broad bract; spike short, the bracts very prominent. —The commonest species in old yards, and an excellent plant. The fls. have an orange-like odor. Clumps of foliage grow 12-20 in. high. B.M. 1433, as *Hemerocallis Japonica*.

Var. *grandiflora*, Hort. (*F. grandiflora*, Sieb. & Zucc.), has very long and large fls. (L.C. III. 4:153. *F. macrantha*, Hort., probably belongs here.

AA. Fls. blue or lilac, more or less inclined or nodding; bract 1.

B. Lvs. glaucous.

Sieboldiana, Hook. (*F. Sieboldii*, Lindl. *F. glauca*, Hort. *F. Sinensis*, Sieb. *F. cucullata*, Hort. *F. glau-*



882. *Funkia subcordata* (× 1.5).

césens, Hort. *F. cordata*, Sieb.). Differs from the last in the metallic blue color of the less cordate lvs., in the inclined bluish or pale-tinted, more slender-tubed and smaller fls. (which do not rise above the foliage), and in having only one small bract at the base of the fl. B.M. 3663. B.R. 25:50. L.B.C. 19:1869, as *Hemerocallis Sieboldiana*. There is a form with the body of the leaf yellowish white and the edge green. L. 69.—Lf. blade and petiole each 1 ft. long, the foliage therefore overlapping the fls. The plant usually cult. as *F. Sieboldiana* is probably *F. Fortunei*.

Fortunei, Baker. Differs from *F. Sieboldiana* in having smaller lvs. and the racemes much overlapping the

foliage, as in other *Funkias*. Petiole 2-3 in. long; blade cordate-ovate, 4-5 in. long; raceme $\frac{1}{2}$ ft. long on a stem or scape 1 ft. long; fls. pale lilac, funnel-shaped, $\frac{1}{2}$ in. long, the segments lanceolate and ascending and half as long as the tube. —Excellent. Generally cult. as *F. Sieboldiana*, and many of the pictures of that name probably belong here, as, apparently, (Gn. 38, p.79; A.G. 11:157; A.F. 6:322. It is probable that the garden synonyms cited under *F. Sieboldiana* are usually applied to plants of *F. Fortunei*.

BB. Leaves green.

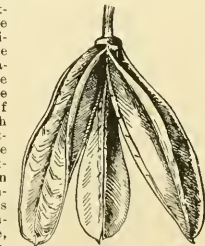
ovata, Spreng. (*F. caribaea*, Sweet. *F. lanceolata*, Sieb.). Figs. 883, 884, 885. Lvs. broad-ovate, 5-10 in. long and half as wide, usually tapering to the petiole, but sometimes subcordate; raceme long and lax; fl. with a short, slender tube and suddenly expanding into a bell-shape, $1\frac{1}{2}$ -2 in. long, nodding, deep blue. B.M. 894, as *Hemerocallis caribaea*. Mn. 1:73. —The commonest blue-fl. species; usually known as *F. caribaea*. *F. marginata*, Sieb., is a form with white-bordered lvs.

lanceifolia, Spreng. (*F. Japónica*, Hort., of some). Lvs. lanceolate to narrowly ovate-lanceolate and the blade 6 in. or less long and 2 in. or less wide; raceme lax, 6-10-fl., on a tall, slender stem; fls. $1\frac{1}{2}$ in. or less long, the tube slender and gradually enlarging upward, pale lilac. Var. *albo-marginata*, Hort. (*F. albo-marginata*, Hook., B.M. 3657) has the lvs. edged white. Var. *undulata* (*F. undulata*, Otto & Dietr.) is a form with undulate white-margined lvs.—Graceful. Fls. smaller than those of *F. ovata*.

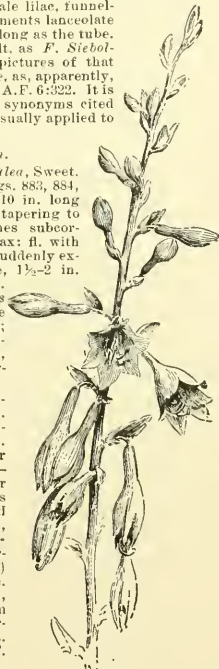
F. aurea, Hort., variegated forms of various species.—*F. álba*, Hort., "bears tall scapes of pale blue fls."—*F. gigantea*, Hort., has "long spikes of blue fls."—*F. marginata*, Hort.—*F. lanceifolia*, var. *alba-marginata*.—*F. tardiflora*, Hort.—*F. unicolor*, Hort.—*F. lanceifolia* var.—*F. variegata*, Hort.—variegated forms of various species, usually of *F. ovata* or *F. lanceifolia*.—*F. viridis-marginata*, Hort., is probably a form of *F. ovata*.

L. H. B.

FURCRAEA (Ant. François de Fourcroy, 1755-1809, chemist). Syn., *Fourcroya*, *Fourcraea*, *Furcraea*, *Furcraea*, *Amarylhidaceae*. About 17 species of succulent desert plants from tropical America, particularly Mexico, some with spiny foliage like Agave, others with minutely toothed margins like *Beschorneria*. They occasionally bear immense loose panicles of greenish white fls., suggesting those of *Yucca filamentosa*, which are known to every plant-lover of the North. The perianth of *Furcraea* is whitish and wheel-shaped; in Agave greenish yellow, funnel-shaped. The filaments in *Furcraea* have a cushion-like swelling at the base, which is absent from Agave. *Furcraea* is cultivated much in the same way as Agave,



884. Old capsule of *Funkia ovata*. Nat. size.



883. *Funkia ovata* (× 1.5).

except that the Furcræas are given more heat and water. *F. gigantea* has a very pretty variegated form, which makes a useful pot-plant.

As a rule, Furcræas bear fruit not more than once, and then die without producing suckers. However, they produce while in flower an immense number of bulbels, which may be used for propagation. It is impossible to say at what size or age the plants will bloom. Grown in pots, they may take a century. On the other hand, plants from bulbels have been known to flower at 3 years.



885. *Funkia ovata*. (See page 619.)

A. *Texture of lvs. firm; spines usually present, deltoid; no minute teeth on margin. (Furcræa proper.)*

B. *Trunk 3-4 ft. long; spines absent.*

gigantea, Vent. Lvs. 4-6 ft. long, 4-6 in. broad at middle, 2½-3 in. above base, usually without marginal spines, rarely with a few near the base; peduncle 20-40 ft. long; odor of fls. strong. Trop. Amer. Naturalized in Mauritius, Madagascar, India. B.M. 2250. G.C. III. 23-27. R.H. 1857, pp. 206, 207. Var. *variegata*, Hort., has variegated lvs.

BB. *Trunk none or short; spines present.*

C. *Length of lvs. 12 ft. or more.*

altissima, Todaro. A recent and little known species named at Palermo, Italy. Franceschi writes that it has hardly any trunk; lvs. bright green, with very few

spines, 12 ft long or more, erect, not drooping. It is tenderer than the other kinds.

CC. *Length of lvs. 5-6 ft.*

elegans, Todaro. Lvs. 4-5 in. broad at middle, 3 in. above base, rough on the back; prickles large; peduncle 20-25 ft. long. Mex.

CCC. *Length of lvs. 2-3 ft.*

D. *Prickles usually large-sized.*

E. *Panicle reaching 10-12 ft.; branches slightly compound.*

Cubensis, Haw. Lvs. 3-4 in. broad above middle, 1½ in. above base, the tip convolute; prickles large, distant, hooked; peduncle 5-6 ft. long. Odor of fls. faint. This and *F. gigantea* are widely spread in trop. Amer. and often cult. in the Old World. They are the oldest in cult. All the rest are rare. Var. *inermis*, Baker, is spineless. B.M. 6543. *F. Lindeni*, Jacobi, has variegated lvs. I.H. 21:186.

EE. *Panicle reaching 30 ft.; branches copiously compound.*

tuberosa, Ait. Lvs. a trifle longer and narrower than in *F. Cubensis*, 2-3 in. broad; fls. sweet scented. Int. by Franceschi, 1900.

DD. *Prickles middle-sized.*

pubescens, Todaro. Baker does not say that the lvs. are not convolute at the tip, nor does he distinguish the lvs. from those of *F. Cubensis*, except in the smaller-sized prickles. It is presumably the only species in Furcræa proper with a pubescent ovary. Peduncle scarcely longer than the lvs.; panicle 5 times as long as the peduncle; branches copiously compound. Trop. Amer. B.M. 7250.

AA. *Texture of lvs. flexible and waxy; spines absent; minute teeth on margin. (Subgenus Ræzlia.)*

B. *Trunk 5-6 ft. high; lvs. glaucous.*

Bedinghausii, K. Koch (*F. Roëzii*, André. *Yucca Parmentieri*, Roez. *Ræzlia regia*, Hort.). Lvs. 3-4 ft. long, 3-4 in. broad at middle, 1 in. above base, permanently glaucous on both sides, very rough on the back; inflor. 15-20 ft. high. Mex. R.B. 1863, p. 327; 1863, p. 133 (full history). R.H. 1887, p. 353; 1895, pp. 468, 469. B.M. 7170. Gn. 52, p. 197. G.C. III. 9:489.

BB. *Trunk finally 40-50 ft. high; lvs. not glaucous.*

longæva, Karw. & Zucc. Lvs. 4-5 ft. long, 4-5 in. broad, narrowed to 2 in. above base, the roughness on the back only on the keel; inflorescence 40 ft. long. Mex. B.M. 5519. G.C. II. 16:653.

F. FRANCESCHI, G. W. OLIVER and W. M.

FURZE. *Ulex*, particularly *U. Europæus*.

GAILLÁRDIA (personal name). *Compositae*. About a dozen American herbs (largely of Atlantic N. Amer.), with alternate, simple, more or less toothed, punctate lvs. and solitary yellow or red, showy heads; ray fls. usually neutral, often with 2 or more colors or shades; disk fls. mostly purple, the styles with slender hispid branches; involucre with two or more rows of leafy scales. Gaillardias are popular and worthy garden plants. There are two types,—the annual forms, which are derived from *G. pulchella* and *G. amblyodon*, chiefly from the former; and the perennials, which issue from *G. aristata*. The species are variable and confusing.

Amongst hardy perennial plants, Gaillardias are conspicuous for profusion and duration of flowers. A constant succession is produced all summer until very late in autumn. They produce a most gorgeous effect in beds or borders. Moreover, they are highly recommendable for cut-flower purposes, as they last for a long time in water, and can be gathered with ample, self-supporting stems. They thrive best in light, open, well drained soil, and should have the full benefit of air and sun. In heavier or in moisture-retaining ground the plants are often winter-killed. The perennial forms are propagated by division, seeds or cuttings in August or September; also by root cuttings in early spring. Seedlings do



886. *Gaillardia pulchella*, var. *picta* (X 2.5).



887. *Gaillardia pulchella*. The form known as *G. Lorenziana* (X 1/2).

purposes we may rely on seed sowing, as this involves less labor, but the cuttings make the better plants. *G. grandiflora* and its many varieties are garden forms of *G. aristata*. Great improvements have been introduced in late years. Some of these are highly colored and of extraordinarily large size, many of the flowers measuring 4 to 5 in. across, as in the variety named Jas. Kewley. Another class has quilled florets (*G. fistulosa*), of which Buffalo Bill is an excellent sample—a large, pure yellow, with maroon disk. Vivian Grey is also a remarkable and most distinct variety, with clear yellow, fringed rays and disk of the same color.

Cult. by J. B. KELLER.

A. Annual Gaillardias: fls. normally mostly red.

amblyodon, Gay. One-2 ft., erect, leafy, hirsute: lvs. oblong or spatulate, sessile and auriculate, entire or nearly so; lobes (or teeth) of the disk corollas short and obtuse; rays numerous, brown-red or maroon throughout their length. Tex. F.S. 21:249.—Somewhat cult. amongst garden annuals, and worthy.

pulchella, Fong. Erect, branching, 12-20 in., soft-pubescent: lvs. oblong, lanceolate or spatulate, rather soft, nearly sessile, either entire or the lower ones lyrate-pinnatifid; lobes of disk fls. acute or awned; heads 2 in. across, the flat rays yellow at top and rose-purple at base. Ark. and La. to Ariz. B.M. 1602, 3551 as *G. bicolor*.

Var. **picta**, Gray (*G. picta*, Hort.). Fig. 886. The common garden form under cult., having larger heads and of various colors. B.M. 3368. R.H. 1852:20. In one form (*G. fistulosa*, *G. tubulosa*, *G. Lorenziana*, Hort.), the ray florets and sometimes the disk florets are enlarged and tubular. Fig. 887. R. H. 1881, p. 377; 1885:156.

AA. Perennial Gaillardias: fls. normally yellow.

aristata, Pursh (*G. grandiflora*, *G. lutea*, *G. maxima*, and *G. perennis*, Hort.). Erect, 2-3 ft.: lvs. rather thick, lanceolate or oblong, sometimes spatulate, varying from entire to sinuate pinnatifid; lobes of disk corollas acute or awned; heads 3-4 in. across, the flat rays yellow, or in cult. varying to red (particularly at the base). Plains W. B.M. 2940. B.R. 14:1186. Gng. 2:345.—This is the common perennial Gaillardia of gardens (cult. under many names). Blooms the first year from seed. From *G. pulchella* it is distinguished by taller growth, firmer lvs., yellow heads, and less attenuate lobes of the disk fls.; but it is practically impossible to distinguish the two, except that one is annual and the other perennial.

L. H. B.

GALÁCTIA (Greek, *gala*, milk; some kinds said to have a milky juice). *Leguminosa*. Perhaps 50 species of prostrate or twining perennial herbs or erect shrubs, widely scattered. They are of the smallest hort. value, and are chiefly distinguished by the calyx lobes, 4, entire, acute; fls. in racemes, or the lower ones clustered in the axils; pods linear. Two kinds, once adv. by E. Gillett.

A. Leaflets 3.

glabélla, Mich. Prostrate, glabrous; stems matted, usually branching, 1-2 ft. long; lfts. elliptic, often notched at tip; fls. 4-10, reddish purple; pods slightly pubescent. Dry, sandy soil. N.Y. to Fla. B.B. 2:335.

not reproduce the parent; therefore, if we are in possession of an extra good variety, we must resort to the other modes of propagation, though for general

AA. *Leaflets* 7-9.

Elliottii, Nutt. Lfts. elliptic-oblong, notched, pubescent beneath: fls. white, tinged red: pod silky. Dry soil. S. C. to Fla.

GALANTHUS (Greek, *milk flower*). *Amaryllidaceae*. **SNOWDROP**. The flowers of Snowdrops (*G. nivalis*, Fig. 888) are amongst the smallest and faintest of our common hardy cultivated spring-blooming bulbs. Much sentiment attaches to them, and in many an old-fashioned garden they are the earliest flowers of the new year. They often bloom in early March, before all the snow has gone. Their pendulous white flowers, with the "heart-shaped seal of green" dear to Rossetti, hold a unique place in the affections of lovers of gardens. Snowdrops are amongst the very few flowers in nature in which the green color is decidedly attractive to our senses. At first sight the fls. seem to have 3 large white petals, inclosing a green and white tube with 6 tips, but a second glance shows that the parts that function as petals are the outer segments of the perianth, while the 3 inner ones, with their 2-lobed tips, are not grown together, but overlap slightly, forming a rather crude but stiffish tube. It would be interesting to know whether the green marks have any relation to calyx tips. Each plant has a globose coated bulb, 2-3 lvs., grows 6-9 in. high, and bears usually only 1 flower, which emerges from a spathe. Behind the perianth is a globose green body, which is the ovary.

In a congenial spot, moist, cool and shady, the plants increase satisfactorily, and sometimes, without any care whatever, form a bed from which literally thousands of flowers may be picked at what is, perhaps, the most desolate and wearisome moment of the year. (For a fine picture of Galanthus, naturalized in the grass, see G.M. 34:184.) The leaves are linear and channeled, and in dark, shining masses make a rich, quiet effect. They come out with the fls., attain their full growth later, and commonly die down in midsummer or fall. A fine large bed of Snowdrops is more to be desired than many novelties, rarities, or any individual plants of indifferent health and vigor. The bulbs are cheap, and

should be ordered in liberal quantities. In purity, modesty and simplicity, Snowdrops have perhaps no peers among hardy spring-blooming bulbs other than squills, grape hyacinths, and the glory-of-the-snow (*Hionodoxa*). Crocuses are more cheerful and more brilliant plants, with larger and more variously colored flowers.

An era of new interest in Snowdrops began about 1875, with the introduction of the "giant" kind (*G. Elwesii*, Fig. 889), but those who do not care for "large violets" will be likely to cling to the small Snowdrops. Nevertheless, *G. Elwesii* is very distinct, and should be the first choice if any large kinds are desired, and to secure the best forms the connoisseur should buy imported bulbs of its varieties. The only kinds known so far to possess a patch of green at the base of the inner segments are *G. Elwesii* and *Fosteri*. Considering that there are only 2 main types in this genus, *nivalis* and *Elwesii*, the profusion of Latin names (especially since 1888, the date of Baker's "Handbook of the Amaryllidaceae") is rather trying, except to the connoisseur who, unlike the general public, is chiefly interested in the larger-flowered forms and the novelties.

There are several types of minor importance. The

autumn-flowering kinds, representing many Latin names, as *Octobrensis*, *Coreyrensis*, *Regina Olga*, are usually weak-growing plants. However, much is hoped from *G. Cilicicus*, especially by the florists, who have hitherto found no Snowdrop that could be profitably forced for Christmas. Doubtless seems to add nothing to the beauty of Snowdrops. So far it seems to have affected only the inner segments of *G. nivalis* and *G. Elwesii*. Yellow Snowdrops are also practically unknown in America. In these the heart-shaped spot and the ovary are yellow instead of green. Of these, *G. borevensis* is said to have brighter markings than *G. inflexus*.

W. M.

The Galanthus is a true winter flower, and one of the few kinds of bulbs which grow naturally in partial shade, and suffer by actual baking of the bulbs. They are found naturally in northern exposures, and conditions similar to these inure to their welfare in gardens. The October kinds must be grown in frames, for the leaves will not ripen in the open. The fall-flowering forms are mostly Grecian, and they all show a white line in the channeled face of their leaves. *G. nivalis* flowers in the writer's garden, at Elizabeth, N. J., in a mild January, and *G. Elwesii* is even earlier. Among the choicer kinds are *G. Imperati*, *G. Ikarie* (very distinct, Scilla-like lvs.), *G. Whittallii* and *G. Melvillei major*, which the finest forms of *G. nivalis*. For general culture no form of Galanthus is so universally satisfactory as *G. nivalis*. The writer has had disappointing results with *G. Fosteri*, and cannot see that *G. Caucasicus*, var. *maximus*, is any great gain in size.

The yellow markings on Snowdrops are signs of degeneracy. Among the flowers each season, though more frequent at some times than others, will be found those with light colored markings and occasionally some white ones, but these plants show lack of vigor. In *G. Elwesii* the spathe are sometimes 2-fld. instead of one. All the fall-flowering kinds are rather delicate and decidedly costly, and promise nothing for forcing. *G. Elwesii* would be best for gentle forcing. The fall-flowering kinds are probably all forms of *G. nivalis*, including *G. Olga*, which Baker keeps as a distinct species.

J. N. GERARD.

Index of names accounted for below:

Byzantium, 12.	Fosteri, 9.	nivalis, 1.
Cassaba, 5.	Graecus, 6.	ochrospilus, 5.
Caucasicus, 4.	grandiflorus, 11.	plicatus, 10.
Cilicicus, 2.	Ikarie, 8.	robustus, 5.
Coreyrensis, 1.	Imperati, 3.	undulatus, 5.
Elwesii, 5.	latifolius, 7.	Whittallii, 5.
Erithrae, 5.	maximus, 4, 11.	

- A. Lvs. merely channeled, not plaited.
 B. Width of lvs. small, 3-4 lines.
 C. Base of lvs. not very narrow.

1. *nivalis*, Linn. COMMON SNOWDROP. Figs. 888, 889. Bulb 6-12 lines thick: basal sheath split down one side: lvs. glaucous, finally 6-9 in. long; outer perianth segments oblong, 6-12 lines long; inner segments green only at the sinus. Feb., Mar. Pyrenees to Caucasus. R. H. 1880, p. 148. G.M. 34:154. G.C. II. 11:237. Gt. 48, p. 232. There are large-fld. and double forms. Var. *Coreyrensis* and others flower in Nov. At least 2 varieties have yellow instead of green markings. Var. *reflexus* has outer segments reflexed. G.M. 34:155.

cc. Base of lvs. very narrow.

2. *Cilicicus*, Baker. Less robust than *Fosteri*, with much narrower lvs., which are narrowed gradually from the middle to a very narrow base. Green color as in *nivalis*. Bulb $\frac{1}{2}$ in. thick: lvs. whitish beneath; outer segments oblong, 9 lines long, 3-4 lines broad; stamens more than half as long as the inner segments. Mt. Taurus, in Cilicia, where it fls. Nov. to Mar. Int. 1898. See G.C. II. 21:214. Pictured in G.C. III. 23:79. A.F. 13:1137. Gng. 6:244. F.E. 11:282. Gt. 48, p. 228.

BR. Width of lvs. medium, 6-9 lines long.

c. Foliage moderately glaucous.

d. Outer segments of perianth 12-15 lines long.

3. *Imperati*, Bertol. Fls. larger than in *G. nivalis*; outer segments more spatulate. Naples and Genoa. This and *Caucasicus* are regarded by Baker as subspecies of *nivalis*. G.C. II. 11:237. G.M. 34:155.



888.
The Snowdrop—
Galanthus nivalis.

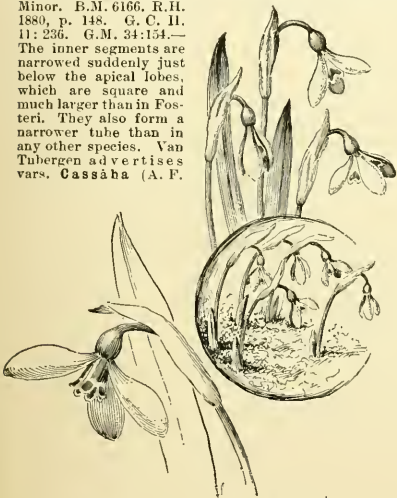
nn. Outer segments 9-12 lines long.

4. **Caucasicus**, Baker (*F. Redoltei*, Rupr.). Lvs. finally 8-9 in. long, mostly 9 lines broad; outer segments oblong-spatulate, with a very narrow claw. Fls. later than *nivalis*. Caucasus. Van Tubergen seems to catalogue var. *maximus* of this species, but consult No. 11.

cc. Foliage very glaucous.

d. Inner segments with lobes rather spreading or crisped.

5. **Elwesii**, Hook. GIANT SNOWDROP. Fig. 889. Bulb larger and fls. more globose than in *nivalis*; outer segments oblong-spatulate, 9-15 lines long, 6-9 lines broad; inner segments green in the lower half and also around the sinus. Mts. of Asia Minor. B.M. 6166. R.H. 1880, p. 148. G.C. II. 11: 236. G.M. 34:154.—The inner segments are narrowed suddenly just below the apical lobes, which are square and much larger than in *Fosteri*. They also form a narrower tube than in any other species. Van Tubergen advertises vars. *Cassâha* (A. F.



889. *Galanthus nivalis* and *Elwesii*.

The upper fls. are *G. nivalis*. The lowest one is *G. Elwesii*.

The middle fls. are a variety of *G. Elwesii*.

3:471. Gng. 5:180 Gt. 48, p. 225. Gn. 55, p. 206), **ochrospilus**, **unguiculatus** (G.C. III. 17:361), and **Erithraeus**, or **Whittellii** (Gn. 57, p. 45), which has the largest fls. *G. robustus*, Hort., seems never to have been accounted for by Baker. It may perhaps be *G. Elwesii*, var. *robustus* which is a trade name. It is broad-lvd. and glaucous.

DD. Inner segments with lobes not spreading or crisped.

6. **Græcus**, Orph. Very near *Elwesii*, but differing as above and in the smaller fls. and narrower outer segments. April. Chios.

BBB. Width of lvs. greatest, 9-12 lines.

c. Green color only near the sinus.

n. Colored on both sides of the inner segments.

7. **latifolius**, Rupr. Bulb 1 in. thick; lvs. lorate, bright green; outer segments oblong-spatulate, 6-9 lines long; inner segments green around the sinus, inside and out; anthers suddenly narrowed to a sharp point, while in *nivalis* and *Elwesii* they are gradually narrowed. Caucasus, where it fls. in May. G.C. II. 11:237; 15:404; 1868:578. Gt. 48, p. 229.

DD. Colored on only one side.

8. **Ikáriae**, Baker. Resembles *Fosteri* in foliage, and *Elwesii* not in coloring but in the square, crisp lobes of the inner segments, which tend to recurve. Outer seg-

ments nearly 1 in. long; stamens rather shorter than the inner segments; green color occupying half the outside of the inner segments. Island of Nikaria (the classical Ikaria). See G.C. III. 13:506. Gn. 52, p. 361 and 49, p. 330. Int. 1893.

cc. Green color also on the lower half of the inner segments.

9. **Fosteri**, Baker. Resembles *latifolius* in foliage and *Elwesii* in flower, but the apical lobes of the inner segments are short and erect, and smaller than in *Elwesii*. Also the stamens are not more than half as long as the inner segments, while in *nivalis*, *Elwesii* and *latifolius* they are three-fourths as long. Asia Minor. Int. 1889. G.M. 34:154.

AA. Lvs. plaited, the edges permanently rolled back.

B. Green color only near the sinus.

10. **plicatus**, M. Bieh. Bulb larger than in *nivalis*; outer segments oblong from a very narrow base, very convex on the back, 9-12 lines long, wide-spreading or even reflexed; inner segments green in the upper half, with a white edge. March, April. Crimea. This is much confounded with *G. Caucasicus*. (G.C. II. 11:236. B.R. 7:545. B.M. 2162. G.M. 34:155.)

11. **grandiflorus**, Baker (*G. mirimus*, Baker, not Velatowsky). Possibly a hybrid between *plicatus* and some form of *nivalis*, remarkable for its robust habit and green color, extending more than half way down towards the base of the inner segments. Int. 1893. See G.C. III. 13:354, 656. See also *G. Caucasicus*, var. *maximus*, No. 4.

BB. Green color also on the lower half of the inner segments.

12. **Byzantinus**, Baker. Intermediate between *plicatus* and *Elwesii*. "Lvs. 3 in. broad," which seems hardly possible, glaucous on both sides, especially beneath; margins distinctly and permanently recurved; outer segments oblong, convex on back, 9 lines long, 4 lines broad, apical lobes somewhat reflexed and crisped; stamens much shorter than inner segments. Int. 1893. See G.C. III. 13:226

W. M.

GALAX (Greek, *gala*, milk; alluding to the whiteness of the flowers). *Diapensiaceæ*. *Galax* lvs., with their lovely shades of red or bronze, furnish some of the most artistic decorative material for Christmas. The *diapensia* family has only 6 genera, and all of them are monotypic or nearly so. The family seems to be nearly crowded out in the struggle for existence, and its geographical distribution is interesting. *Galax* is distinguished from the other genera by the corolla 5-parted, with entire segments; stamens connate with the spatulate staminodes; anthers 1-celled; style very short. The plant has long been cult. in hardy borders and rockeries for its beautifully tinted, persistent lvs. and its slender spikes of fls. borne in July. The plant grows about 6-9 in. high, and is native to the mountains of Virginia to Georgia. J. B. Keller recommends a northern aspect in the lower part of the rockery, where the plants can have shade and moisture. Prop. by division. *Galax* is usually called "Coltsfoot."

aphylla, Linn. **GALAX**. Rhizome perennial; lvs. all from the root, heart- or kidney-shaped, crenate-dentate, often tinged with red or bronze, with radiating nerves and slender petiole, sheathing at the base. B.M. 754. G.F. 5:605. "Aphylla" means "leafless," referring to the scape. W. M.

The use of *Galax* leaves for decorative purposes in a commercial way dates back only to 1890, when they were introduced to the northern florist trade by the writer, who had experimented with them for several years before that date, sending to hospitals and individuals. The reports received fully justified the introducer in advertising the leaf widely as a florist's decorative material for making wreaths, crosses, and in fact all designs for which ivy leaves up to that time had been employed almost exclusively. To-day *Galax* leaves have to a great extent taken the place of ivy leaves, being less expensive, easier handled and kept, and furnishing long, wiry stems. The brilliant bronze

leaves supply a color long needed in this class of work. The sizes of the leaves vary, also, from $\frac{1}{2}$ inch or less to 5 inches in diameter, further extending their usefulness. Small green Galax leaves are now used extensively for hunching with violets, taking the place of the violet leaves. One of the features of the holiday season in Boston is the fakir with his stand of violets hunched with green Galax. They come in again and are used the same way at the first touch of spring, when the early trailing arbutus or "Mayflower" appears on the street. They can be arranged to cover much more space than the ivy leaves, and do not have to be wired, as is the case with the latter. The keeping qualities of Galax are remarkable, and they are now used the year round from cold storage. Outdoor designs, as in cemeteries, will keep fresh and bright for months if not dried out, but otherwise require no care. A favorite arrangement of Galax leaves is to place them loosely in a small vase, where they will retain their bright colors and shape for weeks even in a close, warm room, though most of the leaves are used, commonly with flowers, in designs made up by the florist. As a Christmas decoration they stand preëminent, and their general good qualities mentioned above cause them to be used throughout the year, more, perhaps, than any other decorative green, ferns possibly excepted.

In Philadelphia a few seasons ago an enterprising young woman introduced a novel and taking innovation in the shape of potted Galax plants for society dinners. Small, brilliantly colored green and bronze lvs. were arranged in tiny pots, specially designed by Messrs. Sackett & Company, and placed at each plate, to be carried away by the guests as souvenirs. They were also sold through one of Philadelphia's leading merchants by thousands. The larger cities, Boston, New York, Philadelphia and Chicago, use the largest quantities, though many of these are retailed again to smaller cities and towns all over the United States and Canada, and there is a large export trade now established in them, mostly to Germany and the Netherlands. In 1899-1900, about 70 tons were sold.

The area over which Galax is collected extends from Virginia to Georgia, and is so vast that there is no danger of exterminating the plant by collecting the leaves, even if it were injured thereby, which does not seem to be the case. It is not practicable to grow the plants for the harvest of leaves, at least in America, the process being too expensive. Under cultivation they would perhaps not average one perfect salable leaf per plant, as a speck or wormhole renders the leaf unfit for decorative purposes. In Europe Galax has been tried with varying success under glass, the leaves bringing a very high price.

Galax aphylla is a beautiful ground-covering plant, specially adapted to the Rhododendron border, where the soil and situation alike are suitable to its growth, and delights in shade and a cool, moist, peaty loam. Its charms are far better known in England, however, than at home. The leaves, when full grown, are always bright green, the brilliant bronze shades appearing later when the plant ripens and the frosts begin. Then when they are exposed to the direct rays of the sun the alternating freezing and sun action cause the leaves to turn in a short time, though sometimes this occurs to an extent before any freezing weather. In dense shade they always remain green. In spring, when the sap begins to start, the leaves often turn green or dingy again, and eventually die down the second season.

HARLAN P. KELSEY.

GALEANDRA (Greek for *helmet* and *stamen*). *Ochidaceæ*, tribe *Vandææ*. A genus of deciduous epiphytes. Lvs. distichous, membranaceous; labellum infundibuliform; sepals and petals equal, spreading; column erect, winged; pollinia 2. Culture as for *Eulophia*.

Devoniána, Lindl. Stem erect; lvs. linear-lanceolate, sheathing at base; sepals and petals lanceolate, reddish brown, with green margins; labellum whitish, veined in front with crimson. From the banks of the Rio Negro. B.M. 4610. I.H. 21:176. A.F. 6:609.

Baëri, Lindl. Stems subcylindric, nearly fusiform; lvs. lanceolate; racemes terminal, drooping; fls. large;

sepals and petals similar, lanceolate, yellowish; labellum pale yellow in the throat, interior portion purplish. Mex. S. B.R. 26:49. P.M. 14:49.

D'Escagnolleána, Reichb. f. Stems terete, tapering both ways; lvs. lanceolate, pointed; racemes terminal and drooping; sepals and petals similar, ascending, narrow, yellowish; lip funnel-form or nearly bell-form, fluted, with a rose-purple blotch on the lower limb. Brazil. I.H. 34:22 (1887).

OAKES AMES.

GALÈGA (Greek, *gala*, milk; supposed to increase the flow of milk). *Leguminosæ*. Of 109 names of species in this genus, only 6 are now retained, most of the rest being referred to *Tephrosia*. The 2 plants mentioned below are hardy herbaceous perennials of the easiest culture, about 3 ft. high, with odd-pinnate lvs. and pea-shaped fls. of purplish blue or white. They do not require frequent division, make bushy plants, and bear in July and Aug. many dense, axillary and terminal racemes of fls., which are useful for cutting. Seeds of Goat's Rue are still offered abroad among miscellaneous agricultural seeds, but the plants are little known in this country.

A. Leaflets lanceolate; stipules broadly lanceolate.

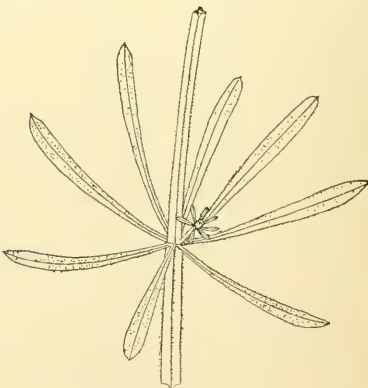
officialis, Linn. GOAT'S RUE. Height 2-3 ft.; lfts. mucronate; fls. purplish blue. Eu., W. Asia. Var. *alba* or *albiflora* is common in cult. Gn. 50, p. 269.—A rose-colored variety is sold abroad; also a dwarf, compact, lilac-vid. variety.

A. Leaflets lanceolate; stipules broadly ovate.

orientalis, Lam. Foliage and stipules larger; fls. purplish blue, nodding; pods pendulous. Caucasus. B.M. 2192. B. R. 4:326.—"Height 2 $\frac{1}{2}$ -4 ft.; rootstock creeping; stem simple." *J. B. Keller*.

J. B. KELLER and W. M.

GALIUM (Galion was the name of a plant mentioned by Dioscorides as used in curdling milk. *G. verum* is used locally abroad for this purpose). *Rubiaceæ*. BED-STRAW or LADY'S BED-STRAW, because of the legend that one of these plants was in the hay on which the mother of Christ rested. This genus contains 150-250 species, widely scattered in temperate regions, mostly weeds, often harsh to the touch, but frequently beautiful in their regular, mathematical habit, caused by the whorled



890. Whorled foliage of a Bedstraw—the native Galium Aparine. Natural size.

arrangement of the lvs. A few plants are slightly used abroad in carpeting rockeries, but *G. mollugo* is a standard plant with many florists who have a hardy border. Their delicate sprays of minute white flowers

are used to lighten the effect of bouquets of other fls., notably sweet peas, which can hardly be arranged with their own foliage, and which in large masses are inclined to look heavy and lumpy. Gypsophilas, which are used for the same purpose, bloom later. They have an equal infinity of detail, which baffles the eye to comprehend. The botanist's analysis of all this misty delicacy and airy grace is "fls. in axillary and terminal, trichotomous cymes and panicles." He also declares that the lvs. are really opposite, the intervening members of the whorls being stipules. Fig. 890. Galiums are annual or perennial herbs, with 4-angled, slender stems and small, white, green, yellow or purple fls.; corolla wheel-shaped, 4-lobed; stamens 4; styles 2. The following are perennials from creeping rootstocks, with white fls. in terminal panicles.

A. *Lvs. in 4's*: fruit hairy.

boreale, Linn. Height $\frac{3}{4}$ - $1\frac{1}{2}$ ft.: stem rather firm, erect and slightly branched; lvs. lanceolate or linear, 3-ribbed, scarcely rough at the edges, often 1 in. long; petals with very short, incurved points. Native.

AA. *Lvs. in 8's or 6's*: fr. smooth or slightly granulated.

Mollugo, Linn. Stem 1-3 ft. long, more or less branched; lvs. obovate to oblong or linear, more or less rough at edges, always terminated by a little point; petals abruptly narrowed into a relatively long point.—This is known in some places as "Baby's Breath," although that name is also given to Gypsophilas (which see). Eu. Perennial.

GALPHIMIA (anagram of Malpighia). *Malpighiaceae*, an order of almost no horticultural value. This genus includes a yellow-fl. shrub cult. in the extreme South, and valued for the exceptional length of its flowering season. The genus has a dozen or less species, mostly Mexican. Shrubs or subshrubs; lvs. opposite, slightly glaucous on both sides or beneath, entire or obscurely toothed, glandular at the margin or base of blade or at the tip of the leaf-stalk; racemes terminal; fls. yellow or reddish. *G. nitida*, probably a recent species, is cult. by E. N. Reaser. Three or four other kinds are rarely cult. under glass abroad.

GALTONIA (after Francis Galton, the distinguished anthropological writer). **GIANT SUMMER HYACINTH**. One of the few Cape bulbs that are practically hardy. This fine plant grows 3-5 ft. high and produces racemes 9-12 in. long of white, funnel-shaped, pendulous fls. in July or later. The plants should be heavily mulched if left outdoors where winters are severe. In favored localities the bulbs may be left for several years with increasingly better results. Large clumps are desirable. They have been suggested for cemetery planting. The genus differs from hyacinths mainly by its more numerous and flattened seeds. The other 2 species are inferior to the following, which was introduced by Lechtlin in the early seventies, and now holds a permanent place in horticulture. The plants prefer a rich, open, moist soil. *Liliaceae*.

candicans, Deene. (*Hyacinthus candicans*, Baker). Fig. 891. Bulb large, round, coated; lvs. lorate-lanceolate, $2\frac{1}{2}$ ft. long; scape often 4 ft. high; racemes 12-20-fl.; fls. fragrant F.S. 21:2173 G.C. 1871:380; 1872:1099 and H. 15:273. R.H. 1882, p. 32. P.G. 3:101. A. G. 17:281. W. M.

GAMBOGE. See under *Garcinia*.



892.
Gamolepis annua.
($\times \frac{3}{8}$.)

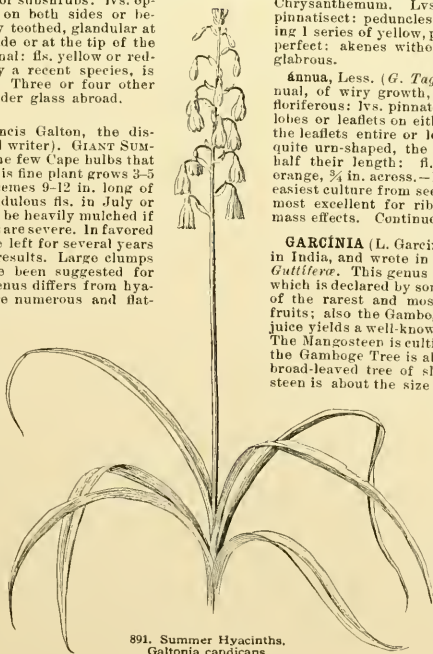
A fine yellow-fl. composite for edgings.

GAMOLEPIS (Greek for *united scales*; referring to the involucre). *Compositae*. About a dozen S. African herbs or small shrubs, somewhat allied botanically to *Chrysanthemum*. Lvs. alternate and mostly pinnatisect; peduncles 1-headed, the heads bearing 1 series of yellow, pistillate rays, the disk fls. perfect; akenes without pappus, wingless and glabrous.

annua, Less. (*G. Tagites*, DC.). Fig. 892. Annual, of wiry growth, a foot or less high, very floriferous; lvs. pinnate or pinnately parted, 5-7 lobes or leaflets on either side of the rachis and the leaflets entire or lobed; involucre nearly or quite urn-shaped, the scales joined more than half their length; fl.-heads bright yellow or orange, $\frac{3}{4}$ in. across.—Hardy or half-hardy. Of easiest culture from seeds in sunny places, and most excellent for ribbon borders and for low mass effects. Continuous bloomer. L. H. B.

GARCÍNIA (L. Garcin, who lived and collected in India, and wrote in the eighteenth century). *Guttifera*. This genus includes the Mangosteen, which is declared by some connoisseurs to be one of the rarest and most luscious of all tropical fruits; also the Gamboge Tree, whose resinous juice yields a well-known pigment and purgative. The Mangosteen is cultivated in the West Indies; the Gamboge Tree is also cult. in S. Fla. It is a broad-leaved tree of slow growth. The Mangosteen is about the size and shape of an orange,

with rind considerably thicker, and edible segments of form and arrangement like those of an orange. It is brilliantly colored outside with rich purple. The persistent stigmas and calyx lobes are seen in Fig. 893. The flavor is said to suggest something between a grape and a peach. Numberless efforts are said to have been made to naturalize this tree in the tropics without success. The successful ripening of this fruit under glass



891. Summer Hyacinth.
Galtonia candicans.

is usually regarded as a consummate achievement in the art of gardening.

Mangostana, Linn. **MANGOSTEEN**. Fig. 893. Height 20 ft.; lvs. 7-8 in. long, elliptic; fls. reddish; petals 4; fr. about 2½ in. in diam. B.M. 4847. L.B.C. 9:845. F.S. 22:359. G.C. 11. 4:657.

Morella, Desr. **GAMBOGE TREE**. Height 30-50 ft.; lvs. more tapering at both ends; fls. yellowish; fr. resembling a Morello cherry in size and shape. W. M.

The Mangosteen is a native of the Malay peninsula and archipelago. It is cultivated, and bears fruit in some parts of Ceylon and in a few spots in the Madras Presidency, but no success has been obtained in its cultivation in other parts of India. DeCandolle, in his "Origin of Cultivated Plants," says: "Among cultivated plants it is one of the most local, both in its origin, habitation and cultivation." In the West Indies it is successfully cultivated in Trinidad and Jamaica, but only in spots where the climate is moist, hot and fairly equable all through the year; for instance, in the Jamaica Botanic Gardens it bears good crops of fair-sized fruit at Castleton, in a val-



893. The Mangosteen—*Garcinia mangostana*. (× ¾.)

One of the choicest tropical fruits.

ley on the north side, with a mean temperature of 76° F. and an annual rainfall of 113 inches, whereas attempts to grow it have failed at Hope Gardens, in the Liguanea plain of the south side, with a mean temperature of 72° and an annual rainfall of 52 inches. Experience in southern India is much the same; it will grow only in valleys,—not in the open plains. In England the tree has been grown in hothouses and the fruit ripened successfully.

The Gamboge Tree is much more widely distributed, being native throughout India, Ceylon, Malaya and Siam. As one might expect, its cultivation is easy, as it stands a considerable amount of variation of moisture and heat. In Jamaica it has become naturalized in some parts of the wetter districts. WM. FAWCETT.

GARDEN and GARDENING. The word Garden etymologically means an inclosed space, and Gardening is therefore, distinguished from agriculture by being carried on within an inclosure of some kind instead of in the open fields. Gardening operations are usually

conducted on a smaller scale than those of agriculture, and by more intensive methods. Gardening and horticulture are really synonymous terms, but, by usage, a horticulturist is supposed to have a more extended training and wider range of activities than a gardener. Moreover, the word Gardening now suggests more of the private, homelike and personal point of view, whereas the most distinctive feature of American horticulture is the immense commercial importance of fruit-growing on a greater scale than that of Old World Gardening, and a marked emphasis of the professional side of a fruit-grower's work. The history and discussion of Gardening are, therefore, set forth in this book under Horticulture. Large private places are often divided into Fruit Garden, Kitchen Garden and Flower Garden. Fruit-growing is the same as Pomology (which see). Kitchen-gardening, in its widest sense, is the same as Vegetable-gardening (which see), or the more learned word, Olericulture; but the expression Kitchen-gardening is now less common, and generally indicates the private and uncommercial point of view, whereas Market-gardening and Truck-gardening (which are practically the same) are now the chief words used for the wholesale and commercial side of Vegetable-gardening in the U. S. Flower-gardening, a third primary division of Gardening, is the same as Floriculture (which see). Under Ornamental Gardening and Landscape Gardening are explained the two different points of view in the use of plants

and flowers for their own sakes or when grouped for artistic effects, the nature-like or picturesque conception being set forth under Landscape Gardening, and the artificial or merely decorative styles under Ornamental Gardening. America being the only country where cut-flowers

are commercially more important at present than the trade in potted plants, a special article is devoted to Cut-flowers in this work. Other departments of Ornamental Gardening are treated under Greenhouse Management, Alpine Gardens (including Rock Gardens), Aquatics (including Bog Gardens), Trees, Shrubs, Herbaceous Perennials and Annuals.

GARDENER'S GARTER. *Arundo Donax*, var. *variegata*, and *Phalaris arundinacea*, var. *picta*.

GARDENIA (after Alexander Garden, M. D., of Charleston, S. C., a correspondent of Linnæus). *Rubiacæ*. This includes the Cape Jasmine, a tender shrub 2-6 ft. high, with thick, evergreen foliage and large, double, waxy Camellia-like, fragrant fls. It blooms from May to Sept. in the South, where it is often used for hedges, and is hardy as far north as Va. In the middle of the century the Cape Jasmine was considered one of the finest stove shrubs in cultivation, but with the waning popularity of Camellias the doom of the Cape Jasmine as a conservatory plant was sealed. The Camellia has a greater range of color, and has had hundreds of varieties, while its scented rival has had barely a dozen. The flowers of the Cape Jasmine have never been so perfectly regular as those of a Camellia, and the plants are very subject to insect enemies. Their bloom is successional rather than close, and large plants are therefore not so showy as Camellias. They are considerably grown abroad for cut-fls. in early spring, young plants a season or two old being used for best results. The variety with variegated foliage is dwarfed and weaker growing. The true botanical name of the Cape Jasmine is *G. jasminoides*, a name almost never used in the trade. "Cape Jasmine" itself is one of the most remarkable cases of the vitality of an erroneous popular name. The single-fl. form was

Introduced much later than the double, and has always been less popular. The earliest picture of a flowering plant with single fls. was published in 1820 in B.R. 449. Some fine plants still known to the trade as Gardenias are now placed in the allied genera *Randia* and *Mitrostigma*. These two genera have a many-celled ovary, while that of *Gardenia* is 1-celled. The calyx in *Gardenia* is often tubular, in *Mitrostigma* 5-parted, in *Randia* various. The testa of the seeds is membranaceous in *Randia*; in *Mitrostigma* rather fibrous. Gardenias are obtainable chiefly through southern and Californian dealers. Cape Jasmynes are also handled by importers of Japanese plants, who sometimes offer seeds also. *G. lucida* was probably introduced by Reassour, and *G. Rothmannii* by Franceschi. For the true Jasmynes (which belong to the olive family, and are often trailing plants), see *Jasminum*.

G. florida and *G. radicans* have long been figured separately, and our nurserymen still keep the names distinct. The only difference which DeCandolle notices is that *G. florida* is more shrubby and erect, with elliptical lvs. acute at both ends, growing spontaneously in China and cult. in Japan, while *G. radicans* has a stem that takes root, lanceolate lvs., and is a native of Japan. Both plants, DeCandolle wrote, were cult. in India and at the Cape. Ellis founded the genus upon a double-fl. specimen, which he figured in the Phil. Trans. Roy. Soc. Lond. in 1761. In 1816 Sims pictured a double form in B.M. 1842 with these remarks: "In the way that *Gardenia radicans* is treated in our stoves, the stems show no disposition to put forth roots; but probably would they suffer to come in contact with the earth. It is doubtful whether it has ever been seen in this country, or even in China, with a single flower. There is a great affinity between this species and *Gardenia florida*, from which it differs very little, except in the lesser size of its flowers and leaves, which last are narrowed at both extremities. The flowers have nearly the same fragrant smell, and the plant, flowering more freely and being more easily propagated than the true Cape Jasmine, it has of late much taken the place of this last, and is frequently sold for it." Before 1820, Sir J. Smith wrote in Rees' Encyc.: "The original idea and character of this genus are taken from *G. florida*, commonly called 'Cape Jasmine.' This was first brought to England by Capt. Hutchinson (of the Godolphin Indianman), who, about the middle of the last century, met with a bush of it in full flower, somewhere near the Cape of Good Hope, probably in a cultivated state. He brought the whole plant in a pot to England. * * * Mr. Gordon, the nurseryman, having obtained layers from the tree, propagated it so successfully that he is said to have gained more than 500 l. by the produce. It is now frequent in our gardens, treated as a stove plant, though it chiefly bears heat in the early spring to make it bloom, but at other times a hardy greenhouse plant. The flowers are the size and aspect of a double *Narcissus poeticus*, with a sweet and very powerful scent, resembling the flavour of ginger. They turn buff as they fade." From the above evidence, and from the pictures cited below, it seems clear that if the trade names *G. Fortunei*, *florida* and *radicans* really represent 3 distinct varieties, the only single distinction that can be made is in width of foliage; *Fortunei* having lvs. 2 in. wide, *florida* 1-1½ in., and *radicans* ½-1 in. wide.

a. Corolla tube cylindrical.

n. Calyx with 5 long teeth.

c. Ribs on the calyx.

jasminoides, Ellis. (*G. florida*, Linn. *G. radicans*, Thunb.). CAPE JASMINE. Discussed above. For pictures of double forms, see B.M. 1842 and 2627 and B.R. 1:79; single, B.R. 6:449 and B.M. 2349; normal and variegated foliage, R.H. 1864, p. 30. China, var. *Fortuniana*, Lindl. (*G. Fortunei*, Hort.). B.R. 32:43. F.S. 2:177. R.B. 23:241. In 1893 John Saul advertised *G. clematifflorea* in addition to *G. radicans*, *G. florida* and vars. *major* and *majestica*. *G. Sinensis grandiflora* of Berger's catalogue perhaps belongs here.

cc. Ribs not present.

lucida, Roxb. Buds resinous; lvs. oblong; stipules annular, variously divided at the mouth, unequally lobed. India, Burma, Luzon.—The calyx teeth are not decurrent, as in the Cape Jasmine, and thus the calyx does not have the ribbed look.

BB. Calyx tubular, with 5 very short teeth.

amœna, Sims. Differs from all here described in having numerous strong spines nearly ½ in. long, which are axillary. Lvs. oval, acute, short-stalked; fls. subterminal; corolla tube 1 in. long, longer than the lobes, which are 6, obovate, white, with margins incurved enough to show the rose bay. India or China.

BBB. Calyx spathe-like.

Thunbergia, Linn. f. Lvs. broadly elliptic, acute, with pairs of glands along the midribs: fls. 3 in. across, pure white; corolla lobes 8, overlapping. S. Afr. B.M. 1004. — "Dwarf-growing."—Franceschi.

AA. Corolla tube short and wide-throated.

B. Fls. 5 in. long and broad.

Rothmannia, Linn. f. Very distinct in foliage and fl. Lvs. with pairs of hairy glands along the midrib: calyx ribbed, with 5 long teeth, equaling the short, cylindrical portion of the corolla tube; corolla tube rather suddenly swelled, ribbed; lobes 5, long-acuminate, whitish, spotted purple in the mouth. S. Afr. B.M. 690. L.B.C. 11:1053. — "Fls. pale yellow."—Franceschi.

BB. Fls. 1½ in. long and broad.

globosa, Hochst. Lvs. oblong, short-acuminate; leaf-stalk nearly 3-5 lines long; fls. white, inside hairy and lined pale yellow; calyx small, with 5 very short teeth; corolla tube wide at the base and gradually swelled; lobes 5, short-acuminate. S. Afr. B.M. 4791. F.S. 9:951.

G. citriodora, Hook.—*Mitrostigma axillare*.—*G. Staleyana*, Hook.—*Randia maculata*. W. M.

Gardenia jasminoides (the true Cape Jasmine) has again become very popular, even suggesting its popularity thirty years ago, when its wax-like, fragrant blossoms were highly fashionable. Then several of the leading florists erected special houses for it, in order that they might flower it in the winter season. The writer had charge of one of these houses. The attempt to bloom them in midwinter was, however, only partly successful, for it is against the nature of the plant to force it into bloom before the turn of the sun in, say, January. If the plants have been well established the previous summer and are well set with flower buds, they can be successfully forced into bloom in a sunny greenhouse, giving them stove heat and frequent syringings with tepid water. The plants will be entirely covered with their great blossoms. To grow and prepare such plants, cuttings with two or three joints or eyes of well-ripened wood should be made in December or January, putting them into the propagating bed of sharp sand, with a bottom heat of not less than 75°, and keeping close until callused. Then air can be admitted. After rooting, they should be potted into small pots and grown on until the middle of May, when they can be planted out into a cold-frame or old hotbed, into a rich, sandy loam, giving them the full sun and treating them the same as *Ficus elastica* is now grown. Abundance of water and frequent syringing are essential. Pinch the shoots, so as to make the plants bushy and branchy. In the latter part of August or beginning of September the plants should be potted into 5-, 6- or 7-inch pots, according to their size, then placed either in a hotbed with gentle bottom heat or in a house where a moist stove temperature can be maintained until the plants are well rooted. During this period they should be slightly shaded, after which the plants can be hardened off and put into their winter quarters. Put in a cool greenhouse where Azaleas or Camellias or other New Holland or Cape stock is wintered, until their time for forcing into flower arrives, in the early part of the new year.

There is considerable difference between the large-leaf or *Fortuniana* variety and the common *G. jasminoides*. While the same treatment will answer for both, and the fl. of the former is much larger, it is not so profitable for commercial purposes as the ordinary *G. jasminoides*. There is also a difference between these and the variety known as *G. radicans*, and its variegated variety, *radicans fol. var.* These plants grow much dwarfer, and their habit is more radicate or flat or prostrate in growth. Their foliage is myrtle-like and the flowers are much smaller and are less valuable. These, however, make good flowering (dwarf) pot-plants under similar treatment. The variegated form is cultivated in great abundance in Japan, in the gardens in semi-tropical sections. None of the other varieties is of much commercial importance, and they have value only in botanical collections.

H. A. STEEBCHT.

GARDEN LEMON. See under *Cucumis Melo*.

GARDÓQUIA *heticoides* = *Cedronella Mexicana*.

GARLAND FLOWER in the South sometimes means *Hedychium coronarium*. Often means *Daphne Cneorum*.

GARGET. *Phytolacca decandra*.

GARLIC (*Allium sativum*, Linn.). Hardy perennial bulbous plant, closely allied to the onion. It is native of southern Europe. It has flat leaves, and the bulb is

composed of several separable parts or bulbs, called cloves. These cloves are planted, as onion sets are, in spring or in fall in the South. They mature in summer and early fall. If the soil is rich, it may be necessary to break over the tops to prevent too much top growth and to make the bulbs better, as is sometimes done with onions. This is done when the top growth has reached normal full size. The cloves are usually set 4-6 in. apart in drills, in ordinary garden soil. The bulbs are used in cookery, but mostly amongst the foreign population. Strings of bulbs braided together by their tops are common in metropolitan markets (Fig. 894).

L. H. B.

GARLIC PEAR. See *Cratava*.

GARRYA (after Nicholas Garry, secretary of the Hudson Bay Company). Including *Fadyenia*, *Cornacea*. Ornamental evergreen shrubs with opposite, petioled, entire lvs., with the small greenish white or yellowish fls. in catkin-like, often pendulous spikes, and with dark purple or dark blue berries. None of the species is hardy North, but *G. Veatchi*, var. *flavescens*, and also *G. Fremonti*, which are the hardiest, can probably be grown north to New York in sheltered positions, while the others are hardy only South. They are well adapted for evergreen shrubberies, and the staminate plants are especially decorative in early spring with the

894. Garlic, as strung for market.

showy, pendulous catkins, to 1 ft. in length and often bloom in midwinter. The Garryas thrive well in a well-drained soil and in sunny, sheltered position; in England they are often grown on walls. Prop. by seeds or by cuttings of half-ripened wood under glass; also by layers and sometimes by grafting on *Aucuba*. About 10 species in W. N. America from S. Oregon to S. Mexico, west to W. Texas. Shrubs with exstipulate lvs.: fls. dioecious, apetalous, 1-3 in the axils of opposite bracts on elongated, often drooping, axillary spikes; staminate fls. with 4 sepals and 4 stamens, pistillate with 2 sepals and 2 styles and a 1-celled ovary; berry 1-2-seeded, rather dry.

elliptica, Dougl. Shrub, to 8 ft.: lvs. elliptic to oval-oblong, obtuse or acute, usually undulate, glabrous above, densely tomentose beneath, 1½-3 in. long; 3 fls. in the axils of short and broad, pointed bracts; spikes

rather dense, staminate 2-12 in. long, often branched, pistillate 1-2 in. long; fr. globose, silky tomentose. Calif. to New Mex. B. R. 20:1886. Gn. 33, p. 562; 51, p. 257; 53, p. 449; 55, p. 258.—This is the handsomest species, and stands about 10° of frost (sometimes more) in a sheltered position.

Thurii, Carr. (*G. elliptica* × *Fadyenia*). Shrub, to 15 ft.: lvs. elliptic to elliptic-oblong, at length glossy and glabrous above, whitish tomentose beneath, 2-5 in. long; bracts remote, ovate-lanceolate, with usually 1 fl. in each axil; spikes shorter than those of the former; fr. ovoid, tomentose. Originated in France. R. H. 1869, p. 17; 1879, p. 154, 155.

G. Fadyenia Hook. (*Fadyenia* Hookeri, Griseb.). Shrub, to 15 ft.: lvs. elliptic to oblong, acute or mucronulate, glossy above, tomentose beneath or almost glabrous at length, 2-4 in. long; bracts oblong-lanceolate, remote; fr. tomentose. Jamaica, Cuba.—**G. Fremonti**, Torr. Shrub, to 10 ft.: lvs. ovate to oblong, acute, glabrous on both sides, yellowish green, 1-3 in. long; spikes dense, 2-5 in. long, with short bracts; fr. pedicelled, glabrous. Ore. to Calif. G. C. II. 15:431.—**G. macrophylla**, Benth. Shrub, to 6 ft.: lvs. ovate to oblong-ovate, glabrous above, villous-pubescent beneath, 2-5 in. long; spikes dense and showy; fr. sessile. Mexico.—**G. Veatchi**, Kellogg. Spreading shrub, to 8 ft.: lvs. elliptic-ovate to elliptic-oblong, acute, yellowish green, silky-tomentose beneath, 1½-2½ in. long; spikes dense, 1-2 in. long; fr. sessile, usually silky tomentose. Nevada to Calif. and N. Mex.—Var. *harveyana*, Coult. & Evans (*G. flavescens*, Wats.); has the lvs. smaller, longer petioled and less pubescent; it is the more northern form and hardier. Species named for J. A. Veatch, botanical explorer of Cedros Island, Lower California.

ALFRED REHDER.

GARUGA (native name). *Burséracea*. This includes a deciduous East Indian tree, reaching 60 ft., and cult. in S. Fla. and Calif. for its fruits, which are the size of a goose-berry, and are eaten raw, but chiefly pickled. The genus has 6 species in tropical Asia, Amer. and Australia. Tomentose trees; lvs. crowded at tips of branches, alternate, odd-pinnate; fls. opposite, subsessile, serrated; fls. polygamous, paucicled; calyx bell-shaped, 5-ent; petals 5, inserted on the tube of the calyx above the middle; ovary 4-5-celled; ovules in pairs; drupe with 5, or by abortion 1-3, stones, which are wrinkled and finally 1-seeded.

pinnata, Roxb. Lvs. nearly villose; lfts. obtusely crenate. India and Malaya.—Also cult. abroad under glass.

GAS PLANT. Consult *Dictamnus*.

GASTERIA (Greek, *gaster*, belly; referring to the swollen base of the fls.). *Liliaceae*. About 50 species of greenhouse evergreen succulents, allied to *Aloe*, and native of South Africa. Rather small plants, mostly acaulescent, with usually elongated leaves, crowded in 2 ranks or a loose rosette. Flowers with a rosy ventricose, curved tube and short, suberect, greenish segments, about as long as the stamens and pistil. Several species are prolific on aborted peduncles. Hybrids are frequent between the species, and with other genera of the tribe. *Gasterias* flower in winter. For culture, see *Aloe*.

A. Leaves tapering gradually to the point, concave-over or concavely 3-sided.

verrucosa, Haw. (*Aloe verrucosa*, Mill.). Lvs. in two straight or at length twisted ranks, narrow for the genus, dull gray, very rough, with small white tubercles. Cape. B. M. 857.

carinata, Haw. (*Aloe carinata*, Mill.). Lvs. at length spreading in every direction, an inch or more broad, mostly inequilaterally 3-sided, dull, greener, the greener protruding tubercles coarser and more separated. B. M. 1331 (except left-hand leaf).

excavata, Haw. Like the last, but without raised tubercles. Doubtfully distinct from the next. Cape.

glabra, Haw. (*Aloe glabra*, Salm-Dyck. *A. carinata*, var. *subglabra*). Lvs. larger, green, somewhat glossy, some of the coarse, remote, pale dots persistently elevated. Cape. B. M. 1331 (left-hand leaf).

acinacifolia, Haw. (*Aloe acinacifolia*). Lvs. dark green, more elongated, somewhat glossy, the scattered pale dots not raised. Cape. B. M. 2369.

pulchra, Haw. (*Albe pulchra*, Jacq.). Lvs. sometimes purplish, narrower and longer, the rather coarse, pale dots not elevated. Cape. B.M. 765.

nitida, Haw. (*Albe nitida*, Salm-Dyck). Lvs. green, more or less glossy, short, deltoid, very thick, the coarse, pale dots not elevated, and the margins nearly smooth. Cape. B.M. 2304.

AA. *Leaves with nearly parallel margins, abruptly pointed or mucronate.*

B. *Leaves strap-shaped, one or both faces flat or concave, the margins frequently doubled.*

intermedia, Haw. (*G. verrucosa*, var. *intermedia*). Lvs. 2-ranked, more rounded on the back than usual in the group, and some of them tapering as in *verrucosa*, grayish, rough, with numerous pale tubercles. Cape. B.M. 1322 (as *Aloe lingua*).

scaberrima, Salm-Dyck (*G. intermedia*, var. *asperima*, *G. verrucosa*, var. *scaberrima*, *Albe scaberrima*). Lvs. thinner, less concave and tapering, often sword-shaped, very rough, with coarse white tubercles.

disticha, Haw. (*G. denticulata*, Haw. *Albe disticha*, Thunb. *A. lingua*, Thunb. *A. linguiformis*, Mill.). Lvs. somewhat concavo-convex, from apple-green becoming dull gray, evanescently pale dotted, smooth, rough-margined. Cape.

Var. *conspicua*, Haw. (*G. conspicua*, Haw. *Albe conspicua*, Salm-Dyck). Lvs. with less roughened margin, the numerous, more persistent, pale dots not elevated.

Var. *verrucosa* (*Albe linguiformis*, var. *verrucosa*). Lvs. roughened by the persistent elevation of some of the more remote greener dots.

Var. *angulata*, Haw. (*Albe angulata*, Willd.). Lvs. nearly flat on both surfaces, one or both margins acutely doubled.

sulcata, Haw. (*Albe sulcata*, Salm-Dyck). Lvs. very concave, with angular, conspicuously elevated and mostly incurved margins, the green dots sometimes protruding. Cape.

nigricans, Haw. (*Albe nigricans*, Haw. *A. lingua*, var. *crassifolia*). Lvs. plano-convex, rather turgid, from dark green with pale dots becoming uniformly purplish, smooth, the occasionally doubled margins very minutely roughened. Cape. B.M. 838 (as *Aloe lingua*, var. *crassifolia*).

Var. *subnigricans*, Haw. (*G. subnigricans*, Haw.). Greener, the sparse dots somewhat elevated and the margins rough, especially below.

BB. *Leaves sword-shaped, turgid, polished.*

planifolia, Bak. Lvs. 2-ranked, 2-edged, narrow, long, biconvex, dark green, with numerous rather large, often confluent pale blotches, the margin denticulate next the apex. Algoa Bay.

maculata, Haw. (*Albe maculata*, Thunb. *A. obliqua*, Haw.). Lvs. obliquely 2-ranked, occasionally 3-edged, often twisted, broad, with confluent pale blotches, the margin entire. Cape. B.M. 979.

pieta, Haw. (*G.* and *A. Bowieana*). Lvs. spirally 2-ranked on an elongated stem, somewhat purplish, broad, from biconvex becoming concave, smooth margined or a little roughened near the middle. Cape.

marmorata, Bak. Lvs. spirally 2-ranked, often 3-edged, narrow, elongated, smooth, entire or the lower partly rough-margined, highly polished, coarsely palemberled. Cape.

parvifolia, Bak. Lvs. spreading in all directions, mostly 3-edged, very short and thick, duller green, with less confluent, small, pale dots, which are often slightly elevated. Cape. WM. TRELEASE.

GASTONIA *palmeta*. See *Trevesia*.

GASTRONEMA. A section of *Cyrtanthus*.

GAULTHERIA (named by Kalm after Dr. "Gaultier," a physician in Quebec, whose name was really

written Gaultier). *Ericaceae*. This includes the Wintergreen and some other ornamental low aromatic plants with alternate, evergreen lvs., white, pink or scarlet, often fragrant fls. in terminal or axillary racemes or solitary, and with decorative, berry-like red or blackish fr. *G. procumbens* is fully hardy North, while the other N. American species need protection during the winter; they are well adapted for borders of evergreen shrubberies as well as for rockeries, and in suitable soil they are apt to form a handsome evergreen ground-cover. Most of the foreign species can be grown only South or as greenhouse shrubs. Some have edible fruits, and an aromatic oil used in perfumery and medicine is obtained from *G. procumbens* and several Asiatic species. They grow best in sandy or peaty, somewhat moist soil and partly shaded situations. Prop. by seeds, layers or suckers, division of older plants, and also by cuttings of half-ripened wood under glass. About 90 species in the warmer and subtropical regions of Asia, Australia, and in America from Canada to Chile. Erect or procumbent shrubs, rarely small trees, usually hairy and glandular: lvs. petioled, roundish to lanceolate, mostly serrate: fls. in terminal panicles or axillary racemes or solitary; calyx 5-parted; corolla urceolate, 5-lobed; stamens 10; ovary superior: fr. a 5-celled, dehiscent capsule, usually enclosed by the fleshy and berry-like calyx.

procumbens, Linn. WINTERGREEN. CHECKERBERRY. BOXBERRY. PARTIDGE BERRY. STEIN creeper, sending up erect branches to 5 in. high, bearing toward the end 3-8 dark green, oval or obovate, almost glabrous lvs., 1-2 in long, with ciliate teeth: fls. solitary, nodding; corolla ovate, white, about $\frac{1}{4}$ in. long; fr. scarlet. July-Sept. Canada to Ga., west to Mich. D. 73. H.M. 1966. L.B.C. 1:82.

Shallon, Pursh. Low shrub, to 2 ft., with spreading, glandular-hairy branches: lvs. roundish-ovate or ovate, cordate or rounded at the base, serrulate, 2-4 in. long; fls. nodding, in terminal and axillary racemes; corolla ovate, white or pinkish: fr. purplish black, glandular, hairy. May, June. Brit. Columbia to Calif. Called "shalon" or "sala" by Indians. B.M. 2843. B.R. 17:1411. L.B.C. 14:1372.

G. antipoda, Forst. Shrub, to 5 ft., sometimes procumbent, hairy: lvs. orbicular to oblong, $\frac{3}{4}$ - $\frac{1}{2}$ in. fl. solitary, white or pink. New Zealand. Tasmania. *G. coccinea*, HBK. Shrub, to 2 ft., hairy: lvs. roundish ovate, about 1 in. long, slender-petioled, in elongated, second racemes: corolla ovate, pink. Venezuela. R.H. 18:9:181. *G. ferruginea*, Cham. & Schlecht. Small shrub, Rufously hairy: lvs. ovate or oblong, 1-2 in. fls. almost like the former. Brazil. B.M. 4697. *G. fragrantissima*, Wall. Shrub or small tree, glabrous: lvs. elliptic to lanceolate, $2\frac{1}{2}$ - $3\frac{1}{2}$ in. long; racemes axillary, erect, shorter than the lvs.; corolla white or pinkish, globose ovate. Himalayas, Ceylon. B.M. 5981. *G. nummularoides*, D. Don. (*G. Nummularia*, DC.). Procumbent: branches densely rufo-tomentose hairy: lvs. orbicular to ovate, $\frac{1}{2}$ -1 in. long; fls. solitary, ovate, white. Himalayas. G.C.H. 22:457. P.F.G. 2:164. *G. ovalifolia*, Gray. Procumbent, with ascending and sparingly hairy branches: lvs. ovate, acute, 1-1 $\frac{1}{2}$ in. long; fls. solitary, campanulate; fr. scarlet. Brit. Columb. to Ore. *G. parvifolia*, Hook. f. & Thoms. (*G. pyrolifolia*, Hook. f.). Low shrub, sometimes procumbent, almost glabrous: lvs. elliptic-obovate, about $\frac{1}{2}$ in. long; racemes few-fl'd., axillary. Himal. Japan.

ALFRED REHDER.

GAURA (Greek, *superb*). *Onagraceae*. This includes several herbs which are distinct in appearance, but scarcely possess general garden value, though they are pleasant incidents in the hardy border of those who like native plants. The bloom ascends the slender racemes too slowly to make the plants as showy as possible. The best kind is *G. Lindheimeri*, which has white fls. of singular appearance, with rose calyx tubes. *Gaura* is a genus of 20-25 species of annual and perennial herbs confined to the warmer regions of N. Amer.: lvs. alternate, sessile or stalked, entire, dentate, or sinuate: fls. white or rose, in spikes or racemes; calyx tube deciduous, obovate, much prolonged beyond the ovary, with 4 reflex lobes; petals clawed; stamens mostly 8, with a small scale-like appendage beyond the base of each filament; stigma 4-lobed, surrounded by a ring or cup-like border: fr. nut-like, 3-4-ribbed, finally 1-celled, and 1-4-seeded. *Gaura* are easily prop. by seed. They prefer light soils, and the seedlings can be transplanted directly into permanent quarters.

A. Height 3 ft.; fls. white.

Lindheimeri, Engelm. & Gray. Lvs. lanceolate, with a few wavy teeth and recurved margins. Tex. G.W.F. 23. R.H. 1851-41, and 1857, p. 262.

A. Height 1 ft.; fls. rosy, turning to scarlet.

coccinea, Nutt. Lvs. numerous, lanceolate to linear, repand-denticulate or entire; fls. in spikes; fr. 4-sided. Tex. W. M.

GAYLUSSACIA (after J. L. Gaylussac, eminent French chemist; died 1850). Syn., *Adánia*, *Eriodora*, tribe *Vaccinieae*. Evergreen or deciduous shrubs with alternate, short-petioled, entire or serrate lvs., white, red, or reddish green fls. in lateral racemes, and blue or black mostly edible fruits. The deciduous species are hardy North, but are of little decorative value, while the evergreen species, all, except the half-hardy *G. brachycera*, inhabitants of the S. American mountains, are often very ornamental in foliage and fls., but tender and hardly cultivated in this country. They grow best in peaty or sandy soil and shaded situations. Prop. by seeds, layers or division; the evergreen species by cuttings of half-ripened wood under glass. See also *Vaccinium* for cult. About 40 species in N. and S. America, closely allied to *Vaccinium*, distinguished by the 10-celled ovary, each cell with one ovule.

A. Lvs. evergreen, obtusely serrate.

brachycera, Gray. Low shrub, with creeping and ascending stem and spreading angled glabrous branches; lvs. oval, glabrous, $\frac{1}{2}$ -1 in. long; racemes short, with few white or pinkish fls.; fr. black. May, June. Pa. to Va. B.M. 928. L.B.C. 7:648 (as *Vaccinium huxifolium*).

AA. Lvs. deciduous, entire.

B. Fls. in loose racemes; corolla campanulate.

dumosa, Torr. & Gray. Shrub, to 2 ft., with creeping stem and almost erect, somewhat hairy and glandular branches; lvs. obovate-oblong to oblanceolate, mucronate, shining above, leathery, 1-2 in. long; fls. white or pinkish; bracts foliaceous and persistent; fr. black, usually pubescent, rather insipid. May, June. Newfoundland to Fla. and La. B.M. 1106 (as *Vaccinium*).

frondosa, Torr. & Gray. BLUE HUCKLEBERRY. DANGLEBERRY. TANGLEBERRY. Shrub, to 6 ft., with spreading, usually glabrous branches; lvs. oblong or oval-obovate, obtuse or emarginate, pale green above, whitish beneath, membranaceous, 1-2 in. long; fls. slender-pedicelled; corolla broadly campanulate, greenish purple; fr. blue, with glaucous bloom, sweet. May, June. N. H. to Fla., west to Ky., preferring moist, peaty soil. Em. 2:451. G.C. III. 7:580.

ursina, Torr. & Gray. Shrub, to 4 ft., with somewhat pubescent, spreading branches; lvs. obovate to oblong, acuminate, membranaceous, 2-4 in. long; fls. white or pinkish; fr. finally black, insipid. May, June. N. and S. Carolina. Harlan P. Kelsey writes of this species: "Shrub 2-6 ft. high; very local in a few counties in southwestern North Carolina, though common in these stations. Locally it is known as 'Buckberry,' a name given by the native mountaineers from the fact that deer feed on the very abundant clustered fruit in late summer. The berries are much used for pies and jams, and have a most peculiar and pleasant acid flavor, unlike any other *Vaccinium*. It promises to be a valuable addition to our garden fruits."

BB. Fls. in short, sessile racemes; corolla ovate.

resinosa, Torr. & Gray. Erect shrub, to 3 ft., resinous when young; lvs. oval or oblong-lanceolate, mucronate, yellowish green above, pale beneath, 1-1 $\frac{1}{2}$ in. long; fls. short-pedicelled, nodding, reddish; fr. black, rarely white, sweet. May, June. Newfoundland to Ga., west to Wis. and Ky., preferring sandy or rocky soil. Em. 451. B.M. 1288 (as *Vaccinium*).

G. pseudo-Vaccinium, Cham. & Schlecht. Evergreen, usually glabrous shrub, to 3 ft., with elliptic, entire lvs. and red fls. in second, many-rid. racemes. Brazil. B.R. 30:62. R.H. 1845:285.

ALFRED REHDER.

GAZANIA (after Theodore of Gaza, 1393-1478, translator of Aristotle and Theophrastus). *Compositae*. This group contains some of the finest of the subshrubby composites from the Cape of Good Hope. They have an astonishing range of color, — pure white, yellow, orange, scarlet, and the backs of the rays are in some cases rich purple, and even azure-blue. Their foliage is often densely woolly beneath, and the range of form is amazing. Speaking of *G. uniflora*, Harvey says: "Frequently all the lvs. are quite simple; in other specimens some lvs. are deeply 3-lobed, the rest simple, and in our var. *pinnata*, which grows intermixed with the other varieties, the upper lvs. are quite simple, the lower either 3-lobed or pinnately 5-7-lobed, all on the same branch!" The group is also remarkable for the spots near the base of the rays of *G. Patonia* and some others. These markings suggest the eyes of a peacock's tail. The plants are also remarkable for their behavior at night, when they close their fls. and turn their foliage enough to make the woolly under sides of the lvs. more conspicuous. The genus has 24-20 species, which are herbaceous, mostly perennial, rarely annual, with short stems or none; lvs. crowded at the crown of the root, or scattered along the stem; involueral scales in 2 or several rows, cup-like at the base; akenes wingless, villous; pappus in 2 series of very delicate, scarious, toothed scales, often hidden in the wool of the akenes. Harvey in *Flora Capensis* 3:471. N. E. Brown in *Gn.* 47, p. 288.

Gazanias are now rarely met with in some of the oldest-fashioned florists' establishments. Few of the more prominent firms keep them now, and they may be said to be practically out of cultivation in America. All the kinds described below are old garden favorites abroad, particularly *G. rigens*, a common bedding plant, cult. for nearly a century and a half, but whose precise habitat has never been ascertained. Importers are urged to procure (from the Cape if necessary) the other kinds recommended by Brown, at least the perennial sorts, which are *G. junicefolia*, *subulata*, *longicauda*, *uniflora*, var. *leucolena* (exceptionally woolly on both sides of the lvs.), *rigens*, var. *pupurea*, *armerioides* and *crispifolia*. These are presumably equally desirable with the older sorts, though not necessarily of the same ease of culture. *G. montana*, Spreng., a new species, may be expected in American trade in 1900. It has yellow fls., and is figured in *Gt.* 48, p. 584. Of the annual kinds Brown recommends *G. Burchellii*, *Lichtensteini* and *tenifolia*. Gazanias are amongst the most conspicuous and characteristic of the subshrubby composites at the Cape, being brilliant objects in the sandy wastes. They are said to be of easy culture in our cool greenhouses, and are commended for summer use in the borders of those who can keep them under glass in winter. They can be rapidly prop. in midsummer by cuttings made from the side shoots near the base and placed in a close frame.

A. Color of heads yellow.

B. Rays not spotted; heads 2 in. across.

uniflora, Sims. Stems spreading 6-12 in. or more from a center; lvs. varying as mentioned above. The woolliness also varies greatly; sometimes the whole plant is snowy white; sometimes the whiteness is confined to the under sides of the lvs. B.M. 2270. L.B.C. 8:795.—The involucre is woolly, according to Harvey, but the pictures cited do not show it. This and *G. rigens* have short stems, with branches alternately leafy, while *G. vinata*, *Patonia* and *pygmaea* have little or no stem, and the lvs. radical or tufted at the ends of the short branches.

BB. Rays spotted at base; heads 3 in. or more across.

pinnata, Less. Lvs. commonly pinnate (some simple); lobes oblong or linear in several pairs; peduncle longer than lvs.; involueral scales acuminate, particularly the inner ones. Harvey names 6 botanical varieties.

AA. Color of heads orange; rays spotted at base; heads 3 in. or more across.

B. Lvs. mostly entire and spatulate.

C. Basal markings containing brown.

rigens, R. Br. Stems short and densely leafy or diffuse, laxly leafy, with ascending branches; lvs. sometimes sparingly pinnatifid, i. e., with only 1 or 2 side

lobes. B.M. 90 shows a head of scarlet rays, with basal markings of brown, black and white.

CC. *Basal markings without brown.*

splendens, Hort. Fig. 895. Hybrid, said to resemble *G. uniflora* in habit but dwarfer and more compact. Of the kinds in common cult. it is nearest to *G. Pavonia* in coloring of fls.

BB. *Lvs. mostly pinnate.*

Pavonia, R. Fr. PEACOCK GAZANIA. B.R. 1:35 shows markings of brown, white, yellow and blue, which are marvelous in design and precision of execution. Involucral scales short, the inner broad, acute or subacute.



895. *Gazania splendens* ($\times \frac{1}{2}$).

AAA. *Color of heads white above.*

pygmaea, Sond. Lvs. spatulate, entire. Rays white, striped purple beneath. Gn. 47:1011. 1.H. 43:53. B.M. 7455. Var. *maculata*, N.E. Br. Rays pale creamy white, with a blackish spot at the base, reverse striped dull purple. Var. *superba*, N. E. Br. Rays white, unspotted, reverse striped bluish. This species is very unreasonable about its involucral scales, which may be short or long, sometimes cup-shaped at the base, and again almost free. This upsets one of the most important features of Harvey's key.

W. M.

GEAN. *Prunus Avium.*

GEIGER TREE. *Cordia Sebestena*

GEISSORHIZA (Greek words alluding to the coats of the bulb, which cover it somewhat like overlapping tiles). *Iridaceae*. About 30 species of Ixia-like, half-hardy Cape bulbs, which are dormant from Aug. to Nov., and are usually flowered under glass in spring and early summer. The spathe-valves are all green and membranous at the tip, while in Ixia the outer spathe-valve is short, brown and notched at the tip. The genus has a wide range in habit and in color of fls., but these plants are presumably inferior to Ixias for general culture. The following species is advertised in some of the Dutch bulb catalogues that are printed in English.

Latest monograph by Baker in *Flora Capensis* 6:65-76 (1896-97).

Rochensis, Ker. Lvs. glabrous, basal ones narrow, few-ribbed; stem-sheath loose and swelling; fls. 1-2 in. across; perianth tube shorter than the spathe; segments with a nectary at the base. B.M. 598 (not 672, as stated in Index Kewensis), where the whole plant is a trifle over 3 in. high and the fls. purple, with a dark red eye, the latter surrounded by a pale blue circle.

GELSEMIUM (from an Italian name of the true Jessamine, which belongs to a different order). *Loganiaceae*. A genus of only 2 species, the typical one being the Carolina Yellow Jessamine, our native woody twiner of the South, which climbs on trees and bears shining evergreen foliage and a profusion of axillary clusters of bright yellow, very fragrant, handsome fls., 1 in. or more long, in early spring. Lvs. opposite, membranous, the leaf-stalks joined by a transverse stipular line; calyx 5-parted; corolla open funnel-shaped, the 5 lobes broad and imbricated in the bud; stamens 5; anthers arrow-shaped; style slender; stigma 2, each 2-parted, lobes linear; ovary 2-celled; pod oval, flattened contrary to the partition, 2-valved, many-seeded; seeds winged. The cymes of the Chinese species are terminal and trichotomous, of ours axillary, 1-3-fl. Reasoner considers ours one of the best of southern vines, and says: "Not cult. to the extent it deserves. Will grow on any land, rich or poor, wet or dry. Quick-growing, and for several weeks in spring literally covered with its lovely fragrant yellow flowers." It is somewhat grown for winter bloom in northern conservatories. Preparations of the rhizome and roots are common in drug stores. Properties nervine, antispasmodic, sedative.

sempervirens, Ait. St. purplish; lvs. small, lanceolate or ovate, acute or subcordate at the base, short-petioled. Mar., Apr. Margins of swamps and rivers. Va. to Fla. A double-fl. form is advertised.

W. M.

GENIPA (Brazilian name). *Rubiaceae*. This includes a West Indian shrub allied to the Cape Jasmine and barely known to American horticulture. Genipa and Gardenia are hard to separate. Small trees; lvs. with short or no stalks, opposite, large, leathery, obovate or lanceolate, shining; cymes axillary, few-fl.; fls. white to yellowish; calyx limb bell-shaped, truncated, or 5-toothed; corolla salver-shaped, limb twisted to the left, 5-parted; stigma club-shaped or bifid; ovary 1-celled; placentas 2, almost touching each other in the axis; berries edible.

clusifolia, Griseb. Shrub on maritime rocks of Cuba, etc.; lvs. 4 in. or less long, black when dried, obovate, glabrous; corymbs short-peduncled; calyx limb 5-cut; corolla glabrous; berry ovoid.

GENISTA (ancient Latin name). *Leguminosae*. Ornamental low shrubs with small deciduous or half-evergreen lvs., showy yellow fls., generally in terminal racemes or clusters, appearing profusely in spring or summer, and followed by small, insignificant pods. None of the species is quite hardy North, but *G. tinctoria*, *Anglica*, *Germanica* and some other European species will do well in a sheltered position or if somewhat protected during the winter, while the others are more suited for cult. in southern regions. They are well adapted for covering dry, sandy banks and rocky slopes, and for borders and rockeries. They grow in any well-drained soil, and like a sunny position. Prop. by seeds, sown in spring, also by layers and by greenwood cuttings under glass. About 80 species in Europe, Canar., N. Afr., W. Asia. Allied to Cytisus, but without callose appendage at the base of the seeds; branches usually striped, sometimes spiny; lvs. entire, alternate, rarely opposite, simple, sometimes 3-foliolate; fls. yellow, rarely white, style hardly curved; calyx 2-lipped, with the upper lip deeply 2-parted. The Genista of florists is Cytisus.

A. *Color of fls. white.*

monosperma, Lam. (*Retama monosperma*, Boiss.). Shrub, to 10 ft., with slender grayish branches, almost

leafless; lvs. small, simple or rarely 3-foliate, generally linear or linear-spatulate, silky; fls. white, fragrant, in short lateral racemes; corolla silky; calyx purple; pod broadly oval, 1-2-seeded. Feb.-April. Spain, N. Afr. B.M. 683.

AA. *Color of fls. yellow.*

B. *Twigs striped, not winged.*

C. *Pod globular, indehiscent, 1-seeded.*

sphaerocarpa, Lam. Similar to the former, but lower and less silky, almost leafless; fls. yellow, very small, in numerous panicle racemes; corolla glabrous. May, June. Spain, N. Afr.

CC. *Pod oval to linear, dehiscent.*

D. *Branches almost leafless at flowering season or lvs. very small and scarce.*

E. *Fls. in terminal heads, sessile.*

umbellata, Poir. Erect shrub, to 2 feet, with rigid branches, forming a dense bush; lvs. simple or 3-foliate, lanceolate or linear-lanceolate, silky, $\frac{1}{2}$ - $\frac{1}{2}$ in. long; corolla silky, over $\frac{1}{2}$ in. long; pod linear-oblong, tomentose, 2-5-seeded. April, May. Spain.

EE. *Fls. in racemes, pedicelled.*

ephedroides, DC. Erect shrub, to 3 ft., with rigid branches; lvs. sessile, simple or 3-foliate, linear, almost glabrous; fls. in many-fld. terminal racemes, small; standard much shorter than keel; pod oval, 1-seeded, silky. April, May. Sardinia, Corsica.

Etensis, DC. Shrub, to 6 ft., with slender branches; lvs. simple, small, linear, silky; fls. axillary, forming loose, terminal racemes, fragrant; keel shorter than the standard; pod glabrous at maturity, oblique-oval, 1-2-seeded. June, July. Sicily, Sardinia. B.M. 2674.

DB. *Branches leafy, with conspicuous lvs. (only G. virgata sometimes scarcely leafy).*

E. *Spiny.*

ferox, Poir. Erect shrub, to 6 ft., with many stout spines; lvs. simple, rarely 3-foliate, oblong to obovate, almost glabrous; fls. in numerous terminal racemes along the branches; corolla glabrous, over $\frac{1}{2}$ in. long, fragrant; pod linear, densely silky, many-seeded. Spring, N. Africa. B.R. 5:368.

Germánica, Linn. Erect or ascending spiny shrub, to 2 ft., with villous branches; lvs. elliptic-oblong, ciliate; fls. small, in 1-2 in. long racemes; pod oval, villous, few-seeded. June, July. M. and S. Europe.

EE. *Not spiny; lvs. always simple.*

F. *Fls. in racemes; erect shrubs.*

G. *Flt. villous or silky, 1-4-seeded.*

virgata, Link. (*Spartium virgatum*, L'Hér.). Shrub, to 8 ft., with slender branches; lvs. lanceolate to elliptic, silky-villous, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; fls. in numerous short, 3-6-fld. racemes; standard and keel silky; pod oblong, 1-3-seeded, villous. May, July. Madeira. B.M. 2265.

florida, Linn. Erect shrub, to 6 ft., with glabrous striped branches; lvs. spatulate-oblong or lanceolate, silky beneath, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; fls. in dense, many-fld. racemes; corolla glabrous; pod oblong or narrow-oblong, silky, 2-4-seeded. April-July. Spain.

GG. *Flt. glabrous or nearly so, 3-10-seeded.*

polygalifolia, DC. Erect shrub, to 6 ft., with somewhat silky branches; lvs. spatulate-oblong, glabrous above, sparingly silky beneath, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; fls. in many-fld. slender racemes; standard and wings glabrous, keel silky; pod oblong or narrow-oblong, almost glabrous, 3-6-seeded. May-July. Spain.

tinctoria, Linn. DYER'S GREENWEED. Flt. 896. Erect shrub, to 3 ft., with striped, glabrous or slightly pubescent branches; lvs. oblong-elliptic or oblong-lanceolate, almost glabrous, ciliate, $\frac{1}{2}$ -1 in. long; racemes many-fld., panicle at the ends of branches; corolla glabrous; pod narrow-oblong, glabrous or slightly pubescent, 6-10-seeded. June-Aug. Europe, W. Asia; naturalized in some places E. B.B. 2:271.

Var. pléna, Hort. With double fls. **Var. virgata**, Mert. & Koch (*G. virgata*, Willd., not Link, not Lam. *G. elata*, Wender.). Of more vigorous growth, to 6 ft. high; pod 3-6-seeded. Southeast Eu.

FF. *Fls. arillary; dwarf, procumbent shrub.*

pilosa, Linn. Dwarf, procumbent or ascending; lvs. cuneate, oblong or obovate, dark green and almost glabrous above, silky beneath; fls. axillary, 1-2, often racemose toward the end of branches; pod linear, silky, 5-8-seeded. May, June. M. and S. Eu., W. Asia.

BB. *Twigs broadly 2-winged.*

sagittalis, Linn. (*Cytisus sagittalis*, Mert. & Koch). Dwarf, procumbent, with ascending or erect, mostly simple branches; lvs. ovate to oblong, villous; fls. in terminal, short racemes; corolla glabrous; pod linear-oblong, silky. May, June. Eu., W. Asia.

G. alba, Lam. = *Cytisus albus*. — **G. Andréna**, Puisseau = *Cytisus scoparius*, var. *Andréna*. — **G. Anglica**, Linn. Spiny shrub, to 3 ft. sometimes procumbent, glabrous; lvs. oval to linear-oblong, bluish green; racemes few-fld. M. Europe. — **G. Anzatica**, Ten. Allied to *G. tinctoria*. Dwarf, diffuse; lvs. elliptic, obtuse, glabrous; fls. in racemes. Italy. S.B.F.G. 2:36. — **G. aspalathoides**, Lam. Low, spiny shrub; lvs. simple or 3-foliate; fls. 1-5, axillary, forming loose, terminal racemes; pod many-seeded. N. Africa. — **G. Canariensis**, Linn. = *Cytisus Canariensis*. — **G. cándicans**, Linn. = *Cytisus candicans*. — **G. elata**, Wender. = *G. tinctoria*, var. *virgata*. — **G. Hispanica**, Linn. Allied to *G. Germanica*. Dwarf, silky; fls. in head-like, short racemes. Hardy in western N. Y., flowering after the middle of May. A spiny plant with oblong lvs. L.B.C. 18:1738. R.H. 1888:36. — **G. jincea**, Lam. = *Spartium jinceum*. — **G. Maderénsis**, Wbb. = *Cytisus Maderénsis*. — **G. ovata**, Walld. & Kit. Allied to *G. tinctoria*. To 1 ft., with ascending or erect branches; lvs. ovate to lanceolate, villous; pod villous. S. E. Eu. L. B. C. 5:482. — **G. monosperma**. — **G. scariosa**, Viv. = **G. triangularis**. — **G. scoparia**, Lam. = *Cytisus scoparius*. — **G. Sibirica**, Hort. not Linn. = *G. tinctoria*. — **G. triangularis**, Willd. Dwarf, with ascending or procumbent triangular branches, glabrous; lvs. obovate to lanceolate, with transparent margin; fls. in short racemes. Italy, S. E. Eu. L. B. C. 12:1135 (as *G. scariosa*). — **G. virgata**, Willd., not Lam., not Link, nor DC. = *G. tinctoria*, var. *virgata*.

ALFRED REHDER.

GENTIANA (after Gentius, king of Illyricum, who is said to have discovered the tonic value of these plants). *Gentianaceae*. Gentians are amongst the most desirable of alpine plants, and of blue flowers in general, but they are generally considered difficult to establish. The genus is the largest in the order, and from a garden point of view the most important. About 180 species, widely scattered in temperate and mountainous regions. Chiefly perennial herbs, rarely annual or biennial, often dwarf, diffuse or tufted, sometimes erect and slender, or even tall and stout; lvs. opposite, mostly sessile; fls. blue, violet, purple, rarely dull yellow or white; floral parts typically 5, rarely 4-7.

The Blue Gentian, celebrated by tourists in the Alps, is probably mostly the stemless Gentian, *G. acutis*. This was brought to English gardens so long ago that all record of its introduction is lost. It is by far the most popular kind in cultivation. This species is by some split into 5 distinct species, of which *G. angustifolia* of Villars (not Michaux) is nearest to the Gentianella of English gardens. It has been so much modified in cultivation that it now has stems 4-6 inches high, and

the rootstock is so stoloniferous that the plant has to be cut back every year when used for edgings in English gardens. In France it is easily grown in a compost of one-half humus or leaf-soil and one-half good vegetable mold, to which may be added a little sand. Corveon writes: "It can be multiplied by means of offsets, but it is infinitely better to raise it from seed, and, in doing this, it should not be forgotten that the seeds of this group of Gentians are very tedious, and, more especially, very capricious in germinating. I have sown seeds of *G. acaulis*, some of which did not germinate for 12 months, while others (which I must say were more recently gathered) germinated in a few weeks. The seedlings should be potted as soon as possible and while they are very young. They will begin to flower in about 3 years from the time of sowing, rarely sooner." Except *G. Andreinii*, *G. Saponaria* and *G. puberula*, and perhaps a few others, Gentians do not thrive as well in America as in England. Our seasons are too hot and dry. Whenever possible, give a damp atmosphere.

It is rash to generalize on Gentian culture, because some plants are tall, others dwarf, some found on mountains, others in lowlands, some in moist soil, others in dry lands, while some like limestone and others cannot endure it. The annual kinds are of interest only to the expert. Alpine plants in general are unique in requiring an extremely large water supply, combined with extremely good drainage. Another difficult problem is to keep the plants as cool as they are on the mountains without shading them more than nature does. Gentian seeds are small, and in germination slow and uncertain. They should be sown as soon as gathered, for the thorough drying out of small seeds is, as a rule, soon fatal. Gentians are difficult to establish, and dislike division of the root, but are well worth patient years of trial, for they are very permanent when once established. Nature-like alpine gardens are one of the latest and most refined departments of gardening, and Gentians are one of the most inviting groups of plants to the skilled amateur. Consult *Alpine Gardens*.

There are several Fringed Gentians, but ours (*G. crinita*, Fig. 897) is perhaps the most beautiful of Gentians, and one of the choicest and most delicate of American wild flowers. It has been proposed as our national flower, and, while sought after less than the trailing arbutus, it is in even greater danger of extermination in certain states because it is a biennial, and because it has never been successfully cultivated. Seeds of *G. crinita* have long been advertised by one American dealer, but at the Cornell Experiment Station these have never been germinated. The Fringed Gentian is, however, firmly rooted in American literature, and from the time of Bryant's ode many tributes in verse have been paid to its unique beauty. The daily unfolding of its square-ridged and twisted buds has been watched in thousands of homes. By the artists its blue is often considered the nearest approach to the color of the sky, but it must be confessed that a shade of purple often appears in the older flowers.

The Gentian enthusiast should hasten to procure a copy of "The Garden" for Aug. 24, 1895, which contains Corveon's fine cultural monograph of Gentians translated from H. H. 1895, p. 525, and 1894, p. 42. Corveon cultivates his Gentians at Geneva, Switzerland. The writer of the present article has searched Corveon's monograph for facts concerning season of bloom, habitat and cultural directions, which are scattered below.

Corveon makes 4 cultural groups of Gentians:

1. Tall Gentians for general culture: species whose roots are more or less stout, which are of relatively easy culture, and therefore suitable for borders, rockwork and landscape gardening. Typical plant, *G. lutea*; others are *G. affinis*, *alba*, *Andreinii*, *asclepiadea*, *Bigelovii*, *Burseri*, *Cruciata*, *decumbens*, *Fetisowii*, *gelida*, *Kesselringii*, *macrophylla*, *Olivieri*, *Pneumonanthe*, *Porphyrio*, *Saponaria*, *sceptrum*, *septemfida* and *Waltjevi*.

2. Low-growing Gentians: species whose roots being less stout are adapted to rockwork, and for the open ground only when a special compost is provided. Includes *G. acaulis* and the species into which it is sometimes divided.

3. Tufted Gentians: species with sessile flowers growing little above the level of the ground, and suited

for the same positions as Group II. Typical plant, *G. verna*; others are *G. Bavarica*, *imbricata*, *Oregana*, *ornata*, *Pyrenaica*, and *pumila*.

4. Rare Gentians: species which cannot be grown without some special knowledge and practical experience. Typical plant, *G. purpurea*; others are *G. ciliata*, *Fraichetii*, *punctata*, and presumably all the rest.

The two most popular Gentians in American cultivation seem to be *G. acaulis* and *Andreinii*. These are, perhaps, followed by *G. Cruciata*, *puberula* and *Saponaria*. The plant which King Gentian knew is probably *G. lutea*, the root of which furnishes the Gentian drug stores. From the same sources comes the liqueur or cordial called "Gentiane."

Index of names: those marked with an asterisk (*) appear in American trade catalogues; the rest are cult. abroad. The plants are perennials and mountain-loving, unless otherwise stated.

* <i>acaulis</i> , 51.	* <i>Cruciata</i> , 45.	<i>Pannonica</i> , 42.
<i>adscendens</i> , 3.	<i>Dinarica</i> , 56.	* <i>Parryi</i> , 36.
<i>affinis</i> , 29.	* <i>decumbens</i> , 3.	<i>Pneumonanthe</i> , 20.
* <i>alba</i> , 7.	<i>detonsa</i> , 16.	<i>Porphyrio</i> , 31.
<i>algida</i> , 19 and 11.	<i>Fortuni</i> , 27.	<i>pseudo</i> - <i>Pneumonanthe</i> , 25.
<i>alpina</i> , 55.	<i>frigida</i> , 9, 10.	<i>prostrata</i> , 25.
* <i>Andreinii</i> , 92.	<i>Fraichetii</i> , 18.	* <i>puberula</i> , 41.
<i>angulosa</i> , 48.	<i>Gandini</i> , 43.	<i>pumila</i> , 50.
* <i>angustifolia</i> , 52 and 31.	<i>gelida</i> , 11.	* <i>punctata</i> , 6.
* <i>asclepiadea</i> , 19.	<i>imbricata</i> , 47.	<i>purpurea</i> , 4.
<i>barbata</i> , 16.	<i>incarnata</i> , 8.	<i>Pyrenaica</i> , 24.
<i>Bavarica</i> , 49.	<i>intermedia</i> , 8.	<i>quinquefolia</i> , 17.
* <i>Bigelovii</i> , 39.	<i>Kochiana</i> , 53.	<i>rubra</i> , 5.
<i>Burseri</i> , 2.	<i>Kurroo</i> , 37.	* <i>Saponaria</i> , 21.
* <i>calycosa</i> , 35.	* <i>linearis</i> , 23.	* <i>scabra</i> , 26.
<i>campestris</i> , 12.	<i>Lutea</i> , 1.	* <i>sceptrum</i> , 34.
<i>Carpatica</i> , 46.	* <i>macrophylla</i> , 44.	<i>septemfida</i> , 28.
<i>Catesbeii</i> , 21 and 22.	<i>Moorcroftiana</i> , 13.	<i>serrata</i> , 16.
<i>ciliata</i> , 15.	* <i>Newberryi</i> , 28.	<i>Thomasii</i> , 4.
* <i>Cuschi</i> , 54.	<i>ochroleuca</i> , 8.	<i>triflora</i> , 33.
<i>cordifolia</i> , 28.	<i>Olivieri</i> , 30.	<i>verna</i> , 48.
* <i>erinita</i> , 14.	* <i>Oregana</i> , 40.	
	<i>ornata</i> , 32.	

- A. *Calyx spathe-like, split in two.*
 - B. *Color of fls. yellowish.*
 - c. *Form of corolla wheel-shaped*... 1. *lutea*
 - cc. *Form of corolla club-shaped, at least in bud*..... 2. *Burseri*
 - BB. *Color of fls. blue or purple, at least above.*
 - c. *Corolla plaited*..... 3. *decumbens*
 - CC. *Corolla not plaited.*
 - d. *Anthems grown together*..... 4. *purpurea*
 - DD. *Anthems free*..... 5. *rubra*
- AA. *Calyx with a tubular portion, and usually 5 lobes.*
 - B. *Color of fls. yellowish, or greenish white.*
 - c. *Style distinct: capsule not stalked*..... 6. *punctata*
 - CC. *Style none or very short: capsule stalked.*
 - D. *Height 2 ft.*..... 7. *alba*
 - DD. *Height 9-12 in.*..... 8. *ochroleuca*
 - DDD. *Height 6 in. or less.*
 - E. *lobes of calyx longer than the calyx tube*..... 9. *frigida*
 - EE. *lobes of calyx shorter than the calyx tube.*
 - F. *fls. lanceolate-linear*..... 10. *algida*
 - FF. *fls. ovate-lanceolate*..... 11. *gelida*
- BB. *Color of fls. blue or purple.*
 - c. *Corolla not plaited.*
 - D. *Glands found at the base of the filaments.*
 - E. *Calyx 4-ctd.*..... 12. *campestria*
 - EE. *Calyx 5-ctd.*..... 13. *Moorcroftiana*
 - DD. *Glands not found at the base of the filaments.*
 - E. *Fringed Gentians: calyx 4-ctd.*
 - F. *Capsule raised on a distinct stalk.*
 - G. *Apex of lobes fringed, the sides less so*..... 14. *crinita*
 - GG. *Apex of lobes not fringed, base fringed*..... 15. *ciliata*
 - FF. *Capsule on a very short stalk*. 16. *serrata*

- EE. *Not fringed*: calyx 5-cut; corolla lobes tipped with a sharp point 17. *quinquefolia*
- CC. Corolla plaited.
- D. *Stigmas 2, always distinct.*
- E. *Capsules finally raised on a distinct stalk.*
- F. *Anthers permanently grown together.*
- G. *Calyx as long as the corolla* 18. *Froëlichii*
- GG. *Calyx one-half or one-third as long as the corolla.*
- H. *Seeds not at all winged*..... 19. *asclepiadea*
- HH. *Seeds slightly winged.*
- I. *Fls. open* 20. *Pneumonanthe*
- II. *Fls. closed, blue* 21. *Saponaria*
- HHH. *Seeds strongly winged.*
- I. *Fls. closed, purple*..... 22. *Andrewsii*
- II. *Fls. open*..... 23. *linearis*
- FF. *Anthers free, at least finally.*
- G. *Number of corolla lobes 10*. 24. *Pyrenaica*
- GG. *Number of corolla lobes 5 (rarely 4).*
- H. *Calyx 4-lobed* 25. *prostrata*
- HH. *Calyx 5-lobed.*
- I. *Lvs. distinctly rough above (hispid-scarbrous)* 26. *scabra*
- II. *Lvs. distinctly rough at the margins (scarbrous).*
- J. *Lobes of calyx shorter than the calyx tube* 27. *Fortuni*
- JJ. *Lobes of calyx as long as the calyx tube.*
- K. *Corolla lobes ovate, acute, a little longer than the much cut appendages*..... 28. *septemfida*
- KK. *Corolla lobes oblong-lanceolate, obtuse, thrice as long as the much cut appendages*..... 29. *affinis*
- III. *Lvs. not distinctly rough above or at margins.*
- J. *Seeds not at all winged.*
- K. *Form of corolla lobes linear-oblong* 30. *Olivieri*
- KK. *Form of corolla lobes ovate, often broadly so.*
- L. *Fls. solitary.*
- M. *Peduncled* 31. *Porphyrio*
- MM. *Not peduncled* 32. *ornata*
- LL. *Fls. in clusters of 3-5 or more.*
- M. *Lvs. lanceolate-linear*..... 33. *triflora*
- MM. *Lvs. ovate to oblong-lanceolate.*
- N. *Height 2-4 ft.*..... 34. *sceptrum*
- NN. *Height 9-12 in.*
- O. *Calyx lobes ovate, about as long as the calyx tube* 35. *calycosa*
- OO. *Calyx lobes linear, moderately or much shorter than the calyx tube* 36. *Parryi*
- JJ. *Seeds winged (at the base in Kurroo; in Bigelovii wings narrow, thickish).*
- K. *Height 2-8 in.: fls. spotted.*
- L. *Pedicle 1/2 in. long or more*..... 37. *Kurroo*
- LL. *Pedicle very short, practically absent* 38. *Newberryi*
- KK. *Height 1-2 ft.*
- L. *Fls. in a dense spike*..... 39. *Bigelovii*
- LL. *Fls. 1-few or several.*
- M. *Appendages conspicuous, sometimes nearly as long as the corolla lobes* 40. *Oregana*
- MM. *Appendages only half as long as the corolla lobes* 41. *puberula*
- EE. *Capsule sessile.*
- F. *Anthers grown together; style distinct; seeds winged.*
- G. *Calyx 5-cut, the lobes longer than the calyx tube* 42. *Pannonica*
- GG. *Calyx entire, truncate, indistinctly 5-lobed*..... 43. *Gaudini*
- FF. *Anthers free; style usually not distinct; seeds not winged.*
- G. *Lvs. 6-12 in. long; calyx 5-lobed*..... 44. *macrophylla*
- GG. *Lvs. much shorter; calyx 4-lobed*..... 45. *Cruciata*
- DD. *Stigma 8, contiguous, rather funnel-shaped, the margin crenate-fimbriate.*
- E. *Anthers free; style distinct.*
- F. *Calyx pellucid, veiny.*
- FF. *Calyx leafy*..... 46. *Carpatica*
- G. *Seeds winged*..... 47. *imbriata*
- GG. *Seeds not winged.*
- H. *Lvs. ovate* 48. *verna*
- HH. *Lvs. obovate*..... 49. *Bavaria*
- HHH. *Lvs. linear*..... 50. *pumila*
- EE. *Anthers connate; style short* 51. *acaulis*
- F. *Fls. spotted.*
- G. *Color sky-blue*..... 52. *angustifolia*
- GG. *Color violet-blue*..... 53. *Kochiana*
- FF. *Fls. not spotted.*
- G. *Corolla broadly bell-shaped.*
- H. *Size of fls. large*..... 54. *Clusii*
- HH. *Size of fls. small*..... 55. *alpina*
- GG. *Corolla almost cylindrical*..... 56. *Dinarica*

1. *lutea*, Linn. Fls. in dense, umbel-like cymes; corolla 5-6-parted; lobes oblong-linear, acuminate; anthers free; style none. July-Sept. Eu., Asia Minor.—Prop. only by seed. Sow seed in Nov. in coldframe. Seedlings appear the following March and April. In May and June prick them out under a coldframe, and in Aug. transfer young plants to pots, where they should be kept until needed for permanent outdoor use. Be very careful never to break the roots. Sometimes cult. abroad for medicine.

2. *Bürseri*, Lapeyr. Lvs. 7-nerved; corolla mostly 6-cut; lobes ovate-oblong, acute; anthers connate; style distinct. June, July. Pyrenees.—Cult. like 1.

3. *decumbens*, Linn., f. (*G. ascendens*, Pall.). Lvs. linear-lanceolate, margins scarbrous; fls. blue; corolla narrowly obovate, toothed between the lobes; lobes 5, ovate; anthers connate, finally free. Himal., Sib. June-Aug. B.M. 705, 723.—Cult. like 1.

4. *purpurea*, Linn. Lvs. ovate-oblong, 5-nerved; fls. purple above; corolla tube yellowish, club-shaped; lobes mostly 6, obovate-subrotund, one-third the length of the tube. Aug., Sept. Eu. L.B.C. 6:583 shows a rich, dull purple, with no trace of blue.—Compost of sphagnum and heath soil. Be careful not to break the roots.

5. *rubra*, Clairv. (*G. Thomasia*, Gillab.). One of 5 or more natural hybrids between *G. lutea* and some species of the section *Celanthæ*, which includes *G. punctata*, *purpurea*, *Pannonica*, and *Bürseri*: fls. purplish outside. Swiss Alps.

6. *punctata*, Linn. Lvs. 5-nerved; calyx 5-7-cut; corolla tube bell-shaped; lobes ovate, muticous, one-third the length of the tube; anthers finally free. Middle Eu.—The spots are not arranged in any definite order. This belongs to the section *Celanthæ*, in which the seed has a wing of the same color, while the next 5 species belong to the section *Pneumonanthe*, in which there is no wing, or it is of a different color.—Cult. like 18.

7. *alba*, Muhl. St. stout; lvs. acuminate, with a clasping base; fls. in a terminal head, with single or clustered ones in the upper axils; dull white, commonly tinged yellowish or greenish; corolla resembling *G. Saponaria*, but more bell-shaped and open; lobes ovate, short. Little if at all spreading. Low grounds and mountain meadows, N. Amer. B.M. 1551, erroneously, as *G. ochroleuca*.—Cult. like 20.

8. *ochroleuca*, Froel. St. ascending; lvs. ovate-lanceolate and obovate; fls. in crowded terminal, nearly sessile, leafy cymes; corolla yellowish white, club-shaped



Fringed Gentian (*Gentiana crinita*), one of the most sought of American wild flowers

connivent at the apex. N. Amer. Not B.M. 1531 or 1551. Var. *intermedia*, Griseb. (*G. intermedia*, Sims, not L. B. C. 3:218), may be a hybrid between this and *G. Andreinii*. It resembles *G. ochroleuca* in having calyx lobes of unequal lengths, but as long as or longer than the calyx tube, and free anthers: it resembles *G. Andreinii* in the tinge of purplish blue. B.M. 2303. Var. *incarnata*, Griseb. (*G. incarnata*, Sims). B. M. 1856 from Carolina is not cult. These forms are not considered worthy of varietal rank in Gray's Syn. Fl.

9. *frigida*, Haenk. Lvs. spatulate-linear, obtuse: fs. 1 or 2 at the top, sometimes a few in the upper axils; calyx not laterally cut, and half as long as the corolla or more; calyx teeth lanceolate, a little longer than the calyx tube; corolla club-shaped; plaits not cut. Carpathian Mts.; also N. Amer.—This is the true type of *G. frigida*, which is not in cultivation, but is inserted to make clear the differences between *G. atida* of Pallas and of Steven.

10. *algida*, Pall., not Stev. (*G. frigida*, var. *algida*, Griseb.). Lvs. lanceolate-linear; fs. 2-5 at the top and distinctly pedicelled; calyx laterally cut and one-third the length of the corolla; calyx teeth linear-lanceolate, hardly as long as the calyx tube and sometimes only half as long; corolla between club- and bell-shaped; plaits cut with a few crenate teeth. Altai Mts., E. Siberia. N. Am. Gn. 17, p. 343, same as Gn. 27, p. 89; 48, p. 146, and N. 2:60, Fig. 93.—This grows 4-5 in. high, has numerous stems and fs. nearly $2\frac{1}{2}$ in. long, whitish, with blue spots in longitudinal lines. The writer has not seen Gt. 1006.

11. *gelida*, M. Bieb. (*G. algida*, Stev., not Pall.). Lvs. ovate-lanceolate, 3-nerved: fs. few and terminal, or many in the upper axils, peduncled; calyx teeth linear-oblong, acute, nearly as long as the calyx tube or shorter than it; corolla rather bell-shaped, yellowish white, its lobes broadly ovate, twice as long as the calyx and twice as long as the lacerated plaits. June, July. Caucasus. Not P.M. 7:5, which is *G. septemflora*, var. *cordifolia*.—"Light, deep, cool soil and full sunlight." *Correvo*n.

12. *campestris*, Linn. Annual: fs. dark purplish blue; calyx 4-cut; corolla nearly bowl-shaped, crowned; anthers free; style none.

13. *Moorcroftiana*, Wall. Annual, 4-10 in. high: fs. pale blue; calyx 5-cut; corolla funnel-shaped. Himal. B.M. 6727, where fs. are shown as pale purple.

14. *crinita*, Fröel. Fig. 897. FRINGED GENTIAN. Biennial: erect, branched, 1-2 ft. high: lvs. lanceolate or ovate-lanceolate, acutish, from a rounded or subcordate partly clasping base; corolla lobes wedge-obovate: seeds roughened by scales or needle-like projections. Moist woods and meadows. N. Amer. B.M. 2031. D. 275. G.W.F. 19. Mn. 4:161. B.B. 2:613.—The ribs of the calyx (made by the decurrent lobes) are one of the minor beauties of this plant, and are probably more pronounced than in the other Fringed Gentians here described.

15. *ciliata*, Linn. Perennial: stem flexuose, scarcely branched: lvs. linear, obtuse: corolla lobes obovate-oblong: seeds smooth. Dry limestone soils. Eu. Not B.M. 639, which is *G. serrata*.—Hardly 3 per cent of *Correvo*n's seedlings have flowered. He recommends a heavy, compact soil which is almost clayey, and full sunlight.

16. *serrata*, Gunn. (*G. barbata*, Fröel. *G. detónsa*, Griseb. *G. detónsa*, var. *barbata*, Griseb.). Annual: stem erect, branching, 3-18 in. high: lvs. linear or lance-linear: corolla lobes oblong or spatulate-obovate, fringed around the apex and sides or sometimes either part nearly bare. Wet lands, Ural and Altai Mts., Caucasus, N. Amer. B.B. 2:614. B.M. 639 erroneously as *G. ciliata*.—No plants appear to be advertised as *G. serrata*. *G. barbata* is a trade name abroad.

17. *quinquefolia*, Linn. (*G. quinquefolia*, Hill, Lammark and others). Annual: height 1-2 ft., the larger plants branched: lvs. 3-7-nerved: inflorescence thyrsoid-paniculate: clusters 3-5-fl.: fs. bright blue; calyx one-fifth or one-fourth as long as the narrowly funnel-shaped corolla. N. Amer. Probably the form in cult. is var. *occidentalis*, Gray. Height 2-3 ft.,

paniculately much branched: inflorescence more open: calyx half the length of the broader corolla. B.B. 2:615. B.M. 3496.—Very pretty.

18. *Fröelichii*, Jan. Stems short, almost tufted: fs. blue, solitary, peduncled, nearly as long as the stem; corolla not spotted. Very rare in Alps, limestone rocks.—Easily grown on rockwork in compost of equal parts of sphagnum, heath soil and vegetable mold. Half-exposure to sunlight.

19. *asclepiadæa*, Linn. Stem strict: calyx teeth very short: fs. in spike-like racemes, dark blue; corolla club-shaped; calyx one-third as long as the corolla: seeds not winged. July-Sep. S. Eu., Caucasus. B.M. 1078. Gn. 48, p. 143, and 54, p. 39.—The white-fl. form is excellent. Shade or half-shade, and moist, deep soil rich in humus.

20. *Pneumonánthe*, Linn. Stem erect: fs. dark blue in a cyme-like raceme (the top fs. opening first); corolla club-shaped; lobes ovate, acute, mucronate, much longer than the appendages. Aug.-Oct. Mountain marshes, Eu., N. Asia. Var. *guttata*, Sims, is dotted white. B.M. 1101.—Requires a cool, deep, spongy soil, rich in humus. Dislikes lime, and prefers sandy soil. Does remarkably well when planted on margins of ponds or brooks. Prop. by seed or division." *Correvo*n.

21. *Saponária*, Linn. (*G. Catesbei*, Walt., not And.). BARREL OR SOAPWORT GENTIAN. Stem ascending: fs. light blue, club-shaped; calyx lobes linear or oblong, mostly as long as the calyx tube; corolla lobes short,



897. Fringed Gentian—*Gentiana crinita* ($\times \frac{1}{2}$).

broad, roundish, erect, little, and often not at all longer than the 2-cleft and many-toothed intervening appendages. N. Amer. B.M. 1039.—(Hooker is probably wrong in referring this picture to *G. Andreinii*, though the calyx lobes in the plate are not narrow enough.) Cult. like 20.

22. *Andrewsii*, Griseb. (*G. Catesbei*, And., not Walt.). CLOSED, BLIND OR BOTTLE GENTIAN. Fig. 898. Stem ascending: fs. purplish blue; calyx lobes lanceolate to

ovate, usually spreading or recurved, shorter than the calyx tube; corolla lobes entirely obliterated, the teeth at the top being supposed to be the remains of the appendages often found between the corolla lobes in other species, July-Aug. Moist places, N. Amer. B. M. 6421. D. 273. B. B. 2:616. Gn. 27:477. L. B. C. 9:815 erroneously as *G. Sapoumaria*.—A white-fl. form is cult. For culture, see 20.



898. Closed Gentian—*Gentiana Andrewsii*. (x 14.)

gined; fls. blue, solitary; the parts usually in 4's; corolla salver form, in fruit inclosing the capsule. N. Amer., Asia.

26. *scabra*, Bunge. Stem erect, leafy; fls. dark blue, clustered; corolla bell-shaped. E. Asia. *G. Fortuni* is considered a variety by recent authorities. Var. *Buergeri* is advertised by Yokohama Nursery Co.

27. *Fortuni*, Hook. Lvs. rather distant, 3-nerved; terminal fls. rather clustered; corolla lobes blue, spotted white; outside of tube green; plaits blue, terminated by 3-toothed appendages, much shorter than the corolla lobes. China. B. M. 4776. F. S. 9:947. L. H. 1:36.—Now thought to be a variety of *G. scabra*.

28. *septemfida*, Pall. Lvs. lanceolate ("ovate," *Griseb.*), 3-5-nerved; fls. dark blue, in head-like cymes; calyx lobes linear; corolla club-shaped. July-Oct. N. Asia, Orient. B. M. 1229 and 1410 (both purple outside and dotted brown within; the lobes of the latter spotted white). L. B. C. 1:89. Gn. 54, p. 37. P. M. 8:51. Not F. S. 8:765.

Var. *cordifolia*, Boiss. (*G. cordifolia*, C. Koch.) has heart-shaped lvs.; corolla tube greenish white outside, unspotted within; lobes narrower, unspotted. B. M. 6497. P. M. 7:5, erroneously as *G. gelida*.—The name *septemfida* is misleading, as 7-lobed corollas are very rare. Cult. like 1.

29. *affinis*, Griseb. Lower lvs. obovate-oblong; upper lvs. lanceolate, acutish; fls. dark blue, in racemiform cymes; calyx lobes oblong-linear; corolla narrowly obconical, open. Northwest Amer. Gn. 46, p. 77, and 48, p. 139. B. B. 2:615 (where corolla lobes are pictured erect, but said to be spreading).—Cult. like 20.

30. *Olivieri*, Griseb. Fls. dark blue, in umbel-like cymes; corolla narrowly obconical; plait triangular, nearly entire. June-Aug. Mountain pastures, Asia. By recent authority referred to *G. decumbens*.—Cult. like 1.

31. *Porphyrio*, J. F. Gmel. (*G. angustifolia*, Michx., not Vill.). Lvs. narrowly linear; fls. blue, somewhat brown-dotted (also a snow-white variety with a greenish blue outside); corolla funnel-shaped; anthers connivent but never connected. July-Aug. Moist pine barrens, N. Amer. B. B. 2:618.—Cult. like 20.

32. *ornata*, Wall. Lvs. broadly linear; fls. blue, streaked; calyx lobes spreading; corolla ventricose; lobes very short, spreading. Himal. B. M. 6514. G. C. H. 20:596.

33. *triflora*, Pall. Stem erect; fls. dark blue; corolla club-shaped. E. Siberia.

34. *scæptrum*, Griseb. Lvs. oblong-lanceolate; fls. dark blue; corolla club-shaped; seeds winged on one side according to Griseb., but Gray says not winged. Aug., Sept. N. W. Amer.—Cult. like 1, except that it requires half shade and a rather peaty soil.

35. *calycosa*, Griseb. Lvs. ovate; fls. dark blue, commonly solitary, according to Gray; corolla oblong-funnel-shaped; appendages triangular-awl-shaped, lacinate or 2-cleft at the tip. N. W. Amer.

36. *PARRYI*, Engelm. Lvs. somewhat glaucous, ovate to oblong-lanceolate; fls. purple-blue, appendages narrow, deeply 2-cleft. N. W. Amer.

37. *Kurroo*, Royle. St. tufted, as high as 7 in.; lower lvs. lanceolate, upper linear; fls. blue, spotted white inside, 1-3 on a stem; corolla bell-shaped. Himal. Gn. 17:224. B. M. 6470. Var. *brevidens* has shorter calyx lobes. J. H. III. 30:3.

38. *Newberryi*, Gray. St. 2-4 in. high; lower lvs. ovate or spatulate; fls. pale blue, white inside, greenish dotted; corolla broadly funnel-shaped. N. W. Amer.

39. *Bigelovii*, Gray. St. 6-16 in. high, equally leafy to the summit; fls. purple; corolla more narrowly funnel-form and smaller than in *G. affinis*. July, Aug. N. Mex. B. M. 6874. —8" Sown forms large clumps, often with 40-50 stems from a single plant, each bearing 10-20 bright blue fls." *D. M. Andrews*.

40. *Oregana*, Engelm. Height 1-2 ft.; lvs. ovate; fls. blue; corolla broadly funnel-shaped, over 1 in. long, lobes short, rounded. July, Aug. N. W. Amer.

41. *puberula*, Michx. About 1 ft. high; lvs. oblong-lanceolate to lanceolate-linear; fls. blue; corolla open-funnel-shaped, 1½-2 in. long; lobes ovate. N. W. Amer. B. B. 2:615.

42. *Pannonia*, Scop. Lower lvs. broadly elliptical, 5-nerved, margin scabrous; upper ones ovate-lanceolate, 3-nerved; fls. purple above; calyx 5-7-ct; corolla leathery; anthers connate at first, finally free. Eu.

43. *Gaudini*, Thom. Natural hybrid with the fruit of *G. purpurea*, but the membranous corolla of *G. punctata*; fls. rosy violet. Eu.

44. *macrophylla*, Pall. Lvs. lanceolate, distant, very spreading; internodes unequal; fls. dark blue. July, Aug. B. M. 1414, not L. B. C. 3:218.—Cult. like 1.

45. *Cruciata*, Linn. (*Cruciata verticillata*, Gilib.). Lvs. ovate-lanceolate, crowded, erect-spreading; internodes equal; fls. dark blue. June-Aug. Eu., N. Asia.—Cult. like 1. Limestone and full sunlight.

46. *Carpathica*, Kit. Lvs. obovate; fls. dark blue (as are the next 4 species); corolla funnel-shaped. Carpathian Mts.—Little known.

47. *imbricata*, Frøel. Lvs. acute, margins scabrous, (the next 3 species with smooth margins); corolla lobes subrotund. June, July. Limestone rocks, Alps.—In this and the next 3 species, the corolla lobes are usually crenate, half the length of the tube, and 6 times the length of the plait. "Eastern and granitic Alps." *Correvois*. Cult. like 49.

48. *vérna*, Linn. Tufted; stem angled; lvs. ovate or ovate-lanceolate; fls. solitary; calyx membranaceous; corolla nearly bowl-shaped; lobes ovate, obtuse. Apr.-June. Eu., Caucasus. B. M. 491. L. B. C. 1:62. R. H. 1859, p. 250. Gn. 48, p. 139. G. C. H. I. 24:373. Var. *alata*, Griseb. (*G. angulosa*, M. Bieb.), is taller and has the nerves of the ventricose calyx produced into wings.—Rockwork, in a compost of heath-soil, finely crushed granite, and vegetable mold, with full sunlight.

49. *Bavarica*, Linn. Calyx lobes lanceolate; corolla funnel- or nearly bowl-shaped; lobes obovate, obtuse; ovary sessile; seeds not winged. May-Aug. Cent. Eu. F. S. 7:651. L. B. C. 13:1256. J. H. III. 35:585. Gn. 15:174 (poor).—The pictures cited all show a salver-shaped corolla. "Requires a soil that is peaty, or at the very least porous and cool, well drained, and capable of retaining an abundant supply of moisture, although it may be fully exposed to the sun. In the alpine garden here we grow them in pure sphagnum moss on a wall facing due south, but the plants which we raise for sale are grown in pots in a compost of sphagnum, heath-soil and sand. Finest of Group III." *Correvois*.

50. *pumila*, Jacq. Stem 3-4 angled; calyx lobes linear; corolla lobes ovate, acute. June, July. Tyrolese and Carinthian Alps.

51. *acaulis*, Linn. GENTIANELLA. STEMLESS GENTIAN. By the botanists of continental Europe this is often split up into the 4 or 5 following species. The plants that Linnaeus had in mind were probably mostly Chusii and Kochiana. For pictures of *G. recutis* in its widest sense, see B.M. 52, G.C. III, 15:236. Gn. 48, p. 146, and 54, p. 39, and F.S. 23:242, where a more detailed account of the 4 following species is given.

52. *angustifolia*, Vill., not Michx. Stoloniferous: lvs. linear-oblong, narrowing towards the base, glaucous above: fls. spotted with brightly green; calyx lobes more or less spreading, oval, abruptly contracted at the base. May, June. Limestone rocks, Alps.—Considered by Correvon the handsomest species of the whole genus.

53. *Kochiana*, Perr. & Song. Lvs. large, flat, thin, spreading, oval or broadly oblong, light green: calyx lobes oblong, limp, more or less contracted at the base and separated by truncate sinuses; corolla with 5 blackish green spots on the throat. May, June. Common in pastures on granitic Alps.—Dislikes lime.

54. *Chusii*, Perr. and Song. Lvs. lanceolate-acute, leathery: fls. dark blue; calyx lobes pressed close against corolla, not contracted at base, and separated by acute sinuses. May, June. Limestone rocks, Alps.

55. *alpina*, Vill. Stem almost wanting: lvs. small, glaucous, curving inwards and imbricated, forming rosettes which incurve at about the middle: fls. dark blue. May, June. Granitic Alps.—This and *G. Kochiana* "require a compost of one-third crushed granite, one-third heath soil, and one-third vegetable loam, and should be planted on rockwork half exposed to the sun."

56. *Dinaria*, Beck. Lvs. broad, thick, erect: fls. dark blue. Alps of S. and E. Austria.

The following are trade names abroad of Gentians not sufficiently described for insertion above: *G. Arvensis*, Hort. Perhaps a var. of *Pneumonanthe*. Fls. Napoleon blue. See G. II, 30-40.—*G. Chappuisii*, Thon. Naturally hybrid, intermediate between *lutea* and *punctata*: corolla spotted red: calyx 5-ent. Grisebach does not say whether the corolla is not plaited, anthers always free, and style none. Alps, above Engadine.—*G. Fetisovi*, Regel. St. erect, tall: fls. deep blue. China. Gt. 1009.—*G. Hongsti*, Haussm. = *G. Kummeriana*.—*G. Kosselringi*, Regel. Height about 8 in.: fls. whitish, dotted violet outside. Turkestan. Gt. 1087.—*G. Kummeriana*, Sendt. Hybrid between *lutea* and *Pannonica*. Fls. yellowish.—*G. Wallibiana*. Height 8-12 in.: fls. clear blue.—*G. Wubjowi*, Regel & Schmalh. Fls. whitish, dotted pale blue. Turkestan. Gt. 1140. W. M.

GENUS, pl. **GENERA** (i. e., *kind*), is a term used in natural history to designate a group of species. As with species, so the Genus is an indefinite conception, varying with the author. The chief value of the conception is its use in aiding us conveniently to arrange and name plants and animals. The name of the Genus is the first of the two words in the name of the plant: thus, in *Brassica oleracea*, *Brassica* designates the Genus, and *oleracea* the particular *Brassica* of which we are speaking. It is impossible to trace the origin of the genus-conception in natural history, but it is usually ascribed to Konrad Gesner (Zurich, 1516-1565). L. II. B.

GEONOMA (Wittstein gives this ponderous explanation: "Greck. *geonomos*, skilled in agriculture; for this tree puts forth buds at the apex of its stem which become new trees"). *Palmaeaceae*, tribe *Ariceae*. Slender spineless palms with ringed, reed-like stems; lvs. terminal or alternate; blade entire, 2-lobed at the apex, or more or less pinnatisect; segments acuminate, 1-nerved, with the margins broadly recurved at the base; rachis acute above, convex on the back; petiole nearly cylindrical, concave at the base above; sheath tubular; spadices ascending or recurved, simple, forked or paniculately branched, slender or stout, often colored; spathe 2, often deciduous before flowering, or obsolete, the lower one partial, truncate, concave, the upper one compressed or fusiform; fls. borne in the furrows of the spadix, at length partially exserted, when in 3's the upper one pistillate; cells of the anthers twisted; fr. small, globose, black. Species about 100. Tropical America. For *G. Ghiesbreghtiana*, see *Calyptrogyne*.

JARED G. SMITH.

Several of the members of this extensive genus of small-growing palms are useful for the greenhouse, though most attractive while in a small state, from the fact that Geonomas soon begin to form a stem, and when aged become rather scantily furnished specimens. These palms are by no means difficult to grow, and do not require a very high temperature, their natural habitat being the mountains of Central and South America, some of the species being found at an altitude of over 4,000 feet above sea level. Geonomas form part of the undergrowth on their native mountains, and are said never to appear in the open country unsheltered by trees of larger growth; therefore, shade is necessary for them when cult. under glass.

The old practice of growing Geonomas in a very light, peaty soil does not seem to be the only method, for excellent results have been secured by growing them in a good loam, well manured and well drained, giving an abundance of water and a night temperature of 60°. Red spiders and thrips are the most troublesome insects to which these plants are subject, and both of these pests multiply much more rapidly if the plants are kept too warm and dry.

The most useful species from a commercial point of view is *G. Riedeliana* (*G. gracilis*), which reminds one of *Cocos Weddelliana*, but has longer leaflets. Those marked thus (*) are cult. under glass in the North; those marked thus (†) are cult. in S. Calif. only; the others are cult. indoors North and also in S. Calif., except *G. Spixiana*, which is cult. only in S. Fla. The picture of *G. Spixiana* below is adapted from Martius' work on palms.



899. *Geonoma Spixiana*.

A tall palm, as it grows in the tropics.

A. Lvs. simple, 2-lobed at the apex.

B. *Cuneate-oblanccolate*, rusty, tomentose.

Spixiana, Mart. Fig. 899. Stem slender, solitary, 6-9 ft. high; blades 3 ft. long, bifurcate one-fourth of their length, each lobe lanceolate-acuminate, divergent. Western Brazil.

BB. *Cuneate-ovate*, plicate.

Seemannii, Hort. Low, 1-3 ft. high: lvs. all alike, the first 2 in. long, the later ones 10 in. long, short-petioled, triangular, with broad, serious margins; blade feather-veined. Central America.

AA. *Lvs. pinnate.*

B. Basal leaf-segments narrow; the upper ones the broadest.

**acaulis*, Mart. Acaulescent: lvs. long-petioled, 3-4 ft. high; blade unequally pinnatisect, 22-25-nerved on each side; basal segments 4 lines wide, spreading, the middle and upper erect-spreading at an acute angle, $\frac{3}{4}$ -4 in. wide, the apical very wide. Central Brazil.

BB. Broad and narrow segments irregularly intermingled.

C. Blade of leaf 6 ft. long; petiole 1 ft. long.

†*Pohliana*, Mart. Stem 12-15 ft. high, slender, densely ringed, columnar or reedy; segments very unequal, linear-lanceolate, falcate-acuminate, few-nerved and many-nerved intermixed, 16-20 in. long. Trop. Brazil.

cc. Blade 2-2½ ft.; petiole 4 in. long.

†*elegans*, Mart., var. *robusta*, D. H. Stem 6 ft. high, 3-4 lines in diam.; segments rarely 3, usually 5-7, 1-nerved, 10-14 in. long, some 4 lines wide, intermixed with broader, many-nerved ones, all long, falcate-acuminate. Central Brazil.

BBB. Leaf segments all alike (except the connivent apical ones).

C. Alternate, remote, linear, scurfy.

**Riedeliana*, H. Wendl. (*G. gracilis*, Lindl. & André). Habit of *Coros Weddelliana*, the whole plant sparsely covered with caducous, brown, shining scales; petiole slender, 1½ ft. or more long, terete below, flattened above; rachis triangular, bisulcate above; lvs. spreading, drooping at the apex; segments 10-12 in. long, about 9 lines wide, linear-acute, elegantly recurved, the 2 terminal ones connivent. Brazil. L.H. 21:169.

cc. Equidistant; petiole half as long as the blade.

Schottiana, Mart. Stem 9-15 ft. high, 1-1½ in. thick; lvs. recurved, spreading; petiole half or more than half as long as the blade; segments about 25 on each side, 10-12 in. long, two-fifths in. wide, equidistant, linear or linear-lanceolate, very long acuminate. E. Brazil.

The following are imperfectly described, but are in the trade: **G. imperialis*, Linden.—**G. princeps*, Linden.—**G. Pymontiana*, Hort. Belongs under A. One of the smallest lvs. measures 28 in. long by 10 in. at the broadest. Has not flowered yet and the genus is therefore uncertain. R. H. 1898, p. 262. G. C. III, 23:258. F. E. 10:886.—**G. speciosa*, Barb.-Rodr.

JARED G. SMITH, W. H. TAPLIN and W. M.

GEORGIA, HORTICULTURE IN. Fig. 900. The climatology of Georgia is unique. Latitude and altitude combine to exaggerate the four and one-half degrees covered by the state from south to north into at least ten, thereby embracing an extraordinary range of climate. In something less than 300 miles a transition is effected from a subtropical to an almost boreal vegetation.

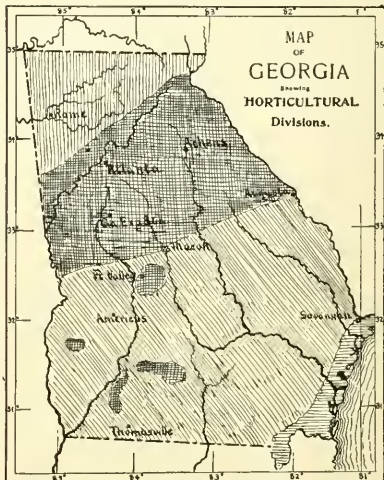
Proceeding northwestwardly from the coast, the country rises gradually until it culminates in the Blue Ridge, the highest peaks of which (in Towns county, on the Tennessee line) stand a little more than 5,600 feet high. Intermediately may be found as varied a climate, and consequently as extended a range of horticultural production, as can be met with in a journey of a thousand miles due north and south, in a region of normal elevation, such as the Mississippi valley.

Measurably the geology of the state corresponds with its elevation and consequent climatology, and is not complex except in the extreme northwestern portion. Two formations—the tertiary and metamorphic—cover nine-tenths of its area. The Sea Islands, and coast for a short distance inland, are alluvial or quaternary, and here the vegetation is of a subtropical character—palmettoes and live-oaks on the islands and pines and hammock growth inland, together with the citrus, fig and olive families, where cultivated.

Slightly beyond the tide-water limit begins the vast sweep of the pine forests, known locally as the "Wiregrass Region," which extends inland some 160 miles, on an average, covering nearly the whole of the tertiary formation. A range of low sand hills, about 300 feet high, extending diagonally across the state, separates the ter-

tiary and metamorphic regions. At its base the land has attained an average altitude of less than 200 feet.

From the summit of this ridge or terrace, formerly the primordial sea-beach, stretches the metamorphic region—the red clay or cotton belt—rising gradually toward the northwest until the Piedmont escarpment is reached—another low hill range on the southern side of and parallel to the Chattahoochee river valley. The height of this escarpment varies from 1,000 to 1,500 feet. Beyond this are the Appalachian foothills and then the



900. Georgia, to show horticultural regions.

mountains, in very irregular formation, their spurs radiating in all directions.

In extreme northwest Georgia the surface dips in a general way toward the Tennessee river valley (elevation 700 feet), interspersed, however, with a chaos of mountains and coves, with a complex tangle of geological formations, from lower silurian to eocene.

The prevailing natural growth of the tertiary is yellow pine—that of the metamorphic region hard woods, embracing nearly all of the North American species, oak and hickory predominating.

All this has been a necessary preface to a division of the state into separate horticultural areas, which correspond in the main with its geological features, and may be classified as follows:

Horticultural Areas: Corresponding Geological Divisions.

1. FIG AND CITRUS BELT.....Quaternary Formation
2. PEAR AND MELON BELT.....Tertiary Formation
3. PEACH AND GRAPE BELT.....Metamorphic Formation
4. APPLE AND CHERRY BELT.....Tennessee Dip

1. *The Fig and Citrus Belt.*—In this zone the citrus family does not thrive indigenously, nor is it planted for commercial purposes. Yet oranges and lemons live and bear unprotected, though latterly subject to injury from frost. It is the home of the Ogeebee lime, and formerly both indigo and the olive flourished on the Sea Islands, but their culture has been for many years abandoned. Figs grow to perfection. About the ports—especially Savannah—heavy trucking is followed for the northern market—chiefly potatoes, strawberries, cabbages, celery, tomatoes, onions and peas.

2. *The Pear and Melon Belt.*—The sandy soil of the tertiary is especially adapted to the melon and the oriental pear—the former over its entire area, the latter mainly in the southern part. These form two of the leading horticultural industries in this section. The Georgia melon is extensively shipped and widely known throughout the continent. Zymotic blight has of late greatly checked the pear industry, and discouraged the growers. In isolated locations, wherever there exist well defined elevations above the surrounding country—*islands*, possibly, of the tertiary sea, prematurely uplifted—they have been converted into vast peach orchards of hundreds of thousands of trees—in the Marshallville and Fort Valley district (the birthplace of the Elberta) running into millions.

Japan plums also thrive in the "Wiregrass," and are now attaining considerable commercial importance. Figs yield abundant crops throughout this zone. Most of the Labrusca type of grapes and all of the *Estivalis* type succeed admirably in the elevated portions and are beginning to be extensively cultivated; but the *Scumpenong* (*Vitis rotundifolia*) is the typical grape of the section. The strawberry does only moderately well—frequently summer-scalds. All blackberries thrive, but raspberries are not generally successful.

But the "Wiregrass" is the home of the sweet potato. Here the pumpkin yam and Georgia yam attain their highest perfection.

3. *The Peach and Grape Belt.*—It is an anomaly that while the metamorphic region, with its red clay soil—especially on the Piedmont escarpment—is the home of both the peach and the grape, most of the great commercial orchards of the state are located in the "out-cropping peach districts" of the tertiary. Cheaper lands and earlier maturity are the cause. Yet naturally the metamorphic region is peculiarly adapted to peach and grape culture, and it was here that both attained their first development in this state. More species of grapes and a greater number of varieties of each species will attain perfection in middle and Piedmont Georgia than in any one region of America east of the Rockies—a sweeping assertion, but facts sustain it. *Labruscas*, *Vulpinas*, *Estivales*, *Rotundifolias*—all seem equally to thrive; but prices are poor, and grapes are everywhere giving way to peaches, with apples on bottom lands, although this is not an apple region.

Japan plums usually do not so well as in the "Wiregrass." Native plums are not profitable—even the Wild Goose is unsatisfactory. Figs are uncertain, and in the northern portion of the zone require winter protection. Strawberries and blackberries are excellent, and raspberries quite successful in the Piedmont area and northward. Gooseberries and some currants do well in certain portions of the mountains, but not south of the escarpment.

4. *The Apple and Cherry Belt.*—Apples do not do equally well throughout the entire division styled the "Tennessee Dip." Yet in many localities, especially in the mountain coves, they thrive as well as in western N. Carolina or Vermont. This is notably the case in Pickens, Gilmer, Murray and Fannin counties, which are famous for their apples. Cherries, especially *Morillos*, form a safe crop here, and, in general, most of the horticultural productions of a much higher latitude find a place.

Insect and fungous affections have to be combated in all parts of Georgia, just as elsewhere (except in certain portions of the mountains, where neither are as yet introduced). Growers are generally learning, however, the value of the spray pump.

The San José and other scales have invaded the state, especially in the southern portion, where some twenty odd counties report infestation. But they are being intelligently combated, for the most part, and it is hoped that they will be steadily held in check.

The main trouble with the Georgia fruit-grower (aside from pear blight and the premature blooming of peaches) is the curculio. Thousands of dollars are annually spent in "jarring" for this pest, but it still remains a serious menace.

HUGH N. STARNES.

GEORGINA. A synonym of *Dahlia*, which still lives in the form of "Georginen," the popular name of Dahlias in Germany

GERANIUM, FEATHER. See *Chenopodium Botrys*.

GERANIUM (Greek, *crane*; from the resemblance of the fruit to a crane's bill). *Geraniaceæ*. CRANE'S-BILL. Generally herbaceous plants, usually caulescent: lvs. simple, alternate or opposite and much lobed, sometimes almost radical: fls. regular; sepals 5, imbricated; petals 5; stamens 10, in two rows; anthers 10: seed when ripened separated from the ovary and with its awn bent sinusously. The genus *Erodium*, its nearest ally, has but the inner row of stamens furnished with anthers and the awn of the seed is bent spirally. The Geraniums of common speech are classed in the genus *Polygonium*, having at the side of the pedicel a distinct narrow tube and zygomorphic flowers. The genus *Geranium* has over 150 species, found in the temperate zones particularly of the northern hemispheres, very few in the tropics. Valued for the border or rockery, and the roots of some, as *G. maculatum*, find use in medicine on account of their astringency. Thrive well in ordinary garden soil, and are propagated by seeds and division of roots.

The following is an alphabetical list of species and varieties described below:

<i>album</i> , 17, 18, 19.	<i>flore pleno</i> , 9.	<i>plenum</i> , 14.
<i>argenteum</i> , 11.	<i>ibericum</i> , 8.	<i>praecox</i> , 9.
<i>Armenum</i> , 4.	<i>incisum</i> , 13.	Richardsoni, 20.
<i>Bachhousianum</i> , 4.	<i>Lancastriense</i> , 6.	Robertianum, 3.
<i>Balkanum</i> , 21.	<i>Londesi</i> , 11.	<i>sanguineum</i> , 6.
<i>cinereum</i> , 2.	<i>macrorrhizum</i> , 7.	<i>Sibiricum</i> , 21.
<i>collinum</i> , 11.	<i>maculatum</i> , 14.	<i>sylvaticum</i> , 21.
<i>Endressi</i> , 5.	<i>phatum</i> , 10.	<i>tuberosum</i> , 21.
<i>erianthum</i> , 13.	<i>phytopetalum</i> , 8.	<i>Walliebium</i> , 16.

A. *Fls. red or pink.*

B. *Stature very dwarf.*

1. *argenteum*, Linn. SILVER-LEAVED CRANE'S-BILL. About 3 in. high: lvs. almost radical, on long petioles, 5-7-parted, with 3-fid linear lobes, both surfaces hoary; peduncles almost radical, 1- or 2-fld.: fls. large, pink, with darker veins; petals emarginate. Middle of June to Aug. Carnic Alps. B.M. 504. L.B.C. 10:948.—One of the best for the rockery. Often acts as a biennial in N. E.

2. *cinereum*, Cav. GRAY CRANE'S-BILL. Like *G. argenteum*, but 2-fld. and paler in color: lvs. not as hoary in appearance. June, July. Pyrenees.

3. *Robertianum*, Linn. HERB ROBERT. RED ROBIN. About 9 in. high: lvs. thin, ovate-orbicular, 3-5-parted, with 3-fid pinnatifid lobes; peduncles slender, 2-fld.: fls. small, bright crimson. June to Oct. Amer., Eu., Asia and N. Afr. B.B. 2:341.—For the rockery, and delights in a moist soil and some shade. Odor disagreeable.

BB. *Stature 1 ft. or more.*

4. *Armenum*, Boiss. (*G. Bachhousianum*, Regel?). About 2½ ft. high: lvs. radical, upright, orbicular, with 5 deep lobes: fls. about 1½ in. across, inclining to dark crimson. All season at irregular intervals. Armenia. R.H. 1891, p. 350.—A very vigorous and floriferous species. Sometimes growing 4 ft. high.

5. *Endressi*, J. Gay. About 18 in. high: lvs. opposite, palmate, 5-lobed, upper ones 3-lobed, serrated; peduncles axillary, 2-fld.: petals entire, fringed at base, light rose, darkly veined. Summer. Pyrenees.—Among the best for the border, and useful for cutting.

6. *sanguineum*, Linn. About 1½ ft. high, with stem occasionally forked, erect: lvs. all petiolate, mostly 7-parted, with 3-5-lobed linear lobules; peduncles long, mostly 1-fld.: fls. very large, blood-red. June to Aug. Eu.—One of the best species in cult.

Var. *Lancastriense*, Hort. A dwarfier form, smaller and with less deeply lobed foliage. Fls. lighter in color, veined purple.

7. *macrorrhizum*, Linn. A large-rooted species, about 1½ ft. high, with a stem suffruticose at base: lvs. smooth, round, basal ones 5-lobed, cauline 3-lobed, toothed and often colored red: calyx inflated; petals spatulate and blood-red in color. May to July. S. Eu. B.M. 2420.

AA. *Fls. blue or violet.*

8. *Ibericum*, Cav. IBERIAN CRANE'S-BILL. From 1-1½ ft. high; stem erect and leafless below, above dichotomously branched, villous; lvs. opposite, 5-7-parted, with deeply cut lobes and toothed lobules; fls. 1 in. across, in showy, open panicles, violet. July, Aug. *Herbaria*. B.M. 1386.

Var. *platypetalum* (*G. platypetalum*, Fisch. and Mey.). Slightly shorter than the parent, with lvs. less deeply lobed and lobes less pointed; fls. deeper and richer in color, and also larger.

9. *pratense*, Linn. MEADOW CRANE'S-BILL. About 2½ ft. high, with an upright round stem; lvs. mostly hand-shaped, with 7 lobes, each deeply cut; peduncles mostly 2-fld., drooping after flowering; fls. large, blue; petals entire. June, through Aug. *Eu.*—Var. *florè pleno*. Not as tall as parent. Very numerous deep blue fls. in clusters. June and July, and often again in fall.



901. *Geranium maculatum* (× ¾).

AAAA. *Fls. dark blue, almost black.*

10. *phæum*, Linn. About 2 ft. high, with upright, short-haired stem, glandular above; lvs. 5-7-lobed and deeply toothed; peduncles 1-2-fld.; petals spreading, obovate, unequally notched and often with a small spur, very dark blue, almost black, with white spot at base of each petal. May, June. *Cent.* and western *Eu.*—A good border plant.

AAAA. *Fls. purple in various shades.*

11. *collinum*, Steph. (*G. Londesii*, Fisch.). Height 2-3 ft.; stem angular and slightly decumbent; lvs. palmately 5-parted, deeply divided and cut; petals entire, purple, with a tinge of violet. June, July. Eastern *Eu.*

—One of the showiest in its season. Should be cut back before seeding, to induce second bloom.

12. *Frémontii*, Torr. About 1 ft. high, sometimes sub-acaulescent; upper lvs. 3-5-cleft, lower ones 7-cleft, with 3-fld or incised lobes; fls. light purple. Rocky Mts. Recently introduced. Blooms all summer.

13. *incisum*, Nutt. (*G. eridanthum*, Lind.). About 1 ft. high, leafy branched; lvs. finely cut; pedicels conspicuously glandular-pubescent; petals with stiff white hairs, inner surface purple, about 1 in. wide. *Ore.*—A hardy species well worth growing. Not perfectly hardy near Boston.

14. *maculatum*, Linn. WILD OR SPOTTED CRANE'S-BILL. Fig. 901. The common American species, about 1½ ft. high; stem angular; basal lvs. long-petioled, deeply 3-5-parted; stem-leaves opposite, shorter petioled; peduncles 1-5, inflorescence often umbellate; fls. 1-1½ in. broad, rose-purple; petals woolly at base. June, July. *N. Amer.* G.W.F. 3. B.B. 2:341.—Showy native species; should be more in cultivation. Grows best in somewhat wet places. Var. *plènum*, a double-flowered variety of deeper color.

15. *Richardsoni*, Fisch. & Trautv. About 1½ ft. high; lvs. thin and terminal, lobe of the uppermost lvs. longer than the often greatly reduced lateral lobes; pedicels conspicuously glandular pubescent; fls. large, reddish purple; petals with long white hairs on inner surface. *Colo.* and west.—Stems and young growth tinged with red.

16. *Wallichianum*, D. Don. Of prostrate trailing habit; stem and lvs. covered with silky hairs; lvs. light green, 5-parted, with deeply toothed lobes; fls. large, purple, borne sparingly all summer. Himalayas. B.M. 2377.—For the rockery.

AAAAA. *Fls. white.*

17. *Ibericum*, var. *album*. A white-fld. var. of No. 8.

18. *maculatum*, var. *album*. A white-fld. var. of No. 14.

19. *pratense*, var. *album*. A white-fld. var. of No. 9.

20. *Richardsoni*. This species (No. 15) in its native habitat is usually white, mostly roseate-veined.

21. *Sibiricum*, Linn. SIBERIAN CRANE'S-BILL. A slender, somewhat forked plant, villous, 1-2 ft. high; lvs. deeply 3-5-parted; peduncles slender, usually 1-fld.; fls. very small, dingy white. June through Aug. *Siberia*, and naturalized near New York. B.B. 2:341.—Another form under same name, with brick-red fls., said to be in cultivation.

G. Balkanum, Hort. A hardy plant, with fragrant foliage; fls. on radical stems, 1 in. across, dark magenta. June.—*G. sylvaticum*, Linn. About 2 ft. high, with a soft-haired, upright, round stem; lvs. 5-7-parted, lobes oblong, deeply toothed; fls. purple or violet. June, July. The common wood Geranium of Europe.—*G. tuberosum*, Linn. Tuberos-rooted, 9-15 in. high, with stem at base naked; lvs. many-lobed, linear and serrate; pedicels 1-2-fld.; fls. large, violet. May. S. *Eu.*

G. N. LAUMAN.

GERARDIA (after John Gerarde, 1545-1607, perhaps the most popular of the herbalists). *Scrophulariaceæ*. Hardy annual and perennial herbs, all American, and mostly of the Atlantic states, with yellow or rosy purple fls., in late summer and autumn, the latter color rarely varying to white; lvs. mainly opposite; calyx 5-toothed or cleft; corolla bell- to funnel-shaped, broad throated, 5-parted, the 2 posterior lobes often smaller and more united; stamens commonly more or less hairy; anthers more or less approximate in pairs; capsule globose, 2-grooved; seeds usually angled, loose coated. The first 3 species described belong to a section in which the roots are more or less parasitic. These plants are therefore rather difficult to cultivate, and are offered only by collectors. *G. tenuifolia* is offered by one dealer, the seeds presumably gathered in European gardens.

A. *Fls. yellow.*

B. *Corolla pubescent outside; biennial or annual.*

Pediculària, Linn. Pubescence partly glandular and viscid, especially on the pedicels and calyx, while in the next 2 species there is no glandular pubescence. Lvs. 1-2 in. long, all pinnatifid. *N. Am.*

bb. *Corolla glabrous outside*: perennial.

c. *Height 5-6 ft.*

quercifolia, Pursh. Stem at first glaucous: lower lvs. 3-5 in. long, 1-2-pinnatifid; upper lvs. often entire. Dry woods, N. Am.

cc. *Height 1-2 ft.*

lævigata, Raf. Not glaucous: lvs. 1½-4 in. long. Oak barrens, etc., N. Am.

AA. *Fls. rosy purple rarely varying to white.*

B. *Height 1 ft.*

tenuifolia, Vahl. Height 1 ft.: branching, paniculate; inferior, racemose: lvs. mostly narrowly linear: corolla ½ in. long. Low or dry ground, N. Am.

BB. *Height 2-3 ft.*

linifolia, Nutt. Perennial: lvs. erect, very narrowly linear, 1 line wide; calyx teeth minute; corolla 1 in. long. Low pine barrens, N. Am. Not cult., but said to be a parent with *Pentstemon pulchellus* of G. hybrida, Hort. Int. by Haage & Schmidt, 1899. The poor cut in S.H. 2:245 seems nearer *Pentstemon* than *Gerardia*.

W. M.

GERMANDER. See *Teucrium*.

GESNERIA (Conrad Gesner, Zurich, 1516-1565, celebrated naturalist, and considered to be the originator of the idea of genus in taxonomy). *Gesneraceae*. Sometimes written *Gesnera*. More than 50 herbs of tropical America (chiefly Brazilian), with simple, opposite lvs. and showy tubular fls. in terminal short panicles or fascicles. Calyx campanulate, 5-parted; corolla long, straight or curved, more or less ventricose, the base often distinctly swollen or gibbous, the limb mostly shallow-toothed and nearly regular or bilabiate; stamens 4, didynamous (in pairs under the upper lip); style 1, long; glands on the disk in the fl. Handsome warmhouse plants (mostly tuberous) allied to *Achimenes*, *Gloxinia*, *Isoloma* and *Streptocarpus*. Some of the *Gesnerias* of the trade belong to *Nægelia*, which differs, amongst other things, in having an annular or ringed disk rather than a disk of distinct glands.

L. H. B.

Gesnerias are tuberous bulbous, or rhizomatous plants. They are natives of tropical S. America and Mexico, and all have a period of rest corresponding with the dry season. The stems rise directly from the root-stock. They are clothed with opposite, mostly heart-shaped, sometimes ovate, leaves. They are densely hirsute; the hairs often are brightly tinted, giving them a sheen like the plumage of birds, so that they are quite as much admired for their handsome foliage as for the flowers. The inflorescence is generally a branched corymb, and the flowers are tubular-labiate, with the limb rarely flattened, as in *Achimenes*. *Gesnerias* are not nearly as popular as they once were, probably on account of the transitory character of their corollas, which are continually falling, lasting but a day or two. The roots must be kept in a moderately warm place, such as would suit *Gloxinias*. They should be kept in the pots in which they have grown, and be watered about once a week during the resting period. It is a mistake to suppose the roots can be kept in dry sand and still retain their vitality. When the roots show a tendency to send up stems is the time to start them, picking out the advanced ones first. In this way a long season can be secured. They need a light soil to start with, about equal parts leaf-soil, loam and sand, and should be placed in a moderate temperature. Very little water will be required until they are well started. If it is desired to increase stock, smaller bulbs may be boxed off, and cuttings made of surplus shoots. Seeds are produced rather freely, and some good hybrids are in cultivation. As they advance in growth, larger pots will be needed, and a little stronger soil,—the mixture divided into four parts, adding well-decayed manure. They will take abundance of water and some liquid manure when coming into bloom. If neatly trained they make handsome specimens. Their beautiful foliage is liable to be spoiled by impurities or sediment in water, so that we avoid overhead syringing, particularly as they develop. After blooming, a good light place should be given, and

the plants watered until they show signs of going to rest. As they are naturally an undergrowth, a light shading will be beneficial in the hottest weather.

Cult. by T. D. HATFIELD.

A. *Lvs. green.*

cardinalis, Lem. (*G. macrantha*, Hort.). Stem 6-12 in. high, stout and hairy: lvs. large, cordate-ovate, crenate-dentate, petioled; fls. red, tubular, hairy, slender (2-3 in. long), the upper lip projecting and the lower one almost wanting, borne in a terminal, more or less flat cluster. Nativity unknown. Gn. 42:874.—*G. Durvili*, Hort., is evidently only a slender form of this species.

Héndersoni, Hort. Lvs. velvety green: fls. 3 in. long, brilliant scarlet, in a large truss. Probably of garden origin.

longiflora, Hort., is a small-leaved species, with drooping, long-tubed nicotiana-like white fls. (Gn. 33:644.—The botanical position of this plant is in doubt. It is not the *G. longiflora*, HBK., which is purple-fl., nor *G. longiflora*, DC., which is *Achimenes longiflora*. By some it has been confounded with *Isoloma longiflorum*, Deene.

AA. *Lvs. richly colored, at least underneath.*

Léopoldi, Scheidw. Compact: stem erect from the large, depressed tuber, thinly hairy: lvs. verticillate in 4's, broadly ovate-acuminate, more or less unequal at base, dentate, green above and purple beneath: fls. long-tubular, thinly hairy, the lobes nearly equal; light scarlet, in a rather loose, umbel-like cluster. Nativity not recorded. F.S. 7:704-5. Gn. 53:1176.

Donkeleriana, Lem. (*G. Donkelerii*, Hook.). Stem often 2 ft. tall: lvs. large, cordate-ovate, crenate, hairy, green and purple-tinged above and purple beneath: fls. tubular-campanulate, the rounded lobes nearly equal, dull red, 2 in. long, hanging from long pedicels in a large panicle. Variable. Colombia. B.M. 5070. R.B. 21:97. F. 1853:241.

Exoniensis, Hort. Hybrid: lvs. velvety, with red and purple hairs: fls. bright orange-red, in close clusters.

refulgens, Hort. Hybrid: lvs. cordate-oval, red hairy: fls. deep red or vermilion.—One of the best.

G. cinnabarina, Lindl., is a *Nægelia*.—*G. Guatemalensis*, Hort., "a free grower and bloomer, fls. orange," was once offered by Saul.—*G. jasminiflora*, Hort., "fls. of the purest white, freely produced, beautiful," once offered by Saul.—*G. oblonga*, Hort., fls. orange, offered once by Saul.—*G. robusta*, Hort., "vermilion, beautifully spotted and tigered," offered once by Saul.—*G. zebra*, Paxt., see *Nægelia*. The *Gesnerias* are much confused by hybridizing and breeding.

L. H. B.

GÈUM (Greek, *geuo*, to have a taste; referring to the roots). *Rosaceae*. This genus includes some fine hardy border and rock plants, some of which are valued for their bright red fls.; some for their pure yellow fls.; others for their long plummy fruits. Herbs, with a perennial rhizome, sometimes stoloniferous: root-lvs. crowded, odd-pinnate, the alternate lobes often smaller, terminal ones largest; stem-lvs. few, mostly of 3 lfts. or bract-like: fls. 1-2 in. across, solitary or corymbose. More than 30 species, mostly in temperate and frigid regions.

The plummy kinds are all contained in the subgenus *Sieversia*. *G. Chilensis* is the best species, and in the gardens is commonly seen in double form. A gardener writes that "inferior forms show scarcely any duplicity." Gems are of easy culture, and are prop. by division or seed. It is said that they hybridize freely if grown together. The dwarf kinds are suited only to the rockery. Corveon, of Geneva, Switz., writes that *G. reptans* is one of the best of the rockery kinds, and needs full sunlight. For *G. triflorum* he advises half exposure to sun and a light, moist soil. *G. rivale* grows naturally in marshy places.

A. *Plummy Geums: style in fruit long and plumose.*

B. *Fls. yellow.*

C. *Plants spreading by runners.*

réptans, Linn. Root-lvs. interruptedly pinnatifid: upper lvs. 3-lobed: fls. erect; petals obovate. Eu Gn. 45:956.—The purple styles are pretty.

cc. Plants not spreading by runners.

d. Root-lvs. pinnatifid.

montanum, Linn. Calyx lobes entire, while those of reptans are often 3-cut at apex. S. Eu. G. C. II. 13:425. Gn. 45. p. 285.

dd. Root-lvs. kidney-shaped.

radiatum, Michx. Very hirsute. Root-lvs. 2-5 in. broad; stem 1-5 fld.; bractlets minute. Mountains of N. C.—Int. by H. P. Kelsey.

bb. Fls. bright red, unmixed with yellow.

c. Lateral lobes of lvs. minute.

coccineum, Sibth. & Sm., not Hort. "Stem-lvs. 3-lobed; root-lvs. lyrate, the terminal lobe largest, cordate-reniform; fls. erect. Mt. Olympus in Bithynia."

The above is an exact translation of the entire description given by Sibthorp and Smith, *Flora Græca*, t. 485.—The chances are that all the plants in the trade under this name are really *G. Chilense*.

cc. Lateral lobes of lvs. 1 in. long.

Chiloense, Balb. (*G. coccineum*, Hort., not Balb.). "Stem-lvs. 3-parted, lacinate; root-lvs. interruptedly lyrate, pilose; terminal lobe rotund, somewhat 3-lobed, erenate; fls. panicle; carpels villous." The above is a literal translation of B.R. 16:1348, where the terminal lobe is shown to be 2½ in. each way. Chile. B.R. 13:1088, and under 1099. L.B.C. 16:1527. Gn. 14:156; 45, p. 284. R.H. 1890, p. 305, and 1881, p. 309, all erroneously as *G. coccineum*.

Var. **miniatum**, D.K. (*G. miniatum*, Robt. Parker), has fls. about 2 shades lighter in color. A robust form growing 2-3 ft. high, easily prop., and fls. from Apr. to end of July. Gn. 38:772, where it is supposed to be a hybrid of *G. Chiloense*, var. *grandiflorum* × *G. aureum*, which is a robust many fld. form of *G. montanum*, or else of *G. Chiloense* × *G. urbanum*.

Var. **grandiflorum**, D.K., is an improved form. "The double fld. form of this seems to be a more general favorite, the blooms lasting longer, though I think they lack the elegance of those of the simple form. They begin to expand soon after May and are produced until Oct." D.K., in Gn. 38, p. 299.

bbb. Fls. chiefly dull red, mixed with yellow.

triflorum, Pursh. Low, softly hairy; lfts. very numerous and crowded, deeply cut; fls. 3 or more on long peduncles; calyx purple, as long as the petals. Coulter says the petals are erect. Arctic Am. L.B.C. 17:1609. "Fruit showy all summer." Woolson.

aa. Not long and plump in fruit.

b. Style jointed and bent in the middle.

c. Fls. purplish orange.

rivale, Linn. Root-lvs. lyrate; stem-lvs. few, with 3 lobes or lfts.; calyx brownish purple; petals purplish orange. N. temp. regions. Var. **album** is also sold.

cc. Fls. golden yellow.

macrophyllum, Willd. Eastern plant, which F. W. Barclay says is offered by collectors, and prefers a moist, sunny place. B.B. 2:221.

bb. Style not jointed, straight.

Rössii, Seringe. Slightly pubescent above; scape 1-3 fld.; styles glabrous. Colo., arctic regions.—Fls. large, bright yellow.

G. atrococcineum, Hort., may be a typographical error for *G. atrosanguineum*.—*G. atrosanguineum*, Hort., is presumably a form of *G. Chiloense*, with darker fls. than the type, and sold mostly, if not entirely, in its double condition.—*G. Japonicum*, Thunb., is sold, but little known. St. flexuose, hirsute; lvs. 3-5-lobed, hirsute; fls. erect, yellow; petals as long as the calyx; fr. hirsute, awned, recurved. Japan. W. M.

GEUVINA (from the Chilean name). Also written *Guerina*, *Protéece*. One species, *G. Avellana*, Molina (Syn., *Quadraria heterophylla*, Ruiz & Pav.). CHILEAN NCT. CHILE HAZEL. An evergreen tree, with large, alternate pinnate, dark green, glossy lvs. and white, hermaphrodite fls. in long, axillary racemes. Fruit about the size of a cherry, coral red when ripe, the seed hav-

ing a pleasant flavored kernel, resembling the hazel in taste and largely used by the Chileans. Strangely grown in California. Prop. by seeds or by green cuttings under glass. W. A. TAYLOR.

GHERKIN. A small Cucumber. The Burr or West Indian Gherkin is *Cucumis Anguria*.

GIBB, CHARLES, Canadian horticulturist, and author of important works on Russian fruits and other hardy trees, was born at Montreal June 29, 1842, and died at Cairo, Egypt, March 8, 1890, while returning from a collecting trip in China and Japan. In 1872 he brought to Montreal the first caudex fruit exhibited in Canada. His farm at Abbotsford, Province of Quebec, contained the best collection of hardy fruits, trees and ornamental shrubs in Canada. His trip to Russia in 1882 with Prof. J. L. Budd, the subsequent importations, his second trip to Russia, and his various publications on hardy trees make part of a chapter of great interest and significance in the history of American horticulture. His travels were extensive. His chief works are "Ornamental and Timber Trees not Natives of the Province of Quebec" (a comprehensive list of species of possible value for Canada), "Report on Russian Fruits," "Hasty Notes on the Trees and Shrubs of Northern Europe," "Russian Apples Imported by the Department of Agriculture, Washington, in 1870" (an elaborate comparison of Russian opinions and American experience), "Nomenclature of the Russian Apples," "Of Translating and Rendering into Euphonious English Unpronounceable Russian Names, also Throwing Out Synonyms," and "Fruits for the Cold North." For a fuller account, with portrait, see *Annals of Horticulture*, 1890, 287-290.

W. M.

GIDEON, PETER M., pioneer pomologist of the northern Mississippi states, 1818-1899, resided since 1853 on Lake Minnetonka, Minnesota, and devoted his efforts to the production of apples of sufficient hardiness to withstand the climate. He was born in Ohio. He afterwards lived in Illinois. From boyhood he seems to have been possessed of the idea to raise seedling fruits. He was one of those rare individuals who sets a distinct ideal and strives for it throughout a lifetime in spite of every adversity. These are persons of strong and uncompromising wills. They often antagonize their fellows; but their works are usually beneficent. Gideon conceived that the amalgamation of the Siberian crab and the common apple would give the perfect apple for the Northwest. His seedlings were numerous. Several of them have been named and disseminated, and are of value. But his greatest achievement, the Wealthy apple, was of pure *Pyrus Malus* stock. This variety is now one of the standard apples of his geographical region, and it is gaining favor elsewhere. It is a boon to the Northwest. Even when in poverty, it is said that Mr. Gideon spent his last dollar to buy the seeds from which this apple came. He was instrumental in distributing 10,000 apple seedlings in Minnesota, and some of these are now attracting attention. His work was wholly empirical, yet he did so much and continued his work for so long a time that the results have contributed to the knowledge of plant-breeding. Probably no other American has labored so long and devotedly for the attainment of a specific ideal in the apple. Portrait and eulogies will be found in *The Minnesota Horticulturist*, Jan., 1900.

L. H. B.

GILIA (Philipp Salvador Gil, Spanish botanist of the latter half of the eighteenth century, collaborator with Xauerez). *Polemonioides*. American herbs, mostly of western North America, of nearly 100 species, as the genus is now understood by most botanists. Fls. small, of many colors, the corolla funnel-form to bell-shaped or sometimes salver-form, 5-lobed; stamens 5, inserted near the base of the corolla tube, the filaments usually naked; ovary 3-loculed, with axile placentas, the stigmas 3 (or sometimes 2). Gilia is a very polymorphic genus, into which Gray now (Syn. Fl. 2, pt. 1, suppl.) throws *Collomia*, *Lianthus*, *Leptosiphon*, *Leptodactylon*, *Navarretia*, *Hugelia*, *Ipomopsis*, *Fenzlia*. In this conception, Gilia is defined as follows: "Fls. naked, not in-

volucellate; calyx partly herbaceous, scarious below the sinuses; lobes narrow and acute; corolla salverform or funnel-form to campanulate or almost rotate;



902. *Gilia grandiflora* ($\times \frac{3}{4}$).

filaments not bearded at base; seeds wingless; herbs, or a few suffruticose."

Several of the *Gilias* are popular garden annuals or biennials (a few perennial). They are of the easiest culture, being vigorous, hardy and floriferous. They are mostly dwarfish, and are excellent for low masses, edgings or rockeries. Seeds may be sown where the plants are to grow. Any good soil will suit them.

Following are the names in the American trade:

achillesefolia, 8.	coronopifolia, 10.	Leptosiphon, 13, 14.
aggregata, 11.	debilis, 5.	liniflora, 12. [15.
alba, 6, 13, 16.	densiflora, 13.	lunifolia, 12.
androsacea, 14.	dianthiflora, 16.	micrantha, 15.
aurantiaca, 10.	dianthoides, 16.	minima, 3.
aurus, 15.	elegans, 10, 11.	Navarretia, 3.
capitata, 6.	Fenzlia, 16.	niotalis, 9.
carmines, 15.	grandiflora, 1.	rosea, 9, 15.
coccinea, 2.	hybridus, 15.	sanguinea, 10.
Collomia, 1, 2.	Iponopsis, 10, 11.	speciosa, 16.
congesta, 4.	laciniata, 7.	tricolor, 9.

A. Lvs. normally alternate, entire or pinnately cut or divided (lower lvs. sometimes opposite).

B. Fls. in dense heads, which are subtended by leafy involucre.

C. Foliage entire or at least not much parted.

1. **grandiflora**, Gray (*Collomia grandiflora*, Dougl.). Fig. 902. Erect, with minutely pubescent reddish stems, 1-2 ft. high: lvs. linear-lanceolate or oblong, narrowed below but scarcely petioled, entire, acute; fls. many, in dense terminal heads, buff or salmon color, redder inside, 1 in. long. Plains, W. of Rocky Mts. B.M. 2894. B.R. 14:1174.—This and the next are interesting annuals. Useful as bee plants.

2. **coccinea**, Gray (*Collomia coccinea*, Lehm.). More slender; stems not red; lvs. narrower (mostly linear), somewhat cut at the ends; fls. smaller, slender-tubed, yellow or buff outside and brick-red inside. Chile. B.R. 19:1622.

cc. Foliage pinnately parted or compound.

3. **minima**, Gray (*Navarretia minima*, Nutt.). Dwarf and tufted (3 in. or less high), nearly glabrous: lvs. needle-like, pinnately parted; fls. white, the corolla scarcely exceeding the white-hairy calyx. In arid districts, Dak. W.

4. **congesta**, Hook. A foot or less high, erect or spreading, tufted: lvs. mostly 3-7-divided into linear divisions: corolla white, the oval lobes nearly as long as the tube; calyx teeth long-pointed, nearly equaling the corolla. A small-fl. species growing from Wyo. W.

BB. Fls. not in close heads, but more or less scattered: or if capitate, the heads not leafy-subtended.

c. Plant perennial: seed only 1 in a locule: fls. small.

5. **debilis**, Wats. Two in. or less high: lvs. oblong, entire or 2-3-lobed, petioled: fls. solitary and nearly sessile, the purple corolla $\frac{3}{4}$ in. long, the tube exceeding the calyx. S. Utah.—Offered by collectors.

cc. Plant annual: seeds more than 1 to the locule: corolla distinctly tubular, but relatively small.

D. Inflorescence capitate.

6. **capitata**, Dougl. Fig. 903. Plant 18 in. to 2½ ft. tall, the stems long and nearly straight between joints: fls. about $\frac{1}{2}$ in. long, in dense, nearly globular heads, which terminate long, naked stems; corolla lobes lance-linear, acute: lvs. cut into very unequal linear lobes. Calif. and Ore. B.M. 2698. B.R. 14:1170.—An old favorite. There is a white form (var. *alba*). There is also a var. *major*.

7. **laciniata**, Ruiz & Pav. Much like the last in botanical characters, and possibly a form of it; lower and much more slender, the leaf-divisions mostly very narrow (usually almost thread-like), the heads smaller or the fls. sometimes even scattered. Chile.—The fine foliage and compact habit make this species an excellent garden plant.

DD. Inflorescence mixed, capitate on the main branches, scattered on the others.

8. **achillesefolia**, Benth. Fig. 904. Stout (2-3 ft.) and very branched and bushy, the early main branches terminating in large, dense heads, but the later, finer growth bearing scattered fls.: lvs. small, with short, linear lobes or teeth: fls. large, violet or purple-blue.



903. Flower of *Gilia capitata*. ($\times 2$.)

904. *Gilia achillesefolia*. ($\times \frac{3}{4}$.)

the corolla lobes oblong or obovate; capsules large. W. Calif. B.M. 5939 (showing only capitate inflorescence).—An old garden plant. Fls. vary to white and rose.



905. *Gilia tricolor*.
Natural size.

DDD. Inflorescence scattered or loosely cymulose.

9. *tricolor*, Benth. Fig. 905. A very diffuse, twiggy grower, 2-2½ ft. high, sparsely pubescent; lvs. few on the full grown plant, small, with many short, very narrow or needle-shaped divisions; fls. comparatively large (¾ in. long or nearly so), nearly or quite bell-shaped, the corolla 2-3 times the length of the calyx; color of the roundish lobes violet and passing to whitish at the base, of the throat brown-purple and of the tube yellow. W. Calif. B.M. 3463. B.R. 20:1704.—One of the commonest of garden annuals. There is a white form (*G. nivâlis*, Hort.) and a rose-colored form (*G. rosea*, Hort.). Thrives with the least care, and is always a profuse bloomer.

ccc. Plant biennial: seeds few or many in each locule; fls. large and long-tubular, red (running into white forms), the corolla very much surpassing the subulate calyx lobes. (*Ipomopsis*.)

10. *coronopifolia*, Pers. (*Ipomopsis elegans*, Poir. *I. aurantiaca* and *I. sanguinea*, Hort.). STANDING CYPRESS. Stem strict and unbranched, sometimes 6 ft. high, very leafy; lvs. pinnate, the divisions needle-like and about 1 in. long; fls. many, 1½ in. long, long-trumpet-shape, borne along the sides of the summit of the stem, the calyx inconspicuous amongst the short bract-lvs., the corolla scarlet or pink-red and dotted and yellowish within, varying to orange, its lobes obtuse or nearly so and flaring. In dry soil, S. Car., south and

west. B.R. 20:1691.—Common old garden plant, and worthy. Fls. scentless.

11. *aggregata*, Spreng. (*Ipomopsis elegans*, Lindl.). Differs in mostly shorter stature, and more slender habit, with redder (sometimes white) fragrant fls., with acute and reflexing corolla lobes. Neb., south and west. B.R. 15:1281.—Probably not in cult. The fls. are fiery scarlet or sometimes nearly white. A very showy biennial.

AA. Lvs. opposite, entire, or, if alternate (as in No. 12) palmately parted.

B. Foliage very fine, the lvs. cut into thread-like or linear divisions.

c. Corolla rotate-bell-shape, with a short, flaring tube.

12. *liniflora*, Benth. (*G. linifolia*, Hort.). Fig. 906. Ten to 20 in. high, diffuse and branchy; lower lvs. mostly opposite, but the upper alternate, all palmately divided to the base in needle-like or spurry-like divisions; fls. rather large for the size of the plant, the corolla white or bluish, nearly rotate, the thin lobes obtuse. Calif. B.M. 5895.—A useful tufty garden annual. The name *liniflora* is meant to designate the resemblance of the fls. to those of *Linum tenuifolium*; but some catalogue maker, evidently thinking that the name meant linear-flowered, and was therefore inappropriate or an error, has changed the name to *G. linifolia*, under which name it is known in the trade.

cc. Corolla salver-form, with a filiform and elongated tube (*Leptosiphon*).

13. *densiflora*, Benth. (*Leptosiphon densiflorus*, Benth.). Erect or even strict, 1-2 ft., hairy; lvs. with many filiform somewhat rigid divisions; fls. in rather close heads, lilac or white, ½-¾ in. long; tube of the corolla scarcely longer than the leaves; lobes of the corolla scarcely longer than the leaves; lobes of the corolla spreading, obtuse, often dentate, nearly or quite as long as the tube. Calif. B.M. 3578. B.R. 20:1725.—Common garden annual. The white-fl. form is known as var. *alba*, Hort.

14. *androsæca*, Steud. (*Leptosiphon androsæcus*, Benth.). Much like the last, but the tube very slender and much exerted beyond the calyx and leaves; fls. 1 in. long, pink, lilac or white, in rather close heads, the corolla lobes ovate-acute and entire, much shorter than the tube, 12-18 in. Calif. B.M. 3491. B.R. 20:1710.

15. *micrantha*, Steud. Fig. 907. Tufted, 8 in. or less high, the stems most leafy near the top; lvs. short, fasciated; fls. with an exceedingly slender thread-like tube which is 1-1½ in. long, and projecting prominently above the upper fascicles of lvs., the corolla lobes spreading and obtuse; color range very wide,—from purple to lilac, red, yellow and white. Calif.—A popular and important bedding plant. Forms of it are known as *Leptosiphon aureus*, *carminæus*, *hybridus*, and *roseus*.



906. *Gilia liniflora* (× ½).

907. *Gilia micrantha* (× ½).

BB. Foliage of entire (but narrow) lvs.

16. *dianthoides*, Endl. (*Fenzlia dianthiflora*, Benth.). Fig. 908. Tufted, 6 in. or less high; lvs. narrowly linear, opposite; fls. 1-1½ in. long, lilac or purple, with yellowish throat, the flat-spreading lobes denticulate or

nearly fringed. S. Calif. B.M. 4876. R.H. 1865:10.— A choice little annual, excellent for edgings and rock-work, bearing a profusion of pink-like fls. The fls. sometimes vary to white (*Fenzlia alba*, Hort.). A large-fl. form is called *C. speciosa*. L. H. B.



908. *Gilia dianthoides*.
The Fenzlia of gardens.

5 long white or rose-tinged narrow petals, which are more or less unequal, 10-20 included stamens, 5-toothed calyx, and 5 2-4-seeded pedis: fls. many in loose, terminal clusters in summer. To this genus Britton has recently given the name *Porteranthus* (*Porter's flower*, in honor of Dr. T. C. Porter), because Adanson had earlier made a genus *Gillenia*. The species are *G. trifoliata*, Moench (BOWMAN'S ROOT), in rich woods from N. Y. to Ga. (Mu. 8:129. B.M. 489), and *G. stipulacea*, Nutt. (AMERICAN PECAC), with a more southern range. The former has ovate-oblong serrate leaflets and small, mostly entire stipules; the latter has lanceolate deeply incised leaflets and leafy incised stipules, and is more pubescent. *Gillenias* are excellent, graceful plants for the mixed or hardy border. They are hardy and of easy culture in any good soil. 2-4 ft. tall. They propagate by seed and division. L. H. B.

GILLYFLOWER down to Shakespeare's time usually referred to what we now call the carnation, *Dianthus Caryophyllus*, also known as clove pink. Since Shake-

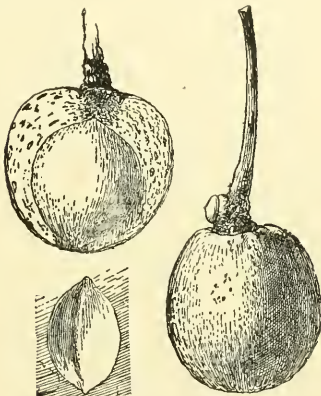


909. Ginkgo.

peare's time Gillyflower has usually meant either wall-flowers or stocks, as explained under *Cherianthus* and *Matthiola*.

GINGER. *Zingiber officinale*. Wild Ginger. *Asarum Canadense*.

GINKGO (Chinese name). *Conifera*, tribe *Taxee*. One tree, with wedge-shaped lvs., fls. small and mostly dioecious. Pistillate fl. solitary, the single naked ovule ripening into a drupe. Staminate fls. in slender, loose catkins.



910. Ginkgo fruit and seed. Natural size.

biloba, Linn. (*Salsbùria adiantifolia*, Smith). GINKGO. MAIDENHAIR TREE. KEW TREE. FIGS. 909, 910. A tall, sparsely branched, usually slender tree, attaining a height of 60-80 ft.: lvs. 3-5, clustered, fan-shaped, divided at summit, with thickened margin, striated on both sides with numerous parallel veins: fls. dioecious; male catkins slender, stalked; females on long footstalks, in pairs, of which one usually aborts: fruit a drupe, consisting of an acid, foul-smelling pulp surrounding a smooth, angular oval, cream-colored, thin-shelled, sweet-kerneled nut. Northern China. F.S. 10, p. 119. G.C. III. 5:265, 269. G.F. 1:175. A.G. 12:268. Gng. 6:194.

Introduced to America early in the century, and generally successful on good soil in the eastern states as far north as eastern Massachusetts and central Michigan and along the St. Lawrence river in parts of Canada. Of special value for solitary planting to secure picturesque effects. Considerably planted in Washington, D.C., where it is growing in esteem as a street tree because of its upright habit and freedom from insect injury. Easily propagated from seed, stratified in autumn; varieties by budding and grafting. Several horticultural forms are recognized, including *laciniata*, *pendula* and *variegata*.

The foul odor of the ripe fruits, which continue to mature and drop during a period of some weeks, constitutes the chief objection to the species as a street tree, or near dwellings, and suggests the advisability of propagating from staminate trees by grafting or budding, for planting in such locations. The kernels, which have a sweetish, slightly resinous flavor, are highly esteemed for food in China and Japan, and are gathered from fruiting trees in Washington for such use by Chinese laundrymen.

The word Ginkgo seems to be pronounced with a hard initial G in the orient, but in English a soft G should be used. The name is often spelled Ginkgo, but the other spelling is preferable because Linnaeus spelled it so in the generic name. W. A. TAYLOR.

GINSENG (*Panax quinquefolium*, Linn. *P. Ginseng*, Meyer. *Aralia quinquefolia*, Decne. & Planch.) is to the Chinese more than quinine or any other drug is to Americans. As its name Panax implies, it is a panacea, being employed for all the ills that flesh is heir to. Though credited with stimulating, aromatic, alterative,

carminative and tonic properties, the root is with us seldom used except as a demulcent. The reverence in which it is held, and the high price that it commands in China, led to extensive search for a substitute, which resulted in the discovery in 1716 of American Ginseng, *Panax quinquefolium*, near Montreal, Canada. This root was favorably received by the Chinese, and soon became an important article of export. During the past 40 years the price of American Ginseng has advanced nearly 700 per cent, but owing to the energetic hunt for the root, to the destruction of forests and to the gathering of plants at improper times, the wild supply has greatly decreased. With the advancing prices and the diminishing supply came experiments in Ginseng cultivation, most of which failed through ignorance of the plant's peculiarities. The seed ripens in Sept. If dry it will not germinate until the second year, but if fresh and properly kept nearly all the seeds will germinate the first season. The soil must be a light, friable loam, free from stones, etc., rich in humus and well drained; the plants must be well supplied with shade and moisture. Cultivated Ginseng already commands a considerably higher price than the wild root, and, though no returns can be expected from a plantation until it is 3 or 4 years old, the industry is found to be profitable by the men that have given it careful attention.

Ginseng beds can be located in orchards, gardens, or woods, where the roots may remain without danger of deterioration for several years after they first attain marketable size. The roots are so valuable that they are likely to be stolen, and beds should, therefore, be placed where they can be guarded. M. G. KAINS.

For further information on Ginseng, send to Div. of Publications, Dept. of Agriculture, Washington, D. C., for Bulletin No. 16 of the Div. of Botany, revised by M. G. Kains in 1898, or consult Kains' Ginseng, its cult., etc., Orange Judd Co., 1899. W. M.

GLADIOLUS (diminutive of Latin *gladius*, a sword, from the shape of the lvs. of the first description species), *Iridaceae*. (Gladioli are amongst the most popular of all garden plants, and particularly of the class known as summer-flowering bulbs, ranking in popularity with cannas, dahlias, lilies and iris, and having probably no other rivals. They are also the most important, commercially, of all the "Cape bulbs.")

About 140 species of cornus herbs, which bear lily-form fls. in spikes at the summit of a scape. Fl. more or less tubular, the tube usually funnel-shaped (enlarging upwards); segments 6, more or less unequal, strongly narrowed or even clawed at the base, the upper ones often hooded or roofed over the opening or mouth of the flower; stamens 3, inserted on the tube; stigmas 3, on a long style; ovary 3-lobed. Fig. 911. Monogr. by Baker, Iridaceae, pp. 198-229 (1892).

About 15 of the species are natives of Europe and western Asia. A few have been discovered on the mountains of tropical Africa. The larger part of the species are South African, however (Cape Colony and Natal), and of these species the habitat is not mentioned in the following synopsis. The Europe-Asian species are little cultivated in this country. Some of them are hardy. The S. African species, variously hybridized, have given rise to the numerous and excellent garden strains. There are semi-double forms. L. H. B.

I. THE CULTURE OF GLADIOLI.

A. From the amateur's point of view.

The essentials of Gladiolus culture can be told in a sentence: the corms should be planted as early in spring as the soil can be fitted; they flower the same season in July and August, and can be stored over winter in any cool, dry cellar that will keep potatoes. Late spring frosts do not penetrate the soil deep enough to hurt the early planted corms. The blooming season can be easily prolonged until frost by successive plantings from April to July 4. The flowers are excellent for cutting, and last a week in water. Some varieties need staking, but stakes are objectionable on general principles, even when neat and slender. Seedlings are easily raised, and the process is described in the next paragraph. Gladioli are easily forced to flower in Novem-

ber and December, as the corms can be kept dormant by the simplest kind of cold storage. It is common for florists to hold some corms in a cool place until August; then plant them in boxes of rich soil 4-5 in. deep, and keep the boxes outdoors until frost. After frost-time the corms are brought into a cool greenhouse, where they flower within two months. New corms form above the old one, and bloom the next season (Fig. 912). Cormels or "spawn" also form on offshoots: these lie in two or three years.

L. H. B.

AA. From the commercial point of view.

The culture of Gladioli is very easy, and can be conducted under nearly any of the conditions suitable for potatoes. Gladioli succeed best in a sandy loam which is retentive of moisture. For successful commercial culture it is essential that such soil conditions are obtainable. Planting should be commenced as early in the spring as the proper working of the soil will permit. Such preparation of the soil as puts it in a loose, friable condition will answer. Probably the ideal soil is a sod, fall plowed and then most thoroughly worked in the spring. Strong, fresh stable manure should be avoided. If soil is not sufficiently rich in plant-food it is best to use all strong manures on a previous season's crop of some other kind. Any complete fertilizer is beneficial when thoroughly worked through the soil, at the rate of 600 to 1,000 pounds per acre. The ground being prepared, it should be furrowed 4 in. deep and from 24 to 36 in. apart, according to method of cultivation. If fine, round bulbs are to be grown, and the stock for planting exceeds 1½ in. in diameter, it will be necessary to place the bulbs right side up in the furrow by hand, either in single or double rows 2 in. apart. Bulbs of lesser size can be scattered as evenly as possible along the furrow, with an average of 10 or 12 to the foot of furrow. Clean culture throughout the growing season is essential. Cutting the spike of flowers is a help to increasing the size of the bulbs. Four months is sufficient for the growth and maturity of the bulb. To harvest, loosen the soil and lift the bulbs by their tops, and lay on the ground to dry off and ripen. Should weather permit



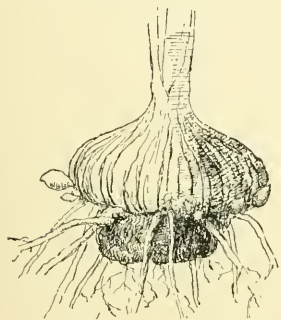
911. Parts of a Gladiolus flower.

they can be entirely ripened out of doors. Cut the tops off close to the bulb, pulling off the old bulbs and roots, and place in thin layers in crates and store in a cool, dry place. If circumstances require, the tops can be trimmed off at once on lifting, and the bulbs taken under cover for cleaning and drying.

Gladioli are increased in three ways: (1) by natural division from the parent corm; (2) by seed; (3) by the small corms growing at the base of the new corm.

In the first method all that is necessary is to separate the corms growing from the original, either when cleaning in the fall or before planting in the spring.

When seeds are sown, the seedlings should all produce corms of flowering size in 3 years. Seed should be planted very early in the open ground on rich, sandy soil and not allowed to suffer in the least for lack of



912. Gladiolus corm growing above the old one.
Also shows cormels.

moisture. At the end of the first season's growth the corms of the seedlings will be the size of peas, and can be stored under the same conditions as large corms. The second season plant the corms as if they were garden peas. Some will bloom the second year, and all should bloom the next.

Increasing stock by the small corms or bulblets is the most common method, and the one by which a variety is perpetuated. The small corm is but a cutting or eye, and can be stored in bags, boxes or other suitable receptacles and kept from frost. It is a help to sprouting if the corms are not allowed to dry out during the period of rest. They should be planted like 1-year seedlings, making blooming bulbs the first and second year.

E. H. CUSHMAN.

AAA. From the American hybridizer's point of view.

The garden evolution of Gladioli in general is explained at length below. The writer has been asked to present the American share in this interesting history. Some ten years ago, when the writer began, under the inspiration of Luther Burbank, his own work in hybridization, the best American-grown stock available was the Hallock collection of some 400 named varieties of *Gandavensis* and about 100 of the earlier Lemoine hybrids, all of European origin. After trial, the writer placed them all in mixtures.

About this time Luther Burbank began to offer a few named varieties, but shortly afterwards sold his whole stock, the collection being now in the writer's hands. This collection, in the opinion of the writer, is the best strain of *Gandavensis*. The varieties were largely of variegated types, with many of unique markings and peculiar form. Burbank had given particular attention to varieties calculated to withstand the hot, dry winds of California, and had originated several with specially stiff petals, quite distinct from the ordinary types. The peculiarity of the flowers blooming around the spike like the hyacinth was also his contribution. All of his varieties are now grown in mixture by the writer with the exception of a white variety, which promises to be distinct and valuable for some time to come. However, the vitality of Burbank's strain is remarkable, and in the opinion of the writer it is greater than that of all the other strains of so-called American hybrids which constitute the principal stocks of commerce on this continent.

The latter strains have probably been largely produced from self-fertilized seed of European and American varieties, themselves the product of natural selection, thus carrying to their progeny the objection of a weak and degenerate parentage.

The work of Dr. Van Fleet, of New Jersey, was carried on more for scientific than commercial results, and reaped a deserved success. However, the writer has found that the offspring of a pure species is less stable than that of well-balanced cross-bred varieties, the former system handing down few varieties of permanent commercial value, though they are in themselves valuable as parents for the foundation of new strains.

The best work of a semi-professional character, in the opinion of the writer, has been done by T. S. Moore, of Indiana, who has spared no trouble or expense in procuring choice material upon which to build, and with satisfactory results. As to *G. cruentus* (a strain of reds), the writer thinks that little is to be gained by its use, as we have too many reds already. Its roots tend in this climate to early and rapid degeneration.

The writer believes that the beauty of the individual flower is the highest ideal, though vigor of plant and vitality of variety are also necessary. He regards the Gladiolus as a cut-flower rather than a garden plant, and believes higher satisfaction is gotten from cutting the spike when the first bud opens than from leaving the flowers to open outdoors.

A new strain of great interest is composed of the hybrids of the *G. Papilio*, var. *major*, a most interesting species in which the under color, a unique shade of blue, is overlaid with dull terra-cotta. In seedlings raised by the writer these colors have separated, producing the most beautiful heliotrope and clematis blues and rich velvety purples, colors quite unknown in the older sections.

Another strain likely to be presented soon is the product of the old species *G. dracecephalus*. The flowers of the hybrids are covered with minute dots similar to those of the species. The species and its hybrids have exceptional vigor and vitality.

Gladioli are most adaptable to all soils, providing reasonable assistance is given. Clean, sandy loam is preferable, fertilized at least every other autumn with well-rotted manure, which is carefully covered below the depth of planting. Before spading or plowing the ground it is well to dress freely with fresh, hardwood ashes. On heavy clay use leached ashes freely, and cover deeply all the green vegetable refuse and leaves that have been partially rotted under the manure pile since the previous autumn. Also fill in the trenches with sand or loam. In swamp muck and vegetable deposit, a mixture of sand added yearly is all that is needed, the trenches being filled with sand at planting. Cold, springy swamp lands with the water half filling the trenches at planting, have given perfect satisfaction with blooming bulbs, that have been developed on the other soils. Water should be freely used during the season of active growth; moderately with blooming stock before budding in order to ripen the plant; then again freely before the buds show color and until after blooming. Full exposure to the sun and air is necessary for the best results.

H. H. GROFF.

II. THE KINDS OF GLADIOLI.

alatus, 2.	dracecephalus, 19.	purpureo-auratus
angustus, 5.	floribundus, 23, 26.	21.
atroviolaceus, 7.	Froebel, 31.	Quartmannus, 9.
biflorus, 8.	Gandavensis, 27.	ramosus, 26.
blandus, 22.	grandis, 3.	Saundersii, 18.
Brencheyensis, 27.	Leichtlini, 16.	segetum, 14.
Bride, 26.	Lemoinei, 28.	sulphureus, 10.
Byzantium, 13.	Milleri, 25.	triaculatus, 5.
cardinalis, 17.	Naessianus, 29.	tristis, 4.
Childsii, 30.	nanus, 26.	Turicenis, 32.
Colvillei, 26.	Natalensis, 20.	versicolor, 3.
communis, 12.	oppositiflorus, 24.	vinulosus, 11.
concolor, 4.	Papilio, 15.	vittatus, 11.
crispiflorus, 6.	psittacinus, 20.	Watsonianus, 1.

Other Latin names are in the trade, but they are mostly or wholly garden forms.

I. *Species*.—Few of the original species of Gladioli are in cultivation in their pure form. When grown at

all, they are prized chiefly as oddities, or because of their botanical interest. The following species are either offered at the present time in American trade or are parents of modern garden forms:

A. *Fl. with a long, slender, cylindrical curved tube, which is enlarged in the middle: segments nearly equal.*

1. **Watsonianus**, Thunb. Corm small, globose; stem slender, 18 in. or less, with 1 long, narrow-linear and stiff leaf and 2-3 short, sheathing lvs.: fls. 2-4, in a lax 1-sided spike, 2 in. or less long, bright red, the wide-spreading segments oblong and acute. B.M. 450.—Little known in this country, but offered by the Dutch growers.

AA. *Fl. short and open, the tube short or scarcely any; segments very prominently clawed, usually unequal.*

2. **alatus**, Linn. Small, the stem only 4-8 in. high, and slender: lvs. 3-4, linear and rigid: fls. 3-4 in a lax spike, the curved tube $\frac{1}{2}$ in. long, the perianth bright red and often strongly veined; segments very unequal, the 3 lower tongue-like and protruded, the others obovate or nearly orbicular, all of them differently colored toward the base. B.M. 586; 592 (the var. *Namuaquensis*).

AAA. *Fls. of medium length, with a funnel-shaped tube, which is flaring at the top; segments narrowed below, but not distinctly clawed. (Gladiolus proper.)*

B. *Lvs. linear ($\frac{1}{2}$ in. or less wide)—except sometimes in Nos. 9, 10.*

C. *Perianth-segments acute.*

3. **grándis**, Thunb. (*G. versicolor*, André). Stem slender, 2 ft. or less: lvs. about 3, linear or nearly terete, strongly ribbed: fls. 6 or less, 3 in. long, with a curved tube; segments nearly equal, oblong-lanceolate and cuspidate, as long as the tube and twice longer than the stamens, recurved and often wavy, yellowish or creamy, tinged and striped with purple-brown: seeds winged. B.M. 1042.

4. **tristis**, Linn. Very like the last: fls. 2-4, somewhat smaller; segments shorter than the tube and not twice longer than the stamens, acute, yellowish white with purple or brown pencillings, or (in *G. concolor*, Salisb.), almost white or uniform yellow. B.M. 272, 1098. G.F. 8:75.

5. **angustus**, Linn. (*G. trimaculatus*, Lam.). Small and slender species (10-20 in. tall): lvs. 3-4, very narrow: fls. 2-6, long-tubed, white, the oblong segments shorter than the tube and the 3 lower ones with a characteristic purple median line ending in a heart-shaped mark. B.M. 602.

CC. *Perianth-segments obtuse.*

D. *Color purple or violet.*

6. **crispiflorus**, Herb. (*G. imbricatus*, Linn., var. *crispiflorus*, Baker). Stem 1-2 ft., rather slender: lvs. 2-5, sometimes $\frac{1}{2}$ in. broad: fls. 4-10, the tube $\frac{1}{2}$ in. long and curved, the segments obovate (1 in. long), crisped or wavy on the edge, dark purple, more or less marked with white and red: seeds winged. E. Eu. and W. Asia.—Hardy or nearly so.

7. **atroviolaceus**, Boiss. Stem 1-2 ft. high: lvs. 3, closely ribbed, firm: fls. few, the tube $\frac{1}{2}$ in. long and curved, the obovate segments 1 in. long and dark purple or violet-blue: seeds globose. W. Asia.—Hardy or nearly so.

8. **biflorus**, Klatt. Dwarf (1 ft. or less): lf. single, very narrow: fls. 2-3, the tube nearly straight, the oblong segments twice as long as the tube, lilac.

DD. *Color essentially yellow or orange.*

9. **Quartinianus**, Rich. Strong, 2-4 ft.: lvs. 3-4, rigid, sometimes nearly ensiform: fls. 4-9, in an open spike, large, the narrow curved tube $\frac{1}{2}$ in. long; upper segments hooded, the others smaller and more or less reflexed, bright yellow or yellow flushed and feathered with scarlet. B.M. 6739. G.C. III. 24:467, and Gn. 55:1225 (var. *superbus*) Mts. of Trop. Afr.—Not known

to be in the Amer. trade, but attracting attention in Europe. One of the best of the genus.

10. **sulphureus**, Baker. Stout, but low: lvs. 3-4 the blade short and somewhat ensiform: fls. 6-8, large, the curved tube $\frac{1}{2}$ in. long, soft bright yellow; upper segments ocellate; the 3 lower ones small. Mt. Kilimanjaro. Gn. 38:762(1)

DDD. *Color (under color) white or nearly so.*

11. **vittatus**, Hornem. (*G. vinulus*, Klatt). Low: lvs. 3-4, very narrow: fls. 3-6, nearly erect, the slightly curved tube nearly or quite an inch long, whitish, the 3 lower segments with a purple central blotch.

BB. *Leaves ensiform ($\frac{1}{2}$ in. or more broad, and flat or flattish).*

C. *Under- or body-color essentially purple.*

12. **communis**, Linn. Stem $1\frac{1}{2}$ -2 $\frac{1}{2}$ ft.: lvs. 3-4, 1 ft. or less long: fls. 4-8, small ($1\frac{1}{2}$ in. long), with a curved tube; segments bright purple (flesh-colored in the var. *carneus*), nearly equal in length, all connivent or touching (making a narrow fl.), the 3 lower ones long-clawed and with a median line: seeds broad-winged. France, Germany. B.M. 86, 1575.—Hardy. Little known in cult. in this country.

13. **Byzantinus**, Miller. Fls. more and larger, plant more robust, segments more spreading at maturity, although the 3 upper ones are contiguous, dark purple, the 3 lower ones with a prominent white median line: seeds winged. Mediterranean region. B.M. 874.—Hardy. Little known in gardens.

14. **segètum**, Ker. Differs from *G. Byzantinus* in having globular (not winged) seeds, and in the flaring or spreading segments of the bright purple, obovate-obtusate sepals. Canaries and Mediterranean region. B.M. 719.—Hardy. Little grown. Early.

15. **Papilio**, Hook. Stem 2 ft. or often more: lvs. about 4, rigid, 1 ft. or more long: fls. 6-12, with a curved tube, pale purple or lilac, yellow in the throat; upper segments obovate and hooded, $1\frac{1}{2}$ in. long, the lower ones very narrow below and marked with large red-brown blotches. B.M. 5565.—Handsome. Varies to white in cult.

CC. *Under- or body-color essentially red (No. 20 may be sought here).*

16. **Leichtlini**, Baker. Stem about 2 ft. tall, terete: lvs. about 4, 1 ft. long: fls. 6-8, large, with a curved tube $1\frac{1}{2}$ in. long, crimson and yellow; upper segments obovate and connivent, 3 lower ones much smaller and acute, spreading, red at tip but yellow and minutely red dotted below.

17. **cardinalis**, Curt. Tall: fls. many, nearly erect, bright scarlet, the tube $1\frac{1}{2}$ in. long and nearly straight; upper segments long-spatulate (2 in. long), scarlet, the 3 lower ones shorter and narrower, with a large white blotch. B.M. 135.

18. **Saundersii**, Hook. f. About 2 ft.: lvs. 4-6, strongly ribbed and stiff: fls. 6-8, large, bright scarlet, the tube 1 in. to $1\frac{1}{2}$ in. long and curved; 3 upper segments long-spatulate, uniform scarlet, connivent (2 in. long), 3 lower smaller, white-blotched and spotted. B.M. 5873. Gn. 12:83.—Handsome.



913. *Gladiolus Gandavensis.* ($\times \frac{1}{2}$.)

ccc. *Under- or body-color essentially yellow.*

19. *dracoccephalus*, Hook. f. Stem stout, 2 ft. or less; lvs. 3-4, rather firm; fls. 3-6, of medium size, yellowish green, the tube (2 in. or less long) curved; upper segments elliptic-obovate and more or less hooded, yellowish and closely striate with purple, the other segments much smaller and reflexing, mostly green and purple spotted. B.M. 5884.—Odd.

20. *psittacinus*, Hook. (*G. Natalensis*, Reinw.). Stem 3 ft. high, stout; lvs. about 4, rather rigid; fls. many and large, with a curved tube nearly or quite 2 in. long, rich yellow but thickly grained and overlaid with red (particularly about the margins of the segments); upper segments obovate and hooded, the lower much smaller and reflexing. B.M. 5944. B.R. 17:1442. L.B.C. 18:1756.—One of the leading parents of garden Gladioli.

21. *purpureo-auratus*, Hook. f. Stem 3-4 ft., very slender; lvs. 3-4, short; fls. 10 or more, primrose-yellow, medium in size, the curved tube less than 1 in. long; segments obovate, not widely spreading, the lower ones with a purple blotch. B.M. 5944. G.F. 2:89.—Handsome. A parent of modern Gladioli.

cccc. *Under- or body-color white.* (Forms of No. 15 may be sought here.)

22. *bländus*, Ait. Stem 2 ft. or less tall; lvs. usually 4; fls. few, white and red-tinged, the curved tube $1\frac{1}{2}$ in. long; segments all oblong or oblong-spatulate and flaring or recurved, some of them red-marked in the throat. Variable. Sometimes pure white (B.M. 648), and sometimes flesh-color (B.M. 645).—An old garden plant.

23. *floribundus*, Jacq. Stem short (1 ft.), producing fls. from near its base; lvs. usually 4; fls. 12 or less, large, white tinged with pink, the slightly curved tube 2 in. or less long; segments obovate or spatulate, obtuse, wide-flaring, red-lined. B.M. 610.

24. *oppositiflorus*, Herb. Much like the last, but fls. more numerous and smaller, in a distichous (or 2-sided) spike, white, sometimes marked with rose. B.M. 7292 G.C. III. 13:291. Gn. 45:963.—A very handsome plant growing 3-6 ft. high, and producing spikes 2 ft. long.

25. *Milleri*, Ker-Gawl. Stem 12-20 in.; lvs. about 4; fls. rather large, 4-5, nearly erect, milk-white, the tube 2 in. or less long and nearly straight; segments oblong and nearly acute. B.M. 632.

II. *Hybrids*.—The garden Gladioli are hybrids of various kinds and degrees. Of many, the parentage is so confused that it cannot be made out. However, there are four main lines of development or divergence, represented in the late-flowering *Gandavensis*, *Lemoinei* and *Nanceianus*, and the early-flowering *Colvillei*. An important article on the hybridizing of Gladioli, by Robert T. Jackson, will be found in G.F. 2:88.—Some of the points of merit of the modern Gladioli are: good constitution; good substance or texture of flower; brilliancy and definiteness of color; large size; long spikes (20-25 blooms).

26. *Colvillei*, Sweet (*G. cardinalis* × *tristis*). Fls. open or flaring, with oblong-acute segments, scarlet, with long blotches at the base of the lower segments; early-flowering; spikes short. Hardy south of Washington with some protection. R.H. 1895, p. 289. G.C. III. 12:90. Gn. 25:520; 34:680; 50, p. 66.—The oldest of the garden forms.

Runs into many types and strains. The modern white-flowered type, represented by *The Bride*, is best known in this country. Small forms are known as *G. nanus*. Some forms are known as *G. floribundus*.

Another form of early-flowering Gladioli is known as *G. ramösus*, Paxt. (issue of *G. cardinalis* and *oppositiflorus*), but it is probably no longer possible to distinguish these two groups.

27. *Gandavensis*, Van Houtte (*G. psittacinus* × *cardinalis*). Fig. 913. Upper segments nearly or quite horizontal or hooded, the colors in bright shades of red and red-yellow, variously streaked and blotched; late-flowering; spikes long. The commonest old-time type of garden Gladioli. F.S. 2:84 (1846). R.H. 1846:141. P.M. 11:27.—First offered to the trade by Van Houtte, Aug. 31, 1841. M. Souchet, of Fontainebleau, France,

did much to improve the *Gandavensis* type by repeated selections and breeding. By Herbert and some others, *Gandavensis* is considered to be an offspring of *G. psittacinus* × *oppositiflorus*. *C. Brechtleyensis* is one of the *Gandavensis* tribes.

28. *Lemoinei*, Hort. (*G. Gandavensis* × *purpureo-auratus*). Fig. 914. A modern race characterized by highly colored yellow, red and purplish fls., purple-blotched on the lower segments, with a more or less bell-shaped form of corolla—the segments broad and heavy and the upper ones horizontal or strongly hooded. Grown by M. Lemoine, Nancy, France, and first shown at the Paris Exhibition of 1878. Gn. 17:226; 30:554. R.H. 1879:330.



914. *Gladiolus Lemoinei* (on the right), and *G. Nanceianus*.

29. *Nanceianus*, Hort. (*G. Lemoinei* × *G. Saundersii*). Fig. 914. Robust, with very large, open-spreading fls., the two side segments widely flaring and sometimes measuring 6-8 in. from tip to tip; upper segment long and upright. First exhibited by Lemoine, the raiser, in 1889. The finest race, characteristically is full-open and large fls., in brilliant shades of red and purple. Gn. 41:846. G.C. III. 13:131.

30. *Childsii* (*G. Gandavensis* × *Saundersii*). Fls. similar to *G. Lemoinei* in shape and color. Originated by Max Leichtlin, Germany.

31. *Fröbeli*, Hort., is *G. Gandavensis* × *G. Saundersii*, var. *superbus*.

32. *Turicenis*, Hort., is of like parentage. G.F. 3:89.—This and the last are the work of Fröbel & Co., Zurich. They are of recent origin. L. H. B.

GLADWIN. *Iris fatidissima*.

GLASS. The important subject of greenhouse glass is treated under *Greenhouse Glass*.

GLASSHOUSE. Any glass structure in which plants are grown, particularly one which is large enough to admit the operator. It is a generic term. See *Greenhouse*.

GLASSWORT. *Salicornia*.

GLAUCIUM (name refers to glaucous foliage). *Pa-paveræceæ*. HORNED POPPY. A dozen or more herbs of S. Eu. and W. Asia; annuals, biennials or occasionally per-

ennials, a few of which are grown for their large poppy-like fls. and glaucous-blue foliage. Sepals 2; petals 4; stamens many; ovary with 2 (rarely 3) cells, the stigmas miter-shaped; the fruit becoming a long silique-like capsule; lvs. alternate, lobed or dissected. Glauciums are low, branched herbs, often somewhat succulent, with large fls., mostly yellow or orange, but varying to red and purple. The fls. are usually short-lived, but they are borne in rapid succession. They are well adapted for foliage effects in borders or edgings. Of easy culture in any good soil. They prefer an open, sunny situation. Mostly prop. by seed, but the perennial kinds by division; however, the perennials are short-lived, and usually had best be treated as biennials; they should be grown from seed.



915. *Glaucium luteum*.

luteum, Scop. (*G. flavum*, DC.). Figs. 915, 916. Stems stout, 1-2 ft., pubescent; radical lvs. 2-pinnate and hairy, the upper clasping and sinuate-pinnatifid; fls. generally solitary, on long stems, 2-3 in. across, yellow or orange. Eu.—Sparingly naturalized E. Perennial or biennial; sometimes grown as an annual.

corniculatum, Curt. (*G. phoeniceum*, Gaert. *G. rubrum*, Hort.). Lower: radical lvs. pinnatifid, pubescent, the upper ones sessile and truncate at the base; fls. red or purplish, with a black spot at the base of each petal. Eu.—Mostly annual. *G. Fischeri*, Hort., is probably a form of this. L. H. B.

GLAZIŌVA. See *Cocos insignis*

GLĚCHOMA. See *Nepeta*.

GLEDITSCHIA (after Gottlieb Gleditsch, director of the botanic garden at Berlin; died 1780). Syn *Gleditsia*. **LEGUMINŌSE**. HONEY LOCUST. Ornamental deciduous trees, often with large branched spines on trunk and branches; branches spreading, forming a broad graceful rather loose head, with finely pinnate foliage, generally light green and turning clear yellow in fall; the greenish fls. appearing in racemes early in summer are inconspicuous, but the large, flat pods are numerous



916. *Glaucium luteum* ($\times \frac{1}{2}$).

and the fertile tree is therefore to be preferred for planting. *G. triacanthos* is a useful native. *G. Japonica* and *G. ferax* are almost hardy North. They are very valuable trees for park planting and for avenues, and make almost impenetrable hedges if planted thickly and pruned severely. The coarse-grained wood is durable and strong. The pulp of the pods of *G. triacanthos* is sweet when fresh, hence the name Honey Locust, but becomes bitter at length; in Japan it has been used as a substitute for soap. The Gleditschias are of vigorous growth and thrive in almost any soil. Prop.

by seeds sown in spring about 1 in. deep, they should be soaked in hot water before being sown; varieties and rare kinds are sometimes grafted on seedlings of *G. triacanthos* in spring. About 10 species in N. America, Asia and Africa. Lvs. alternate, abruptly pinnate, often partly bipinnate on the same leaf, or wholly bipinnate, both usually on the same tree; fls. polygamous; calyx lobes and petals 3-5, stamens 6-10; pod compressed, mostly large and indehiscent, 1-many-seeded.

A. Pod thin-walled: lvs. pinnate with more than 12 lfts., or bipinnate.

triacanthos, Linn. HONEY or SWEET LOCUST. THREETHORNED ACACIA. Fig. 917. Tree, 70-140 ft., usually with stout simple or branched spines 3-4 in. long; lvs. 6-8 in. long, with pubescent grooved rachis; pinnate with 20-30 lfts., bipinnate with 8-14 pinnae; lfts. oblong-lanceolate, remotely crenulate-serrate, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long; fls. very short-pedicelled in $\frac{1}{2}$ -3 in. long, narrow racemes; pod 12-18 in. long, slightly falcate and twisted at length. May, June. From Pa. south to Miss., west to Neb. and Tex. S. S. 3:125, 126.—Var. *inermis*, DC. Unarmed or nearly so, of somewhat more slender and looser habit. Var. *Bujoti*, Hort. (*G. Bujoti pindula*, Hort.). With slender, pendulous branches and narrower lfts.

Japonica, Miq. Tree, 60-70 ft., with somewhat compressed, often branched spines, 2-4 in. long; lvs. 10-12 in. long, with grooved and slightly winged, puberulous rachis, pinnate with 16-24 lfts., bipinnate with 8-12 pinnae; lfts. ovate to oblong-nearly lanceolate, obtuse, entire or remotely crenulate, lustrous above, $\frac{3}{4}$ -2 in. long; fls. short-pedicelled in slender racemes; pod 10-12 in. long, twisted, bulgiate, with the seeds near the middle; pulp acid. Japan, China. G. P. 6:165.—Var. *purpurea*, Rehd. (*G. Sinensis*, var. *purpurea*, Loud. *G. cocinea*, Hort. *G. Sinensis*, var. *orientalis*, Hort.). Lfts. broadly oval to oblong-oval, obtuse or emarginate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. on the pinnate, smaller on the bipinnate lvs.

ferox, Desf. Tree, with compressed, large, usually branched spines; lvs. with grooved, almost glabrous rachis, usually bipinnate; pinnae 6-10, with many lfts.; lfts. ovate-lanceolate to lanceolate, acute, minutely and remotely crenulate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. China. Often cult. under the name *G. macracantha*, *Sinensis* var. *Japonica* and *horrida* and usually referred to *G. Sinensis*, but seems more closely allied to *G. Japonica*. Var. *nana*, Hort., is a shrubby, often less spiny form.

AA. Pod thick-walled: lvs. pinnate, with 4-12 lfts., rarely bipinnate.

Sinensis, Lam. Tree, to 40 ft., with stout conical often branched spines; lvs. 5-7 in. long, with grooved pubescent rachis, and 8-18 lfts.; lfts. ovate or oblong-ovate, obtuse or acute, crenulate-serrate, r-ticulate beneath, $\frac{3}{4}$ -2 in. long; fls. distinctly pedicelled, in slender racemes; pod almost straight, thick, 4-7 in. long, 1-1 $\frac{1}{2}$ in. broad. China.

G. aquatica, Marsh. (*G. monosperma*, Walt. *G. inermis*, Mill. not Linn.). WATER or SWAMP LOCUST. Tree, to 60 ft., with mostly simple spines; lvs. pinnate, with 12-18 ovate-oblong, crenulate lfts., or bipinnate, with 6-8 pinnae; pod thin, elliptic, 1-seeded, 3-2 in. long. From Carolina south, west to Texas. S. S. 3:127-28.—*G. australis*, Hemsl. Tree with large spines; lfts. very oblique, oblong, crenate leathery, shining; pod with coriaceous walls, 4-5 in. long. S. China.—*G. Caspica*, Desf. Allied to *G. triacanthos*. Lvs. pinnate with 12-20 ovate, crenulate lfts., or bipinnate with 6-8 pinnae; pod thin, pulpy, to 12 in. long.—*G. Fontanaii*, Spach.—*G. macracantha*—*G. horrida*



917. *Gleditschia triacanthos*. ($\times \frac{1}{2}$.)

Willd.—*G. Sinesis*.—*G. macrocartha*, Desf. Allied to *G. Sinesis*; spines and lfts. generally larger: pod 4-6 in. long, $\frac{3}{4}$ in. broad, often almost cylindrical. China. ALFRED REHDER.

GLEICHENIA (W. F. Von Gleichen, 1717-1783). *Gleicheniaceae*. A genus of about 30 species of ferns from the tropical and south temperate zones, growing naturally in dense thickets. The leaves fork, often several times, and the family is characterized by dorsal sori composed of a few nearly sessile sporangia; these are surrounded by a broad transverse ring, and open vertically. The species after the third are often catalogued under Mertensia, a name which, because used for a genus of flowers, must give way to *Dicranopteris* if they are separated and placed in a distinct genus, where they probably belong.

A. *Ultimate lobes small, rounded*.

B. *Sorus of 3-4 sporangia, superficial*.

rupéstris, R. Br. Lobes rounded or obtusely quadrangular, the margins thickened and recurved, somewhat glaucous beneath. Australia. Var. *glaucescens*, Moore, has lvs. of thicker texture, which, when young, are very glaucous on both sides, contrasting with the reddish purple stalks.

circinata, Swz. Lobes ovate or rotund, with the rachides pubescent when young; 3-5 times forking, the ultimate pinnules 1 in. long. Austral., New Zealand.

Var. **spelunca**, Hort. (*G. spelunca*, R.Br.). Lvs. pendent but not curving; pinnules curved inward, forming small cavities. Var. **semivestita**, Labill. (*G. semivestita*, Hort.), differs in its close and very erect habit, and flat, deep green pinnae. Var. **Méndelli**, Moore (*G. Méndelli*, Hort.). More robust and compact than the type, with flat, thicker and glaucous lvs. Gn. 51, p. 472.

BB. *Sorus of 2 sporangia concealed in slipper-shaped lobes*.

dicarpa, R.Br. Lvs. 2-4 times forked, with the lobes strongly arched, rotund or narrow, with the under surface rusty-hairy. Australia.

AA. *Ultimate lobes pectinate: sori near the middle of the veinlets*.

C. *Leaf, after first forking, bipinnate*.

glauca, Hook. Primary branches elongate, 2-3 ft. in length; rachises with rusty scales; pinnæ 4-8 in. long, with closely placed entire segments, glaucous beneath. China and Japan.

CC. *Leaf with fan-shaped divisions*.

labellata, R. Br. Lvs. 2-3 times forked, the divisions ascending, 6 in. or more long, elliptic-lanceolate; ultimate divisions linear. Australia.

longipinnata, Hook. Branches of the lvs. repeatedly dichotomous; pinnæ up to 2 ft. long, 3 in. wide. Trop. America.

AAA. *Ultimate branches with a pair of forked pinnæ: leaf stems zigzag, repeatedly dichotomous*.

dichotoma, Willd. With a distinct pair of pinnae arising from the base of the forked branches; segments not decurrent. Tropical regions generally, but several species have been confused here, as in many of the widely distributed species. L. M. UNDERWOOD.

GLÓBBA (Malayan name). *Scitamineaceae*. This genus, which belongs to the same family with the canna and ginger plant, contains some herbaceous conservatory plants with rhizomes and habit of canna, and a singular floral structure. Only one species is known to be cult. in America. This is known to the trade as *G. coccinea*, which is really *G. atrosanguinea*, figured at B.M. 6626. Index Kewensis is clearly in error in referring *G. coccinea* to *G. albo-bracteata*, as is plain from G.C. II. 18:71. Veitch introduced in 1881 a plant under the provisional name of *G. coccinea*, as it was supposed to be a new species, but the next year it was identified with *G. atrosanguinea*. This plant was highly praised in 1893 by John Saul, who said substantially: "Plants in bloom the greater part of the year; stems much crowded, 12-18 in. long, gracefully arching on all sides; fls. scarlet and yellow, in dense racemes." The result of the

discovery of this plant is generally given to F. W. Burbidge, but in G. C. II. 18:407 Burbidge gives the honor to Curtis. For culture, see *Alpinia*.

atrosanguinea, Teijsm. & Binend. (*G. coccinea*, Hort., Veitch). Stem slender, becoming 2-3 ft. high; lvs. 3-4 in. long, elliptic, acuminate at both ends; sheaths purplish, pubescent, closely clasping the stem; lower flowerless bracts distant, brown, 6-9 lines long; upper and flowering bracts crowded, red; fls. $1\frac{1}{2}$ in. long; corolla yellow, tubular, thrice as long as calyx. Borneo. B.M. 6626. W. M.

GLOBE AMARANTH. *Gomphrena*.

GLOBE FLOWER. See *Trollius*.

GLOBE HYACINTH. Consult *Muscari*.

GLOBE MALLOW. See *Spiralcea*.

GLOBE THISTLE. See *Echinoops*.

GLOBE TULIP. See *Calochortus*.

GLOBULARIA (the flowers in small, globular heads). *Globulariaceae*. (About a dozen species of Old World herbs, shrubs and shrubs, with small blue fls. mostly in globular heads. Lvs. from the root, or alternate, leathery, entire or with a few sharp teeth. Probably the commonest and best species is *G. trichosantha*, which thrives at the front of well-drained borders, but is particularly showy in the rockery. For this and *G. vulgaris* and its forms, J. B. Keller advises rather moist but well-drained soil and partial shade. Prop. by division or seed.

A. *Hardy herbaceous plants about 6-12 in. high*.

B. *Root-lvs. 1-nerved*.

trichosantha, Fisch. & Mey. Height 6 in.; root-lvs. spatulate, 3-toothed at apex; stem-lvs. obovate or oblong, mucronate, sessile. July, Aug. Asia Minor. Syria.—"Lvs. turn blackish purple in fall."—*Watson*.

BB. *Root-lvs. 5-nerved*.

vulgaris, Linn. Height 8-12 in.; root lvs. obovate, petiolate, nearly entire, apex entire, notched or mucronate; stem-lvs. lanceolate, sessile. S. Eu., Caucasus. July, Aug. B.M. 2256.

AAA. *Tender subshrub*.

Alypum, Linn. Lvs. obovate-oblong, mucronate or 3-toothed at apex. Mediterranean regions.—Cult. in S. Calif. by Franceschi, who says it is covered with fls. all winter. Also cult. abroad under glass. W. M.

GLORIOSA (Latin for *glorious*). Syn., *Methonica*. *Liliaceae*. Three tropical species, all African, and one also Asian. They are tall, weak-stemmed plants, supporting themselves by means of tendril-like prolegations of the alternate, lanceolate or lance-ovate lvs. fls. many and showy, long-stalked, borne singly in the axils of the upper lvs.; perianth of 6 distinct long segments, which are undulate or crisped, and reflexed after the manner of a Cyclamen, variously colored; stamens 6, long and spreading, with versatile anthers; ovary 3-lobed; style long, and bent upward near the base. Odd and handsome plants, to be grown in a warm house. They are not difficult to grow. The brightest fls. are produced in sunlight. The plants grow from tubers. These tubers should be rested in early winter, and started in pots in January to March. The plants bloom in summer and fall. When potting the old tubers, offsets may be removed (when they occur) and grown separately for the production of new plants. The tubers may be cut in two for purposes of propagation. Let the plants stand near a pillar or other support. Give freely of water when the plants are growing. In this country they are sometimes bedded out in summer. W. E. Endicott cultivates *Gloriosa* outdoors in summer at Canton, Mass., and finds that the plants so treated are not much inclined to climb and flower as freely as under glass. In Florida, they may be grown permanently in the open. Success with *Gloriosa* depends on having strong bulbs. Consult *Bulbs*.

A. *Segments (or petals) much crisped.*

superba, Linn. CLIMBING LILY. Stem 5-10 ft. high; lvs. ovate-lanceolate; segments 3-4 in. long and less than an inch wide, opening yellow, but changing to yellow-red and deep scarlet. Africa, Asia. B.R. 1:77. Gn. 38:781. R.B. 23:121.

AA. *Segments somewhat undulate, but not crisped.*

simplex, Linn. (*G. viridescens*, Lindl. *G. Plinii*, Loud.). Fls. opening yellow, and remaining so in shade, but becoming deep yellow-red when exposed to the sun; wider than in *G. superba*, barely undulate and wavy, and not prolonged or hooked at the end as in the latter species. Africa. B.M. 2529. Var. **grandiflora**, Nichols. (*Melthonia grandiflora*, Hook.), has fls. 8 in. across. B.M. 5216.

G. Abyssinica, Rich., said to be the largest-fl. species, seems not to be in cult. L. H. B.

GLORY OF THE SNOW. Fanciful name for *Chionodora*.

GLORY PEA. See *Cianthus*.

GLOXINËRA. Name given to hybrids of *Gloxinia* (Sinningia) and Gesneria. See *Gloxinia*.

GLOXINIA. The genus *Gloxinia* was founded by L'Heritier in 1785 (named in honor of P. B. Gloxin, a botanist of Strassburg) upon *G. maculata* of Brazil. Early in this century a related Brazilian plant was introduced, and it attracted much attention: this plant was named *Gloxinia speciosa* by Loddiges in his Botanical Cabinet in 1817, and it was there figured. In the same year it was figured by Ker in the Botanical Register, and also by Sims in the Botanical Magazine. Sims wrote that the plant was "already to be found in most of the large collections about town [London]." These writers refer the plant to the Linnaean class Didymia, but Ker also suggests that it may belong to the Camelinaceae. This *Gloxinia speciosa* was the fore-runner and leading parent of the garden Gloxinias, plants which are now referred to the family Gesneraceae; but it turns out that the plant really belongs to Nees' genus *Sinningia*, founded in 1825 on a Brazilian plant which he named *S. Helleri*. All our garden Gloxinias are *Sinningias*, but to gardeners they will ever be known as *Gloxinia*; therefore, we will trace the evolution of them here. The genus is one of the *Gesneraceae*.

Gloxinia has no tubers; *Sinningia* has. *Gloxinia* has a ring-like or annular disk about the ovary; *Sinningia* has 5 distinct glands. The *Sinningias* are either stemless or stem-bearing, with a trumpet-shape or bell-shape 5-lobed and more or less 2-lipped corolla, a 5-angled or 5-winged calyx, 4 stamens attached to the base of the corolla, and with anthers cohering at the tips in pairs, and a single style with a concave or 2-lobed stigma. The garden *Gloxinias* belong to the subgenus *Ligeria* (subgenus of *Sinningia*), which has a short stem or trunk, and a broad-lobed, bell-shaped flower.

The true *Gloxinias* are not florists' flowers, and they are little known in cultivation. They are apparently not in the American trade. The old *G. maculata* is figured in the *Gardeu* 39:801 (p. 364), and it is probably to be found in choice collections in the Old World. It produces knotty rootstocks, which, as well as the leaves, may be used for propagation. It is also figured in B.M. 191. *G. glabrata*, Zucc., from Mex., is the *G. glabra*, Hort., *Achimenes gloxiniaflora*, Forkel, and *Plectopoma gloxiniflorum*, Haust. It is a stemmy plant, with white fls. with yellow-spotted throat. (B.M. 4430, as *G. fimbriata*, Hort.) *Plectopoma* is now referred to *Gloxinia*. A few forms of this were once offered by Saul, but, with the exception of *P. gloxiniflorum*, they are probably all garden forms.

The garden *Gloxinias* (genus *Sinningia*) are nearly stemless plants, producing several or many very showy bell-like fls. each on a long stem. *Gloxinia speciosa* originally had drooping fls., but the result of continued breeding has produced a race with fls. nearly or quite erect (Figs. 918, 919). The deep bell of the *Gloxinia* is very rich and beautiful, and the erect position is a decided gain. The fls. also have been increased in size and number, and varied in shape and markings;

the lvs. also have become marked with gray or white. The color of the original *Gloxinia speciosa* was apparently a nearly uniform purple. The modern races have colors in white, red, purple and all intermediate shades; some are blotched, and others are fine-spotted or sprinkled with darker shades. It is probable that the larger



918. *Gloxinia* of the florists.

part of the evolution in the common greenhouse *Gloxinia* is a direct development from the old *G. speciosa*, but hybridity has played an important part. One of the earliest recorded series of hybrids (1844) was with *Sinningia guttata*, which is a plant with an upright stem and bearing rather small spotted fls. in the axils of the lvs. (B.R. 13:1112). The issue of this cross showed little effect of the *S. guttata*, except a distinct branching habit in some of the plants (B.R. 30:48). It is possible, however, that *S. guttata* has had something to do with the evolution of the spots on the present-day flower, although the original *G. speciosa* was striped and blotched in the throat. The student who wishes to trace some of the forms of garden *Gloxinias* may look up the following portraits: B.M. 1937, *speciosa* itself; B.M. 3206, var. *albiflora*; B.M. 3934, var. *macrophylla* variegata; B.M. 3943, var. *Menziesii*; F.S. 3:220, *Zeichleri* (hybrid); F.S. 3:268; F.S. 4:311, *Fyiana* (hybrid); F.S. 6:610; F.S. 10:1002; F.S. 14:1434-6; F.S. 16:1699 and 1705; F.S. 17:1768, 1772-1776; F.S. 18:1846, 1878, 1885, 1918-19; F.S. 19:1955, double forms; F.S. 21:2164; F.S. 22:2324. I.H. 42:39, 41. Gt. 47:79; Gt. 48, p. 86. Gn. 15:168; 43:909; 52, p. 268. R.H. 1846:301, *Teuchlerii*; R.H. 1848:201, *Fyiana*; 1877:70, *variabilis*; R.H. 1883, p. 248. For florists' plants, see A.F. 11:7; A.G. 14:49; Gng. 6:83. There are many Latin-made names of garden *Gloxinias*, but the plants are only forms of the *G. speciosa* type. One of the commonest current trade names is *G. crassifolia*, a name applied to some of the best and largest-growing strains.

There are double forms of *Gloxinia*, in which an outer but shorter corolla is formed. These forms are more curious than useful. *Gloxinia* (*Sinningia*) has been hybridized with *Gesneria*; and the hybrid progeny has been called *Gloxinera* (G.C. 111. 17:145, Fig. 22). L. H. B.

Gloxinias are general favorites with most people. Their large tubular and richly colored blossoms, together with their soft, velvety green leaves, make a gorgeous display when in flower. Being natives of tropical America, they require stove temperature during their growing season. Though they may be grown so as to flower at almost any season of the year, yet they are naturally summer-flowering plants, and do best when treated as such. They are propagated by seeds, or by cuttings made of leaves or stems. Seeds are preferable, unless one wishes to increase some very choice colored variety, when it is best to propagate by leaf cuttings,

using partly matured medium sized leaves with a small portion of leaf-stalk attached (Fig. 629, p. 423). These may be inserted in an ordinary propagating bed, where, if kept rather on the dry side, they will soon root and form tubers, when they may be potted and grown on. Seeds should be sown in a warm temperature early in February, in pans or shallow boxes containing a finely sifted mixture of peat, leaf-mold and silver sand in about equal proportions. The seedlings will begin to appear in about ten days, when great care must be exercised in watering, or they will "damp-off," as gardeners term it. In fact, success with these plants throughout the year depends largely upon the care exercised in watering. Even in their most active growth the water always should be given from the spout of a watering can, taking care not to wet the leaves, though they like a warm, humid atmosphere during their growing season. As soon as the seedlings can be conveniently handled, they should be potted singly into thumb pots and grown on rapidly, using in subsequent shifts a mixture of two parts leaf-mold, 1 part good fibrous loam and 1 part peat. The plants must be well shaded from sunlight and placed in a position free from draughts. The seedlings should begin to flower by the middle of August, when they should be given an abundance of air. After flowering, the leaves will begin to mature, when water should be gradually withheld. As soon as the leaves have all ripened off, the pots should be stored away in some convenient place for the winter, in a temperature of about 45°, giving just sufficient water to keep the tubers from shriveling. Towards the middle of February the tubers will show signs of starting into growth. A batch should be started at this time, choosing the tubers which appear most active, and the remainder should be held back for another month; this will give a much longer period of blossoming. The tubers should have all the old soil shaken off and be potted again in clean, well drained pots, using sizes just large enough to accommodate the tubers, the compost being the same mixture as before recom-

carefully grown. Gloxinias are particularly free from insect pests or fungous diseases, and the same tubers can be grown for several years. EDWARD J. CANNING.

As Gloxinias are essentially tropical plants, they require a temperature of 60° (night) if started early; yet seedlings raised during summer time do splendidly when planted in coldframes. When a select collection is desired, it is customary to plant hundreds of seedlings in frames for the summer. A large majority of these will bloom, from which a number of the best is selected. In connection with this method of culture, it is interesting to note that nearly all the plants which fail to bloom are strong growers, making grand specimens the following season, and the majority of them will be purple-flowered. The more upright-growing plants of red and pink shades are the first to bloom; and curiously, also, the latest plants to start of any age are generally the best. Although cultural directions usually insist on care in watering so as to avoid wetting the foliage, we have never been careful to follow these instructions closely, except when the plants are coming into bloom, but we realize that it might be detrimental in moist, dull weather. The greatest objection we have to wetting the foliage is on account of sediment from the water making a deposit on the bright, hairy foliage, taking away the luster which gives such a healthy and effective appearance to well-bloomed plants. T. D. HATFIELD.

GLYCERIA. Referred to *Panicularia*.

GLYCINE (Greek for *sweet*). *Leguminosae*. Perhaps 15 or 20 species in tropical Asia, Africa and Australia, mostly twining vines. The Glycines are allied to Dolichos, Vigna and Phaseolus: the cult. species are distinguished by small and hairy fls. in short axillary racemes; stipules very small and free from the petiole; leaflets (3) large and thin; seeds short or globular and pea-like. In this country Glycine is known only in the Soy Bean, *G. hispida*, Maxim. (Fig. 195, p. 137), which is an erect, hairy annual from Japan and China. It is also known as the Soja Bean, Coffee Bean and Coffee Berry. It grows 2-4 ft. high, making a rank, bushy herb, and bearing axillary clusters of small hanging, hairy pods, with constrictions between the seeds. The seeds are nearly globular, pea-like, usually white (e. Fig. 191, p. 136). In China and Japan the beans are much used for human food, but in this country the plant is grown for forage, having begun to attract attention about 25 years ago. The beans may be used as a substitute for coffee; and for this purpose the plant is often sold. The Soy Bean, in the form in which we know it, seems to be unknown in a wild state. It is probably a domesticated form of *Glycine Soja*, Sieb. & Zucc., which is wild in Japan. These two species are united by some authors and separated by others (see Franch. & Sav. Fl. Jap. 1:108. Maxim. Bull. Acad. St. Petersb. 18:398). For purposes of perspicuity and definition, they may well be kept separate in the books. The Soy Bean has also been separated as a distinct genus under the name of *Soja hispida*, Munch; but this disposition is now mostly given up. For the economic merits of Soy Beans, see various experiment station reports; also Farmers' Bull. 58, U. S. Dept. of Agric. It has been recommended as a drought-resisting crop.

Glycine was once applied to *Wistaria*. It is sometimes used for that genus at the present day in foreign lists.

L. H. B.

GLYCYRRHIZA (Greek, *sweet root*). *Leguminosae*. Licorice, also spelled *Liquorice*, and *Licorice*. This genus contains the plant whose roots produce the Licorice of commerce. Seeds in pods are listed by a few dealers with miscellaneous agricultural seeds. The genus has about a dozen widely scattered species of perennial herbs, often glandular; lvs. odd-pinnate; flts. of indefinite number, rarely 3, entire, with minute glands or teeth; fls. blue, violet, white or yellowish, in axillary racemes or spikes, which are peduncled or sessile.

glabra, Linn. Height 3-4 ft.; flts. ovate, subretuse, subglutinous beneath; spikes peduncled, shorter than the lvs.; fls. distant; pods glabrous, 3-4-seeded. Summer and autumn. W. M.



919. Modern Gloxinia blooms ($\times \frac{1}{2}$).

mended. They should be given but little water until active root growth commences. As soon as the pots are filled with roots, they should be shifted on at once into the pots they are intended to flower in, as frequent shifts would more or less damage their leaves, which have a tendency to cling round the sides of the pots. The first batch should come into flower in June. When

The roots of Glycyrrhiza, a native of southern Europe and central Asia, are used extensively by druggists; in America by brewers and manufacturers of plug tobacco; in Turkey, Egypt and France to make cooling drinks. Our supply—more than one and a half million dollars' worth in 1899—is derived mainly from Spain, Portugal, Italy, Turkey and Russia (Transcaucasia), the roots from Spain and Italy being considered best, and those from Turkey poorest on account of their bitterness. The soil for Licorice must be deep, mellow, moist, rich and free from stones. Plants are usually set in rows, 3 ft. or more apart, and not less than 1 ft. asunder. After the plants have covered the ground, they are allowed to shift for themselves for 3 or 4 years. Harvesting is primitive, the roots being exposed by the plow and pulled by hand. Large quantities of roots are thus left to produce a succeeding crop or to overrun the field as weeds. One ton to the acre is considered a fair yield; 1.6 cents a pound an average price. In America the only fields worthy the name are in California, where Licorice is not considered very paying. Experiment and experience with it are, however, but little more than begun.

M. G. KAISER.

GLYPTOSTRÖBUS. See *Taxodium*.

GMELINA (after one of five distinguished German botanists named Gmelin). *Verbena*. Eight species of E. Asiatic and N. Australian trees and shrubs, bearing yellow or brownish irregular fls. sometimes nearly 2 in. across. A very few plants may be cult. in European greenhouses, and in America only in S. Fla. and S. Calif. outdoors. The genus produces a fancy timber similar to teak, which is a product of the same order. Vitis and Clerodendron are better known congeners. Spiny or not; shoots tomentose; lvs. opposite, entire, toothed or lobed; fls. in panicle cymes, tomentose at least while young; corolla tube slender below; limb oblique, 5- or 4-lobed; stamens 4, didynamous.

A. Lvs. becoming 9 in. long, 6 in. wide.

arborea, Roxb. (*G. Rheedii*, Hook.). Unarmed tree, sometimes attaining 60 ft., deciduous, flowering with the young lvs.; lvs. cordate-ovate. India, Malaya. B.M. 4395. Cult. only in S. Calif. by Franceschi, who keeps *G. Rheedii* separate.

AA. Lvs. $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long.

Asiatica, Linn. (*G. parviflora*, Pers., a typographical error for *G. parvifolia*, Roxb.). Shrubby, sometimes spinescent; lvs. ovate or obovate, entire or lobed. India, Ceylon.

GNAPHALIUM. See *Leontopodium* and *Helichrysum*. There are various native Gnaphaliums, but they are not in cultivation. *G. lanatum* of gardeners is *Helichrysum petiolatum*.

GOAT'S BEARD is usually *Spiraea Aruncus*; also the genus *Tragopogon*, to which the Salsify or Oyster Plant belongs.

GOAT'S FOOT. *Oxalis Caprina*.

GOAT'S RUE. See *Galega*.

GOBO. See *Burdock*.

GÆTHEA. See *Pavonia*.

GOETIA. Included in *Ænothera*.

GOLDEN CHAIN. *Laburnum vulgare*.

GOLDEN CLUB. *Oreontium*.

GOLDEN DEWDROP. Fanciful name for *Duranta Plumieri*.

GOLDEN FEATHER. See *Chrysanthemum parthenoides*.

GOLDEN ROD. *Solidago*.

GOLDEN SEAL. *Hydrastis*.

GOLD FERN. *Gymnogramma*.

GOLDFUSSIA. Included in *Strobilanthes*.

GOLD THREAD. *Coptis trifolia*.

GOMBO, Gumbo, or Okra. See *Hibiscus esculentus*.

GOMPHRENA (name suggested by *Gomphrena*, Pliny's name for some *Amaranth*, supposed to be derived from *grapho*, to write or paint; alluding to the bigly colored or "painted" foliage). *Amarantaceæ*. This genus includes the Globe *Amaranth*, a common everlasting flower of easy culture. It is also known as Bachelor's Button, though two other utterly distinct plants (*Cealosea Cyanus* and *Banunculus acris*) have the same popular name. The flower-heads are an inch or less in diameter, globose, of many colors, and chiefly remarkable for the showy bracts, which hide the true flowers. In a family remarkable for brilliant foliage this genus seems to be the only one valued for everlastings. Nearly all the other everlasting flowers of importance belong to the Composite. *Gomphrena* has about 70 species, mostly in the warmer parts of America and Australia, but the Globe *Amaranth* is widely dispersed throughout the tropics. Herbs erect or prostrate, pubescent to villous, with or without a leafy involucre; fls. short or long, white or colored; bracts short or long, concave, and keeled, winged or crested on the back. For culture, see *Annals and Everlasting Flowers*.

globosa, Linn. **GLOBE AMARANTH. BACHELOR'S BUTTON.** Height 18 in. or less; lvs. elliptic to obovate, the largest 4 in. long, 1 $\frac{1}{2}$ in. wide, tapering to a petiole. July. B.M. 2815. R.H. 1890, p. 522. F.R. 1:333. The following names of horticultural varieties indicate the range of color: vars. *alba*, *aurea*, *cænea*, *nana compacta* (= *alba*), *purpurea*, *striata*, *violacea*. Dwarf and compact forms are likely to be associated with any color. There is a narrow-leaved form of this species which Voss calls *G. Haageana*, Kl. (*G. aurantiaca*, Hort. *G. coccinea*, Deene), which has lanceolate lvs., often 6 times as long as broad. The lvs. are rarely $\frac{1}{2}$ in. wide. R.H. 1854:161. All are easily grown annuals.

G. gnaphalioides, Vahl. See Pfaffia. W. M.

GONANIA is a typographical error in some nursery catalogues for *Gouania*.

GONGORA (after Don Antonio Caballero y Gongora, Bishop of Cordova). Includes *Acropera*. *Orchidaceæ*, tribe *Vandæe*, subtribe *Cyrtopodiæ*. A small genus of plants with curious spotted fls., not common in cultivation, and of little value except for collections. Distinguished from the other members of the subtribe by being epiphytic, having the dorsal sepal adnate to the column, and by its many-fld. raceme. Dorsal sepal erect, spreading, thus appearing to spring from the base of the column; lateral sepals spreading or reflexed from the base of the column, wider; petals small, adnate to the base of the column; labellum continuous with the column, narrow and fleshy, with 2 thick lateral horned or aristulate lobes, and a central one which is saccate or even folded, forming a vertical plate; column erect or ascending, not winged; pseudobulbs sulcate, sheathed, bearing 1 or 2 large, plicate lvs.; fls. borne in a long, loose, pendent raceme arising from the base of the pseudobulbs.

Gongoras are extremely free-flowering, and grow easily in a mixture of sphagnum and peat, with a little charcoal added for drainage. During the growing season they require plenty of water, and brisk heat. In the winter they require little water, but should be kept in a moist atmosphere in a cool, shaded house. They grow well with Cattleyas, or in a temperature of 60° in winter and 80° in summer. Some growers prefer to use fine fern root packed tightly and for a top finish a little fine moss found in damp meadows, instead of sphagnum, which in this climate is quick to decay.

A. *Lateral sepals ovate or oblong, truncate.*

truncata, Lindl. Pseudobulbs deeply furcate; lateral sepals rotund, oblong, truncate, the upper one longer, keeled; petals minute, ovate; sepals and petals pale straw color, spotted with purple; base of labellum compressed in the middle, 2-horned; apex ovate, canaliculate. B.R. 31:56.

AA. *Lateral sepals broad, ovate, pointed.*B. *Fls. light sepia brown; ovary much incurved.*

galeata, Reich. f. (*Marillària galeata*, Lindl. *Acropora Loddigesii*, Lindl.). Pseudobulbs ovate-conical, clothed with membranous scales: lvs. broadly lanceolate, 6 in. long; racemes drooping, 6-8 in. long, with 6-12 pale sepia brown fls.: dorsal sepals galeate; petals small, oblong-truncate; labellum 3-lobed; lateral lobes inflexed, middle one saccate. The plants bear several short, rather large-fld. racemes. Aug. Mex. B.M. 3563. L.B.C. 17:1645.

BB. *Fls. yellow; ovary somewhat incurved.*

Armeniaci, Reichb. f. (*Acropora Armeniaci*, Lindl.). Pseudobulbs ovate, sulcate, 2-lvd.: raceme loose, bearing many yellow fls.: sepals ovate, rounded, apiculate, the lateral ones oblique; petals one-half as long as the column; labellum fleshy; apex ovate, plane, acuminate, base tuberculate, crested. B.M. 5501.

AAA. *Lateral sepals lanceolate to ovate-lanceolate.*B. *Fls. chocolate-brown, spotted.*

atropurpurea, Hook. Pseudobulbs oblong-cylindrical, deeply sulcate, 2-lvd.: lvs. about 1 ft. long, lanceolate, subplicate; racemes numerous, 2 ft. long, bearing many chocolate-colored, spotted fls. about 2 in. in diam.; margins of the sepals revolute; petals small, twisted at the apex; labellum 4-horned at the base; apex folded so as to form a vertical triangular plate. This species is the most common in cultivation. It is nearly always in flower during the summer. Trinidad. B.M. 3220.

BB. *Fls. yellow, spotted.*

quinquenervis, Ruiz & Pavon (*G. maculata*, Lindl.). Pseudobulbs ovate-oblong, deeply furrowed, 2-lvd.: lvs. broadly lanceolate, 5-plaited; racemes many, 2 ft. long, with numerous yellow fls. spotted with dark red: lateral sepals reflexed, meeting in the back; petals small, linear-oblong, from the middle of the column; lip 4-horned at base; apex folded, tapering to a setaceous point. A curious plant, much resembling *G. atropurpurea* except in color and form of the fls. May-Aug. B.M. 3687. B.R. 19:1616.

BBB. *Fls. dull red-purple spotted, with a yellow labellum.*

tricolor, Reichb. f. (*G. maculata*, var. *tricolor*, Lindl.). Pseudobulbs ovoid, 2½ in. long, deeply furrowed: lvs. ovate-oblong, acuminate, about 5-ribbed, 6 in. long; raceme slender, pendulous, lax-fld., 6-10 in. long; pedicels with ovary 1½-2 in. long, speckled like the rachis; fls. about 2 in. long; dorsal sepals lanceolate, with revolute margins, tip recurved; lateral sepals ovate-lanceolate, with revolute margins, dull red-purple, with a pale, stout midrib; free portion of the petal spreading, up-curved, lanceolate, speckled; labellum golden yellow, base cuneiform saccate, truncate in front, with an awn on each side, apical part broadly funnel-shaped, with a spurlike, slender, speckled tip, gibbons behind; column slender, speckled. B.M. 7530. B.R. 33:69.

G. fuscata, Hort. (*Acropora fuscata* and *luteola*, Hort.), has been cult. for many years, but no description is available.

H. HASSELBERG and WM. MATHEWS.

GONIOMA (Greek, *gonia*, angle, corner; the corona cornered near the top). *Apocynaceae*. A monotypic genus containing a South African shrub. John Saul, of Washington, D. C., spoke of it as having racemes of double white fls., borne on the point of every shoot, and suggesting the Cape Jessamine by their form and fragrance. He probably had some other plant in mind, for, according to DeCandolle, *Gonioma* has yellowish fls., only a third of an inch long, borne in cymes which are shorter than the lvs., the lvs. being 1¼-2 in. long. Saul also advertised "*Tabernaemontana Camelliflora pleno* (Glory of the Day," which may have been a variety of the common *Tabernaemontana coronaria*. *Gonioma* differs from *Tabernaemontana* in having the ovules arranged in 2 series instead of an indefinite number of series.

Kamássi, E. Mey. (*Tabernaemontana Camássi*, Regel). Height 16-20 ft.: lvs. opposite or the upper ones in 3's, oblong-lanceolate, entire, leathery, 4-6 lines wide; cymes small, terminal, 8-10 fld.: fls. salver-shaped, yellowish, 3 lines long; tube a little wider at the middle and angled, constricted at top, pilose within from the middle to the top; lobes a third as long as the tube, ovate, cordate, twisted to the right in the bud; style 2-ent.

GONIOPHLEBIUM. A subgenus of *Polypodium*, with anastomosing veins; by some regarded as a genus. For *G. subauriculatum*, see *Polypodium*.

GONIÓPTERIS (Greek, *angled fern*). *Polypodiaceae*. A group of tropical ferns allied to *Phlegopteris*, with naked rounded sori and the lower veinlets of contiguous segments or lobes united. By some placed under *Polypodium*.

crenata, Presl. Lvs. 1-2 ft. long, on stalks nearly as long, with a terminal pinna 6-8 in. long, often 2 in. wide, and 4-8 similar lateral pinnae; margins bluntly lobed; sori near the main veins. Cuba and Mexico to Brazil.

L. M. UNDERWOOD.

GOOBER is a commoner name in the South than "Peanut," which is the universal name in the North. For culture, see *Peanut*; for botany, see *Arachis*.

GOODIA (after Peter Good, who found the plant in N. S. Wales). *Leguminosae*. An Australian genus of 2 species of shrubs, with pea-like fls., chiefly yellow, but with red markings. Both species have long been cult. in a few conservatories abroad, but the pubescent species is now forgotten and the glabrous one, in America is cult. chiefly in S. Calif. outdoors. Under glass these shrubs are treated like Cape heaths or Australian hardwood plants. The genus has no near allies of garden value. It belongs with 4 other Australian genera to the sub-tribe *Bossieae*, in which the lvs. are mostly simple; stamens constricted into a sheath, which is split above; seeds strophiolate. From these 4 genera *Goodia* differs in having 3 leaflets, and its racemes terminal or opposite the lvs. instead of axillary.

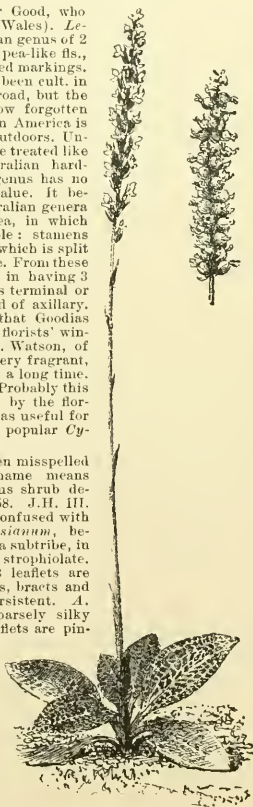
A. Schultze writes that *Goodias* are occasionally seen in florists' windows in America. Wm. Watson, of Kew, says the fls. are very fragrant, and remain on the plant a long time. He adds (G.F. 2:244): "Probably this plant, if taken in hand by the florists, would prove quite as useful for spring flowering as the popular *Cytisus racemosus*."

lotifolia, Salisb. Often misspelled "latifolia," but the name means "lotus-leaved." Glabrous shrub described above. B.M. 958. J.H. III. 29:484.—Likely to be confused with *Argyrobolium Andreestianum*, belonging to the *Crotalaria* sub-tribe, in which the seeds are not strophiolate. In *Argyrobolium* the 3 leaflets are digitate and the stipules, bracts and bractlets small but persistent. A. *Andreestianum* has sparsely silky lvs. In *Goodia* the 3 leaflets are pinnately arranged, and the stipules, bracts and bractlets very evanescent.

W. M.

GOOD-KING-HENRY. Consult *Chenopodium*.

GOODYERA (after John Goodyer, British botanist, who helped Johnson in his edition of Gerard's Herbal

920. *Goodyera pubescens*.

Orchidaceae, tribe *Neottieae*. This genus includes the Rattlesnake Plantain and a few other dwarf terrestrial orchids of minor importance which are cult. chiefly for their variegated foliage. They grow a few inches high, with scapes 8-15 in. high at most. About 25 species. Lvs. radical, usually reticulate-veined; fls. in dense or loose spikes; labellum saccate; anther on the back of the column.

A. *Hardy native plants.*

B. *Labellum strongly inflated, with a short tip.*

pubescens, R. Br. RATTLESNAKE PLANTAIN. Fig. 920. Lvs. ovate, deep green; veins netted, white; scape stout; spike dense, ovate in outline before anthesis; fls. globular, whitish; beak of stigma short, obscure. Aug. N. F. to Fla., west to Mich. and Minn. L.B.C. 1:1. B.B. 1:474. Mn. 2:54. F.S. 15:1555. A.G. 12:281 and 13:520. Should be grown in ordinary loam mixed with pine needles and dry pine twigs. Not well suited for greenhouse cult.

BB. *Labellum saccate, with an elongated tip.*

C. *Beak of the stigma shorter than its body.*

repens, R. Br. Lvs. ovate to oblong-lanceolate; veins dark; spike 1-sided; labellum with a recurved tip. L.B.C. 20:1987. B.B. 1:474. Rhodora, 1, plate 1. Var. **ophioides**, Fernald (Fig. 921), is the commoner form of this species, with very broadly marked lvs.

CC. *Beak as long as or longer than the stigma.*

tesselata, Lodd. (*G. pubescens*, var. *minor*). Lvs. broadly ovate to oblong-lanceolate; venation exceedingly variable; scape slender; spike loose; fls. white; labellum less saccate than in *G. repens*; tip straight. B.M. 2540. L.B.C. 10:952. Rhodora 1, plate 1. Confused by tradesmen with the next. —Should be planted out in a rockery in shade, the roots being firmly placed among dead pine needles and loam. Referred by Index Kewensis to *G. pubescens*.

BBB. *Labellum scarcely saccate, margin involute.*

Méuziesii, J. Indl. Plant rather large; veins netted; spike somewhat 1-sided. Western U. S. to northern N. Eng. B. B. 1:475. — Advertised by Dutch dealers.

AA. *Tender exotics, cult. under glass.*

B. *Lvs. with a whitish midvein.*

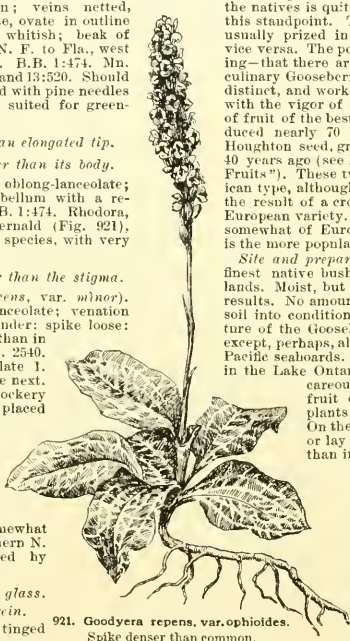
velutina, Maxim. Fls. whitish, tinged rose. Japan. F.S. 17:1779.

BB. *Lvs. with white, netted veins.*

Schlechtendalliana, Reichb. f. (*G. Japonica*, Blume). In general appearance like *G. tessellata*. Lvs. ovate; spike loose; fls. white. Japan.—Once advertised by Piteher & Mandä.

G. Dawsoniana and *G. discolor*. See *Hemaris*.—*G. quercicola*. See *Physurus*.

921. *Goodyera repens*, var. *ophioides*. Spike denser than common.



immense English varieties were derived, with a crying need for better table varieties, practically nothing has been done to improve the natives. Our natives have not been improved primarily because the American people have never acquired or cultivated a taste for the fresh fruit of the Gooseberry. In England the fruit of many of the large, fine-flavored varieties is used uncooked. In America the fruit of the Gooseberry is thought of only in connection with pie (tart) or jam, and when transformed into these food products, flavor, while of some importance, is but a minor consideration. The claim that English Gooseberries are less palatable than the natives is quite true, when passed upon from this standpoint. The best cooking apples are not usually prized in the raw state on the table, and vice versa. The point is this—and it is worth making—that there are dessert Gooseberries and also culinary Gooseberries. We should keep the classes distinct, and work for the production of varieties with the vigor of our natives and quality and size of fruit of the best European. Houghton was produced nearly 70 years ago, and Downing from Houghton seed, grown by Charles Downing, about 40 years ago (see Bailey, "Evolution of our Native Fruits"). These two varieties represent the American type, although it is possible that Downing is the result of a cross between Houghton and some European variety. The habit of the plant partakes somewhat of European characteristics. Downing is the more popular.

Site and preparation of soil.—The largest and finest native bushes are found upon rich bottom lands. Moist, but not soggy, clay loams give best results. No amount of fertilizing will bring sandy soil into condition suitable to the successful culture of the Gooseberry anywhere in this country except, perhaps, along the north Atlantic and north Pacific seaboard. Good results have been secured in the Lake Ontario fruit region on reddish, calcareous clay. In such situations the fruit does not drop easily, and the plants are usually free from mildew. On the east and west coasts the aspect or lay of the land is of less importance than in the interior. In the mid-continental region a sharp, north sloping or a cool, clay loam ridge is essential to the fullest success. A clover sod turned under and thoroughly worked up is an excellent preparation for the Gooseberry plantation. A heavy preparatory application of barnyard manure may tend to make the soil too porous and too easily dried out. If applied the season previous to setting the plants, and the land is cropped with potatoes, it will be left in good condition to receive the Gooseberries.

Gooseberries, particularly the English kinds, will endure more shade than most fruit plants, provided the soil is suitable. Good results are often secured by planting in rather densely shaded city gardens. Where these conditions prevail, special attention should be paid to maintaining an open head, in order to discourage the growth of mildews.

Planting and training.—The Gooseberry vegetates at a low temperature. It should, therefore, be planted as soon as the ground can be worked in spring. A better plan is to plant early in autumn. It may be transplanted successfully as early as August 15 south of latitude 42 degrees, and north of that line from September 1 up to the beginning of frosty weather. When set out late in autumn, the surface of the ground should be thoroughly mulched with straw or manure. The English varieties grow somewhat larger than the American type, and require rather more space. The plants are variously distanced, according to the inclination of the growing; 6 x 3, 5 x 3, and 4 x 4 ft. apart for garden culture are the commoner distances at which the plants are set.

The training of the Gooseberry is exceedingly simple. It bears most freely on 2- and 3-year-old wood. The aim

GOORA NUT is a name for the *Cola*.

GOOSEBERRY. The Gooseberry and the currant are two of the hardiest types of hush fruits. The native forms range far north into British America (see *Ribes*). Seedlings of these are also very hardy. English varieties are comparatively tender. The Gooseberry appears not to have been cultivated for more than 300 years. There was, however, a remarkable increase in the number of varieties in England between 1650 and 1750. The Gooseberry became a favorite fruit with the Lancashire weavers, who should be credited with this great development. Miller, 1751, says it would be useless to attempt an enumeration of varieties. In America the Gooseberry has been a neglected fruit. With wild forms in abundance, types greatly superior to those from which the

OAKES AMES.

should be to keep a continuous supply of vigorous shoots. As they become enfeebled, cut them out. Encourage spurring by cutting back when a variety indulges in a rambling habit, like Josselyn (Red Jacket). In the East, it is recommended to thin the head to lessen the tendency to mildew. This is probably good advice, but in the West it does not apply with the same force; rather cut out the weaker branches, and prevent mildew by other methods. Thin, also, to facilitate fruit picking. Prune to encourage upright



922. *Ribes Grossularia* in bloom. Nat. size.



923. Leaves of *Ribes Grossularia*. Natural size.

berries without receiving much punishment in return. The berries cluster along the lower side of the bearing branch. They are best removed by elevating and steadying the branch with one hand while the other hand rapidly removes the berries, working from the base upwards. Picking costs between 1 and 2 cents per quart—usually 1½ cents. English Gooseberries should be marketed either in quart boxes or in 5-pound Climax baskets.

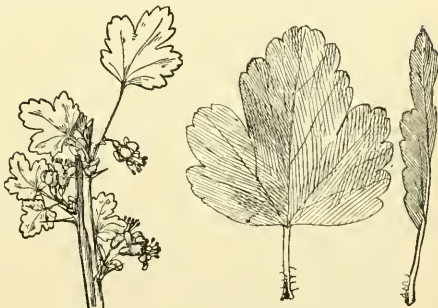
American varieties are nearly always picked green, and are usually called for in considerable quantities for stewing, jam making or for canning. These are shipped in 10- and 20-pound baskets. Beach, in Bull. 114, N. Y. Exp. Sta., gives the following reasons for marketing Gooseberries in the green condition: "(1) The hard, green fruit is not as easily injured in picking and packing as the pulpy ripe fruit, and it will stand transportation better. (2) The fruit that is allowed to ripen on the bushes is exposed longer to attacks of sunscald and mildew, and should long-continued rains follow a period of drought, the ripening fruit is liable to crack and spoil. (3) The ripening of fruit is an exhaustive process, from which the tree is partly relieved when the fruit is marketed green. (4) The proceeds from the green fruit usually compare favorably with the proceeds from the ripe fruit, although the large English varieties sometimes bring the highest prices of the season."

Gooseberries are very palatable if canned just before reaching maturity. Sugar should be used in the proportion of one-third to one-half pound to each quart of berries. When treated in this way, Gooseberry pie may be enjoyed at any time during winter. Gooseberry jam is indulged in to a considerable extent by residents of Iowa, Nebraska, Minnesota and Dakota. Wild berries are gathered and largely used for the purpose, their aromatic acidity giving a spiciness to the finished prod-

growth, when cultivating varieties like Mountain Seedling and Houghton. The bush form, with several stems, is to be preferred to the single stem; plantations last longer in bush form, and are more productive.

Tillage and fertilizing.—In the east and west coast climates, and in the lake region, clean culture may be given; but in the interior, mulching with straw manure or barnyard litter is better than muleching with soil. Cool, rich soil constitutes an essential to success. Good results have been obtained by the use of coal ashes as a mulch. This is, of course, only an amateur's method, and not feasible on a commercial scale. The Gooseberry is grown with a fair degree of success between young orchard trees on the loose soils bordering the upper waters of the Mississippi and Missouri rivers. The practice is not to be commended from the standpoint of the welfare of the orchard. Gooseberries are also grown between grape rows—a practice hardly to be commended. Practice only shallow tillage.

Picking, marketing, and conserving.—Picking Gooseberries is an uncomfortable and generally uncongenial occupation. The best native varieties, as a rule, are those most completely armed with thorns. A little practice, however, will enable a dexterous picker to secure the



926. *Ribes oxycanthoides* in bloom ($\times \frac{1}{2}$).

927. Leaves of *Ribes oxycanthoides*. Natural size.

net which is notably wanting in that made from cultivated types.

Types and varieties.—Practically, there are two types of Gooseberries in cultivation.

1. The European (*Ribes Grossularia*, Figs. 922, 923), characterized by stocky, upright growth, light-colored spines, thick, glossy lvs. and large, variously colored fr. The plants are less hardy than our natives or their hybrids, are affected by our hot summer suns, and are very susceptible to fungous troubles, prominent among which is mildew. The New York Experiment Station recommends the following varieties: Crown Bob (Fig. 924); red, large, round, of good quality. Industry (Fig. 925), Lancashire Lad; fr. dark red, nearly round; plant prolific, healthy. Prince Harry; red, one of the largest, green, good quality.

2. Americans, and hybrids between European and American species, usually classed with Americans (Figs. 926, 927, 928): lvs. thinner than in *R. Grossularia*; leaf-stalks hairy, spines borne singly, fr. small, reddish green, shading off to purple. Pale Red may be considered a good type of the species. Varieties: Champion



924. Crown Bob, an English Gooseberry ($\times \frac{3}{4}$).



925. Industry, one of the English Gooseberries. Nearly natural size.

928. An American Gooseberry ($\times \frac{1}{2}$)—*Ribes oxycanthoides*.

partakes largely of European characteristics. Downing is the most widely planted of all Gooseberries in America (Fig. 929); fruit medium size, oval, green; plant upright, vigorous, healthy, productive. Houghton, an old favorite; fr. small, round, dark red, good quality. Pearl; almost identical with Downing, of which it is a seedling. Josselyn; fr. large, red, oval; plant vigorous and prolific. Another promising native type is *B. Cynosbati*, represented by the Mathews, of Iowa origin.

Propagation.—This is effected in three principal ways. (1) Cuttings: The Gooseberry does not "strike" very readily from cuttings. Native varieties root more freely than English types. The cuttings may be taken in the fall, as soon as the wood is ripened. They should be 7 to 9 in. long. They may be set in the ground at once, or tied in bundles and buried in the ground, or stored in a cold cellar over winter. The cellar must be cold—almost down to freezing point. Fall-set cuttings should be planted obliquely, so that the heating of the ground will not throw them out. Set cuttings in nursery row 3 feet apart and give clean culture. (2) Layers: Propagation by layering is the common nursery practice. For this purpose, plants 5 or 6 years old are used. They should be vigorous and healthy. They should be cut back severely in the autumn or early spring. This encourages a dense, bushy growth. The layering is done by plowing a furrow against the row on each side and forcing the branches down by throwing soil directly on top of the bushes. In moist regions a comparatively small amount of covering is necessary. In dryish regions 5 or 6 inches of soil is necessary. In the fall the soil is removed and the rooted branches separated from the parent bush, leaving buds for the production of shoots the following season; or, the entire plant may be taken up and divided. (3) Root-cuttings: Native Gooseberries may also be propagated by cuttings of the roots. The plants are taken up in the fall with all roots possible. The latter are cut into 2- or 3-inch lengths and



929. Downing Gooseberry.

packed in boxes of earth, which are stored in a cold cellar. In spring the pieces of roots are planted in nursery rows, covered with 2 inches of soil. English varieties are not readily propagated by this method. When single-stem plants are desired, they should be grown from cuttings. In order to discourage sprouting tendencies the buds above the roots should be removed—disbudded. Layer plants are best for producing the bush form of plant used almost exclusively in America.

Diseases.—The Gooseberry, as a rule, is affected seriously by only two plant parasites, mildew and leaf-spot. The former attacks the English varieties, while the latter is the chief fungous enemy of American varieties.

Mildew (*Sphaerotheca Mors-Uvae*): This is the bug-bear of English varieties in America. It has done more to discourage the cultivation of this type than anything else. This fungus attacks shoots, foliage and fruit. It covers the affected part with a gray, frost-like coating. This turns to a dirty brown later on. It is a surface-growing parasite, and the web-like covering may be peeled from the fruit in its early stages. The ends of the shoots and younger leaves are attacked first, causing the bush to take on a stunted appearance. Remedies for mildew: (1) Sanitary: circulation of air secured by a favorable site, good drainage and proper training. (2) Fungicides: (a) Potassium sulphide, liver of sulphur 1 oz. to 2 gals. water. Spray 4 or 5 times, at intervals of 6 or 8 days, beginning with the unfolding of the leaves. (b) Bordeaux mixture may be used with good results for the first two applications. It stains the fruit when applied after the fruit is half-grown. (c) Dilute copper sulphate, 1 oz. to 15 gals. water, may be used throughout the season.

Leaf-spot (*Septoria Ribis*): This disease attacks the leaves only. It produces numerous small brown, irregularly shaped spots or patches on the lvs. This spotting causes a premature dropping of the lvs., often before the fruit is fully developed. Remedy: Spray early in the season, and again after harvesting the fruit, with Bordeaux mixture.

Injurious Insects.—(1) The imported Currant worm: The larva of a saw-fly attacks the foliage soon after fruit sets. The attack is first made on the lower leaves. From this point the worms work upward on the bush, stripping the leaves in their line of march. The worms are exceedingly voracious, and will defoliate a bush in 2 or 3 days. The mature insect is a saw-fly, which deposits its eggs on the under side of the leaf. Usually two broods occur during the season. Treatment: Spray with arsenical poison early. Bordeaux mixture and Paris green may be used in combination for the early spray. For the later sprays, fresh powdered hellebore, at the rate of 1 lb. to 50 gals. of water, is effective. The grower should not wait for the insect to make its appearance, but should ward off danger as soon as the leaves appear by spraying with Bordeaux mixture and Paris green, which will adhere to the foliage and be on the spot when needed. Other injurious insects are the Gooseberry fruit worm (*Epochra Canadensis*), which burrows in the green fruit, causing it to drop. Remedy: Destroy infested berries.

(2) Currant borer (*Psyonotus supernotatus*): The larva of a moth. Eggs are laid near the tip of the cane, down the center of which the larva tunnels. Infested canes are readily detected. They should be cut out and burned. San José scale and four-lined leaf-bug are sometimes injurious. When a plantation is infested by the former it should be thoroughly treated with whale oil soap mixture in winter, diluted kerosene on sunny days in spring, or, in bad cases of infestation, it will probably be wisest to root up and destroy the bushes. Kerosene emulsion is used against the four-lined bug with success.

JOHN CRAIG.

GOOSEBERRY, BARBADOES. See *Pereskia*.GOOSEFOOT. Vernacular for *Chenopodium*.

GORDONIA (after James Gordon, an English nurseryman; died 1780). *Ternstroemiaceae*. Ornamental trees and shrubs with alternate, simple, rather large, deciduous or persistent lvs., axillary, showy white fls. and a woody capsule. Only *G. pubescens* is hardy north to Mass., while the others are cultivated only in subtropical regions. They all have very handsome shining foliage, and produce their large white fls. even on rather small plants. They grow best in a somewhat moist, peaty or sandy soil. Prop. by seeds, layers or cuttings from half-ripened wood under glass. About 15 species in the S. Atlantic states and tropic and trop. Asia. Fls. solitary and axillary toward the end of the branches; sepals and petals 5, rarely more; stamens numerous; capsule 5-celled, dehiscent with 2 or many usually winged seeds in each cell.

P. J. Berckmans writes that a large tree in the Bartram garden, near Philadelphia, was long supposed to be the only living specimen of *G. pubescens*. All other specimens in cultivation are believed to have been propagated from the Bartram tree, which has lately died. All efforts since 1790 to rediscover this tree in the South have failed.

A. *Foliage deciduous.*

pubescens. L'Hérit. (*G. Atamāha*, Sarg.). Shrub or tree, to 30 ft.; lvs. obovate-oblong, narrowed into a short petiole, sparingly serrate, bright green and shining above, glabrous, turning scarlet in fall. 5-6 in. long; fls. short-pedicelled, pure white, about 3 in. across; petals roundish obovate, with crenulate margin, concave; capsule globular. Sept., Oct. Georgia, but not found again since 1790. S.S. 1:22. G.W.F. 47. Mm. 6:201. Gng. 7:167. M.D.G. 1899:25.—One of the few trees that flower in autumn.

AA. *Foliage evergreen.*

Lasiánthus, Ellis, **LOBLOLLY BAY** Tree, to 60 ft., usually shrubby in enit.; lvs. obovate-lanceolate, narrowed into a short petiole, erenately dentate, dark green and shining above, 4-6 in. long; fls. long-pedicelled, white, 2-3½ in. across; petals oblong-obovate; stamens short; capsule ovate. July, Aug. Va. to Fla. and Miss. S.S. 1:21. B.M. 668.

anómala, Spreng. Large shrub; lvs. oblanceolate, narrowed into a very short petiole, entire or serrate, dark green above, 3-6 in. long; fls. almost sessile, creamy white, 2-3 in. across; petals roundish obovate. Nov. S. China. B.M. 4019 (as *Polyporus arillarlis*). B.M. 2047 and B.R. 4:349 (as *Cumelia azitlaris*).

G. Janáncia, Rolliss. See Schima Noronha.

GORSE, *Ulex Europæus*.

ALFRED REHDER.

GOSSÝPIUM (name used by Pliny, probably from the Arabic). *Maltæceae*. COTTON (which see). Probably not more than a dozen original species, although more than 100 have been described. The species which have produced the cultivated Cotton are now much confused. Two or three species are in the trade for ornamental purposes: *G. Davidsonii*, Kellogg, from Lower California, a woody plant with handsome yellow but rather small fls. (1 in. long), and small cordate, mostly entire lvs. *G. Sturtii*, F. Muell. A shrub of several feet, more or less marked with black dots; lvs. broadly ovate, entire; fls. large, purple, with a dark center.

L. II. B.

GOUANIA (Antoine Gouan, 1733-1821, professor of botany at Montpellier, France). *Rhamnaceae*. This genus includes the "Chawstick" of Jamaica, a rapid-growing, shrubby vine, with pretty heart-shaped lvs., grown sometimes for ornament in the extreme South. It is suitable for screening unsightly objects. The stems are chewed in the West Indies. Tooth brushes are made from the frayed ends and tooth-powder from the pulverized wood. The genus has about 30 species of shrubs, from a sometimes tall climber, tendrill-bearing; branches long and slender; lvs. alternated, petiolate, penninerved, entire or dentate; fls. in clusters, arranged along axillary and terminal, elongated peduncles; disk 5-lobed; style 3-fid; capsule with 3 indehiscent berries.

Domingénsis, Linn. Lvs. usually 1½-2 in. long, elliptical, glabrate, with blunt, distant serratures; veins tapering towards the margin; capsule winged, emarginate. West Indies.

GOUMI. See *Elæagnus*.

GOURD. In England, a generic name for species of *Cucurbita* (which see). In America the term is used to designate those cucurbitous fruits which are hard-shelled, and are used for ornament or for the making of domestic utensils. The Gourd of history is probably *Lagenaria*. In the northern United States, the small, hard-shelled forms of *Cucurbita Pepo* (var. *ovifera*) are commonly understood when the word *Gourd* is used. The Gourds in the Amer. trade are referable to their species as follows:

Ananonda, <i>Lagenaria vulgaris</i> .	Onion-shaped, <i>Cucurbita Pepo</i> .
Apple-shaped, <i>Cucurbita Pepo</i> .	Orange, <i>Cucurbita Pepo</i> .
Bicolor, <i>Cucurbita Pepo</i> .	Ostrich Egg, <i>Cucumis dipsaceus</i> .
Bonnet, <i>Luffa</i> .	Pear-shaped, <i>Cucurbita Pepo</i> (Fig. 597).
Bottle-shaped, <i>Lagenaria vulgaris</i> .	Powder Horn, <i>Lagenaria vulgaris</i> .
Calabash, <i>Lagenaria vulgaris</i> .	Rice, <i>Luffa</i> .
Coloquinte, <i>Cucurbita Pepo</i> .	Serpent or Snake (not Snake Cucumber, which is a <i>Cucumis</i>), <i>Lagenaria vulgaris</i> and <i>Trichosanthes</i> .
Dipper, <i>Lagenaria vulgaris</i> .	Sponge, <i>Luffa</i> .
Dipsaceous, <i>Cucumis dipsaceus</i> .	Spoon, <i>Lagenaria vulgaris</i> .
Dish-cloth, <i>Luffa</i> .	Sugar Trough, <i>Lagenaria vulgaris</i> .
Egg, Egg-shape, <i>Cucurbita Pepo</i> .	Tashkent, <i>Cucurbita Pepo</i> .
Gooseberry, <i>Cucumis Anguria</i> .	Turk's Turban, <i>Cucurbita Pepo</i> .
Hedgehog, <i>Cucumis dipsaceus</i> .	Vegetable Sponge, <i>Luffa</i> .
Hercules' Club, <i>Lagenaria vulgaris</i> .	Wax Gourd, <i>Benincasa cerifera</i> .
Maté Gourd, small form of <i>Lagenaria vulgaris</i> .	
Mock Orange, <i>Cucurbita Pepo</i> .	

L. H. B.

GRAFTAGE comprises the process and operation of inserting a part of one plant into another, with the intention that the part shall grow on the foster root, together with all the questions which arise in relation to the practice. It is a comprehensive or generic term, whereas *grafting* is a specific term designating merely the operation. The term *Graftage* (analogue of the French *greffage*) was proposed by the present writer in 1887.

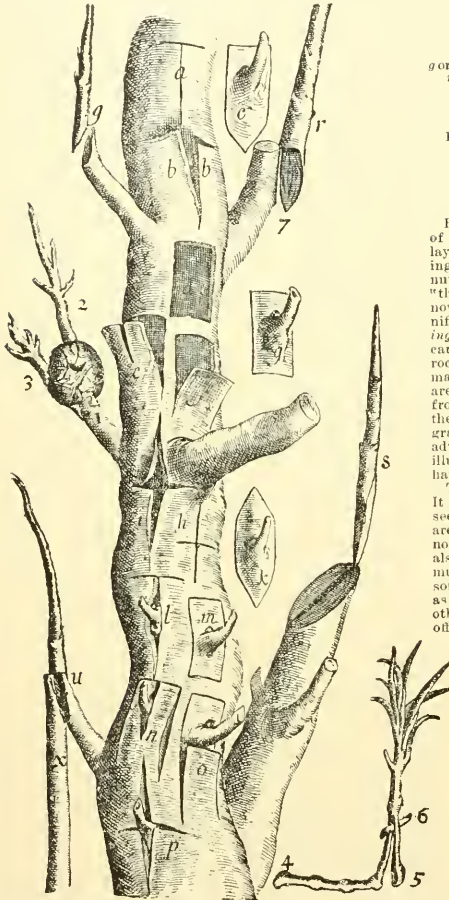
Grafting is one of the oldest of the arts of plantcraft. It is probable that the real art of grafting has held more or less as a professional or class secret in the ancient world, for the writers seem to have only the vaguest notion of its possibilities and limitations. Vergil writes (Preston's translation):

But thou shalt lend
Grafts of rude arbuté unto the walnut tree,
Shalt bid the unfruitful pine sound apples bear,
Chestnuts the beech, the ash blow white with the pear,
And, under the elm, the sow on acorns fere.

It seems to have been a popular misconception that any kind of plant will grow on any other. Pliny asserts that the art of grafting was taught to man by nature. Birds swallow seeds, and these seeds, falling in "some cleft in the bark of a tree," germinate and make plants. "Hence it is that we see the cherry growing upon the willow, the plane upon the laurel, the laurel upon the cherry, and fruits of various tints and hues all springing from the same tree at once." This, of course, is not grafting at all, but the implanting of seeds in earth-filled chinks and cracks, in which the plants find a congenial foothold and soil. But the ancients have left us abundant testimony that genuine grafting was employed with success. Pliny describes a cleft-graft. He gives several precautions: the stock must be "that of a tree suitable for the purpose," and the graft must be "taken from one that is proper for grafting; the incision or cleft must not be made in a knot; the graft must be from a tree "that is a good bearer, and from a young shoot;" the graft must not be sharpened or pointed "while the wind is blowing;" "a graft should not be used that is too full of sap, no, by Hercules! no more than one that is dry and parched;" "it is a point most

religiously observed, to insert the graft during the moon's increase."

The accompanying cut (Fig. 930) reproduced exact size from Robert Sharrock's "History of the Propagation and Improvement of Vegetables," 1672, shows various kinds of grafting in vogue over two centuries ago. Following is the literal explanation of the plate :



930. Sharrock's illustration of the modes of Grafting. 1672.

The Exemplification of the Operations by the Figure.

- a. Denotes the ordinary cutting of the bark for inoculation.
- bb. The sides of the bark lifted up for the putting in of the shield.
- c. The shield taken off with the bud, which lies under the stalk of the leaf cut off.
- ln. The shield put into the stock to be bound up.
- d. The bark cut out in an oblong square, according to another usual way of inoculation.

- g. The shield cut out for the fitting the disbarbed square.
- m. The same shield put into the stock.
- f. A variation of the forementioned way, by cutting off the upper part of the oblique square, and binding the lower part down upon the shield.
- o. The shield so put in to be bound up.
- e. Another variation by slitting the bark that the bud and leaf may stand forth at e, and the bark slit be bound down upon the shield.
- h. A cross cut for inoculation.
- i. The same cross cut lifted up, in this figure somewhat too big.
- k. The shield cut off to be put thereon.
- p. The shield put in.
- gorq. The cut of cyon and stock for whip-grafting.
- r7. The cut of cyon and stock for shoulder-grafting.
- s. The cut of the cyons and slit of the stock for grafting in the cleft.
- z. The stock set for ablaetation or approach.
- u. The cyon of the branch for the same operation.
- 12. The branch that is to be taken off by circumposition.
- 3. The branch that bears up the mold to the disbarbed place.
- 4. The branch of a carnation to be laid.
- 5. The joynt where the slit begins.
- 6. The next joynt where the slit is propped open, with a piece of a carnation leaf put in.

Herein are seen the germs of all the grafting practices of the present day, together with some practices of layering. Sharrock treated the whole subject of grafting under the head of "Institutions," and here he minutely describes the cleft-graft, and speaks of it as "the common way of grafting." The practice which we now know as inching or grafting by approach, he significantly calls "Ablaetation" (that is, *suckling* or *weaning*). Now that so much is said about the proper and careful selection of cions, it is interesting to read Sharrock's advice on this subject: "Good bearing trees are made from Cyons of the like fruitfulness. * * Cyons are best chosen from the fairest, strongest shufts, not from under shoots or suckers, which will be long ere they bear fruit, which is contrary to the intention of grafting." But we have seen that Pliny gave similar illustration before the Christian era,—which is only another illustration of the fact that most of our current notions have their roots deep in the past.

The chief office of grafting is to perpetuate a variety. It is employed in those cases in which plants do not bear seeds, or in which the seeds do not come true or are difficult to germinate, or when the plants do not propagate well by cuttings or layers. It is also employed to increase the ease and speed of multiplying plants. A third office is to produce some radical change in the nature of the cion, as rendering it more dwarf, more fruitful, or otherwise changing its habit. A fourth general office of grafting is to adapt plants to adverse soils or climates. An example is the very general use of the peach root in the southern states upon which to work the plum, as the peach thrives better than the plum in sandy soils. The practice in Russia of working the apple on rootstock of the Siberian crab is an example of an effort to make a plant better able to withstand a very severe climate.

In common practice, the effect of the stock on the cion is rather more a mechanical or physical one than physiological or chemical. The influences are very largely those which are associated with greater or less growth. As a rule, each part of the combined plant—the stock and cion—maintains its individuality. There are certain cases, however, in which the cion seems to partake of the nature of the stock; and others in which the stock partakes of the nature of the cion. There are recorded instances of a distinct change in the flavor of fruit when the cion is put upon stock which bears fruit of very different character. There are some varieties of apples and pears which, when worked upon a seedling root, will tend to change the habit of growth of that root. Examples are Northern Spy and Whitney apples, which, when grafted on a root of unknown parentage, tend to make that root grow very



931. Stick of buds. (x 1/2.)

deep in the soil. All these instances seem to be special cases, or exceptions to the general rule that each part maintains its individuality. Reasons for this change of nature in these cases have not been determined, and in most cases such results are not to be predicted. The most marked effect of stock on the cion is a dwarfing influence. Dwarfing may be expected whenever the stock is of a smaller stature than the cion. The most familiar example is the dwarf pear, made by working the pear on quince stock. Supplying a plant with a slow-growing root is only the beginning of the making of a dwarf. The plant must be kept dwarf by subsequent pruning and other care. It is significant that there is comparatively little demand for large-growing forms of woody plants, whereas there is a great demand for dwarf forms.

Extended experiments on plants which are not commonly grafted have thrown considerable light on the possible mutual influences of cion and stock. The researches of Daniel (whose latest contribution comprises nearly all of vol. 8 of Ann. Sci. Nat. Ser. 8, Botany, 1898) show that the stock may have a specific influence on the cion, and that the resulting characters may be hereditary in seedlings. These experiments, as also those of Vöchting, have thrown much light on the physiology of grafting and the variation induced by it, but they will not modify the practices of horticulturists nor greatly change our ideas respecting the results to be obtained from accustomed operations. Experience has

grafting, particularly in the Old World. Cases of poor union and the difficulties of sprouting from the root or stock are cited as proofs that graftage is injurious and devitalizing. But these are instances of poor graftage. They show what should not be done. Properly done, on plants of proper affinity, graftage is not devitalizing. It is essential to modern horticulture. There are disadvantages, to be sure, but the advantages over-balance. There are disadvantages in wearing boots. There is no use in arguing against things which are indispensable.

The ways or fashions of grafting are legion. There are as many ways as there are ways of whittling. The operator may fashion the union of the stock and the cion to suit himself, if only he apply cambium to cambium, make a close joint, and properly protect the work. Thus, Thouin in his "Monographie des Greffes," 1821, describes 119 kinds of grafting. All kinds of grafting may be classified into three groups:

1. Bud-grafting or budding. In the old days called inoculation.
2. Cion-grafting, or what is now thought of as grafting proper.
3. Grafting by approach, sometimes called inarching.

A word may be needed about the terminology of graftage. As already explained, *grafting* is merely the operation of inserting a part of one plant into another; but it is ordinarily restricted to grafting by means of short twigs or cions, and *budding* is used to designate the insertion of single buds which are severed from the branch on which they grew. *Stock* is the plant or part on which the grafting is done. *Cion* is the part inserted into the stock, although it is usually restricted to cuttings of twigs, and does not include detached buds. In many writings the word is spelled *scion*, but the other is shorter and etymologically more correct. When the writer found it necessary to use the word in print, he chose the shorter form, although it is not commended by the dictionaries. It has been said that *cion* is an anatomical term. It may be; but it was originally a horticultural term. The early horticultural writings used *cion* and *cyon*. *Scion* is later, and has nothing to commend it except usage; but the usage is not uniform. The word *graft* is sometimes used in the sense of *cion*, but it would better be used for the completed thing,—the new plant or part made by the joining of cion and stock.

Budding.—The operation of budding consists of inserting a single detached bud underneath the bark of the stock. It is employed only in stocks of small diameter, and preferably in those not more than a year old. The operation may be performed whenever the bark will peel and whenever mature buds may be obtained. The bark will peel in early spring and again in late summer or early fall, and the operation of budding in the open ground is therefore performed at those times. In the spring the buds are secured from twigs of the previous season's growth. At the second budding season, in late summer or early fall, the buds are secured from growing twigs of the season. At that time of the year the buds will be sufficiently developed to be easily recognized and handled. Budding is much employed in nurseries. Peaches, cherries, plums, and most stone fruits, are habitually budded rather than cion-grafted. In the East apples and pears are usually budded in the nursery; but in the West apples at least are usually root-grafted. It is practicable to insert buds in the tops of young trees, rather than cions, for the purpose of



932. Shield-budding ($\times \frac{1}{2}$).



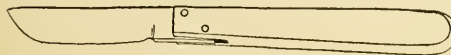
933. The bud set in the matrix ($\times \frac{1}{2}$).



934. The bud tied.

long since determined what general and practical results are to be expected from grafting.

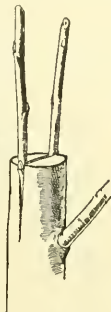
The limits within which grafting can succeed are to be determined only by experiment. These limits are often within the species, and usually within the genus, but there are instances in which plants of distinct genera intergraft with success, as in some of the cacti. But generic and graftage limits are not comparable: genera are only arbitrary divisions proposed for purposes of classification, and intergrafting, like intercrossing, has no necessary relation to these conceptions. In general, the closer the affinity of cion and stock, the better the union. When stock of the same species cannot be secured, it is allowable to choose another species. Thus, it has been impossible to grow the varieties of Japanese plum stocks upon which to grow the varieties of Japanese plums, and peach, Marianna, myrobalan and domestica plum stocks have been used. In some cases another species grows more readily from seed, is cheaper, is less liable to fungous injury in the nursery, or has some other practical advantage. Thus, most domestica plums (*Prunus domestica*) in the North are worked on the myrobalan (*P. cerasifera*); most sweet and sour cherries



935. Budding knife ($\times \frac{1}{2}$).

Prunus Avium and *P. Cerasus* are worked on the Mahaleb (*P. Mahaleb*); many kinds of roses are worked on manetti and *Rosa multiflora* stocks.

From time to time there arises an agitation against



936. Cleft-grafting.



937. The cleft-graft waxed.



938. Cleft graft cion.

changing the tree into a different variety. Sometimes the buds are inserted in limbs which are two and three years old; but it is usually preferable, if the tree is of some age, to cut back the tree somewhat heavily the previous season or the previous spring, in order to get a growth of suckers into which the buds may be set. Third-rate stocks are sometimes set in nursery rows and budded the following July in western nurseries.

The cutting from which the buds are taken is known to budders as a *stick* (Fig. 931). In early spring budding, this stick is the last year's growth of the variety which it is desired to propagate. Later in the season the stick is the twig which is grown during that season. Not all the buds on the stick are strong enough or good enough for budding. The budder will usually discard the weak ones at the top and at the bottom, unless he is very much pressed for buds, as may be the case with new or rare varieties. If the stick is taken late in the season the leaves will be on; but these are quickly cut off to prevent too much evaporation from the cutting. About one-fourth of an inch of the leaf-stalk is left to serve as a handle to the bud.

The ordinary operation of budding is that which is shown in the illustrations. It is known as shield-budding, from the shape of the removed bud. With a thin-bladed, sharp knife, the operator slices off the bud by placing his thumb beneath the bud and making a deft and quick stroke of the blade. Just under the bud he cuts a little into the wood. Some budders afterward remove this bit of wood; but this is not essential. If this wood is somewhat hard and dry, or if it carries some pith with it, it may serve to dry out the bud or to prevent intimate contact with the cambium of the stock. In ordinary operations this truncheon of wood is not removed. Most budders cut all the buds on a stick before they insert any of them; but they are allowed to hang to the stick by their upper or lower ends, being snipped off by the knife as fast as they are needed (Fig. 931).

The stock is first prepared by removing all the leaves and twigs from the area which is to be budded. In the case of nursery stock, it is customary for a boy to strip the lower leaves of the stock a day or so in advance of



939. Cleft-grafting of an old tree.

the budding. If the stripping is done three or four days or a week before the budding, it will sometimes cause the bark to set and, therefore, interfere with the operation. Nursery trees are usually budded as near the ground as the operator can work—not more than 2 or 3 inches above the surface. In most cases, the budder prefers to

set the bud on the north side of the stock in order that it may be shaded from the hot sun.

A T-shaped incision, just through the bark, is made on the stock (Fig. 932). The crosswise incision is usually made first. As the operator takes his knife from the last incision which he makes, he gives it a deft turn to right and left and loosens the flaps of the bark, so that the bud can easily be inserted. The bud is now taken from the stick and shoved into the matrix underneath the bark until it is entirely within the cleft (Fig. 933). A boy follows and ties the bud, making 4 or 5 deft turns and holding the strand by covering the lower end underneath one of the turns (Fig. 934). No wax or other covering is used. Any soft strand may be used for this purpose. It was the old custom to use basswood bark, which was taken in the spring from the inner layers of the bark of the basswood tree. This material was then macerated in water and afterwards pounded to make it soft. Yarn is also used. At the present time raffia is universally employed. This is the stripping of an oriental palm, and it can be bought in the market at about 20 cents per pound, and at that price is cheaper than home-made materials; it is also better. It is customary to lay it on the ground or in a damp place over night in order to soften it and to allow the operator to flatten out the strands. This raffia is cut in



940. Bark-grafting.

the length to suit before the tying is begun, and the bunch of strands is then held underneath the belt or carried in a box. For budding, the operator prefers a small, thin-bladed knife, with a rounded or thumb-shaped cutting surface (Fig. 935).

When budding is performed late in the season, the bud does not throw out a shoot until the following spring. It merely grows fast or "sticks" to the stock. Two or three weeks after the setting of the bud, the bandage is cut so that it will not restrict the swelling of the stock. If the stock grows very rapidly, it may be necessary to cut the bandage before that time. Nothing more is done with the tree until the following spring, at which time the whole tree is cut off about one inch above the bud. This one bud now throws out shoots and makes a very heavy growth, being impelled by the strong root. During this first season of growth a peach tree will attain the height of four to six feet, and be ready for market in the fall. If the bud is set early in the spring it will throw out a shoot the same season; but ordinarily it would not make the growth in one season that the bud does in the other case. Spring budding in the open air is rarely employed in nursery practice. It is sometimes used in the top-budding of established plants. In all budding practices, it is important to keep down the suckers from the stock.

In the South a peach tree may be large enough in June, if the seeds are planted in February or March, to be budded. The bud will grow the same year, and by fall will make a salable tree. This operation of budding in early summer on stocks which grow that year is known as June-budding. As a rule, June-budded trees are smaller than fall-budded trees; but they can be obtained one year sooner.

There are many other kinds of budding. Some of these will be found in American writings. None of these other styles of budding, however, is of commercial importance in this country.

GRAFTING proper is the operation of inserting a twig or a woody cion into a stock. The kinds of grafting are very many. Few are described here. They may be classified in respect to the place or position of the cion on the stock: root-grafting, or the insertion of the cion in the root of the stock; crown-grafting, or the insertion of the cion at the crown (surface of the ground); stem-grafting, or the insertion of the cion in any part of the main stem or trunk; top-grafting, or the insertion of the cion in the top or branches of the plant. Grafting may again be classified in respect to the maturity of the cion: dormant wood grafting; and softwood or herba-

ceous grafting, in which the cion is taken from green or growing wood.

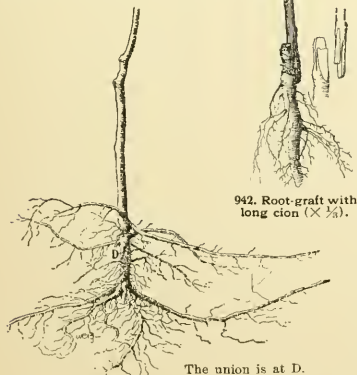
It is customary to classify grafting in respect to the way in which the union is made. There are three general types in common use in this country: cleft-grafting, whip-grafting, veneer-grafting.

Cleft-grafting consists in splitting the stock and inserting a wedge-shaped cion into the cleft. It is employed only in rather large stocks, preferably in those which are an inch or more in diameter. The stock is cut off, and it is split with a knife made for the purpose. The cleft is then held open by a wedge and the cions are inserted in the side of the cleft in such position that the cambiums of the stock and cion are in contact (Fig. 936). The whole surface is then securely waxed in order to prevent evaporation and to protect the wounds from the sun (Fig. 937). Cleft-grafting is performed in early spring. The cions are taken some time previously from the last year's shoots. They are stored in the cellar or other cool place in order that they may be perfectly dormant. It is customary to cut them of three buds' length; but if the shoot is very long-jointed and if the variety is new or rare, and the wood therefore scarce, they may be made of one or two buds. The wedge-shaped part should be somewhat thicker on the outside in order that it may be clasped tightly in the cleft (Fig. 938). It is customary to have one bud near the top of the wedge. Although this bud is covered with wax, it is the most likely to grow, since it is nearest the source of food supply and is less injured by external conditions. It pushes through the wax. It is customary to insert two cions in all stocks, even though only one branch is desired. By inserting two cions, the chances of success are doubled, and the wounds heal better if a twig grows on each side. After a year or two, one of the cions may be cut off if desired.

There are many kinds of grafting-wax, but the one which is most serviceable for applying with the hands in the open air is made by melting together one pound (by weight) of rendered tallow, two parts of beeswax and



941. Whip-graft.



942. Root-graft with long cion ($\times \frac{1}{2}$).

943. Tree grown from a long-cion root-graft.

four parts of resin. The melted liquid is poured into a pail or tub of water, when it immediately hardens. It is then pulled until it is light-colored and develops a grain.

It is then put away for future use, and will keep indefinitely. When used, the warmth of the hands will cause it to soften. The hands should be greased to prevent it from sticking.

Cleft-grafting is the method usually employed in the top-grafting of fruit trees, as apples, pears, plums and cherries. Old peach trees are rarely changed over to a new variety. If they are, budding is employed, as already suggested; the limbs are headed back so that new



944. Grafting knife ($\times \frac{1}{2}$).

wood is secured in which the buds may be set. It is important, in all top-working of fruit trees, to keep down the suckers which spring up around the cion, and which sometimes completely choke it. In changing over the top of a fruit tree, all the leading branches should be grafted (Fig. 939). It is well to stand at some distance from the tree and make a mental picture of how the tree will look when the new top is secured; the grafts should be set in approximately a radius from the center of the tree. It is rare that the stock should be larger than two inches in diameter where the cions are set. On some of the main branches it will be necessary to graft side branches lower down in order to fill the top and to afford footholds to pickers and pruners. It will require from three to four years to change over the tree to a new variety. Each year a little more of the original top is removed, and the cions take more and more of the space.

Bark-grafting (Fig. 940) is a most excellent method of grafting fairly large limbs, since it does not injure the stock so much as the cleft-graft. The cions are cut thin and inserted between the bark and wood. The bark is securely bound to hold it tight, and the entire surface is waxed, as in cleft-grafting. This method is called crown-grafting by the French and English.

Whip-grafting is employed in the nursery and on very small stocks. It is not used in top-grafting except now and then on small limbs. The pictures sufficiently illustrate how the work is done. The cion and stock should be of approximately equal size. Each is cut off in a slanting direction, and a split or tongue is made near the middle. The same shape is given to cion and stock (Figs. 941, 942). The object of the tongue is to hold the parts together securely; it also presents more contact. The cion is then bound to the stock, preferably by means of waxed cord. If the graft is above ground, the wounds should be thoroughly waxed over the string. If the graft is below ground, the tie will be all that is necessary: the moist earth packed around the wound will prevent evaporation and protect it.

The chief use of the whip-graft is in root-grafting, which is employed chiefly on apples and mostly at the West. In the East, other things being equal, budded apple trees are preferable to root-grafted trees. In the West, however, it is necessary to have apple trees on roots of known hardiness. The seedling stocks are not of known hardiness, even though the seeds have come from the hardiest varieties. It is therefore customary to use cions 6 to 12 in. long, grafted onto pieces of roots $2\frac{1}{4}$ -4 in. long (Fig. 942). The graft is set so deep that only the top bud of the cion projects above the surface. The piece of root acts as a nurse, and roots may start from the cion itself (Fig. 943). When the tree is transferred to



945. Veneer-grafting.

the orchard, the original root may be cut off in case it is not very vigorous; although this is not done if the union seems to be good and the foster roots are strong. This root-grafting is done in winter (Dec. and Jan. preferred); the grafts are stored in clean sawdust, sand or moss in a cool cellar, and are set in nursery rows in the open early in the spring, after the manner of grape cuttings.

The waxed string, with which the whip-grafts are tied, may be made by dropping a ball of yarn into the melted grafting wax which is spoken of above. In five minutes the wax will have penetrated the ball, but the strand can readily be unwound. The best material for this purpose is No. 18 knitting cotton. This is strong enough to hold the work together, and yet weak enough so that it may be broken in the hands without cutting the fingers. It will ordinarily decay during the year, and thereby not interfere with the growth of the tree. If the grafting is done in a room at a living temperature, the



946. Veneer-grafting.

waxed string should be soft enough to stick to the stock without being tied. Four or five turns are made around the union. Waxed Manila paper, cut in narrow strips, is also much used; also single strand cotton "chain" or warp-thread, either waxed or not waxed.

Any sharp knife with a handle large enough to be grasped readily is useful for whip-grafting. The blade should be thin, and the steel of best quality. The handle should also be strong. Fig. 944 shows a common form of grafting knife. Good shoe-knives may be used.

Veneer-grafting.—This style of grafting, which is considerably used under glass with fancy and ornamental plants, consists in simply chamfering the surfaces of cion and stock and applying the one to the other (Fig. 945). The cion is bound to the stock by raffia or other material. If the graft is in the open the wounds are thoroughly waxed; but in the house they may be covered merely with moss. This style of union is used with herbaceous plants, as well as on hard wood. Sometimes the stock is severed at the point of union, as in Fig. 945; but in other cases it is not severed nor headed back until the cion has taken hold (Fig. 946). In the latter case, the stock is not injured in case the graft does not grow.

Herbaceous grafting.—Pelargoniums, chrysanthemums and other soft-wooded greenhouse plants are

sometimes grafted for the novelty of having more than one variety growing on the same root. Probably most herbaceous plants can be grafted readily, with the exception of the endogens, which do not lend themselves to the operation, although there are instances in which grafting has been made successful on them. In order to succeed with an herbaceous cion, it is necessary that the room be rather close and moist in order that evaporation may not be very rapid. One should endeavor to secure the general conditions which obtain in a good propagating house.

The temperature should be kept rather below the normal for that species until union has taken place. It is usually best to cover the union with moss or some other material in order to protect the wound and to check evaporation. Best results are secured when the cion is firm in texture, as also in the case of herbaceous cuttings. The kind of graft is of less importance, although it is customary to use the veneer-graft cions, since there is less injury to the stock and the outer surfaces are easily applied to each other. The cion ordinarily consists of one or two joints, and if the leaves are large, they are cut in two, as in the making of softwood cuttings.

Inarching.—In those cases in which union takes place with much difficulty, it is possible to effect the conjunction by allowing the cion to grow fast to the stock before the cion is severed from its own roots. The plant which it is desired to have grow on the stock is bent over to the stock, the surfaces of the two are exposed so that the cambiums may be pressed close together, and the two are then bound until union takes place. In some cases a tongue is made in both the cion and the stock, much as in whip-grafting, so that the surface of contact is greater and the parts are held together more securely. When the cion has become thoroughly established on the stock, the cion is severed from its own root and the top of the stock is cut off. This inarching or grafting by approach is also used in the greenhouse when it is desired to transfer the whole top or the whole branch of one plant to another. The illustration (Fig. 947) shows such a case. Inarching is seldom employed in this country in a commercial way.

Inarching is sometimes employed to unite two branches into one for the purpose of making a specimen fruit grow larger. If, for example, a twig of an apple tree is inarched into a limb just back of a fruit, the extra food supply may cause that fruit to grow larger, and a finer specimen may be obtained. This use of the graft is employed only for the purpose of securing extra fine specimens for exhibition or other purposes.

Bridge-grafting.—Wounds or girdles may be bridged by cions, as in Fig. 948. Trim the edges of the girdle to the fresh, firm tissue, insert cions which are whittled wedge-shape at each end, draw bandages around the trunk so as to hold the free edges of the bark and the ends of the cions, and pour melted wax over the work. This operation is performed in spring, with dormant cions. Prevent the buds from throwing out shoots.



947. Inarching the branches of two plants.



948. Bridge-grafting.

If the cions are placed close together, they will soon unite along their sides and make a continuous covering of the wound.

Literature.—For further discussion of the whole subject of grafting, the reader is referred to current works on fruit-growing; also to the two American special books on the subject—Fuller's "Propagation of Plants" and Bailey's "Nursery-Book." In English work, "Ballet's" "Budding and Grafting" is standard. It is an English version of "L'Art de Greffer." L. H. B.

GRAM, or CHICK PEA. *Cicer arietinum.*

GRAMMÁNGIS (Greek, *gramma*; perhaps referring to the markings of the fls.). *Orchidææ*, tribe *Vandææ*. Species about 4, of Madagascar and Java. Pseudobulbs short and thick, with foliage-leaves only at their summit, hence not enclosed in the leaf-sheaths: fl.-clusters from the base, many-fl., pendulous; fls. not spurred; middle sepal strongly concave, lateral sepals somewhat sac-shaped at base, free, spreading; petals ascending, somewhat different in form and color; lip 3-lobed, with erect lateral lobes and recurved middle lobe; column slender, winged. Nearest *Cymbidium* differing chiefly in having the foliage-leaves only at the end of the pseudobulb, and the rostellum crescent-shaped (in *Cymbidium* it is triangular). From *Grammatophyllum* (which see), *Grammangis* differs in the attachment of its pollen masses and in the position of its foliage-leaves. Best cultivated in baskets hung near the glass, where the light is most intense. The plants can also be grown successfully in pots placed near the glass, or fastened to blocks, but in the latter case they must be given more water.

Éllisiæ, Reichb. f. (*Grammatophyllum Éllisiæ*, Lindl.). Pseudobulbs 7-11 in. long, each bearing 5-6 lvs. lvs. 1½-2 ft. long; sepals yellow, elegantly marked with dark transverse lines; petals and lip pale pink, the latter with a strong mid-nerve. Summer. Madagascar. B.M. 5179.

G. Huttoni, B. & H. (*Cymbidium Huttoni*, Hook. f.). Pseudobulbs of a single internode, 3-5 in. long, elongated, oblong, green; lvs. in pairs, 6-8 in. long, 2-2½ in. wide, dark green, coriaceous; raceme about 10-fl., drooping; sepals obovate, marked above described. Calyx transversely inside with chocolate color, lip greenish, with chocolate stripes, June. Java. B.M. 5676.

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GRAMMÁNTHES (Greek, *letter-flower*; the petals of the full-colored varieties with a darker mark like a letter V, whence also the name of the synonymous genus *Vau-anthes*). *Crassulidææ*. This genus includes a small, half-hardy, annual, succulent plant, with thick, fleshy lvs. and yellow fls., which grows about 6 in. high and is used for edgings, baskets and pots. All the 9 specific names are now referred to one, *G. gentianoides*. Besides the type, 4 botanical varieties were recognized in *Flora Capensis* 2:331 (1863-2). Calyx bell-shaped, semi-5-lobed; corolla tube as long as the calyx; limb 5-6-lobed; carpels 5-6, many-ovuled, with awl-shaped styles; scales minute, and evanescent; follicles many-seeded.

gentianoides, DC. Glabrous, somewhat glaucous; branches forking; stems rigid, filiform; lvs. opposite, distant; fls. orange, yellow, or creamy white, and marked as above described. Cape. B.M. 4607 and 6401. F.S. 5:518. The type (var. *vera*, Haw.) has lvs. ovate-oblong; limb of corolla ovate-oblong, a third longer than the stem. Var. *chlorostylis*, Haw., has lvs. oblong or linear; fls. a little larger; limb of corolla ovate-lanceolate, twice as long as the stem. W. M.

GRAMMATOPHYLLUM (Greek, *gramma*, a line or streak, and *phyllon*, leaf; probably referring to the parallel leaf-veins). *Orchidææ*, tribe *Vandææ*. A small genus of perhaps 8 or 9 epiphytic species, of which about half are well-defined, inhabiting the islands from Madagascar to the Philippines and New Guinea. The genus includes some of the largest and showiest of cultivated orchids. Roots numerous; stems or pseudobulbs many-leaved; lvs. long, ribbon-shaped, thick, evergreen; racemes long-stalked, loosely many-fl., springing from near the base of the pseudobulb; fls.

large, not obviously spurred; sepals and petals nearly equal, spreading; lip comparatively small, with margin entirely free, 3-lobed, with erect lateral lobes; column slender. Allied genera are *Grammangis* and *Cymbidium*, from both of which *Grammatophyllum* differs in having the pollen masses each borne upon an appendage of the stalk, while in the two related genera they are attached to a common stalk without special appendages.

The few species in cultivation are such infrequent bloomers that the flowering of a fine example is something of an event. They are propagated from pieces of the pseudobulbs. The plants are best grown in good-sized and well-drained pots filled with peat, and need considerable water while actively growing. They should be allowed to rest occasionally. Season of bloom and further cultural details with each species.

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Cultivate *Grammatophyllum* in shallow perforated pans three-fourths filled with broken potsherds. The solid part of the potting material should be of fern fiber packed very tight and thin. Place near the strongest sunlight, under lightly shaded glass. Keep a temperature of 70° to 95° in the growing season. Give plenty of water while growing. They need a long season of rest, without water, in a shaded house, in a temperature of 50° to 55°.

WM. MATHEWS.

A. *Pseudobulbs very long, comparatively slender.*

speciosum, Blume (*G. Sanderianum*, Hort.). **LETTER PLANT.** Pseudobulbs 6-10 ft. long, slender, flexuous; lvs. 2-ranked, 1-2 ft. long; flower clusters open, sometimes 6 ft. long from the base of the stalk; fls. numerous, 6 in. in diam., clear yellow, spotted with deep red-purple. Winter. Malayan region, notably Java. G.C. III. 7:297; 14:15; 22:145, 147; 13:1. B.M. 5157.—This magnificent plant, one of the very largest of its family, has been well-named the "Queen of Orchids." A huge individual growing on a tree in the open at the Botanical Garden of Buitenzorg, Java, has the following dimensions: diameter of whole plant, 18 ft.; collar about the trunk of the tree formed by the closely interwoven roots 7½ ft. in diameter, 2½ ft. thick, and over 3 ft. high; flower-clusters (appearing at the same time) 50-60, each 2 ft. or more in length and bearing 70-100 flowers. And it must be remembered that this huge plant is an epiphyte! Temperature, especially soil temperature, should be carefully regulated in growing this plant. Owing to the brighter light, it does better in American than in European hothouses.

AA. *Pseudobulbs comparatively short and thick, leafy only at summit.*

B. *Fls. greenish or yellowish, spotted with brown.*

Fenzliænum, Reichb. f. (*G. Mearesianum*, Hort.). Lvs. 4-6; fl. clusters sometimes 15 at one time, each over 5 ft. long and containing over 60 fls.; sepals and petals narrow, cream color to greenish yellow, tipped and spotted with brown and purple; lip streaked with purple. Apr. Island of Amboina, Philippine Islands (?). J.H. III. 29:123. G.M. 34:334.—The fls. are smaller and the spots fewer and smaller than in *Rumphianum*.

Rumphianum, Miq. (*C. Guillemii* II, Kränzin). Pseudobulbs 6-8 in. long, ovoid or fusiform; lvs. 1-2 ft. long; raceme nodding or hanging, 3-4 ft. long from the base of the stalk; fls. often 30-35, 3 in. in diameter, green outside, green blotched with brown-purple within; sepals and petals similar; lip purple-veined, downy. Molucca Islands, Borneo, New Guinea, and (?) the Philippines. B.M. 7507.—A large, showy species.

BB. *Fls. brown, streaked with green.*

multiflorum, Lindl. Lvs. 3-4; fl. clusters nearly 2 ft. long. Summer. Philippine Islands. P.M. 6:217.—This very desirable species has not yet found its way into American trade. It is easily grown, either in a pot filled with a well-drained compost of heath soil and potsherds, or merely fastened to copper wire and hung from the roof.

G. Éllisiæ, Lindl.—*Grammangis Éllisiæ*.—*G. indeterminata*, Hort.—*G. levitum*, Hort.—[?] T. H. KEARNEY, JR.

GRANADILLA. Consult *Passiflora*.

GRAPE. The Grape is probably the oldest of domesticated fruits. It is probable that wine was made from it before the species was brought into cultivation. It seems to have been cultivated at the dawn of history. Its product was certainly no rarity in Noah's time.



949. The Labrusca or Fox-Grape type. a. Niagara; b, Brighton

The Grape of history is the Old World *Vitis vinifera*, the "wine-bearing *Vitis*," probably native to Asia. The paramount use of the Grape always has been the production of wine. A subsidiary value is the production of raisins; and another is the production of fruit for the dessert and for culinary uses. Great efforts were made to introduce the cultivation of the European Grape into the American colonies, but the efforts resulted in failure. It was not until the latter part of the present century that the chief causes of this failure became known: the depredations of the phylloxera and mildew,—and even then the causes were discovered largely because these enemies had made incursions into the vineyards of Europe. In the meantime, one or two of the native species of *Vitis* had been ameliorated, and American viticulture had become established on a unique and indigenous basis, and the fruits are grown to eat rather than to drink. So fully did the early American ventures follow European customs that the Grapes were usually planted on terraced slopes, as they are on the Rhine and about the continental lakes. Even to this day the terrace ridges can be traced in some of the slopes about Cincinnati, where Longworth and others cultivated the Grape fifty years and more ago. Those early experi-

ments finally failed because of the incursions of the black rot.

Of all countries, North America is richest in species of *Vitis* (see the article *Vitis*). These species range from ocean to ocean and from the British possessions to the tropics. The species which has been most improved is *Vitis Labrusca* of the Atlantic slope, although it seems to possess less native merit than some of the southwestern species-types. Of this species are the Concord and Catawba types (Figs. 949-951). To some extent it has been hybridized with *Vitis vulpina* (as in Agawam, Lindley, Barry, and others of E. S. Rogers' varieties), and with native species. Already a number of the popular varieties represent such wide departures that they cannot be referred positively to any species. Of these, Delaware and Isabella are examples. The second most important species, in point of amelioration, is *Vitis arifolia*, from which several of the best wine Grapes have sprung (Fig. 952). The Post-oak Grape (*Vitis Linsecomi*, or *V. arifolia*, var. *Linsecomi*) of the Southwest, is one of the most promising species, and already has given excellent results in hybridization. See Figs. 953, 954. *V. rotundifolia* of the South has given the Scuppernon and a few less known forms. Beyond these species, there are none which have given varieties of great commercial importance, although considerable has been done in improving them. Some of the best of the wild species are practically untouched; there is only a comparatively small area of our great country which has yet developed large interests in Grape-growing: the Grape-types of a century hence, therefore, may be expected to be very unlike the present day varieties. For an extended sketch of American Grape history, see "Evolution of Our Native Fruits." The American Grape literature is voluminous. Fifty authors have written on the subject. Yet there is very little of this writing which catches the actual spirit of American Grape-growing; this fact, together with the intrinsic intricacy and diversity of the subject itself, makes it seem wise to devote considerable space to the Grape in this Cyclopaedia.

While the native Grape was being ameliorated in the East, the Old World *Vitis vinifera* was becoming established on the Pacific slope. In fact, *Vitis vinifera* has there run wild. The phylloxera and mildew are not native there, and the climate better suits the species. The Pacific coast viticulture, therefore, is of the Old World kind. Wine is the leading revenue of the Grape.

We now know that the phylloxera or root-louse can be evaded when the *vinifera* Grape is grafted on native or resistant stocks, and the mildew can be combated by fungicides. Of late years, therefore, new efforts have been made to grow the wine Grape in the eastern states, and in the southern latitudes some of these experiments promised well for a time. However, so great attention is required in order to produce a satisfactory product as to discourage the growing of *vinifera* varieties in the open in the East. *Vinifera* types will always be special Grapes in the East, adapted only to particular conditions, for it is not to be expected that they can compete with



950. The Labrusca type of Grape, comprising most of the common American varieties.

the more easily grown and cosmopolitan native varieties. Under glass, however, the vinifera varieties thrive; below a special discussion is given to this branch of the subject.

The greatest development of the native Grape industry has taken place in New York and Ohio, bordering lakes and large streams. These areas are the lower Hudson river valley; the region of the central-western New York lakes; the Lake Erie region of New York, Pennsylvania and Ohio. There are also important Grape interests in Ontario, Michigan, and other northern parts. There is considerable interest in Grape culture in the cooler parts of Georgia and Alabama, and there are enlarging areas in the country extending from the Ozark region southward. Nearly all the country, excepting the northernmost parts, raises Grapes, but in most cases the growing of them cannot be said to be extensive enough to be called an industry. Although the Grape sections of the North hug the water areas and the land, therefore, is often steep, all Grape growers prefer nearly level land. The Old World plantations are largely on very steep lands; such lands, by virtue of their warmth and drainage, are thought to give an extra quality of wine. These ideas were brought to this country, and many of our early vineyards were planted on terraced slopes. But we grow Grapes for a different purpose from the Europeans, and land is cheap and labor is dear. Old World methods cannot be followed in the American commercial plantations.

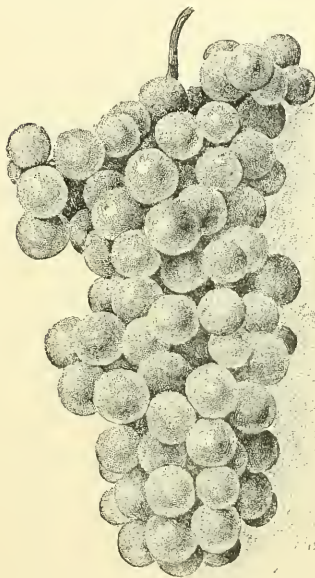
The ideal bunch of Grapes is one which is of medium size for the variety, compact, uniformly developed and ripened throughout, containing no small or diseased berries, and with the bloom intact. A very dense or crowded cluster is not the most desirable, for all the berries cannot develop fully, and the cluster is not easily handled when the fruit is eaten. Fig. 955 shows a cluster of good shape and compactness; Fig. 956 is too broad and irregular; Figs. 957 and 958 are rather too dense and compact.

The American Grape is essentially a dessert fruit. It is eaten from the hand. There are several manufactured products, but, with the exception of wine, they are yet of minor importance. Americans are not a wine-drinking people, and wine is a secondary output of the Grape in the eastern states, although there are many large wine-cellars in New York and Ohio, and the product is of excellent quality. Unfermented grape juice is a product which deservedly is growing in popularity. The lack of secondary domestic uses of the Grape is one reason for the very serious glut in the markets. However, one year with another, the profit on a good vineyard may be expected to exceed that on the staple farm crops.

The American book literature of the Grape is nearly as large as that of all the tree fruits combined.

Probably 100 books, counting the various editions, have been published in North America since Adlum's volume in 1823 (see "Evolution of Our Native Fruits," pp. 117-126). The earlier books were founded largely on European practices. The leading current works are: 'Bush-berg Descriptive Catalogue and Grape Growers' Manual;' Mitzky's "Our Native Grape;" Fuller's "Grape Culturist;" Husmann's "American Grape Growing and Wine Making." For the Pacific slope, Husmann's "Grape Culture and Wine Making in California," Wickson's "California Fruits," and Eisen's "Raisin Industry" are current guides. Detailed discussions of pruning and methods of training are contained in "The Pruning-Book." A standard European monograph is Foëx's "Cours Complet de Viticulture."

Pruning and Training.—A Grape vine is pruned in order to reduce the amount of wood (that is, to thin or to limit the amount of fruit), and to keep the plant within manageable shape and bounds. A vine is trained



952. Horticultural product of *Vitis aestivalis*—Onderdonk, seedling of Herbmont ($\times \frac{3}{4}$).

in order to keep it off the ground, out of the way of the workmen, and to so arrange the fruit that it will be well exposed to light and air. In order to understand the pruning of Grapes, the operator must fully grasp this principle: *Fruit is borne on wood of the present season, which arises from wood of the previous season.* To illustrate: A growing shoot, or cane of 1899, makes buds. In 1900 a shoot arises from each bud; and near the base of this shoot the Grapes are borne (1 to 4 clusters on each). This is shown in Fig. 959. The 1899 shoot is shown at the top. The 1900 shoot bears 4 clusters of Grapes. While every bud on the 1899 shoot may produce shoots or canes in 1900, only the strongest of these new shoots will bear fruit. The skilled Grape grower can tell by the looks of his cane (as he prunes it, in winter) which buds will give rise to the Grape-producing wood the following season. The larger and stronger buds usually give best results; but if the cane itself is very big and stout, or if it is very weak and slender, he does not expect good results from any of its buds. A hard, well-ripened cane the diameter of a man's little finger is the ideal size.

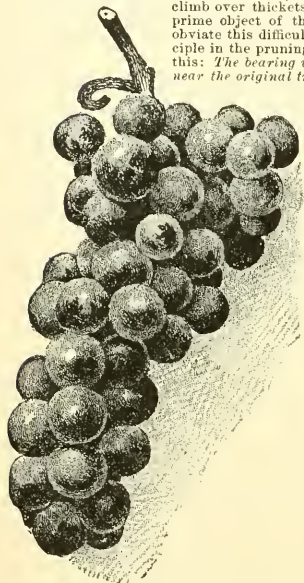
The second principle to be mastered is this: *A vine should bear only a limited number of clusters,*—say from 30 to 80. A shoot bears clusters near its base; beyond these clusters the shoot grows into a long, leafy cane. An average of two clusters may be reckoned to a shoot. If the vine is strong enough to bear 60 clusters, 30 good buds must be left at the annual pruning. How much a vine should be allowed to bear will depend on the variety, distance apart of the vines, strength of the soil, age of the vine, system of pruning, and the ideals



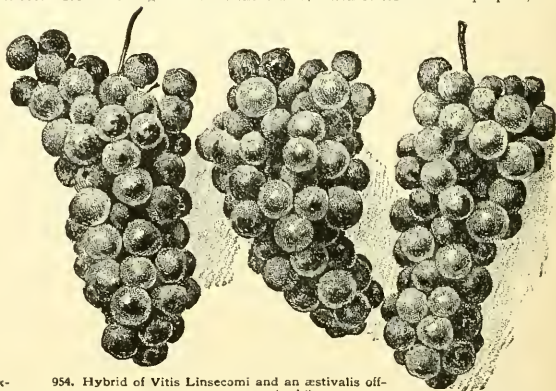
951. Champion, one of the early-season Labruscas, but of poor quality ($\times \frac{3}{4}$).

of the grower. The Concord is one of the strongest and most productive of Grapes. Twelve to 15 lbs. is a fair crop for a mature vine; 20 lbs. is a heavy crop; 25 lbs. is a very heavy crop. An average cluster of Concord will weigh $\frac{3}{4}$ – $\frac{1}{2}$ lb. The vine may be expected to carry from 30 to 60 clusters; and the annual pruning will leave from 15 to 30 buds.

Since the bearing wood springs from new canes, it follows that the fruit of the Grape is each year borne farther from the main trunk of the vine. Observe that the fruit of wild vines is borne beyond reach when they climb over thickets and trees. It is a prime object of the Grape-grower to obviate this difficulty. The third principle in the pruning of Grape vines is this: *The bearing wood should be kept near the original trunk or head of the vine.* When one cane is sending out fruit-bearing shoots, another shoot is taken out from near the main trunk or head to furnish fruit-bearing shoots for the



953. Hybrid of *Vitis Linsecomi* and a Fox-Grape derivative—Husmann ($\times \frac{3}{4}$).



954. Hybrid of *Vitis Linsecomi* and an *aristalis* off-shoot—Hermann Jaeger ($\times \frac{3}{8}$).

next year; and the other or older cane is entirely cut away after the fruit is off. That is, the wood is constantly renewed; and the new shoots which are to give bearing wood the following year are called *renewals*. There are some systems of Grape training which renew back to the root every year or two, and these have been called renewal systems; but every system of Grape pruning must practice renewal in one way or another.

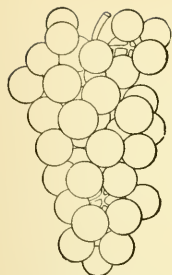
An old system of renewal was by means of spurs. Fig. 960 illustrates this. The horizontal part is a permanent arm or branch. We will suppose that it grew in 1890. In 1891 a shoot grew upward. It bore two or three clusters of fruit. In the fall it was cut back to *a*, two buds being left to supply the shoots of the succeeding year. This short branch is now called a *spur*. Only one shoot was wanted for the next year, but two buds were left in case one should be injured. In 1892, a branch grew from one of these buds; it bore fruit: in the fall it was cut back to *b*. In 1893 a shoot will grow from one of the buds, *c*. Thus the spur elongates year by year, becoming a forking, complicated, stubby branch. After a few years it may become weak: the grower sees this, and if a new shoot should start from the main arm near the base of the spur, he encourages it and cuts off all of the old spur; thus he renews back again to the main vine. Shoots from adventitious or secondary buds are likely to spring from the main arm or the spur at

any time. These are usually weak and are removed, but now and then a strong one arises. Spur pruning is now rarely used except in Grapes grown on arbors or under glass, in which cases it is necessary to have a long, permanent trunk. On arbors it is best to carry one arm or trunk from each root to the top of the framework. Each year the lateral canes are cut back to spurs of two or three buds. The pruning of glasshouse Grapes is discussed under *Grapes under Glass*.

The current systems of pruning renew to a head—or to the main trunk—each year. The trunk of the vine is carried up to the desired height—to one of the wires of the trellis—and one or more canes are taken out from its top each year. The object is to keep the bearing wood near the main trunk and to obviate the use of spurs. This type of pruning is illustrated in Fig. 961. This engraving shows the head of a vine seven years old, and on which two canes are allowed to remain after each annual pruning. The part extending from *b* to *f* and *d* is the base of the bearing cane of 1892. In the winter of 1892–3, this cane is cut off at *d*, and the new cane, *e*, is left to make the bearing wood of 1893. Another cane springs from *f*, but it was too weak to leave for fruiting. It was, therefore, cut away. The old stub, *b, f, d*, will be cut away a year hence, in the winter of 1893–4. In the meantime, a renewal cane will have grown from the stub *e*, which is left for that purpose,

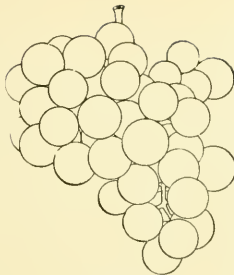
and the old cane, *b, d*, will be cut off just beyond it, between *c* and *f*. In this way, the bearing wood is kept close to the head of the vine. The wound *a* shows where an old stub was cut away this winter, 1892–3, while *b* shows where one was cut off the previous winter. A scar upon the back of *f*, which does not show in the illustration, marks the spot where a stub was cut away two years ago, in the winter of 1890–1. This method of pruning can be kept up almost indefinitely, and if care is exercised in keeping the stubs short, the head will not enlarge out of proportion to the growth of the stock or trunk.

There are two common styles of training in use in the northern states, but each of them practices essentially the system of renewals which is described in the last paragraph. One style of training carries the trunk only to the lowest wire of the trellis. The canes—usually 2 in number—are tied horizontally on the bottom wire, and the bearing shoots are tied, as they grow, to the two wires above (Fig. 962). This is an *upright system*. The other style carries the trunk to the top wire. The canes are tied on the top wire, and the bearing shoots hang. This is the *drooping* or *Kaiffing system*. If the shoots run out on the top wire by clinging to it by tendrils, they are torn loose, so that they will hang; this is a very necessary practice. There is controversy as to the comparative merits of these systems, which proves that



955. Grein Golden.

A good Grape cluster.



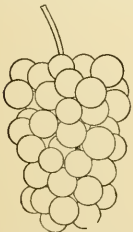
956. Eaton.

each has merit. It is probable that the upright system is better for the slender or shorter varieties, as Delaware, and also for those whose shoots stand erect, as Catawba. The Kniffin has distinct merit for strong-growing varieties, as Concord; it is also cheaper, since it requires no summer tying. Grape-training is a very special subject; it is discussed at length, with many illustrations, in "The Pruning-Book."

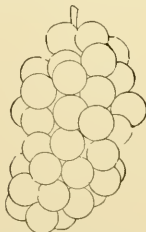
One- or 2-year-old vines are planted either in the fall or early spring. At planting, the vine is cut back to 3 or 4 buds and the roots are well shortened. If all the buds start, the strongest one or two may be allowed to grow. The canes arising from this bud should be staked and allowed to grow through the season; or in large plantations the first-year canes may be allowed to lie on the ground. The second year this cane should be cut back to the same number of eyes as the first year. After growth begins in the second spring, one of the strongest shoots should be allowed to remain. This cane may be grown to a single stake through the second summer. At the end of the second year the cane may be cut back to the bottom wire of the trellis, if upright training is to be employed. The cane may be strong enough at this time to be made the permanent trunk of the Kniffin training, but in most cases the trunk is not carried to the top wire until the third year.

The main pruning is performed when the vine is dormant. The ideal time is January and February in the North, although the work is often begun in November if the area is large. Pruning in spring causes the vine to bleed, but bleeding is not injurious. But late pruning interferes with tillage, and the buds are likely to be injured after they are swollen. Summer pruning is now practiced only to the extent of pulling out suckers and weak shoots, and even this is not always done. Heading-in the vine in summer is likely to start side growths, which are useless and troublesome.

Propagation.—The Grape grows readily from seeds



957. Moore Early.



958. Massasoit.

which may be kept over winter and germinated in the house early in the spring. They may be even planted in beds in the open, but the proportion of failures will

be greater. Seeds produce new varieties, and they are used only in an experimental way.

The commercial propagation of Grapes is done by means of hardwood cuttings. These cuttings are taken in the winter from the trimmings of vineyards. In all ordinary cases they are made of two or three buds' length, preferably three (Fig. 963). They are cut as soon as the canes are trimmed, tied in small bundles, and these bundles are then buried half their depth in damp sand in a cool cellar. By spring the cuttings will be more or less callused. The cuttings are planted in the open on the approach of warm weather. A loose, loamy soil is selected, and it is well and deeply prepared. The cuttings are inserted until only the upper bud stands at the surface of the ground. These cuttings are placed 6 to 8 inches apart in rows, and the rows are far enough apart to allow of horse cultivation. These cuttings may give plants large enough for sale the following fall; but it is usually preferred to let the plants grow two years before they are put upon the market. In such cases it is customary, in many of the best nurseries, to transplant at the end of the first season. When wood is scarce, the canes are sometimes cut



959. Fruit-bearing of the Grape.

to single eyes. In this case about an inch of wood is left on either side of the bud. Single-eye cuttings are nearly always started under glass, preferably on the greenhouse bench. If they are started in February, they will be large enough for transplanting in a well-prepared seed-bed very early in the spring. Green wood cuttings are sometimes used in the summer time with new and rare varieties, but they are not in general favor. In California, rooted vines of one year are preferred; and in soil in which cuttings root readily, they are sometimes planted directly in the vineyard.

The Grape is easily grafted. Because of the flexible nature of the vine, however, it is customary to make the graft below the surface of the ground. An ordinary cleft-graft is the one which is usually employed. The whole vine is cut off 4 or 5 inches below the surface, and the graft is inserted in the same fashion as in apple or pear trees. The surface may then be waxed or covered with clay or other material, to keep the water out of the cleft, although if the earth is firmly packed around the graft and no water stands, the union may be perfectly satisfactory without any cover (Figs. 964-5). Vines of any age may be grafted. It is important that

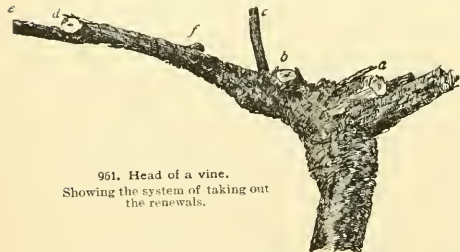
the cions be perfectly dormant. These cions are taken and stored in the same way as cuttings. The grafting should be done very early in the spring, before the sap starts. Grafting may also be done late in the spring, after all danger of bleeding is over; but, in that case, it is more difficult to keep the cions dormant, and the growth is not likely to be so great during the first season. Vineyards which are composed of unprofitable varieties may be changed to new varieties very readily by this means. Vinifera varieties can also be grafted on our common phylloxera-resistant stocks by the same method. Almost any method of grafting can be employed upon the Grape vine if the work is done beneath the surface.



950. Pruning to a spur.

able to many insect and fungous attacks. The most serious difficulty is the phylloxera, which, however, is practically unknown as an injurious pest on the native Grapes. On the vinifera varieties it is exceedingly serious, and it is working great devastation in many of the vineyards of the Old World and of the Pacific coast. The most practicable means of dealing with this pest is to graft the vinifera vines on native or resistant roots.

The mildew and black rot are the most serious of the fungous enemies. The mildew (*Peronospora viticola*) is the more common form of rot in the North. In the South the black rot (*Larstedia Bidwellii*) is very serious. Both these diseases cause the berries to decay. They also attack the leaves, particularly the mildew, causing the leaves to fall and preventing the Grapes from maturing. It is the mildew which has worked such havoc in European vineyards. The mildew is most serious on thin-leaved and smooth-leaved varieties, as the Delaware. It causes yellowish patches to appear on the leaves, with frost-like colonies on the under sides. It causes the berries to decay with a gray and finally a brown rot, the berries usually remaining small and firm but not greatly wrinkled. The black rot causes the berries to become very hard, dry and shriveled, and the epidermis is covered with minute pimples (Fig. 966). The treatment for both these diseases is the same—spraying with Bordeaux mixture. In regions in which the diseases have not been very prevalent, it is usually sufficient to begin the spraying after the fruit has begun to set, and to spray two or three times, as the case seems to require. When the diseases have been very prevalent, however, it is better to begin before the buds swell in the spring.



961. Head of a vine. Showing the system of taking out the renewals.

In infested vineyards, the foliage and diseased berries should be raked up and burned in the fall.

The anthracnose or scab (*Sphaeactoma ampelinum*) is a very serious fungous disease. It is most apparent on the fruit, where it makes a hard, scabby patch. Its most serious work, however, occurs on the stems of the

clusters and on the young growth, where it makes sunken, discolored areas, and where it interferes seriously with the growth of the parts. It is not so easily controlled as the mildew and the black rot. Careful attention to pruning away all the diseased wood and burning it will help in controlling the disease. Before growth starts, spray the vines, trellis and posts with strong sulfate of copper solution. After the leaves open, use the Bordeaux mixture.

In Grape houses the powdery mildew (*Uncinula spiralis*) often does serious damage. It also occurs in the open vineyard, but it is usually not serious there. It appears as a very thin, dust-like covering on the leaves. It sometimes attacks the berries, causing them to remain small or to crack. This fungus lives on the surface, and is therefore readily controlled in Grape houses by dusting with flowers of sulfur or by the fumes of evaporated sulfur.

For further discussions on Grape diseases and difficulties, the reader should consult the bulletins of the experiment stations, publications of the Department of Agriculture at Washington, books on economic entomology, and Loderman's "Spraying of Plants."

Varities.—Of the native Grapes, fully 800 varieties



962. Upright system of Grape training.

At the winter pruning, all the top will be cut away except two canes near the center; these two will be laid down in opposite directions on the bottom wire for the next season's fruiting.

have been named and described. Many foreign varieties have been introduced. Yet, in any region the number of useful commercial varieties is usually less than a dozen. Of the American Grapes (those aside from viniferas), the Concord is the cosmopolitan variety. Others of great prominence are Worden, Niagara, Catawba, Delaware. For the South, consult Munson's article, below. For the Pacific viniferas, consult Wickson's account, below. Following are notes on varieties by Ralph Bush, of the old firm of Bush & Sons, Bush-berg, Mo. This firm was established shortly after the civil war by Isidor and Ralph Bush, father and son. In the early seventies the firm became Bush & Son & Meissner, by the entering of G. E. Meissner. The recent death of the elder Bush and Meissner has left the firm in the hands of Ralph Bush & Sons. It is this firm which publishes the Grape manual already mentioned. In that work and in Mitzky's "Native Grape," great numbers of varieties are described. Mr. Bush's remarks on varieties of Grapes, made for this occasion, are as follows:

"The planting of vineyards, both for market and amateur purposes, is on the increase. The inclination in planting tends more towards quality than to quantity; that is, from the many inquiries and orders, the main question seems to be the adaptation of the variety to the soil or the purpose. In former years the planter, without question, would order so many Concord, Hartford, Ives, Elvira, etc., and in rare cases, one or two of a better variety. Now there is no demand whatever for Hartford, much less for Ives and Elvira, while the planting of even the Concord is on the decrease. The general tendency around the great lakes is still to plant the Catawba, and it certainly thrives very well. In many parts of Ohio, Indiana, Kentucky and Tennessee the Noah and Niagara are in great demand; as also the Delaware, Norton Virginia and Cythniana for wine purposes. In the section south of the Ohio river, as also in the western states, such kinds as Moore Early, Moore Diamond, Brighton, Worden, Cottage, Niagara,

and many of the Rogers hybrids are now planted. In the southern states, from Texas to Georgia, the Niagara, Herbmont, Cunningham, as also Norton Virginia and Cynthiana, are most frequently wanted." L. H. B.

Grapes in the North.—Seeking a proper location for Grapes in the northern states east of the Rocky mountains, one should make a distinction between Grapes planted for commercial purposes and those planted for domestic use. If for the former, the climatic conditions must be so perfect that a crop can be depended on each season with the same certainty as the appearance of the tax collector or the annual interest on the mortgage. If for the latter, the chances may be such as to give a yield of Grapes three years out of five, which is better than no Grapes at all. Any section in which dent corn has a liberal season in which to mature is a practicable place for a household vineyard, provided the early ripening varieties are selected. For this purpose, for black or deep purple, may be suggested Moore Early and Worden. During the past three years the Campbell is often favorably mentioned. For white or pale green, the Green Mountain, sometimes called the Winchell, and for red the Brighton, are good varieties.



963. Common 3-bud cutting of Grape.

The best location for a commercial vineyard is along the shores of our lakes or large rivers. The advantage of such locations is due almost entirely to protection from late and early frosts. During the early development of the Grape industry, many loose ideas were prevalent that certain spots within the different Grape zones had some special magic of sunshine, or temperature, or draught of air, or alchemy of the soil, that gave such superior quality of fruit. The earlier vineyards at Hammondsport, N. Y., were planted upon steep hillsides—so steep that terraces were sometimes formed, which made cultivation and harvesting expensive. Such locations were probably considered superior to all others because some one had seen Grapes grown in similar locations along the Rhine. It was also said that the west bank of the lake was superior because the Grapes received the morning sun. Henry O. Fairchild, a pioneer and progressive vineyardist, in time proved the foolishness of the idea by planting a vineyard on the east side of the lake, where the lay of the land made cultivation more easy and the Grapes received the afternoon sun. In later years, when the Grapes from either shore reached the market, no consumer could tell whether the fruit received the morning or afternoon sun. The first vineyards planted in the Lake Erie belt were at Brocton, Chautauqua county. The industry clung about that initial location many years, for it was a popular belief that there was some special current of air passing



964. Cleft-grafting the Grape.



965. Cleft-grafting the Grape.

from the hills to the lake at that special point that did not pass elsewhere. Now there are more than 25,000 acres of vineyard planted between Silver Creek and Harbor Creek, and the yield of that area for the season of 1899 was about 7,000 car loads. The only marked difference

of Grape product in all that area is the difference between the conscientious and the careless packer. If there was ever any reason for such an idea as the quality of fruit being influenced by location, it was probably due to the inexperience of some outside planter, which led him to put up too much or too little wood, and imperfect ripening of the fruit was the result. The conclusion was jumped at that the difference was due to a heaven-born blessing of location, instead of good judg-



966. Grapes ruined by black rot.

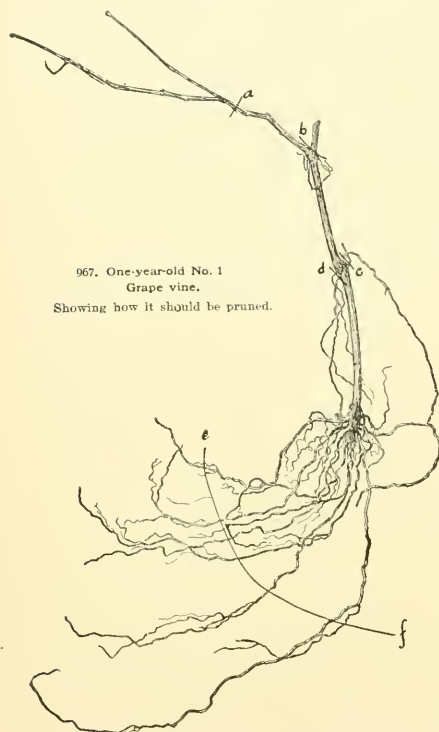
ment in pruning. It is the common thing for writers to lay much stress on "southern slopes" and "sunny slopes," but in most cases they have said so because some one has said so before them, and not because they spoke from experience. Scarcely an acre of the 25,000 planted to vineyards in the Chautauqua belt but faces the north, and is in full view of Lake Erie, as the seats of a theater face the stage.

There is one feature of location upon which much stress must be laid, even in the lake zones, and that is opportunity for frost drainage. It is a well attested fact that the cold air settles in the bottom of a valley; therefore, the bottom of a ravine is usually colder in frosty nights than the hillside. It often happens that a late spring or early fall frost will injure Grapes in the lower location, and not on the slopes. This is a factor that planters of all fruit should observe.

There has been as much nonsense written about the best soils for Grapes as there has been about best location. One has a vineyard planted on the gravel of what was once the beach of Lake Erie, when it had a higher level than at present. His neighbor across the road has a vineyard planted on a very stiff clay, which was once the bottom of the lake. One gets just as large yields and just as fine quality of fruit as the other. The only difference is that the former, being on the gravel, is able to work his soil earlier than the latter; his fruit ripens earlier, so that he is able to borrow all of the neighbor's harvesting tools. Another neighbor has a vineyard extending across both clay and gravel, and he would not sell one acre cheaper than another. In commercial planting, the period of protection from frosts should be broad enough so that the difference in ripening from gravel or clay should not make a difference of success or failure. For domestic planting, the gravel would be preferable. The soils of which most serious warning should be given are those containing a very liberal supply of available nitrogen. All experienced fruit-growers know of the impossibility of early fruiting of trees or vines which are making a rampant growth. There is no fruit so easily intoxicated by nitrogen as the Grape. Long-jointed canes are always to be avoided. Besides being less fruitful, a riotous growth of Grape vine is far more liable to mildew and to other diseases than those of sober growth. One of the surprises in the

development of the Chautauqua Grape zone is that some of the so-called poor land has given vineyards as productive as any,—land that previously had been given over to sheep pasture, briars and mulleins. This land was poor in nitrogen, but no doubt had a fair supply of available potash and phosphoric acid, which Grapes most require.

In preparing land for vineyard planting, it is necessary to lay great stress on the importance of first removing all trees, stumps and large rocks, for when the trellis is put up all tillage of the soil will be in a straight line and one way. A favorite way of disposing of boulders is to



967. One-year-old No. 1
Grape vine.

Showing how it should be pruned.

bury them about twenty inches deeper than one thinks necessary, for they have a vexatious way of overcoming the power of gravitation and creeping out of their graves. The real reason for this apparent freak is the compacting of the soil in later years. If any open ditches should cross the line of the Grape rows, they should be supplied with tile and the ditch filled so as to make long "bouts" possible. Short rows and frequent turning should be avoided as much as possible. Turning at the end of a row is lost labor, and the time it occupies would enable a team to cultivate over a hundred feet straight ahead.

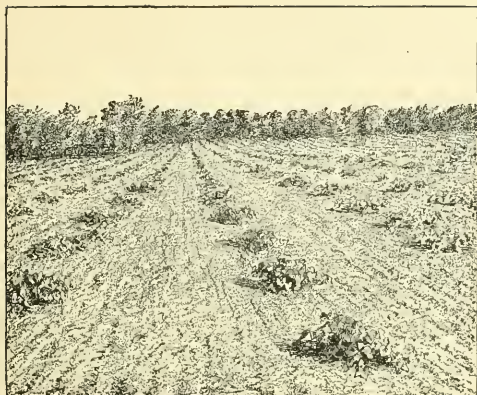
The rows in nearly all the commercial vineyards are 9 feet apart, and the vines are planted 8 feet apart in the row. This makes 605 plants per acre. If the land is sod, plow into narrow lands, so that the center of the dead-furrows are 9 feet apart, and plant in the bottom

of the dead-furrow. When the plow is set to cut a furrow 8 to 9 inches deep, the dead-furrow will have about the required depth for planting. If the ground is stubble, plow the whole field, and then lay out rows by striking a double-furrow. Much care should be exercised to have the rows perfectly straight and to plant the vines straight in the row. This has a practical use, besides appealing to the professional pride of all good farmers. If the plants are not straight in the row, the posts cannot be set straight; and if the posts are not straight the wires composing the trellis will bind on the posts which are out of line, and they cannot be easily tightened in spring.

No. 1 vines, of one season's growth from cuttings, are much to be preferred to No. 2 vines of the same period of growth. A young plant, stunted in growth either by constitutional reasons or accident, has a handicap that usually follows it all through life. For the same reason, avoid planting 2-year-old plants, as often they are the second season's growth of what was a cull the year before. Cull plants and cull vines are seldom worth the cost of reformation. Spring planting is universally followed in the North. It should be completed by the last of May. Some vineyards planted during the last half of June have developed into good production, but it was due to the grace of favorable weather and soil. Fig. 967 represents a fair No. 1 Grape vine. The few roots at *d c* should be trimmed, as well as the main body of the roots shown by segment of circle *e f*. The pruning facilitates planting, and the removed parts would make no root growth of value if retained. The stem of the vine can be cut back to two or three buds, as shown by *a b*. Six quarts of well pulverized fertile soil, well packed about the roots, will hold the plant in place and keep it moist until the furrow can be filled by plowing, if on stubble, or by frequent harrowing and entivating if on sod. During the first season, all cultivation necessary for conservation of moisture should be given. If no tilled crop is planted, this tillage can be done by cultivating or harrowing cross-wise alternately. But little hand-work in weeding will be required. Whether some hoed crop be planted between the rows the first season is a question of profit for each vineyardist to decide. It adds something to the expense of cultivation. It is generally no detriment to the growth of the Grape vines. After the first season, the ground should not be planted to other crops.

The general appearance of an infant vineyard at or about the middle of the first season's growth is shown in Fig. 968. Lay great stress upon the importance of a vigorous and even growth during the first and second years. If such is not attained, many years will be required for the vines to recover, and sometimes they never reach the standard of a good vineyard. Even vines planted after the second year to fill vacancies require constant coddling to bring them up to the average. In the spring of the second year the shoots or canes of the previous season's growth should be cut back to three or four buds, and the canes should be thinned out according to the vigor of the vine—one cane for a feeble growth, and three or four for a decidedly vigorous growth. In all other respects, the second year's management should be a repetition of the first.

In the spring beginning the third year will come the most considerable expense of the undertaking—that of putting up the trellis. There are many forms of training Grapes, and some of them so peculiar that special trellises must be constructed. There are three popular styles of Grape training in the commercial Grape fields of the North: Kniffin system, as practiced in the Hudson river valley; the High Renewal system, as practiced along Lakes Keuka, Canandaigua and Seneca; and the Chautauqua system, as practiced along the Lake Erie valley. It is impossible to say which of the three is preferable. A man's preference usually depends on how he was brought up—like his politics and religion. In horticultural meetings, advocates of the various systems argue the merits with much partisan fervor. It is clear to me that the essential point to be attained in any system is to hang up the vines so that fruit and foliage can obtain the greatest amount of air and sun-bine, all of which can be secured by several methods. The common form of trellis may be illustrated by a high



968. A vineyard in its first summer.

wire fence, as shown in Fig. 969; but the Kniffin system omits the bottom wire.

The vineyardists of the Chautauqua Grape belt have developed a mode of pruning and training of Grapes which has many features peculiar to that district. The trellis is made of two wires, of No. 9 or No. 10 gauge, and chestnut posts. The posts are from 6 to 8 feet in length, and cost 1 cent per lineal foot at the railroad station. In later years, since experience has shown how important air and sunshine are in ripening the fruit, 8-foot posts are most commonly used. Grape posts should be somewhat heavier than those commonly used for wire fence—from one-third to one-half larger—and the heaviest should be sorted out for the end posts, for these bear the strain of the wire. An experienced farmer need not be told that they should be sharpened with a true lead-pencil taper, excepting the crooked ones, which should be so beveled as to counteract the crook in driving.

The usual distance apart for the posts in the row of Grapes is one post to every three vines, or, in other words, 27 feet, and for ease in stretching the wire, they should be in as straight a line as possible. The posts are driven, but a hole should first be made by an unusually large crowbar with a bulb near the lower end. After the posts are stuck into the holes, they are most conveniently driven by the operator standing in a wagon which is hauled through the row by a horse. A fair weight of man is 12 pounds, and it requires a good man to swing one of that size all day. Iron manuls are commonly used because they are the cheapest, but one with an iron shell filled with wood "brooms" or frays the top of the post less than the iron manul. Eighteen inches is a fair depth to drive the posts on most soils. If the proprietor delegates the driving to another man, he would better direct that 20 to 22 inches be the proper depth, for to the man swinging the manul the post seems deeper than it really is.

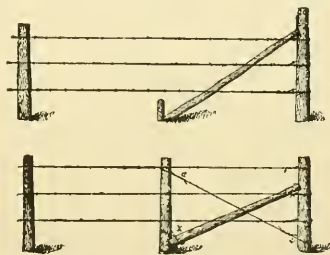
A vineyard should have a break or an alley at right angles to the rows as often as every 50 Grape vines, for the purpose of dumping Grape brush and shortening the trip when hauling fruit. If the vineyard is in fair thrift, longer rows will give so much brush as to be inconvenient in hauling out.

The end posts should not only be the largest of the lot, but should also be well braced. The most common mode is the "hypotenuse brace," consisting of a stiff rail or a 4x4 scantling 12 feet long, with one end notched into the post about midway between the two wires, and the other end resting on the ground against a 2-foot peg of about the same size as the end post.

The wires (two wires in the Chautauqua trellis)

should be strung on the windward side of the post; that is, on the side from which the prevailing winds come. This is very important when the wind is blowing at 30 to 40 miles an hour, and the vines have sails of many square feet of foliage, and perhaps three and four tons of fruit per acre. The staples should be of the same gauge of wire as that used in barbed wire fences, but about one-half inch longer, unless the Grape posts should be of hard wood, like locust; then fence staples will be long enough. The bottom trellis wire is usually placed from 28 to 32 inches from the ground. (Owing to the arm system of pruning in the Chautauqua grape belt, the height of the lower trellis wire is permanent. The upper trellis wire is, in many instances, raised as the vineyard comes to maturity. The first year of fruiting it may not be more than 24 inches above the lower wire, and year by year be raised to 30 and 32 inches. It is not advisable to go more than 36 inches apart without putting in a middle or third wire. Each spring many of the posts will sag, and the upper wire will be slack, and many of the braces will be out of place. All of these faults should be corrected just before tying up the canes in spring.

A large part of the pruning is done in the winter months—some beginning in the fall soon after the crop is harvested. Two grades of labor can be employed in this operation—the skilled and the unskilled. The man of skill, or the expert, goes ahead and blocks out. He stands in front of a vine far more tangled brush than that seen in Fig. 962, and, at a glance, tells by a judgment ripened by much observation, just how many buds are required to ballast and not over-ballast the vine for another year. As the expert stands before the vine making the estimate, he might be likened to a man weighing a ham with steelyards, pushing the weight backward and forward, notch by notch, finding the point of balance. The expert, with his pruning shears, makes a dive here and a lunge there, a clip at the bottom and a snip at the top, and with a few more seemingly wild passes all wood is severed from the bearing vine, but the number of buds desired to give fruit another year are left. The unskilled help, who receives possibly a dollar a day less than the expert, follows the expert, cutting the tendrils and other parts of the vine that are attached to anything but the trellis. The next process is "stripping" the brush, and it is one involving brute force, ragged clothes and leather mittens. If the laborer



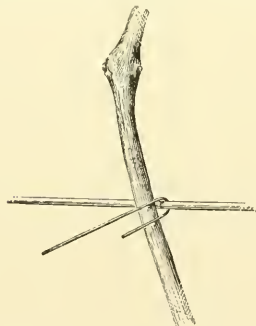
969. Illustrating the bracing of the end post in a fence or trellis.

does not put on a ragged suit, he will be apt to have one before he is done with his job. There is a little knack even in doing this work to the best advantage. The dismembered vines still hang to the upper trellis and often cling with considerable tenacity, and a particular jerk or yank, more easily demonstrated than de-

scribed, is most effectual to land the brush on the ground between the rows.

The next operation is to haul the brush to the end of the row. Many tools have been devised for this purpose, some of them involving considerable expense. It is now the general practice to use a simple pole—one a little larger than would be used to bind a load of logs, and not so large as required in binding a load of hay. It may be a sapling about 4 inches at the butt and 2½ inches at the top, and 10 to 12 feet long. The small end is to be held in the right hand, and the butt end to be pushed along the ground. A horse is hitched to this pole by a rope drawn through an inch hole about 4 feet from the butt or ground end. When starting at the end of the row, it seems that the straight pole would not gather any brush at all. It is a question of catching the first wad, and all the rest of the brush will cling to it. At the end of the row the brush is hauled to a convenient pile, where it is to be burned, and is dumped by letting the end of the pole held in the hand revolve over towards the horse. If the pole hits the horse, the operator will see that there is not enough stretch of rope between the pole and whiffletree, and more must be provided.

Tying is done by women, boys and girls, and cheap men. The tying materials are wire, wool-twine, raffia, willow and carpet-rags. The horizontal arms, at the lower wire, are more or less permanent, and they are loosely confined to the wire, always by string or willow. The vertical canes, which are fastened to the top trellis, are now commonly tied with annealed wire of No. 18 gauge, and cut in lengths of 4 inches. The economy in using the wire is the despatch in tying, and the fact that the work can be done on cool days when light gloves are necessary. The use of wire has been strenuously opposed by people who have never used it. The objection has been that the fine wire would chafe the cane so that the cane would break and fall from the trellis. Such instances occur rarely, and when they do it is so late in the season that the tendrils of the vine are ample to hold it to the trellis. The cane should be tied to the windward side of the wire for the same reason that the wire was stapled on the windward side of the post. In using the wire tie, the operator stands on the opposite side of the trellis from the cane, and follows the movements as illustrated in Figs. 970-975. This operation puts on the wire with the fewest number of movements, binds the cane snug to the trellis, and makes a loop that falls from the trellis on the following season, when the cane is torn away. The tying wire

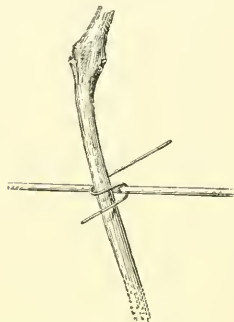


970. Tying with wire. The first movement.

should be thoroughly annealed, so that it can be easily bent and give no springy reaction after being worked. This wire is also useful in tying thorny shrubs to a trellis when a mittened hand is necessary to hold the branches in place while the other hand makes the tie.

To recommend varieties is a difficult and personal

matter. Grapes, like most other fruits, are influenced in character by difference of location. There are many more Concord s sold than any other variety, yet by the fastidious Grape eater it is thought far inferior to many other varieties. However, as it is the sort the public most want, and is a good yielder, it is probably the most



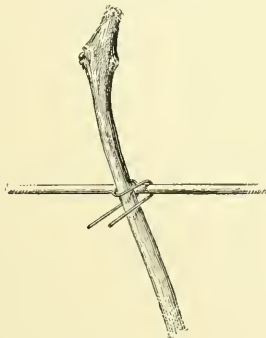
971. The second movement.

profitable to plant. For the past few years many have wished that all their Concord s were Niagara, for the reason that the yield of the latter has been good and the crop brought at least ten dollars per ton more when sold in bulk. Perhaps this condition is only temporary. The Catawba is of excellent flavor; it is latest to ripen and an excellent variety for storage. When placed in good cellars, and an even low temperature is maintained, but not low enough to freeze, this variety will keep in good shipping condition until the last of March and first of April. These are standard commercial varieties in New York and Ohio. Worden is excellent for a near-by market, but does not stand long journeys well.

Many fruits are better picked before fully ripe, of which the pear is a conspicuous example. Grapes have not that characteristic, for no maturing development goes on after the fruit is harvested. As soon as the full ripening period has been reached, the clusters should be gathered by carefully cutting and placing in trays which hold from 25 to 35 pounds. The care in handling should almost equal that taken with eggs. After picking, the fruit should be placed in a fruit house built upon the principle of an ice house, but so arranged as to give free access to the cooling night air, and to be closed each morning to protect from the heat of the day. By such means the temperature can in time be worked down to 40°, which checks excessive evaporation, thereby keeping the stems green and the fruit plump. This is the ideal method, but is far from being attained or even sought in many large commercial districts. The practice is far more closely observed in the Lake Keuka (N. Y.) and adjacent lake districts than in the Chautauqua district. In the former locality many Concord s are stored in this manner and shipped in fine condition during November and December, and Catawbas during the balance of the winter. In the latter district the fruit is sent almost direct from the vine to the consumer. This directness means haste and carelessness that is much to the detriment of the Grapes when they reach the market.

From 1893 to 1899 the price of Grapes steadily declined, and with the decline came a casting about for means to economize in harvesting. One of the ways developed towards that end has been to require that the woman who packs should increase her daily output from 80 9-pound baskets to 200. The woman fulfilled the requirements without working any harder in one case than the other. The increase is at the expense of quality of packing, which at first was at the expense of the consumer or shipper, but in the final outcome resulted in less demand for the Grapes. The public may be fooled part of the time, but sooner or later smart prac-

tices will come back to the point from which they started like a boomerang. Grapes designed for shipment are packed in climax baskets. The size prevailing in the Keuka district are "poneys," having a gross weight of less than five pounds. In the Chautauqua district the 8-pound is the almost universal size. The reason



972. The third movement.

for such distinct customs is due to the demands of the markets to which the Grapes are shipped. Shipments of the Keuka section go to the Atlantic cities, and those from Chautauqua go to the west.

In the Lake Keuka district of western New York there are a number of wine cellars involving large capital, two or three of which make excellent champagne. This industry began at Hammondsport in the sixties, and several varieties of Grapes were planted solely for wine purposes, but the quality of the fruit was not good for table use. In the Chautauqua district the wine industry has received little attention compared to that given in the Keuka district. There has been no opportunity for the blending of several juices, for the reason that the Concord is so nearly the universal variety planted. But another industry—that of bottling Grape juice as it comes from the press—has lately been established, and promises considerable development.

The methods of marketing Grapes are of great variety. During the season of 1893 and 1894 there was formed in the Lake Keuka district and adjacent lakes a coöperative marketing association composed of producers. This association was incorporated and officered by its own members, and represented over three-fourths of the production of that district. The plan was to maintain prices more evenly and to secure a better equalization of supply and of markets. This association was abandoned after two years' trial. The failure was not due to excessive cost in selling nor want of integrity of the officers, but to inability "to pull together," and a desire of each producer to be independent, hoping to do a little better for himself than the association could do for him.

The Chautauqua district has had two periods of coöperative shipments, and each of longer duration than that of the Keuka field. The first was for the seasons of 1892, 1893 and 1894. The plan was resumed again in 1897, and continued through the seasons of 1898 and 1899. For the season of 1897 the association represented about 85 per cent of the acreage of the district beginning at Silver Creek, N. Y., and continuing to Harbor Creek, Pa., comprising about 25,000 acres.

These associations, no doubt, serve a good purpose in giving a more even distribution of fruit in different markets. When there is no concert of action the market of a certain city may be poorly supplied to-day and an advance of prices follows, a state of affairs quickly known to all shippers, with a result that everyone, trying to benefit by such an advantage, will consign to that market, making an aggregate far beyond the demand; and a sharp decline of prices will follow. A union represent-

ing a high percentage of acreage can prevent such glutts, provided the over-supply or under-consumption is not such that all the available markets in the country are not glutted, a state of affairs that is liable to happen at mid-harvest, when double the number of cars is forced on the market.

The total shipments from the Chautauqua district for seven seasons have been as follows:

	<i>No. of Cars</i>
1893.....	3,100
1894.....	3,600
1895.....	3,200
1896.....	4,650
1897.....	6,000
1898.....	—
1899.....	7,000

A. B. Clothier, of Silver Creek, N. Y., gives the following as the expense of planting and developing an acre of Grapes:

Plowing and marking an acre of land.....	\$3 00
Number of plants, 8 ft. x 9 ft., 605.....	12 10
Cost of planting.....	1 50
Number of cultivations first season, 7.....	7 00
Cost of cultivation second season.....	7 00
Number pounds of wire for 2 wire trellis, 600 lbs.; staples, 6 lbs. Cost.....	22 80
Number posts for trellis, 202; number braces, 20. Cost.....	14 14
Cost of putting up trellis.....	3 60

Cost of acre of Grapes, exclusive of land..... \$70 54

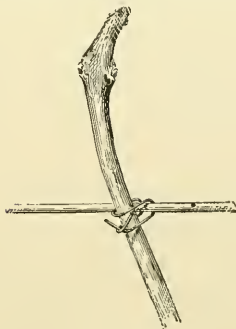
S. S. Crissey, of Fredonia, N. Y., horticultural editor of the "Grape Belt," without going into details, puts the total cost of an acre of vineyard at from \$75 to \$80, which practically agrees with that of Mr. Clothier. These are men of experience and wide observation, and their estimates may be considered to be representative and reliable.

Mr. Clothier gives the following estimate for the cost of labor for an acre of Grapes in bearing, per season:

Cost of pruning, pulling brush, tapping posts, righting braces, stretching wires, tying of vines, and cultivation per acre.....	\$12 00
Cost of picking into crates, 4 tons of Grapes.....	4 50
Cost of hauling to station and loading in car, 4 tons of Grapes.....	4 00
	\$20 50

Mr. Crissey's estimate is a little higher, making cost under the same conditions to be \$23.

As to the yield of an acre of Grapes in the Chautauqua belt, the variation is great. A vineyardist who has any expectation of standing in line with progressive men



973. The tie complete.

should expect to have a record of 4 tons of Concorde per acre. This is more than the average, but unless a man can exceed the average in any line, there is small chance for him to succeed.

As to prices, the variation during the past seven years has been greater than that of the yield. Grapes have

been sold at less than \$10 per ton, and at more than \$15. When more than the latter, it is risky for the seller to be too confident of a much higher price for any great length of time; and if less than the former, the buyer would better secure his supply as soon as possible. An average price is, say, \$12.50. This gives a gross income for a 4-ton acre of Concord as \$50, and a net income from \$27 to \$30. Be it remembered that this is for Grapes in crates. The cost of packing 4 tons of Grapes in 8-pound baskets, including baskets, would be from \$28 to \$30. The prices for Concord in crates or baskets vary so much that it may be advantageous to sell in either way. A man with a small vineyard and a large family would pack in baskets, when another who had to pay all his help or who found help scarce would sell by the ton in crates.

JOHN W. SPENCER.

Grapes in the South.—The region south of the 36th degree north latitude has in it more native species of Grapes than all the world besides. This alone would lead one to suppose the South naturally adapted to vineyard culture. Yet New York, Ohio and California up to the present far excel it in vineyard area, although only three or four species are native in these states. The cause of this is that diligent experimenters and originators have produced varieties of good marketable value adapted to those regions, from natives of those regions, or hybrids of natives with hardiest foreign kinds. In the case of California, the vinifera varieties are mostly grown because the climate and other conditions are so similar to those of the native region of the vinifera. But the South has chiefly planted the northern and foreign varieties which succeed but indifferently in most southern localities, and has neglected almost entirely its native varieties until quite recently. Now experimenters have shown that most excellent and very successful varieties of all colors and seasons can be and have been produced by selection and hybridization of some of the large, fine-fruited varieties.

While the foregoing predicts by actual existence in practical market vineyards in a number of localities in the South what is in store for the South as a whole, the present state of Grape culture in the South at large is a different affair. Information gathered from best sources throughout the South shows that Grape culture is a very small industry. It shows that the leading varieties cultivated in the northern sections of the South are Catawba, Concord, Delaware, Early Victor, Elvira, Ives, Moore Early, Moore Diamond, Niagara, Norton Virginia, Perkins, Worden, Wyoming. Favorable mention is made of America, Beacon, Brilliant, Campbell Early, Gold Coin, Green Mountain, Laussel, Ozark, Presley.

East of Texas and south of Tennessee, the following are chiefly planted: Brighton, Champion, Concord, Delaware, Diana, Diamond, Elvira, Goethe, Hartford, Herbermont, Ives, Missouri Reisling, Moore Early, Niagara, Norton Virginia [Cynthiana], Perkins, Worden. Of the Muscadine class for wine: Flowers, James, Mish, Scuppernong, Thomas. Favorable mention, of varieties testing, is made of Brilliant, Bertrand, Carman, Fern, Gold Coin, Jaeger, Laussel, Marguerite, Superb. In the southwestern section, west of the 96th meridian, are chiefly planted the Herbermont, Jacques [Black Spanish, Leona], Niagara and Golden Chasselas, Malaga and some other vinifera varieties near the gulf coast and in western Texas under irrigation. By several who have had them under trial for several years favorable mention is made of Bertrand, Brilliant, Carman, Fern, Jaeger, Laussel, Marguerite, Muench, Neva, Perry, as furnishing successful table and wine Grapes for this region.

For Georgia, Professor Ilugh N. Starnes gives me the following notes: "Leading varieties in order named: Ives, Concord, Niagara, Delaware, Moore Early, Goethe, Lindley, and for wine Norton Virginia, Scuppernong and Thomas.

"General distance 10 x 10; Delawares 8 x 8; Rotundifolias 10 feet apart. Single stake spiral method of training chiefly used, and either spur renewal or cane renewal pruning employed, according to circumstances. Some growers employ trellises instead of single stakes, using either one or two wires and adopting the umbrella Kniffin or low wire arm spur. Kniffin system of training, according to circumstances. See Bulletin No. 28, Georgia Experiment Station.

"Very little wine is now made in this state, and that is nearly all claret from Norton Virginia, Ives or Concord. In southern Georgia a poor article of Scuppernong wine is made, but it is not adapted to trained palates—too foxy. Delaware and Goethe blended are sometimes used to make a very good Rhine wine, and when properly handled sometimes produce an excellent article. Goethe must, reinforced with 20 per cent of California brandy, make a good pale sherry; yet it is difficult to sell wine here profitably. When it can be sold at all, prices range from 50 cts. to \$2 per gallon, according to the grade. Grape vinegar, while generally regarded as inferior to elder vinegar, will bring about 25 or 30 cts. at retail and 20 cts. wholesale, and at these figures is more profitable than wine.

"When sold fresh the Grapes are generally shipped in refrigerator cars in 10-pound baskets to different northern points. Later shipments take a southerly direction to Atlantic and Gulf seaports. Sometimes the regulation 6- or 9-carrier peach crates are used for shipping Grapes, but are not as satisfactory as the 10-pound separate baskets. Delawares are generally shipped in 5-pound baskets. Returns are uncertain. They vary from 1½ cts. per lb. to 5 cts., according to circumstances. Sometimes as high as 10 cts. is realized on very early and very late shipments or with choice Grapes, but this is seldom. Disteries pay three-fourths of a cent per pound delivered, or gather and pay ½ cent per pound. If only 1 ton per acre of Grapes is the yield, the gross return (and also the net return) per acre would thus be from \$10 to \$15. This is more than cotton ordinarily nets. With two tons per acre of Grapes, which is not an enormous yield, the return would be \$30 per acre delivered at the still. To those who have no scruples in regard to so disposing of their crop, this is probably the most profitable method. There are local stills in almost every county.

"There is not much encouragement now for Grape raising in Georgia, and vineyards are annually being destroyed by hundreds of acres. Some planting, however, is still going on in southern Georgia, in the "wire grass" country, where the industry is still found profitable by reason of the fact that the northern market may be entered ahead of competition, and also that insects and fungous pests have not yet put in an appearance in that region." See Georgia.

Planting, Training, etc.—The vines of the true southern Grapes, such as Herbermont and the Post-oak Grape hybrids, are planted 12 to 14 feet apart, in rows 9 ft. apart, while such northern varieties as are planted are set 8 feet apart in row. The Muscadines, such as Scuppernong, are mostly grown upon arbors about 7 feet high and rarely or never pruned, although trained on trellis, as are other Grapes, and, pruned early in fall, after leaf-fall, succeed excellently. The culture is mostly with the plow, turning first away and then to the rows, hoeing the space along the row not reached by the plow. The trellis mostly used is the 3-wire trellis; first wire at 18 to 24 inches from the ground, and the others successively 1 foot apart, above the first. The training is generally an indifferent attempt at the Kniffin system, and no system is generally carried out. Some pinch back the leading shoots once, a few twice. Some use single posts and spur-prune. A few have made in the Musson canopy through trellis of 3 wires, and report most favorably of it.

Fungicides are used successfully by some. Others plant only such as Ives, Norton Virginia, Moore Early, Perkins, and some other varieties not subject to rot and mildew, so as to avoid spraying. They also avoid, thereby, having Grapes of the finer qualities, and get only the lowest prices. From such mostly come the report that Grape culture with them is unprofitable. So it should be, as such Grapes in the market have the effect to depress prices on all kinds of Grapes, as any grower knows. In the moister parts of the South, black rot, downy mildew and ripe Grape rot are very prevalent, but, excepting the ripe rot, are readily overcome by the Bordeaux mixture spray properly applied.

Few growers in the South use fertilizers in their vineyards. Some use barnyard manure, but the more intelligent use cotton seed or cotton-seed meal in connection with ground bone, kainit and soluble phosphates.

Marketing and Profits.—The crop is mostly marketed fresh in the local or near-by markets, as the ordinary freight and express rates will not permit profitable returns on the varieties mostly grown. But it has been demonstrated that fine Grapes that will carry well can easily be grown in the South, and, when handled in best manner in neat baskets, are quite profitable.

There are a few established wineries in the South, which use Ives, Norton Virginia, Herbemont, LeNoir, and some of the Scuppermong and other Muscadine varieties. The chief complaint of wine-growers is that legislation brought about by the prohibition movement is adverse and often entirely prohibitive. In consequence, some have bottled the juice fresh under some sterilizing process, but the people are not yet educated up to the use of this excellent, healthful, nourishing beverage, yet the demand for it is growing, and may be largely increased by enterprising makers.

Reports collected from all parts of the South state the profits all the way from nothing up to \$150 per acre, sometimes higher, and it is clearly evident that the intelligence and enterprise of the planter is the chief element in controlling profits. Of course, localities, soils and varieties play important parts, but an intelligent grower would not select poor locality, situation, soil and varieties to start with, just as he would not pursue poor methods in the conduct of the business. As an illustration, the writer knows persons who bring to the Denison [Tex.] market, a place of 20,000 population, Ives and Perkins Grapes in bushel baskets, getting, by hard work, about one cent a pound, while others bring in neat 8-pound baskets, carefully packed, Delaware, Brilliant, Diamond, Niagara, Rommel and others of like good qualities, and get from 30 to 50 cents per basket the season through, with brisk sales and no grumbling.

It may be said, in conclusion, that the South promises everything to the wide-awake, intelligent Grape-grower, for its capabilities are unlimited in the production in quality and season when no other section competes with it, and it has vast markets at home and in the great cities just north of it.

T. V. MUNSON.

Grapes on the Pacific Slope.—The Grape industries of California are established upon the success of the vinifera species. There are two wild species in the state, *Vitis Californica* and *V. Arizonica*, but by a popular error the term California Grape has been often used to indicate the Mission Grape, which was introduced from their earlier establishments in Lower California by the padres, who entered the territory now comprised in the state of California in 1769, to extend their missionary work among the aborigines. This Mission Grape has never been fully identified with any variety now grown in Europe, and whether the padres brought it to America in the form of seeds or cuttings is not known. The difficulty in identifying it has led many to consider it a seedling, but it is just as reasonable to hold that it was, two hundred years ago, an esteemed variety which was displaced in the course of viticultural progress by better varieties, and its survival at the California Missions is due to its isolation from that progress. It was this Grape which was found in California by the early American settlers, and very large areas of it were planted, but for the last thirty years it has decreased in favor rapidly, being displaced by many other varieties of superior value for various purposes. These varieties are almost wholly of the vinifera species. The native American varieties and their improved offspring thrive in California when given suitable situation and culture, but they do not meet any encouraging market demand. A very few packages glut the San Francisco market for their kind, while the vinifera table varieties are selling in large quantities. Only a few individuals give any consideration to American varieties for wine, and none of them are suited for raisins. The only attention given to the American species is in the use of some of them as phylloxera-resistant roots, upon which to graft the vinifera varieties, as is done in France; and California experience is a close reproduction of French results in this circumvention of the insect. It seems probable, although some districts are still free from invasion, that in the end all our vinifera vineyards will be upon American roots.

Grape-growing upon a large scale began in California very soon after the American occupation. In the fifties,

collections of the leading European varieties were introduced, and state aid was secured for the promotion of viticulture. The first raisins were shown in 1863, and a considerable wine product was attained soon after, but the sale of it was attended by many disappointments, and discouragement ensued. In the latter seventies the wine interest was revived by better demand for the product, and a new propaganda for extension on better lines and with more suitable methods and better varieties, was earnestly taken up. Again the state granted funds liberally, and the agitation resulted in vine planting and cellar construction in the valleys and foothills all over the state. The product increased more rapidly than the demand for it, and the quality of much of it was success-



974. The common short-pruning system used for the Vinifera Grape in California.

fully impeached. Losses and disappointments were again encountered, and the area of wine Grapes was largely reduced by abandonment, by the advancement of the phylloxera and by the inroads of a peculiar disease which has baffled effort to determine its cause, though thousands of acres have been swept away by it. Even the lessened wine product found most acute trade issues to meet, which were temporarily overcome by growers' cooperative effort until the constantly shrinking production met an advancing demand, and profitable prices for wine Grapes were again secured. This fact has again stimulated interest in planting, even with the greater investment required by resistant roots, and the century closes with a renewal of confidence which bids fair to again extend the wine industry of the state.

The raisin interest of the state did not attract wide attention until about 1875, but it advanced with great rapidity until 1894, when a product of 103 million pounds was reached and a decline of value below the cost of production ensued. As events have proved, this decline was largely due to lack of proper system in marketing, for a period of loss and depression has been followed by return to prices yielding a profit through control of the marketing by a cooperative association of the growers. This experience came just in time to save the raisin interest from large sacrifices, and points the way to future maintenance. The shipping of table Grapes from California to the markets of the eastern states has reached an aggregate of about a thousand car loads on several different years, and is one of the fixed features of overland fruit shipment. The area of Grapes in California in 1900 is about 140,000 acres: one-seventh table Grapes, two-sevenths raisin Grapes and four-sevenths wine Grapes, as nearly as can be estimated.

The Grape has a wider range of adaptation in California than any other single fruit. It endures all elevations to which commercial fruit-growing is carried; it thrives in the most intense valley heat if amply supplied with water by irrigation. It accepts all fertile soils, but is most profitable upon light, deep, warm loams, both in the valleys and on the hillsides. All varieties which will bear well with such treatment are grown with low stumps and very short pruning, which discards nearly all of the previous season's growth. Only a few varieties are given longer canes and the support of a wire or a high stake.

The training of the *vinifera* Grape is very unlike that of the native Grapes. The stocks are kept to low, strong stumps, and the bearing shoots are not trained or are tied to stakes. Trellises are not used. Fig. 974 shows 3 epochs in the common style of pruning, the right-hand figure representing the mature vine.

Though hundreds of varieties of *vinifera* have been introduced from Europe and Asia during the last half century, only a few have survived cultural and commercial tests and are now planted. For raisins the prevailing varieties are White Muscat of Alexandria, and the Muscatel Gordio Blanco and the Malaga, with the Sultana and Thompson Seedless for seedless raisins; for table Grapes, in addition to the foregoing, the Flame Tokay, Emperor, Cornichon, Black Malvoise, Rose of Peru, Black Hamburg, Chasselas varieties and Verdal are chiefly grown, though, of course, a much larger list prevails for local uses. In wine Grapes there is naturally a larger list to meet local requirements of soil and climate and to produce the various kinds of wine.

Acceptable varieties for dry wines are:

Red (Claret and Burgundy).—Zinfandel, Carignan, Mataro, Mourastel, Petite Sirah, Petit Bouschet, Alicante Bronschat, Grenache, Valdepenas, Cabernet Sauvignon, St. Macaire, Belgian, Mendocino, Blue Elbing, Refosco, and Barbera.
White (Sauterne, Hock, etc.).—Semillon, Sauvignon Blanc and Vert, Johannisberg Riesling, Franken Riesling, Traminer, Chasselas Dore (Gutedel), Chanche Fran, Burger, Folle Blanche, Feher Szagos, Green Hungarian, Palomino, White Pinot, Thompson Seedless.

Varities for sweet wines are:

Ports.—Mission, Malvoise, Grenache, Trousseau.
Sherry and Madeira.—Mission, Palomino, West White Profile, Verdello, Feher Szagos, Sultana, Thompson Seedless.
Anglica, Muscat, etc.—Muscat of Alexandria, Muscatella, Furmint (Tokay wine).

In regions of the Pacific coast north of California, *vinifera* varieties are less widely grown, and locations meeting their requirements must be selected with much care and circumspection. The number of varieties is much smaller than in California, as there is no product of wine or raisins, but of table Grapes only, and they are almost wholly early ripening kinds, which can mature in the shorter growing season at the North. On the other hand, the American varieties are widely grown, the Concord, Delaware, Moore Diamond, Moore Early, Niagara and Worden being most favorably reported.

E. J. WICKSON.

Grapes Under Glass.—Under glass, the European varieties alone are used. This species, *Vitis vinifera*, is the vine of the ancients, and is indigenous to the more salubrious parts of eastern Asia and southern Europe. It is referred to in the earliest mythological writings of ancient Egypt and thence on numberless occasions, notably in the Bible and the New Testament. The story of the spies from the promised land, with its generous illustration, has excited the admiration and perhaps questioned the credulity of many of us. It is only fair, however, to state that the size of the cluster there represented has been amply borne out in recent years. The type *Vitis vinifera*, if there ever was a type, has become so merged and modified by cultivation in different climates and countries that it is difficult to trace it at the present day. Over 2,000 varieties have been described, covering the widest range in size, color, texture and flavor, general appearance and quality.

For disparity of size, we have the diminutive Black Corinth, from which the Zante currants are prepared, and the giant Gros Colman, now extensively grown for commercial purposes under glass in England; and for contrast in color we have the beautiful Rose Chasselas and the pink and white Frontignans and Muscats, with their superb qualities and flavors, growing by the side of the blue-black Alicante of thick skin and coarser texture, but valuable for its late-keeping quality; and worth more than all the others put together, we have the Black Hamburg, combining all the good qualities, and easy of culture.

Probably in no branch of horticulture is the gardeners' skill more generously rewarded than in Grape-growing under glass. In England it has been an essential feature of horticultural work for more than a century, resulting in fruit of a finer quality and flavor than that grown in the open air, and very often enormous

clusters, weighing from 20 to 30 pounds. Started there as a matter of luxury, it has become of late years a matter of profit, and vineries of large extent have been erected for commercial purposes. Probably this work has been retarded here by the introduction of the many very excellent varieties of our native Grapes, so easily grown in the open air and so constantly improved by hybridizing with the European, and undoubtedly this work will yet result in a much closer approach to the standard of European quality.

The essential difference between American and European kinds is that in the American the pulp separates from the skin, is usually tough and more or less acid, so that it is disagreeable to remove the seeds, while in the European the pulp adheres to the skin, is tender and sweet throughout, and the seeds are easily removed. European Grapes, when well grown, are valuable and agreeable for the use of invalids, and, undoubtedly, in the judgment of the majority of people, surpass in quality any other fruit grown.

The subject of Grape cultivation under glass may be divided under several heads, as follows: *The Houses; The Border; The Vines; The Fruit.*

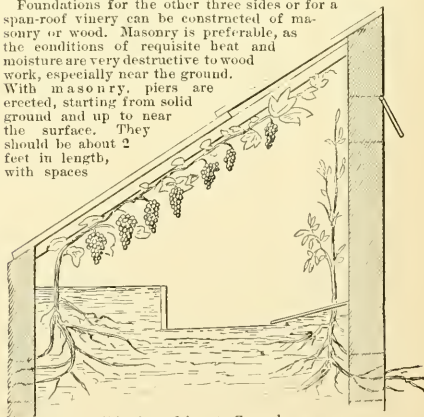
The Houses.—These are mainly of two forms, span-roof and lean-to, with occasional modifications between. Unless one has ample time and a desire to study their construction, it is better to have plans and estimates furnished by professional builders.

Span-roof houses are adapted to large places with spacious grounds, and particularly when an ornamental effect is desired. On account of their exposure on all sides, they require very careful attention, especially if used for early forcing of Grapes. Where early work is not desired, or for use without artificial heat, their disadvantage is not so apparent. Houses without artificial heat, known as cold grapeeries, were in earlier years in more general use than those with heat, but have about disappeared with the introduction of the modern economical heating apparatus, and the very great advantage in the use of the same, if only to a limited extent.

Lean-to houses, on account of their snug construction and protection from northerly or prevailing winds, are especially desirable for early forcing of Grapes (Figs. 975, 976). Often a stable or other building can be utilized for the north side, but generally a wall of brick or stone is erected for this purpose. Such a wall can be covered on the outside with *Ampelopsis triancipitata*, or Crimson Rambler roses, producing a beautiful and ornamental effect. A good house, on a small scale, can be made of hothead sash (Fig. 976).

Foundations for the other three sides or for a span-roof vinery can be constructed of masonry or wood. Masonry is preferable, as the conditions of requisite heat and moisture are very destructive to wood work, especially near the ground.

With masonry piers are erected, starting from solid ground and up to near the surface. They should be about 2 feet in length, with spaces



975. A good lean-to Grape house.

The roots run through the wall to an outside border.

of 2 feet between, and opposite each space a vine is to be planted inside the house, as hereafter described. Strong capstones, thick enough to come slightly above the surface of the border and about 18 inches wide, are then laid from pier to pier. On such a foundation a superstructure can be erected with some confidence. For the base of the superstructure masonry is preferable, about 18 inches in height being necessary before the glass work begins. A hollow wall, constructed of hard brick and cement, is desirable, and openings should be left for ventilation. The upper surface of these walls should be covered with cement. If constructed of wood, the same general plan should be carried out, using the most durable kind only.

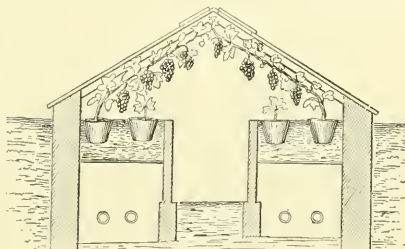
Aside from its durability, masonry has an advantage over wood in being a better equalizer of temperature, and the heavy back wall of a lean-to house can be made of great value for this purpose. The general plans of the superstructure are shown in the illustrations. It should present as much glass surface as possible. The frame can be of iron or wood, as preferred. Light, heat and moisture are the great features desired, also a generous supply of air under favorable conditions. The glass should be of good quality, otherwise blisters will burn the foliage and fruit. Small ventilators covered with wire gauze should be built in the foundation walls, and large ones at the upper part of the house. Ventilation should always be free from a draft or sudden change of temperature. A draft is just as unpleasant to a sensitive vine in a house as it is to a human being, and if subjected to it disease is sure to follow, mildew being the first evidence; and yet a generous supply of air is a prime requisite in growing Grapes under glass, especially during the ripening period. Previous to that time the lower ventilators should be very carefully used, some growers never opening them until the Grapes begin to color, and the new growth and foliage are somewhat hardened. More or less air is always admitted around the glass in a very equable manner and thence to the upper ventilators.

The modern heating apparatus, consisting of a boiler in an adjacent pit for heating water, with circulating pipes throughout the house, as shown in illustrations on *Greenhouse*, is a very perfect and economical supplier of heat, and it should be erected by a practical builder. A little heat at a critical time will often save a house full of Grapes, and, while it can be dispensed with, its advantages are very material.

It is possible to fruit Grapes in benches in pots, removing the pots when the fruit is past, and using the house for other purposes (Fig. 977).

The Border.—A good border is of great importance, as no permanent success can be obtained without it, and probably the difference between success and failure more often lies here than in any other feature.

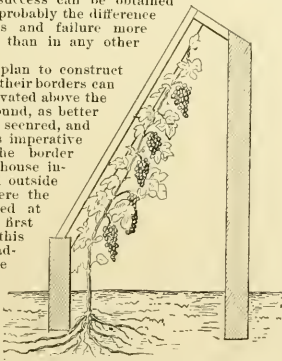
It is a good plan to construct vineries so that their borders can be somewhat elevated above the surrounding ground, as better drainage is thus secured, and good drainage is imperative (Fig. 975). The border should fill the house inside and extend outside adjacent to where the vines are planted at least 6 feet when first made, and to this outside border additions should be made every two or three years of from 2 to 4 feet until a width of 20 feet is secured. The border can hardly be made too rich, provided the material is well decomposed. A mixture of six parts good loamy turf from an old pasture or piece of new ground, and one part of well



977. Even-span house, with the vines plunged in pots.

these probably do a minimum of damage. In such a border, if properly supplied with water, the vine roots will remain at home, and not go wandering off into trouble. Where extra early work is not desired, no attempt should be made to keep the frost entirely out of the border during the winter, as this is apt to result in a heavy, sodden surface in spring. It is better to spade it up roughly just before winter and cover with a good coat of manure, permitting the frost to enter the ground some inches. In the spring it is dug over again and, when raked off, presents a rich, lively surface. The inside border is to be covered with a coat of well-rotted manure, and spaded up and well watered at the time of starting the vines. For midseason work, from February 15 to March 1 is the proper time to do this in New York state, the inside border carrying the vines nicely until the outside border is in shape a month or more later. Then without hard forcing early Grapes can be brought in by the last of June or July, and the later ones through the following two or three months. It is much better to store late Grapes in modern Grape rooms, where they can be kept fresh and plump for several months through the winter, than to attempt extra early work by starting vines in heated borders in November and December.

The Vines.—The amateur should purchase these from some nurseryman of established reputation. Vines 1 or 2 years old are better than older ones. For supporting the vines, light cast-iron brackets are secured to the rafters, and these support wires running lengthwise of the house about 15 inches from the glass, and to these wires the vines are tied as fast as they grow. The vines are to be planted inside the house about a foot from the front wall and about 4 feet apart, placing one opposite each opening in the foundation as before described. It is not desirable to plant them along the back wall of a lean-to house. They should be cut back to two or three buds near the ground, and when these start the strongest shoot only is selected for training and the others rubbed off. As this shoot advances it is tied to the wires, and it may reach the limit of the house by July 1, or perhaps not until September 1, depending on the care, the vigor of the vine, and the border. Once there, the end is pinched and the cane continues to strengthen and increase in size and store up material in the lateral buds until the end of the season, when it is taken down and pruned to one-third its length, laid on the ground and covered from the sun for the winter. Care should be taken that mice do not eat out the buds, as once out they can never be restored. In the spring of the second year, or as soon as it is desired to start the vines, they are tied up again, and the terminal shoot again trained to the top of the house, where it is stopped as before.



976. Lean-to graperly glazed with sash.

Any fruit appearing on this shoot should be removed. The lateral shoots that start out each way below the terminal should be thinned to about 12 or 15 inches apart on each side. This is an important feature, especially if we adopt the spur system of pruning, which we will first consider, for we are now establishing our vine for a long term of years, and it is desirable to have it symmetrical with the side shoots, and fruit evenly distributed over its entire length. An example of a well balanced vine is given in the illustration of the Muscat Hamburg. A few clusters of fruit may be taken from this part of the vine this second year, and the laterals should be pinched at two eyes beyond the cluster, and as they break pinched again through the season. As soon as the leaves fall, the vines are again taken down for pruning. The terminal should be shortened about one-half and the side shoots cut back to a bud very close to the main stem, when it goes through the winter as before.

At the beginning of the third year the terminal again goes to the top of the house without fruit, when it is stopped and the laterals are allowed to bear as before, say not more than one pound of fruit per foot of the main stem. We now have our vine established to the top of the house, and the only pruning in after years is to cut the laterals each year close to the main stem. A bud will nearly always be found in the first one-eighth inch, sometimes several of them. When these start, the strongest is selected and the others rubbed off, unless one is desired for training to the opposite side to fill a vacancy there. When the vines attain full strength, two pounds of fruit per foot of main stem can be grown, but heavy loads require great care. Too heavy a load causes shanking, and then all is lost. The stems of the berries wither and the fruit turns sour before ripening. Rigid pinching of the laterals is very important. Commence at the second joint beyond the cluster, or about 18 inches from the main stem, and



978. Pruning to spurs.

A long or old spur is shown on the left.

pinch thereafter as fast as new shoots break and show a leaf. Pinch early and often. It has been said that a good gardener can carry the summer prunings from a large vineyard for an entire season in his vest pocket. Some require a wheelbarrow. At the place where the laterals start, a spur soon forms on the main stem, from

which the system takes its name. It often becomes several inches in length and quite ungainly. This spur system of pruning is represented in Figs. 978-980.

In the other system of pruning, known as the "long rod" or "long cane" system, a new cane is grown up from a bud near the ground every year as often as desired to replace the old one, which is entirely removed. It is often desirable to do this. If the vine is well established, this new cane can be pruned its entire length the first season, the laterals being pinched, as before described. It will produce finer fruit, but it is not as safe with a heavy load as an old cane.

An ample supply of water judiciously and freely used, particularly at the time of starting the vines, is an absolute necessity. It should not be applied in the house, however, during the period of blossoming, as a dry air is advantageous for the transfer of the pollen for fertilization.

An important feature is thinning the clusters and establishing the load a vine has to carry. This requires experience and judgment. As a rule, about one-half the clusters should be removed—often more—care being taken to balance the load evenly on each side. This should be done as early as the general form of the clusters can be seen, except with the Muscates and other shy setting kinds, when it may be well to wait for the berries to set, as some clusters set perfectly while others fall.

Thinning the berries should be attended to promptly, selecting cool days and mornings for this work. Close growing kinds, like Alicante, cannot be commenced on too early after setting, and it is much better to crowd this work than to have it crowd the operator. In many varieties one-third to one-half the berries have to be removed. Experience is the only guide in this. A pointed stick is very useful with the vine scissors, and never touch the clusters with the fingers.

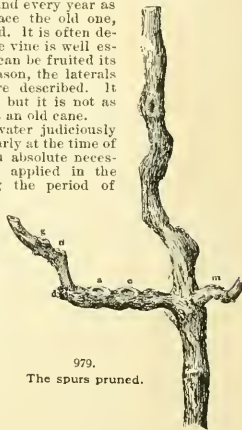
Tying up the shoulders of the clusters is necessary to permit a free circulation of air and light, otherwise the interior may decay, and, once started, the cluster is soon gone. The principal diseases or troubles to guard against are mildew and red spider. The remedy for the former is sulfur, and for the latter moisture. Mildew is generally brought on by a sudden change of temperature. A vigorous condition of the vine has much to do in resisting it. Red spider will almost always appear in the hot weather of July and August if the vines are allowed to become too dry.

Thrips are sometimes very injurious, but can be controlled with nicotine, which, if properly applied, will not injure the fruit. Thrips and red spider, if not taken in time, multiply rapidly, and "an ounce of prevention is worth a pound of cure" in these cases.

Perhaps, in a general way, the most important requisite of all is a large amount of enthusiasm and love for the work. This is necessary to insure the continued care and culture requisite to permanent success.

The Fruit Varieties.—As said before, very many varieties exist, but probably not one-half of these are in active cultivation at the present time. Varieties are adapted to localities, soils, climates, etc. Perhaps 50 have been grown under glass in this country. Of these we will consider a few of the more prominent.

The Black Hamburg is more extensively grown and of more value for this purpose than all others put together, because it meets the requirements of the ordinary cultivator, and will stand abuse and neglect and still give fair results better than any other kind. It rarely gives very large clusters, but is a free bearer, sets perfectly, will carry heavy loads and matures early. Under better care the appearance and improvement in



979. The spurs pruned.



Duchess, one of the choice American Grapes

quality is remarkable, and it can be made as good as the best. It is the variety with which the novice begins. Many houses consist entirely of Black Hamburgs, and many that do not would give far better satisfaction if they did.

Muscat of Alexandria is the best of the white varieties for general cultivation. It requires a higher temperature and longer season than the Black Hamburg to come to perfection, and will keep longer after cutting than that kind. When well grown and ripened it may be taken as a standard of quality. See Fig. 980.

Muscat Hamburg is a black Grape, probably a cross between the two above named varieties, and presenting marked characteristics of each. It has beautiful tapering clusters of fine quality.

Barbarossa is a good variety for those ambitious to grow large clusters, and when well grown is of fine quality. It is a late black Grape, requiring a long season to ripen well, but repays for the trouble by keeping thereafter for a long time. Clusters frequently grow to 8 or 10 pounds in weight, measuring about 24 inches each way, and they have been grown to more than double this weight.

Other large-growing varieties are the White Nice and Syrian, the latter of which is said to be the kind that the spies found in the land of promise. Clusters of 20 to 30 pounds weight are common to these two coarse-growing kinds, but their quality is so poor that they are now rarely grown.

Grizzly Frontignan is a beautifully mottled pink Grape—quite a deep pink sometimes—and has long, slender clusters. In quality and flavor it is unsurpassed by any other Grape, and it ripens rather early.

Royal Muscadine is an early white Grape of fair quality and good habit; frequent in English houses.

Gros Colman, a large black Grape of fine quality and a late keeper, is now grown largely for commercial purposes in England and sent to this side to supply our wants in this line in spring. The berries frequently measure $4\frac{1}{2}$ inches around, and it therefore requires early and severe thinning.

Alicante is a black Grape of very distinct character, seeming to depart somewhat from the vinifera type, very juicy, and of fair quality. It has a very thick skin, and is about the best for long keeping.

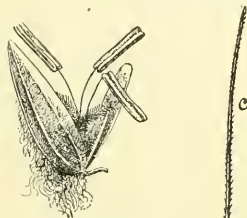
Lady Downys is another late black Grape of good quality, but not adapted to all localities. Rose Chasselas, a small red Grape, is the earliest and very beautiful. Trentham Black, the earliest black Grape, has small clusters, but large, soft berries quite like Alicante.



980. Muscat of Alexandria.

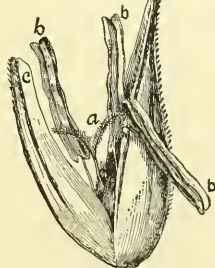
Bearing on spurs (as explained in Figs. 978, 979).

Foster Seedling is a beautiful midseason, amber-colored Grape, with large clusters and berries sometimes liable to crack. Madresfield Court Muscat is a



981. Floret of June-grass. Showing the floral glume, pelt, two feathery stigmas, and three stamens. Enlarged.

(See *Grass*, p. 682.)



982. Floret of a Grass (rye). Much enlarged. cc, floral glume and pelt; a, stigmas; bbb, stamens.

midseason Grape—fine in quality, but also inclined to crack. This trouble can often be controlled by twisting or slitting the stems of the clusters, thereby checking the flow of sap.

Many other popular varieties are described in various works devoted to Grape culture.

For other notes on Grapes under glass, see the article on *Forcing*. D. M. DUNNING.

GRAPE-FRUIT. See *Citrus Decumana* and *Pomelo*.

GRAPE HYACINTH. *Muscari botryoides*.

GRAPE, SEASIDE. *Coccoloba uvifera*.

GRAPTOPHYLLUM (Greek words referring to the variegated foliage). *Acanthaceae*. An oriental genus of about 5 species of tender shrubs, one of which is cult. in a very few American conservatories for its variegated foliage, and is said to be very popular in India and through the tropics. No two lvs. are marked exactly alike, but the yellow color is near the midrib rather than at the margins. The genus is close to *Thyracanthus*, but in *Thyracanthus* the fls. are not so distinctly 2-lipped. Lvs. opposite, entire (in one species spiny-dentate), often colored; fls. reddish purple, wide gaping, clustered either in a terminal thyrse or in the axils; corolla tube inflated above; upper lip with 2 short recurved lobes; lower lip 3-ct; stamens 2. For culture, see *Justicia*.

hortense, Nees (*G. pictum*, Griff. *Justicia picta*, Linn.). **CARICATURE PLANT.** Height finally 6-8 ft.: lvs.

elliptic, acuminate, irregularly marked with yellow along the midrib; fls. crimson, in axillary whorls; corolla pubescent. Habitat? B.R. 15:1227. Lowe 45. (B.M. 1870 shows a variety with reddish brown coloring).

GRASS (*Gramineæ*). Annual or perennial herbs (some bamboos woody), mostly tufted or decumbent, rarely climbing, often creeping and rooting at the base. True roots fibrous. Stems (culms) simple or branching, usually hollow (wheat), sometimes solid (maize) between the nodes. Leaves springing from the nodes, alternate, in two vertical rows on the stem; the sheaths closed



983. Spike of a Grass (rye), containing many flowers.

when young, but usually split down one side in maturing; ligule a thin tongue-like growth at the apex of the sheath; blade entire, parallel-veined, commonly long and narrow; a 2-keel'd membranous prophyllum (or leaf) always standing between each branch and the main axis. Spikelets in panicles, racemes or spikes, usually consisting of 2 (rarely 0, 1, or more than 2) chaffy empty glumes at the base of a short axis (rachilla), which supports one or more floral glumes, in the axil of each of which is commonly 1 flower. Flowers

perfect or imperfect, destitute of true calyx or corolla. Between each floral glume and flower are usually 2 (rarely 3) minute hyaline scales (lodicules). Stamens 3 (rarely 1, 2 or more than 3); pistil 1; ovary 1-celled, 1-ovuled; styles 2 (rarely 1 or 3), usually plumose; fruit (grain or caryopsis) seed-like, often enclosed by the paleot and its floral glume. Seed erect, closely covered by the thin pericarp; embryo small, on one side of the base of the endosperm. Figs. 981-984 show the structure of various Grass florets.

Perennial Grasses, such as those commonly grown for meadow, pasture or lawn, produce large numbers of sterile shoots that bear leaves from very short stems, but no flowers. There are many widely different plants, which in popular language have the name "grass" attached to them, such as knot-grass, rib-grass, cotton-grass, sea-grass, cel-grass, sedge-grass, scorpion-grass, but these do not belong to the family here under consideration. Neither are the clovers and their allies, or the sedges and rushes, to be called Grasses. No other plants are truly entitled to this name, excepting those answering to the description above given.

The plants most likely to be mistaken for Grasses are the sedges (*Cyperaceæ*), of which there are large numbers in great variety frequently found on wet land. The best popular way to distinguish Grasses from sedges is this: the leaves of sedges are arranged on 3 sides or angles of the stem, while in Grasses they are found on 2 sides, alternate and 2-ranked. In making use of this test, care must be taken to select well grown, erect stems. Most sedges have solid stems and most Grasses have hollow stems. To learn to distinguish plants of the Grass family is easy, but to discriminate between species is difficult.

Among the species most commonly known are timothy, red top, June-grass, orchard-grass, meadow fox-tail, the fescues, oat-grass, sweet-vernial, quack-grass, Bermuda-grass, sugar cane, chess, and the cereals, such as wheat, barley, rye, oats, rice, sorghum, Indian corn. In number of species the Grass family occupies the fifth place with 3,500, while the composite, legumes, orchids and madder-trees are larger. In number of individuals, the Grasses excel any other family. Seed plants are arranged in 200 to 220 families, and of all these the true Grasses are of greatest importance to man; in fact, they are of more value as food for man and domestic animals than all other kinds of vegetation combined. None of these families is more widely distributed over the earth's surface, or is found in greater extremes of climate or diversity of soil.

The species are very numerous in tropical regions, where the plants are usually scattered, while in a moist, temperate climate, though the species are less numerous, the number of plants is enormous, often clothing vast areas. Where soil is thin or moisture insufficient, the Grasses grow in bunches more or less isolated. Plants of one section of the family *Panicaceæ* predominate in the tropics and warm temperate regions, while plants of the other section, *Poaceæ*, predominate in temperate and cold regions.

Overstocking dry grazing districts checks the better Grasses, destroying many of them, and encourages the bitter weeds which multiply and occupy the land.

A Grass extends its domain by running root-stocks, by liberating seeds enclosed in the glumes, which are caught by the breeze, by some passing animal, or the nearest stream; the twisting and untwisting of awns bury some of them in cracks, crevices or soft earth. In case a growing stem is thrown down for any reason, several of the lower nodes promptly elongate on the lower side and thus bring the top into an erect position. Each sheath supports and holds erect the tender lower portion of the internode, where it is soft and weak; it also protects the young branches or panicles. Thrifty blades of Grasses suitable for pasture and lawn elongate from the lower end, so that when the tips are cut off the leaves do not cease to elongate, but renew their length. When exposed to sun or dry air, the blades develop a thicker epidermis, and, by shrinking of some of the delicate bulliform cells of the upper epidermis, they diminish their surface as they roll their edges inward or bring them together, like closing an open book. When the plant is in flower the minute and delicate lod-

cules become distended just in time to spread the glumes and liberate the stamens.

Grasses are not so much employed for ornamenting homes as their merits warrant. By selecting, some can be found suited to every week of the growing season, though many of them are in their prime during June, the month of roses. Wild rice (*Zizania*) is fine for rich soil in the margins of ponds, and masses of reed grass for deep beds of moist muck. For massing or for borders the following and others are stately: *Arundo Do-*



984. Staminate spikelet of a Grass (maize).

Showing two florets, one of which (with three stamens) is expanded. 1, 1, empty glumes; 2, 2, palea. Enlarged.

roz, *A. conspiciua*, maize, pampas grass, Eulalia, ribbon grass, *Andropogon formosus*, 1, *Halepensis*, *Asperella Hystrix*, Tripsacum. For glaucous blue-green, use *Elymus arenarius*, *Festuca glauca* and *Poa casia*. For potting and borders, there are striped varieties of Dactylis, Anthoxanthum, Alopecurus, *Holcus lanatus*, *H. mollis*, *Poa trivialis*, *Phleum pratense*; and others may soon be produced. For table decoration nothing is better than the elegant, airy panicles of large numbers of wild Grasses, such as species of *Poa*, *Koeleria*, *Eatonia*, *Panicum*, *Paspalum*, *Eragrostis*, *Muhlenbergia*, *Bromus*, *Festuca*, *Agrostis*, *Deschampsia*, *Uliola*, *Briza*, *Cinna pendula*. For large halls and exhibitions, what surpasses sheaves of wheat, barley, rice, oats or any of the wild Grasses? For decoration, Grasses should be cut before ripe, dried in the dark in an upright position, and may be used in that condition or dyed or bleached. For paths, nothing is more pleasing than strips of well mown lawn.

Drainage keeps out sedges and encourages the better Grasses; manure and irrigation help the best Grasses to choke and diminish most weeds. Enough has already been done to show that rich rewards are sure for him who patiently and intelligently attempts to improve Grasses for any purpose whatever by selection and crossing. Quack-grass is excellent for holding embankments; *Ammophila arenaria* for holding drifting sands. The Grass family furnishes its full quota of weeds, among them quack-grass, crab-grass, chess, June-grass, sand-bur, stink-grass.

Turf-forming Grasses are those that spread freely by creeping rootstocks, such as June-grass, quack-grass, Bermuda-grass, Rhode Island bent and red-top, while most others are more or less bunchy. For northern regions not subject to severe droughts, sow Rhode Island bent and June-grass both, or either one alone; for northern regions, which are liable to suffer from dry weather, sow June-grass and plant Bermuda-grass. These two on the same ground supplement each other in different kinds of weather, securing a green carpet during every part of each growing season. W. J. BEAL.

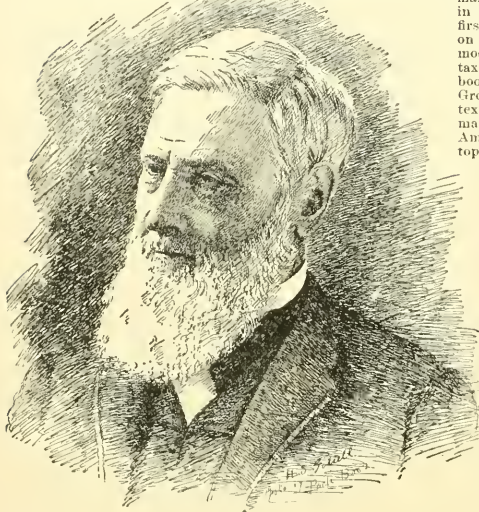
GRASSES, POPULAR NAMES OF.

There are few Grasses which hold commanding positions as specimen plants, although the agricultural values of Grasses are transcendent. Some of the commoner vernacular Grass names are given below, with references to the proper genera: Animated Oats, *Avena*. Artificial G., sometimes used for certain forage plants, as sorghum, but also leguminous plants, as clover, lucerne, sainfoin. Awless Brome G., *Bromus inermis*. Beach G., *Ammophila arenaria*. Bear G., unusual name for *Yucca filamentosa*. Beard G., *Andropogon*; also *Polyopogon Monspeliensis*. Bengal G., *Setaria Italica*. Bent G., *Agrostis*. Bermuda G., *Capriola Dactylon*. Blue-eyed G., *Sisyrinchium*. Blue G., *Poa*. Blue Joint G., *Calamagrostis Canadensis*. Bog G., *Carex*. Bristly Fox-tail G., *Setaria magna*. Brome G., *Bromus*. Buffalo G., *Buchloë dactyloides*. Canada Blue G., *Poa compressa*. Canary G., *Phalaris Canariensis*. Cat-tail G., *Phleum pratense*. China G., *Behmeria nivea*. Citronella G., *Andropogon Naridus*. Cotton G., *Eriophorum*. Couch G., *Agropyrum repens*. Crab G., *Elymus* and *Panicum sanguinale*. Creeping Bent G., *Agrostis stolonifera*. Cream G., *Phalaris aristata*. Crested G., *Deer G.*, *Rhexia Virginica*. Dog's Tail G., *Cynosuroides*. Eel G., *Vallisneria spiralis*. English Rye G., *Lolium perenne*. Esparto G., *Stipa tenacissima*. Feather G., *Stipa pennata*. Feather Sedge G., *Andropogon saccharoides*. Fescue G., *Festuca*. Finger-comb G., *Dactyloctenium*. Finger G., *Chloris*. Fowl Meadow G., *Poa serotina*. Fly Away G., *Agrostis scabra*. Four-leaved G., *Paris quadrifolia*. Fox-tail G., *Alopecurus pratensis*. Golden Top G., *Lamarekia aurea*. Guinea G., *Panicum jumentorum*; also erroneously used for *Andropogon Hialepensis*. Hair G., *Agrostis scabra*. Hare's Tail G., *Lagurus oratus*. Hassock G., *Deschampsia cespitosa*. Herd's Grass in New England is timothy (*Phleum pratense*); in Pennsylvania, Florin (*Agrostis vulgaris*). Holy G., *Hierochloa borealis*. Hungarian G., *Setaria Italica*. Italian Rye G., *Lolium Italicum*. Japanese Lawn G., *Zoysia pugens*. Job's Tears G., *Coix*. Johnson G., *Andropogon Hialepensis*. June G., *Poa pratensis*. Kentucky Blue G., *Poa pratensis*. Large Quaking G., *Briza maritima*. Little Quaking G., *Briza minor*. Love G., *Eragrostis elegans*. Lyme G. of upholstery is *Deschampsia cespitosa*. Marram G., *Ammophila arenaria*. Meadow Fox-tail G., *Alopecurus pratensis*. Myrtle G., *Acorus Calamus*. Oat G., *Arrhenatherum arvenicum*; also various species of *Avena*. Orchard G., *Dactylis glomerata*. Palm-leaved G., *Panicum salicatum*. Pampas G., *Gynerium*. Pepper G., *Lepidium*; also *Ptilularia globulifera*. Plume G., *Erianthus Ravenna*. Pony G., *Calamagrostis stricta*. Purple Bent G., *Calamovilla brevifolia*. Quack, Quick, or Quitch G., *Agropyrum repens*. Quaking G., *Briza*. Rattle-snake G., *Briza maritima*. Ray G., *Lolium perenne*. Red Top G., *Agrostis vulgaris*. Reed G., *Arundo*, *Bamboo*. Reed Bent G., *Calamagrostis*. Reed Canary G., *Phalaris arundinacea*. Rescue G., *Bromus unduloides*. Rhode Island Bent G., *Agrostis exaristata*. Ribbon G., *Phalaris arundinacea*, var. *variegata*. Rough Bent G., *Agrostis scabra*. Roughish Meadow G., *Poa trivialis*. Rough-Stalked Meadow G., *Poa trivialis*. Rye G., *Lolium perenne*. Sand G., *Calamovilla longifolia*. Scurry G., *Coactlearia officinalis*. Scutch G., *Capriola Dactylon*. Seacoast Bent G., *Agrostis coarctata*. Seneca G., *Hierochloa borealis*. Sesame G., *Tripsacum*. Sheep's Fescue G., *Festuca ovina*. Silk G., *Agrostis scabra*. Silver Beard G., *Andropogon argenteus*. Sour G., local name for *Rumex Acetosella*. Squirrel-tail G., *Hordeum*. Star G., *Callitriche*; also locally for *Hypericis* and *Aletris*. Striped G., *Phalaris arundinacea*, var. *variegata*. Sweet-scented Vernal G., *Anthoxanthum odoratum*. Tall Meadow Oat G., *Arrhenatherum elatius*. Tickle G., *Agrostis scabra*. Tear G., *Coix Lacryma-Jobi*. Texas Blue G., *Poa trachinervis*. Timothy, *Phleum*. Tufted Hair G., *Deschampsia cespitosa*. Vanilla G., *Hierochloa borealis*. Viper's G., *Scorzonera*. White Bent G., *Agrostis alba*. Whitlock G., *Draba*, especially *D. verna* and *Saxifraga tritaclytites*. Wood Meadow G., *Poa nemoralis*. Woolly Beard G., *Erianthus*. Worm G., *Spigelia*; also *Scdum album*. Yellow-eyed G., *Xyris*. Zebra G., *Miscanthus Sinensis*.

GRASSWORT. See *Cerastium*.

GRATIOLA (Latin, *grace* or *favor*, from its reputed healing qualities). *Scrophulariaceae*. This genus contains an unimportant trailing annual, which grows wild in wet, sandy places from Quebec to Fla., and bears yellow fls. half an inch long, from June to September. *G. aurea*, Muhl., was once offered by collectors. It is a glandular plant, with lvs. lanceolate, entire or remotely denticulate, and 2 sterile filaments. B. B. 3:162.

GRAVÉSIA (after C. L. Graves, who collected in Madagascar). *Melastomaceae*. Three species of dwarf warmhouse foliage plants, natives of Madagascar, and



985. Asa Gray at 76 years.

cult. in a few American conservatories. For culture and for distinctions from allied genera, see *Bertolonia*, under which name most of the varieties are still known.

guttata, *Trisana* (*Bertolonia guttata*, Hook.). Cauliscent, erect; branches obtusely 4-angled; petioles long, densely scurfy-powdery; lvs membranous, 5-nerved, rounded at base, slightly scurfy above and spotted, under side and calyx scurfy-powdery. cymes terminal, several-fl. Int. 1865, and first described at B.M. 5524 as *B. guttata*, where the lvs. are shown with fairly well defined, double, longitudinal rows of roundish pink dots. F. S. 16:1696 is probably a copy of B.M. 5524. (See, also, Gt. 1865, p. 385, and E. H. 1865, p. 225.) Var. *superba*, Hort. L. H. 26:359 (1879) is shown, with more and larger reddish purple spots, which are less regularly arranged. Var. *legrelleana* (*B. Legrelleana*, Van Houtte). An alleged hybrid obtained by Van Houtte and figured in F. S. 23:2407. Coigneux refers this plate to *Gravesia guttata*, but no fls. are shown, nor have the lvs. any spots. The nerves are outlined in white, and some of the cross veins for short distances. Var. *Alfred Bleu* is brilliantly spotted and lined with bright red, the nerves wholly outlined, the cross veins interruptedly outlined. I. H. 41:13 (1894). Var. *margaritacea*, Nicholson (*B. margaritacea*, Hort. W. Bull.—*Salpiglossis margaritacea*, F. S. 16:1697). See DC. Mon. Phan. 7: 537.

GRAY, ASA (Fig. 985), botanist and naturalist, was born in Paris, Oneida county, N. Y., Nov. 18, 1810, and died in Cambridge, Mass., Jan. 30, 1888. His father was a tanner. He studied medicine, but never practiced it. He early became interested in botany, and entered into correspondence with Dr. Lewis C. Beck and Dr. John Torrey, both of whom were well known botanists of the time. In 1833, Gray became assistant to Torrey, who held the chair of chemistry and botany in the New York College of Physicians and Surgeons. From this connection dates his serious botanical work. His first book, the "Elements of Botany," appeared in 1836. To the schools, however, he became best known through his "Lessons," which first appeared in 1857. To the last revision of this book, in 1887, he gave the name "Elements of Botany," thus revising the title of his maiden effort. The "Botanical Text Book" first appeared in 1842; it went to a sixth edition in 1879. From the first this work was accepted as the highest authority on the subjects which it treated; and it is to-day the model for the formal presentation of morphology and taxonomy. Gray is further known as an author of textbooks in the admirable books for youth, "How Plants Grow," 1858, and "How Plants Behave," 1872. Gray's texts at once became standards, and have done more to make botany teachable in the schools than any other American works. They are expressions of the older or topical method of presenting plant subjects, as contrasted with the newer ideals which first introduced the pupil to biological or life problems. They will always be known as having marked an epoch in the teaching of botany in America.

Gray was chiefly known for his taxonomic and descriptive work with plants. It fell to his hand to review the North American flora. The western country was largely unknown botanically. The collections of government surveys and of individuals went to him for study. His publications on this new flora are voluminous and critical. He also reviewed the floras of many of the Pacific islands and of Japan. His most ambitious work was the "Synoptical Flora of North America." This great work began to appear in 1838, at which time he was a junior author with Torrey. After having passed to two volumes, comprising the orders from Ranunculaceae through Compositae, the work was discontinued until, in 1878, he published the *Gamopetalae* after Compositae. In 1884, he published the families from Caprifoliaceae through Compositae. The necessity of studying the wealth of new material resulting from the extension of the national domain made the completion of the work impossible in the interim. The work is still in progress by Gray's successors.

Gray's most widely known systematic work is the "Manual of the Botany of the Northern United States," which first appeared in 1848, and which he took through five editions. The sixth edition, from the hand of Sereno Watson, Gray's successor in taxonomic work, appeared in 1869. From the first it has been the standard flora of its region. In 1868, Gray supplemented the manual by the "Field, Forest and Garden Botany," which was designed as an easy introduction to the common wild and cultivated plants. Gray regarded this as his poorest work, yet it met a need and has been deservedly popular. It has been our most acceptable account of cultivated plants. It lacks the critical spirit of his other works, and the accounts of the cultivated plants were drawn largely from literature, rather than from the plants themselves. Working chiefly with taxonomic questions, Gray found little interest in plants which, by domestication, have been made to vary to the confusion of the old specific bounds. Yet it is remarkable how accurately he indicated the species which have been chiefly concerned in the evolution of garden forms, and how comprehensively he covered the field of the domestic flora. A revision of the "Field, Forest and Garden Botany" was made in 1895.

In his view of species, Gray accepted the dominant English ideal as held by the Hookers and by Bentham. Species were large conjunctive groups; he tended to make few rather than many. There were indications of a revolt from this point of view in the later years, but:

his personality and influence prevented any great defection. At the present time, the pendulum seems to have swung to the opposite extreme. Species are small disjunctive groups; authors tend to make many rather than few. It will probably be a decade or more before the species-ideal swings back to the middle point, where only a pendulum can remain.

Gray was a philosophical naturalist. He was one of the first of the great American naturalists to espouse the main argument of Darwin's "Origin of Species." In this respect he stands in bold contrast to his great colleague Agassiz. Gray's influence was the greater because he was known to be a pronounced theist. He entered the conflict which arose between organic evolution and theology, and did much to heal the schism. His writings on the evolution controversies were published in two volumes, "Darwiniana" and "Natural Science and Religion."

Gray was a constructive philosopher, as well as a critic. His essay on the "Relations of the Japanese Flora to that of North America," was one of the first masterful attempts to explain the principles of the distribution of species. This essay stands for the following conceptions: that species have one origin; that distribution over the earth is due to physical causes; that the origin of the north temperate flora is circumpolar. One who is unfamiliar with the points of view of his time cannot catch the full significance of these conclusions. They are now accepted, not challenged. Into philosophical discussions of cultivated plants he made few excursions, although his paper on the running out of varieties has become a standard; and in his many reviews he made occasional contributions to this field.

Asa Gray was a lovable man. He was gentle, quiet, sweet-tempered; intellectually he was keen and penetrating. Both by his personality and his teaching, he exerted an incalculable influence on American botany, and, indeed, on American biological science. In Europe he became a representative of what was best in American science. Harvard College, in which he held a professorship from 1842 until his death, became the Mecca of every American botanist. Here he built up the most important herbarium and botanical library in the New World. He was the master of American botany.

Gray's writings were voluminous. He was known as one of the most skilful of American reviewers and biographers. His scattered untechnical writings were republished in two volumes in 1889, by Professor Sargent, as the "Scientific Papers of Asa Gray." See the "Letters of Asa Gray," 2 vols., 1893, by his widow, Jane Loring Gray. L. H. B.

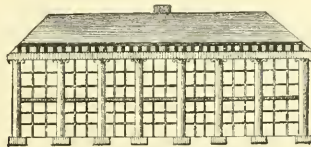
GREENHOUSE. In America the word Greenhouse is used generically for any glass building in which plants are grown, with the exception of coldframes and hotbeds. Originally and etymologically, however, it means a house in which plants are kept alive or green: in the Greenhouse plants are placed for winter protection, and it is not expected that they shall grow. The evolution of the true Greenhouse is credited to have begun with the idea of a human dwelling house. At first larger windows were inserted; and later, a glass roof was added. In early times it was thought best to have living rooms above the Greenhouse, that it might not freeze through the roof. Even as late as 1806, Bernard McMahon, writing in Philadelphia, felt called upon to combat this idea. The old or original conception of a Greenhouse as a place for protecting and storing plants is practically extinct, at least in America (Fig. 986).

Other types of plant houses are the conservatory (which see), in which plants are kept for display; the forcing-house (see *Forcing*), in which plants are forced to grow at other times than their normal season; the stove or warmhouse; the propagating pit. Originally the warmest part of the plant-house, that part in which tropical plants were grown, was heated by a stove made of brick, and the house itself came to be called a stove. This use of the word stove to designate the warmest part or room of the range is universal in England, but in America we prefer the word warmhouse (and this word is used in this Cyclopaedia). Originally, hothouse was practically equivalent to stove, but this term is

little used in this country, and when used it is mostly applied generically in the sense of Greenhouse.

It will thus be seen that there is no one word which is properly generic for all glass plant-houses. The word greenhouse has been suggested, and it is often used in this work; but there are other glass houses than those used for plants. It seems best, therefore, to use the word Greenhouse for all glass buildings in which plants are grown; and usage favors this conclusion.

The long, low Greenhouse range, of the type which we now know in our commercial establishments, probably had a different origin from the high-sided Greenhouse. The greenhouse range appears to have developed from the practice of protecting fruits and other



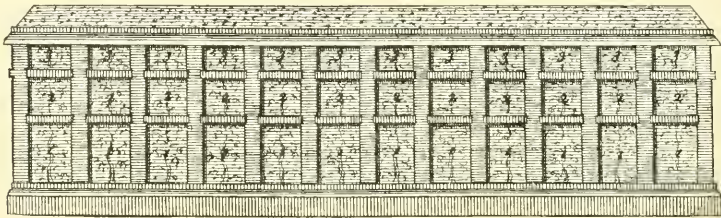
986. The old-time Greenhouse.

With opaque roof and sash-made sides (Abercrombie, 1786).

plants against a wall. In European countries, particularly in England, it is the practice to train fruits and other plants on stone or brick walls, in order that they may be protected from inclement weather and receive the greater sun heat which is stored up in the masonry. It occurred to Nicolas Facio Duilhier to incline these fruit walls to the horizon so that they would receive the greater part of the incident rays of the sun at right angles. He wrote a book on the subject of "Fruit-Walls Improved," which was published in England in 1699. Facio was a mathematician, and he worked out the principle of the inclined walls from mathematical considerations. Such walls were actually built, but according to the testimony of Stephen Switzer, who wrote in 1724, these walls were not more successful than those which stood perpendicularly. Certain of these walls on the grounds of Belvoir Castle, and over which grapes were growing, received the additional protection of glass sash set in front of the inclined walls and over the vines. In addition to this, flues were constructed behind the wall in order that heat might be given. The construction of hollow heated walls was not uncommon in that day. The satisfactory results which followed this experiment induced Switzer to design glass-covered walls. The "glasshouse" which he pictured in the "Practical Fruit-Gardener" (1731) represents a Greenhouse $3\frac{1}{2}$ ft. wide in the clear, Fig. 987. At the back of this house is an inclined heated wall on which the grapes are grown. Three and one-half ft. in front of this, a framework is erected to receive the sash. There are 3 tiers of openings or windows along the front, the two lower ones of which are for window sash, and the upper one is vacant in order to provide for ventilation and to allow space to receive the lower sash when they are lifted up. The whole structure is covered with a roof or coping. Switzer declares that the introduction of these covered, sloping walls "led the world" to the "Improvement of glassing and forcing grapes, which was never done to that Perfection in any Place as it is upon some of the great Slopes of that elevated and noble Situation of *Belvoir Castle*." Johnson, in his "History of English Gardening," quotes the remarks of Switzer, and makes the statement that the use of these walls "led to the first erection of a regular forcing structure of which we have an account." The immediate outcome of these covered walls seems to have been the lean-to Greenhouse, and from that has developed the double span glass range of the present day. Long before Switzer's time plants were forced in a crude way, even by the Romans, mostly by being placed in baskets or other movable receptacles, so that they could be placed under cover in inclement weather; but the improvements of Facio and Switzer seem to have been

amongst the earliest attempts to make low glass ranges for plants, particularly in England.

It was about the beginning of the nineteenth century that great improvements began to be made in the glass-house. This new interest was due to the introduction of new plants from strange countries, the improvement of heating apparatus, and the general advance in the art of building. The ideals which prevailed at the opening of the century may be gleaned from J. Loudon's "Treatise on Several Improvements recently made in Hot-Houses," London, 1805. One of the devices recommended by Loudon will interest the reader. It is shown



987. Switzer's glasshouse, built on an inclined wall. 1731.

in Fig. 988. The bellows is used for the purpose of forcing air into the house, that the plants may be supplied with a fresh or non-vitiated atmosphere. "By forcing the air into the house, once a day or so, double the quantity of air which the house usually contains" can be secured. The house could be "charged." The tube leading from the bellows is shown at *b*; it discharges at *c*. Curtains run on the wire, *i*; the curtain cord is at *f*.

All commercial structures are now built on the plan of the long, low glass range, with very little height at the eaves. The taller glass structures, if built at all, are used for conservatory purposes or as architectural features. The general tendency of the building of glass structures is towards extreme simplicity (Fig. 1005). In the extreme South, lattice-work buildings are sometimes used for the protection of plants, both from light frosts and from the sun (Fig. 989). The heating which is now employed in this country is of three different kinds: hot water under very low pressure or in the open tank system; hot water in practically closed circuits; and steam. Hot water under low pressure is an old-time idea of heating, and is not now popular in this country except for conservatories and private establishments. The heavy, cumbersome pipes are not adapted to laying over long distances and under varying conditions. The commercial houses are now heated by means of wrought-iron pipes, which go together with threads. The comparative merits of steam and hot water in these wrought-iron pipes are much discussed. For large establishments, particularly those which are on various elevations, and which are likely to be changed frequently, steam is preferable; and, on the whole, it seems to be gaining in favor for commercial establishments. It requires no more attention on the part of the operator, when modern heaters are used, than hot water. However, the merits of one system or the other are very largely those of the individual establishment and apparatus, and the personal choice of the operator (see *Forcing*).

The special American literature on Greenhouse construction and management will be found in the following books: Leuchars' "Hot-Houses," 1850; Henderson's "Practical Floriculture," first ed., 1869; Field's "Greenhouse as a Winter Garden," 1879; Hunt's "How to Grow Cut-Flowers," 1893; Taft's "Greenhouse Construction," 1893; Bailey's "Forcing Book," 1897; Taft's "Greenhouse Management," 1898.

L. H. B.

Greenhouse Construction.—For convenience, this subject may be considered under the following heads: i. e.,

Location, Plans, Grading, Foundations, Framework, Glazing and Painting, Plant Tables, Ventilation, Heating.

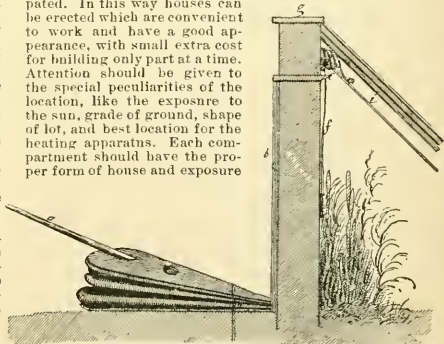
Location.—Greenhouses which are intended for use in connection with the garden should be placed, for convenient attendance, within the garden inclosure or along its boundary. A good location for the garden will usually be found the best one for the greenhouse.

A conservatory or Greenhouse designed for a private place, where specimen and blooming plants will be kept for the pleasure of the family and entertainment of visitors, should be attached to the dwelling or located as

near as possible in a well-kept part of the grounds. A conservatory does not require a full southern exposure. Most decorative plants thrive as well or better and continue in bloom for a longer time if kept in a house having plenty of light, but so located as to receive but little direct sunlight. Large ranges of glass adapted to a variety of purposes are generally kept separate from other buildings. In parks the location should be near a main entrance.

The location of a range of glass for commercial purposes, where the elements of expense and profit are to have the first consideration, is of great importance. The chief items which determine the desirability of a suitable location are the adaptability and value of the land, cost of fuel delivered, ample and inexpensive water supply, and proximity to a market. The top of a bleak hill or the bottom of a valley should both be avoided. Level land, or that having a southerly slope, is the best.

Plans.—When a site for the proposed Greenhouse has been decided upon, full plans should be made before commencing to build. The plans should embrace not only the glass, which is required at once, but should provide for the largest increase which can be anticipated. In this way houses can be erected which are convenient to work and have a good appearance, with small extra cost for building only part at a time. Attention should be given to the special peculiarities of the location, like the exposure to the sun, grade of ground, shape of lot, and best location for the heating apparatus. Each compartment should have the proper form of house and exposure



988. Loudon's device for charging a Greenhouse with air, 1805.

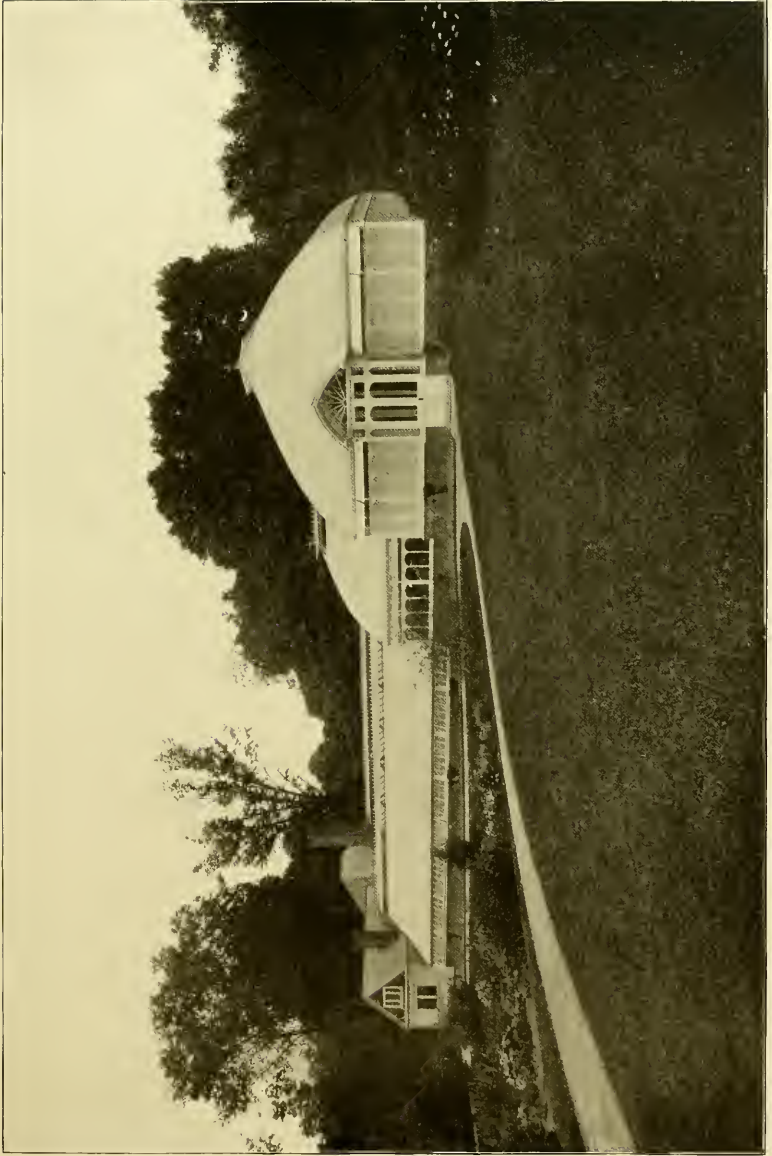
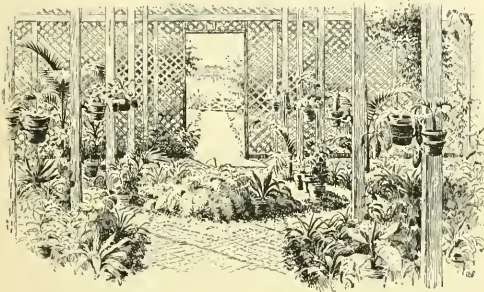


Plate XIII. A glass house range, comprising various types of houses.—Smith College, Northampton, Mass.

to the light adapted to the plants for which it is provided.

It will readily be seen that to locate and plan a range of glass to the best advantage requires skill and experience. In a communication recently received by the



989. A lattice-covered Plant-house.

writer from a superintendent of one of the most important lotanic gardens in the country, it was remarked that "when the architect prevails, the gardener fails." It is also true to a greater degree than in almost any other class of buildings that the beginner or amateur who undertakes to plan and construct his own Greenhouse is likely to pay well for his experience, and will at least sympathize with the "lawyer who pleaded his own cause and found he had a fool for a client." This is perfectly true, as many know to their cost. To plan a Greenhouse satisfactorily the designer must have a practical knowledge of the requirements. To meet this increasing demand, specialists can be found, known as "horticultural architects," who devote their entire time to this branch of work.

Grading.—The floor of the Greenhouse should be a few inches above the outside grade. As most Greenhouses are necessarily built low to accommodate the plants, a small terrace around them adds to the elevation and the good appearance of the structure. It will usually be best to keep the floor of a Greenhouse all on one level. When the variation in the grade of the ground is not too great, the floor line should be at the highest point of the grade. In the case of a long house, the floor line is sometimes made the same as the natural grade, but such an arrangement is to be avoided when possible. For locations on a hillside, the different apartments may have different floor levels, with necessary steps between them.

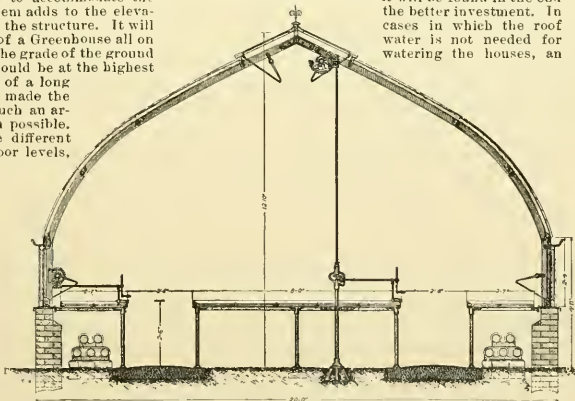
All the sod and loam should be removed from the space to be covered by a Greenhouse, and all the filling necessary made with subsoil. The latter should be laid in thin layers and each wet down and thoroughly tamped. Loam used for filling under a Greenhouse is apt to become sour, and will continue to settle for a long time, causing much trouble and annoyance.

Foundations.—Too much care cannot be given to the preparation of good foundations. These are usually of brick, but may be made of stone or concrete. The brick walls take up less room in the house than stone, and are usually less expensive. The foundation walls should be extended down to a point below the frost line, generally 3 or 4 feet deep, and are usually raised about 2 feet above the grade.

An inexpensive wall of rubble stone work or of concrete is all that is needed in the ground. The part of the wall showing above grade may be of plain brick or faced with stone, to correspond with the construction of other surrounding buildings. A good substitute for these masonry walls is found in the use of cast-iron posts in connection with double boarding. A removable base at the ground line, which can readily be renewed, adds very much to the value of this construction, making it durable and satisfactory. It has been quite extensively adopted by florists in houses for commercial purposes and for small and inexpensive Greenhouses. It is recommended for such houses.

Framework.—The construction best adapted for conservatories, park houses and Greenhouses, and for private places where the improvements are desired to be permanent in character and attractive in appearance, is the combination of iron and wood. In this system, the main frame which supports the weight and strain is of iron or steel, wood being used in the frames for the setting of the glass, and to form a non-conductor, of great advantage in the heating of the house. The iron work in this style of construction usually consists of cast-iron sills capping the foundation walls, wrought-iron rafters setting on the sills, about 8 feet apart and running from sill to ridge, forming the side post and rafter in one piece, cast-iron gutters, and angle-iron purlins between the rafters, all securely bracketed and bolted together, forming a complete framework of metal, light, strong and durable. The wood used consists of light sash bars for the setting of the glass, sashes for ventilation, and doors. This woodwork being entirely supported by the metal frame, and not being used where it will be continually wet, will be found as durable as any other material, and for many reasons better adapted for the requirements of a Greenhouse roof. This combination system of metal and wood construction has been extensively adopted by florists and large growers of cut-flowers, though generally with the cast-iron post style of foundation. The first cost is somewhat increased over an all-wood construction, but in view of its greater durability and saving in repairs,

it will be found in the end the better investment. In cases in which the roof water is not needed for watering the houses, an



990. Even-span curvilinear Greenhouse.
With cast-iron piping.

angle-iron plate is substituted for the gutter, so framed as to allow the snow and ice to slide over it, keeping the roof entirely clear from such accumulations, which

darken a house in the cold winter weather, when light is most needed. The double-boarded sills, when erected with care, are warmer than ordinary masonry walls.

Cast-iron gutters are provided to collect the rain-water from the roof. By exposing the inner side of these gutters to the heat of the house, they are kept free of ice in the winter. Small metal clips fastened with screws are used to connect the wood sash bars to the cast-iron gutters, angle-iron plates and purlins. This method of securing the sash bars in place is very convenient in case of repairs, and renders the structure practically portable. A careful examination of any old Greenhouse will show that the parts of the frame which decay first are those pieces of wood which are joined together, for water penetrating the joints soon destroys the wood. This trouble is largely avoided by arranging the frame so that each piece of wood is fastened directly to the iron frame instead of to another piece of wood. Joints between wood and iron do not rot the wood, the latter being preserved by the corrosion of the metal.

The curvilinear form of house (Fig. 990) is ornamental and particularly well adapted for conservatories, palm houses and show houses of all kinds. It is preferred for vineries and fruit houses, as the form allows the eaves to be supported on the line of the roof without a sharp bend at the plate line. The light in a curved house, being admitted at different angles, is better diffused and more natural than when reflected through a long pane of straight glass. The cost of a curved roof is slightly greater in the construction, but the arched frame is stronger and will keep its shape better than a house with straight lines, thus largely compensating for the extra cost. For special purposes and locations, special forms of frames may be used. Good forms of commercial houses are shown in Figs. 991, 992. The latter is the most popular form for the forcing-house.

For small Greenhouses and those adapted for the use of amateurs, a frame made chiefly of wood will be found quite satisfactory. An improved method of framing is to use small rafters of wood from 5 to 8 feet apart, with cast-iron brackets at ridge and plate; these rafters are connected by light angle-iron cross purlins, and the latter support very light sash bars. The ridge is usually supported by gas pipe posts, and when the rafters are of considerable length additional supports are placed under their centers, instead of darkening the house by rafters of greater size. In this way the roof can be made as light as the metal construction first described, and will nearly approach it in durability and finish. Details of construction of wooden houses are shown in Figs. 993, 994.

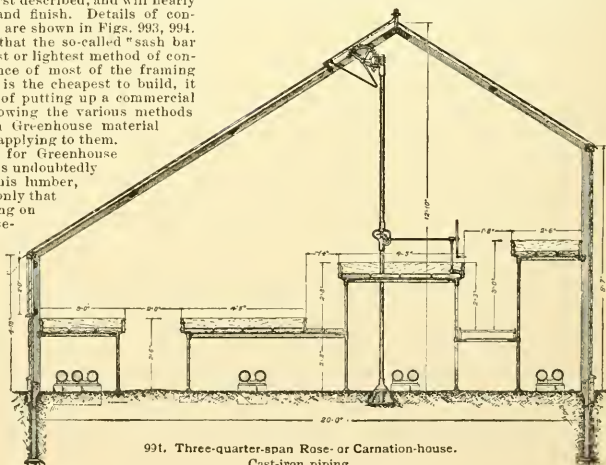
It is generally admitted that the so-called "sash bar construction" is not the best or lightest method of construction, but as the absence of most of the framing reduces its cost so that it is the cheapest to build, it remains a popular method of putting up a commercial Greenhouse. Circulars showing the various methods adopted by the dealers in Greenhouse material can readily be obtained by applying to them.

The best wood to use for Greenhouse framework and plant-beds is undoubtedly cypress. In purchasing this lumber, care should be taken that only that grown in the states bordering on the Gulf of Mexico be selected. This will be found of a dark red or brown color, quite soft and easily worked. There is an inferior variety of cypress growing farther north, which is light in color, hard and springy, and apt to be shaky. As the latter variety is cheaper than red gulf cypress it is frequently used by those who do not know the difference, to the serious detriment of the work and the loss of reputation of cypress for such purposes

In the market there are three grades of cypress lumber, and it is important to know which to select. The best grade is known as "firsts and seconds," and calls for lumber with a small amount of sap on the edges and occasionally a small sound knot. This is the quality which should be ordered for all the framework of the roof, sash-bars, etc. In order to make the material entirely free from sap there will be a waste in cutting up this quality of from 10 to 20 per cent. The second grade is known to the trade as "selects." This name indicates that it has been graded so that one face of each piece of lumber is of about the same quality as the "firsts and seconds," the other face generally being largely sap. This quality is only fit for outside boarding in Greenhouse construction; it has too much sap. The cost is usually about five dollars per thousand less than the best grade. As it looks to the inexperienced eye almost the same as the best grade, too much of it finds its way into Greenhouse structures. Such sap lumber will not last more than from two to five years. Too great care cannot be exercised to avoid its use. The third grade of cypress lumber is termed "cutting up," and is so called because it embraces all the pieces which have imperfections, such as large knots, splits, etc., which bar them from the better grades. This is a good quality to purchase for base boards and plant tables, for by cutting out the sap and objectionable knots it will be found satisfactory for these purposes. The "cutting up" grade costs about ten dollars less per thousand than the "firsts and seconds." The percentage of waste in cutting up will be somewhat greater than in the other grades.

Cypress lumber which has been in use for gutters, sash-bars, plates, etc., in Greenhouses where high temperatures have been maintained is still, after many years, apparently in as good condition as when first used. Owing to the porous texture of the wood, the paint, when applied, sinks in and does not make as fine a coat as on some other woods, but because of this fact the paint adheres to the wood better and lasts longer.

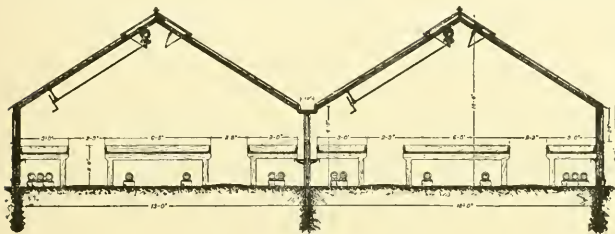
Glazing and Painting.—Ordinary sheet or window glass is in general use for greenhouse glazing. It is better to use only the thickness known to the trade as "double thick." This weighs from 24 to 26 ounces per square foot. The thickness known to the trade as "single thick" weighs only about 16 ounces to the square foot, and is entirely too frail for the purpose. There is very little difference at present in the quality of the imported French or Belgian and the American



991. Three-quarter-span Rose- or Carnation-house.
Cast-iron piping.

glass. The weight of most of the glass of American manufacture is about 2 ounces greater per foot than the imported, and therefore proportionately stronger. This greater strength is of considerable importance in the additional security which it affords from damage caused by that enemy of the florists, the hail storm. There is a great difference in the quality of the glass made by different manufacturers in its adaptation to Greenhouse use. This difference is caused chiefly by

the joints, nor does it provide any means of escape for the condensed water from the under side of the glass, which is a very serious objection. In ordinary glazing, where each light laps over the one below, the condensed water passes through the joints to the outside, forming a perfect remedy for this trouble. The difference in the cost is very slight, if anything, provided the work is equally well done, as the value of the putty omitted is fully offset by the extra cost of the caps.



992. Even-span Houses.
Heated with water in cast-iron pipes.

the quality of the material used in the glass, making it more or less opaque, and in the number of small knots, causing lenses, which concentrate the sun's rays and burn the foliage of the plants. This last defect in the glass cannot be wholly guarded against, as the product of a factory does not always run the same, so that any favorite brand cannot be fully relied upon in this respect. The lenses which burn will be found in all the different grades of glass, firsts, seconds and thirds, with little, if any difference, the grading being done chiefly for other defects, such as affect the value of the glass for window purposes. For these reasons, in selecting the glass for a Greenhouse, it requires experience to decide what make of glass it will be best to purchase. It will be well to purchase from some one who makes a specialty of furnishing glass for Greenhouses, or call in the aid of some friend who has had experience in building, and can give intelligent advice.

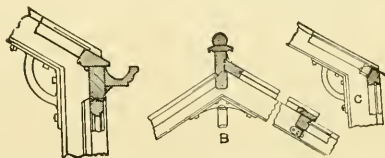
The second quality of glass is usually selected for the best Greenhouse work. The standard widths are from 12 to 16 inches, and lengths vary from 16 to 24 inches. A favorite size is 16 by 24 inches. This is about as large as it is practical to use double thick glass, and makes a roof with comparatively few laps.

It is not safe to purchase fourth quality of glass or the so-called "Greenhouse glass" frequently offered by window glass dealers, as both of the grades contain the culls and lights only fit to glaze cheap sash for market gardeners, and is of doubtful economy even for this purpose. Rough plate or ribbed glass is not adapted for a Greenhouse roof. It not only obscures the light, but is so brittle that the breakage is greater than with the double thick sheet-glass. It is also very difficult to set it so as to make a tight roof on account of the uneven lines of the ribbing. Recently a few conservatories have been glazed with thick, polished plate-glass, making very handsome roofs, but rather expensive.

To set glass properly in a Greenhouse roof, it should be bedded in the best putty on wood sash bars and lapped at the joints. The bars should be spaced accurately, so that the glass will fit the rabbets with not over one-sixteenth of an inch allowance, and the panes of glass should lap each other not more than from one-eighth to one-quarter of an inch. Zinc shoe nails fasten the glass best, using from 4 to 6 to each pane, according to the size of the light. No putty should be used on the outside of the glass. A comparatively new system of glazing has been adopted by some florists, in which no putty is used, but the glass is placed directly on the rabbets of the bars and the ends of the panes are butted together and held in place by wood caps fastened to the sash bars. This system does not make a tight roof, allowing considerable water to enter the house through

the material is exposed to the weather. The material of the second and finishing coats should be pure linseed oil and white lead. Experience has shown that this material is the best for this work. The color should be white, or a light tint of any desired shade may be used, but no heavy color should be adopted which requires coloring matter in place of the lead in the mixing. Each coat should be applied thin and well rubbed out. While the appearance may not be quite as fine when the work is first done, the paint will not peel off, and will last longer and form a better protection for the structure than when it is put on in thick coats. It will also form a good base for repainting, and this should be done in a similar manner. It is economical to repaint a Greenhouse every two years, and generally one coat will be sufficient.

Plant Tables.—Stages for plants in pots or raised beds for planting out usually cover the entire area of a Greenhouse, except the walks, and their cost constitutes a considerable proportion of the expense. Palms are usually grown in solid beds or in pots or boxes sitting on the ground. Many vegetables are grown in solid beds near the ground level. Roses and carnations are usually in raised beds. Angle-iron frames supported on adjustable gas pipe legs, with slate or tile bottoms, form the best plant tables (Fig. 995). Wood bottoms, which can be readily renewed, are frequently substituted, saving a part of the first cost. When the table supports are of wood care should be taken that they are not fastened



993. Details of gutter.

994. Details of ridge (B) and cave (C).

against any part of the framework of the house, unless iron brackets are used so as entirely to separate the woodwork.

Ventilation.—No Greenhouse is complete without a good ventilating apparatus. About one-tenth of the roof should be arranged to open or close for ventilation, though this percentage will vary according to the form of house and the purpose for which it is used. It is not

desirable to open all the ventilators in a long house with one set of apparatus, for frequently one end will not need as much ventilation as the other end, or may be affected by the wind forming a current lengthwise of the house. To avoid this a Greenhouse 200 feet long should have 3 or 4 sets of apparatus, which can be operated separately. In all Greenhouses of considerable width, it is desirable that ventilation should be provided on both sides of the ridge, so that the ventilation can be given on the "leeward" side, which will prevent the wind from blowing directly into the house.

Heating.—The success of the florist, gardener or amateur in the management of a Greenhouse depends largely on the satisfactory working of the heating apparatus. There are two systems of Greenhouse heating which, when the apparatus is properly installed, are economical and satisfactory; viz., hot water and steam. The open-tank hot water heating has more advantage in its adaptation to general use than any other, and is so simple that its management is readily understood by any one. It is practically automatic, and is capable of maintaining an even temperature for ten hours without attention. Low pressure steam heating is well adapted to large commercial ranges, and to large conservatories in parks and private places, where a night attendant can be kept in charge of the fires to turn on and shut off steam from the radiating pipes as the changing outside temperature may require. The heating of Greenhouses to the best advantage under the varying conditions of climate and interior requirements, demands, like the designing of Greenhouses, the services of an experienced specialist in horticultural work.

LORD & BURNHAM CO.

Greenhouse Glass.—The selection of glass for Greenhouses, and the nature of the imperfections which render it undesirable for such use, are questions which have received much attention from horticultural writers, and which have brought forth a variety of answers. Three qualities are essential in all glass to be used in Greenhouse construction: first, minimum of obstruction to solar rays; second, strength sufficient to withstand the strain of winds and storms, especially hail; and third, freedom from defects rendering it liable to burn plants grown under it.

It is an established fact that plants thrive best under a clear and transparent glass, which lets through the greatest possible percentage of the sun's rays. This includes all the solar rays, calorific or heat rays and actinic or chemical rays, as well as the calorific or light rays. Clear white glass of the grade known as "single thick" (12 panes to the inch) lets through from 60 to 70

the thoroughness of the annealing. Glass is annealed by passing through a series of ovens, where it is raised to a high heat and then gradually cooled, whatever toughness and elasticity the finished product may contain being due to this process. The thickness of glass varies, not only with grades (single and double thick), but also more or less within the grades, and even with different parts of the same pane. Single thick glass is too thin for use in Greenhouses, and in selecting any glass for such a purpose it should be examined pane by pane, and all showing marked variation in thickness, either between panes or in different parts of the pane, rejected. A pane of varying thickness is much more liable to breakage from climatic changes or sudden shocks than one which is uniform in this regard. From the foregoing statements it will be seen that, in general, the ordinary double thick green glass is best, as regards both tint and strength, green glass being less liable to change in tint than white, and the double thick being the stronger grade. By green glass is meant simply the ordinary sheet glass, the green color of which is only noticeable when looking at a cut edge.

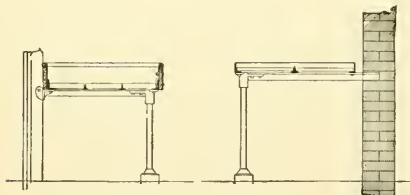
The idea has long been more or less prevalent that such visible defects in sheet glass as the so-called "bubbles," "blisters" and "stones," produce a focussing of the solar rays passing through them, thus burning the foliage of plants grown under glass containing these defects (Fig. 996). This view has been held by glass manufacturers and horticulturists alike, and seems not to have been publicly contradicted until 1895 (Bull. 95, Cornell University Agric. Exp. Sta., p. 278). In view of the erroneousness of this theory, it is rather remarkable that it should have gained such prevalence. Nearly all bubbles and blisters are thinner in the middle than at the periphery, being thus concave rather than convex lenses, and actually diffusing the rays of light passing through them rather than producing destructive foci. While it is true that sand stones or knots in glass may produce foci, these points of focus scarcely ever exist more than a few inches from the surface of the glass, and consequently these defects can do no damage when occurring in roofs several feet distant from the growing plants below.

The only full and complete series of experiments on this subject in this country (conducted at the Cornell University Agricultural Experiment Station, the Physical Laboratory of Cornell University, and a glass factory in Ithaca, New York, but yet unpublished) shows the true cause of the burning by glass to be the variation in thickness of the entire pane, or portion of same, thus causing a prismatic or lens-like effect (Fig. 997), which causes a more or less distinct focussing of the sun's rays at distances varying from 5 or 6 feet to 30 feet, or even more, from the glass.

This defect usually occurs along the side or end of the pane, and is not visible to the eye, but may be easily detected by the use of the micrometer caliper or by testing in the sunlight. It may be found in all kinds of glass, and is caused by a reduction of the upper or pipe end of the cylinder from which sheet glass is made, by the glass blower, to facilitate the removal of the "cap" or neck end of the cylinder, by which it is attached to the pipe while being blown. The defect, as before stated, is one which may be found in all grades and qualities of sheet glass, of both foreign and domestic manufacture. The fact is well known that differences in the thickness of spectacle lenses, which are imperceptible to the eye, may produce sufficient refraction to materially vary the direction of rays of light



996. Burned areas on a Begonia leaf.

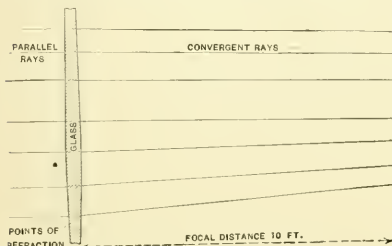


995. Details of iron-frame benches.

per cent of the sun's rays, common green glass of the same thickness, 52 to 56 per cent, and "double thick" (8 panes to the inch) common green glass from 50 to 52 per cent. This percentage is reduced by other colors, dark blue glass letting through but 18 per cent. In connection with the matter of tint, it should be noted that some glass, especially clear white glass purified with arsenic acid, or that in which a large amount of potash is used in proportion to the amount of lime used in manufacture, becomes dull after long exposure to the weather, the dullness being occasioned by the efflorescence of salts contained in the glass. Before this disintegration has proceeded too far, the crust or efflorescence may be removed with muriatic acid.

The strength of glass depends upon its thickness and

passing through such lenses, and it is not difficult to see that the same effect may be produced by similarly imperceptible variations in the thickness of sheet glass. That this is the case has been conclusively shown by the series of experiments before mentioned. These also show that burns on plants, caused by defective glass roofs, occur in lines and not in isolated spots, burns of the latter description being usually the result of a



997. Refraction of light rays by an irregular pane of glass.

weakening or deterioration of tissue, due to carelessness in the matter of ventilation, humidity of the atmosphere and water, and temperature of Greenhouses, rather than to defects in the glass or roofs.

If, therefore, it is not possible to obtain glass of uniform thickness with certainty, it may be found cheaper and often fully as satisfactory to purchase the lower or common grades of double thick glass, using in the roof only those panes which show, after testing in the sunlight for foci, an entire lack of the prismatic character which makes them dangerous to plants grown under them.

J. C. BLAIR.

Greenhouse Heating.—In all sections in which the temperature drops below the freezing point, it is necessary to provide some artificial means for heating Greenhouses. Nearly all modern structures are warmed either by steam or hot water, although hot air flues are occasionally used. While hot water is preferred for small ranges of glass, as it can be depended upon to furnish an even degree of heat when left for a number of hours, steam is more commonly used for extensive plants, as the cost of piping the houses is much less than when hot water is used. Steam boilers require more attention than hot water heaters, but when there is more than 10,000 or 12,000 square feet of glass, it is best to have a night fireman and watchman, and the extra expense can be made up by the saving in the cost of fuel, as it will be possible to use a lower grade of coal. Under these conditions the cost of running a steam plant will be as low as with hot water, but in small houses, where hard coal is used, and the fires receive no attention for six to eight hours during the night, hot water heaters will be cheapest to operate, and will be most satisfactory. See, also, the article *Forcing*.

As the various flowers and vegetables grown under glass require different temperatures, the piping of Greenhouses has to be varied accordingly. Thus, although it may vary from 3 to 5° for different varieties of the same species, our common plants require the following night temperature: violets and lettuce, 45 to 50°; radishes and carnations, 50 to 55°; roses and tomatoes, 60°; cucumbers and stove plants, 70°.

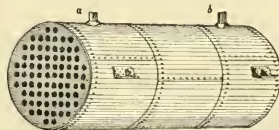
Boilers.—Whether steam or hot water is used for heating, the best boilers for houses with less than 2,000 feet of radiation are of cast iron, but for larger houses, especially when steam is used, boilers of a tubular pattern are commonly preferred. Although it is not usually practiced, it will be safest and often cheapest in the end if two or more boilers of medium size are used, instead of one large boiler of the same capacity as the small ones combined. When only one boiler is used it might result in the loss of all the plants in the house if any accident should happen to it in severe weather, while if

two or more boilers are used, and are so arranged that any of them can be cut off, the danger from this source will be greatly lessened. The use of two or more small boilers will also be found much more economical than one large one during the fall or spring, when it will be far cheaper to maintain a fire in one of the small boilers than in a large one.

In selecting a boiler, it is always desirable to have one sufficiently large to afford the necessary heat without forcing the fire, as this will not only give more satisfactory results, but will result in the economy of fuel and labor, and will prolong the life of the boiler. Boiler makers generally use some definite ratio between the size of the grate and the amount of fire surface in the boiler, but this varies with the size of the boiler and the efficiency of the fire surface. In small hot water boilers, with very effective fire surface, the ratio between the two is frequently as small as 1 to 15, while in larger boilers it is often as great as 1 to 35, and even more attendance. For small Greenhouses it is desirable to have the grate sufficiently large to permit of leaving the fire without attention for eight to ten hours in the severest weather, while for a large range of houses it is customary to employ a night fireman, and a grate much smaller proportionately could be used. In steam boilers the capacity is generally rated at about 100 square feet of radiation for each horse-power; and an average of about 15 square feet of fire surface is considered equivalent to a horse-power, it being customary to estimate that 12 square feet in large boilers and 18 feet in very small ones will equal one horse-power. Thus, in boilers of medium size, an area of 10 square feet of grate will answer for 250 square feet of heating or fire surface, and this will be sufficient for nearly 1,700 feet of radiating surface, where steam is used; and, as hot water requires about two-thirds more radiation, a boiler of the above size will answer for from 2,800 to 3,000 square feet of hot water radiation. In using the above figures for small boilers that will not have attendance during the night, it is generally advisable to make an allowance for this of about 25 per cent, and, when a boiler is required for 1,000 feet of radiation, select one that would be rated at 1,250 feet.

For large ranges, tubular steam boilers will generally be more satisfactory. Good results will be secured from those either of fire-tube or of water-tube construction, and many prefer them when hot water is used; but when tubular boilers are used for hot water heating, although good results may be secured when a regular steam boiler is employed, it is advisable to have them made without a steam dome, and to have the entire shell filled with tubes (Fig. 998). As a rule, these boilers will be less expensive than cast-iron boilers, and if properly cared for, will be nearly as durable.

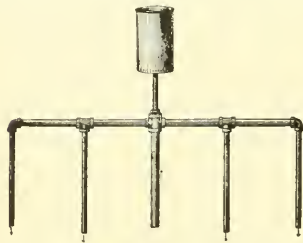
During the past few years a large number of coil boilers have been constructed for hot water heating. These boilers are generally from 4 to 6 feet long, and are



998. Horizontal tubular boiler for hot water.

made from wrought-iron pipe, varying in size from 1 to 2 inches in diameter, but when constructed from 1-inch pipe they are not very durable, as the pipe itself is comparatively thin, and wherever the threads are exposed it is quickly eaten through. There is also more trouble from the boiling over of the water than when larger pipes are used, and when boilers are constructed of 1-inch pipe it is necessary to have either an elevated expansion tank or to run it as a closed system. In making the boiler the pipes are cut of the desired length, usually of 5 or 6 feet, and the ends are connected either by return bends or by manifolds, so as to

form a number of vertical coils, each containing from six to ten pipes. The upper ends of the manifolds are joined at the front end of the heater and connect with a flow pipe, while the lower ends of the rear manifolds are joined to the returns. As a rule, the grate is of the same width as the coil, and from one-half to two-thirds as long. Although a box coil is much cheaper than a cast-iron heater, when we add to its cost the expense for grate, doors and other fittings, and of bricking it in, the amount saved will not be large, especially as the coil



999. Flow and supply pipe for under-bench flows.

boilers are, as a rule, not more than one-half as lasting as cast-iron boilers, most of which are complete and require no brick work or trimmings.

Hot Water Piping.—Modern hot water heating systems do not differ particularly from those in which steam is used, except that larger sized pipes are required to afford the necessary radiation. Formerly 4-inch cast-iron pipes were used in the piping of Greenhouses, but as the joints are packed with oakum, cement or iron filings, they frequently give trouble by leaking, and it is much more difficult to make changes or repairs than when smaller wrought-iron pipes with screw joints are used. Owing to the large volume of water in the pipes, the circulation is necessarily quite sluggish, and it is not easy to secure the high temperature in the water that can be obtained from smaller pipes. Another objection to these large pipes is, that it is not possible to carry the flows overhead, as is often desirable.

When the flow pipes supply a number of houses, or if the heater is at some distance from the Greenhouse to be warmed, it is best to start from the boiler with one large pipe, or with two pipes leading out from different sides of the boiler, rather than to carry independent pipes to each house. If there are several houses to be heated, it is advisable to have the heater located at the north end or side of the houses, as near the center as possible, and carry the flow pipe along the ends of the houses just over the doors, although, if necessary, they may be beneath the level of the doorways. From this main pipe one or more supply pipes can lead into each of the houses. The size of the main feed pipe, as well as of the branch pipes, should be in proportion to the amount of radiation that they supply; and, in determining the amount that can be handled by pipes of different sizes, it is advisable to use somewhat larger supply pipes when all of the radiation, both flow and return, is under the benches than when the flow pipes at least are overhead. A similar allowance should be made when the boiler is partly above the level of the returns, as compared with a system in which the radiating pipes are a number of feet above the top of the boiler, since in the latter case a much smaller supply pipe will suffice. In a general way, the following sizes can be used as supply pipes: 1½-inch pipes for 75 to 100 square feet of radiation; 2-inch pipes for 150 to 200 square feet; 2½-inch for 250 to 350; 3-inch for 400 to 600; 3½-inch for 600 to 800; 4-inch for 1,000 to 1,200; and 5-inch for 1,500 to 2,000 square feet of radiation. The supply pipes should, if possible, rise vertically from the heater to a point higher than the highest point in the system and then should have a slight fall, say 1 inch in 20 feet, so that there will be no opportunity for the pocketing of air in the pipes. It will, however, make but little dif-

ference whether the pipes run up-hill or are given a slight downward slope, and the former arrangement may be used where it will best suit the conditions. In case the pipes are carried under the benches, and it is impossible to sink the boilers much below the level of the coils, it will be well to have the flow pipe run vertically from the boiler to a height of 8 or 10 feet (Fig. 999), and then branch and run horizontally along the ends of the houses, taking off the supply pipes for each and dropping them below the level of the benches.

It is often desirable to have some or all of the flow pipes overhead, as this will greatly improve the circulation and will aid in preventing cold drafts of air upon the plants. Some make use of a single large flow pipe in each house. This is located upon the posts, a foot or so beneath the ridge, and carries the water to the farther end of the house, where branch pipes connect with the coils, but a better distribution of the heat can be secured in houses more than 10 feet wide if two or more pipes are used. These can be upon the ridge and purlin posts, and it is often desirable to have one upon each of the wall plates. The number and size of these flow pipes will depend upon the width of the houses and the size of the coils that they supply. The amount of radiating surface in the flow pipe itself should be added to that in the coil, in determining the size of supply pipe that will be required. For long houses it will often be necessary to use one or more 3-inch pipes, but ordinarily 2-inch or 2½-inch pipes distributed upon the posts and wall plates will give the best results.

The size of pipe used for the returns will depend upon the length of the coils and their height above the boiler, as the pipes for elevated short coils may be smaller than those of considerable length that are below the top of the boiler. Ordinarily 2-inch pipe will be desirable for coils more than 75 feet in length, and will be preferable to a smaller size when they are only 50 feet in length, if the flows are under the benches and the lowest part of the coils are below the top of the boiler. For short coils, pipes as small as 1½-inch may be used where they are somewhat elevated, but for ordinary commercial Greenhouses 1½-inch pipe is better up to 50 to 75 feet, and 2-inch pipe for all others, as, while small pipe furnishes the most effective radiation, the increased friction impedes the circulation.

If a single large flow pipe is used, it is often desirable to have one or more of the returns elevated upon the purlin posts and wall plates, but ordinarily the radiating surface should be distributed upon the walls (Fig. 1000), and under the benches in houses where, as is now generally the case, there are walks along the side walls. In houses in which it is undesirable to have bottom heat, all of the pipes may be upon the walls; and this is also the usual arrangement when solid beds are used, except in wide houses, in which case a portion of the returns may be upon the sides of the beds, beneath the walks, or elevated upon the purlin and ridge posts. The pipes in the coils may be connected at their ends either by means of manifolds or by tees and close nipples, but in either case provision should be made for the expansion of the



1000. Pipe work for modern greenhouse heating. A wall coil.

pipes, which may be done in the case of vertical coils by running them partly across the ends of the houses and in the horizontal coils by the same means, or by placing the header at the lower end of the coil and a foot or so lower, and connecting it with the ends of the pipes by means of nipples and right and left ells.

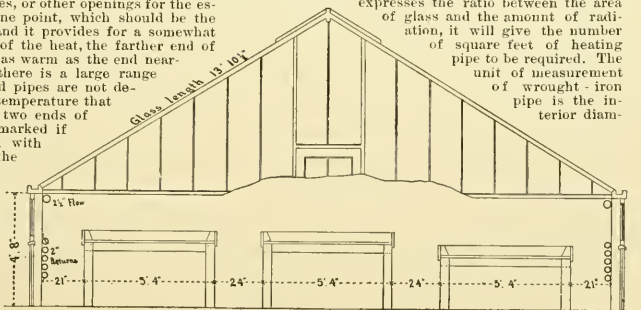
When all of the pipes are under the benches or upon the walls, a single large pipe may be used as a flow to supply all of the others in the coil, or two or more of the pipes of the same size, as the returns may be used as flow pipes. These pipes can be so arranged that they will each supply one or more returns, or they may connect with a header from which all of the return pipes start. Care should be taken to give all of the return pipes a slight fall, and it will be best if this is only enough to insure their being kept free from air. It will be safest to give the smaller pipes a slope of one inch in 15 feet, but 2-inch pipes, if carefully graded and securely supported at intervals of 10 feet, will give good results if the fall is not more than 1 inch in 30 feet. This is often of considerable importance in long houses where it is not possible to sink the heater so as to give the returns a fall of 1 inch in 10 or 15 feet, as is often recommended. It should be understood that better circulation can be secured when a return pipe has but a slight slope if sufficient to keep it free from air, with a vertical drop of the return pipe at the lower end, than when the coil has a much greater fall in running from one end of the house to the other, if this brings the lower end of the coil down to about the level of the main return. The circulation in a coil fed by an under-bench flow will be quite unsatisfactory when the lower end of the coil is below the top of the heater, if it is connected at its own level with the return pipes from other coils, that are considerably higher, and especially if they are fed by elevated flow pipes. When overhead flow pipes are used, the slope of the returns will necessarily be toward the heater, but when the pipes are all under the benches the slope may be in either direction, and if connected at the end nearest the heater it will be necessary to run a return pipe of the same size as the supply pipe, back from the farther end of the house, unless there are a number of houses in the range, when a main return pipe can be run across the farther end of the houses, to which coils can be connected. If a coil is made up of two or more pipes of the same size, a part of which are flows and the others returns, it will be advisable to run all of these pipes down hill; although, if there are only one or two flow pipes, and the lower end of the coil is considerably above the heater, a good circulation can be secured if the flow pipes run up hill to the farther end and are brought back with a downward flow. The downhill system, with a flow pipe running to the farther end of the house, has two advantages, as it does away with the necessity of air valves, or other openings for the escape of air, except at one point, which should be the highest in the system, and it provides for a somewhat more even distribution of the heat, the farther end of the houses being fully as warm as the end nearest the boiler. Where there is a large range of houses and overhead pipes are not desired, the difference in temperature that can be secured at the two ends of the houses will not be marked if the coils are connected with the main flow pipe at the end nearest the boiler, and are joined with a main return pipe passing along the farther end of the houses, and if the coils upon the walls are carried along the ends of the houses to the doors.

For all hot water heating plants an expansion tank is necessary (Fig. 999). This may be made from heavy galvanized sheet-iron, or a riveted boiler iron tank may be used. It should be connected with the heating pipes, but the point of connection will make little difference, although when the downhill system is used, if the pipe leading to the expansion tank starts from the highest point of the system it will make the use of air valves unnecessary. The tank may be located only slightly above the highest point of the system, but it will be best placed at least 10 to 15 feet higher, as the elevation of the tank

will lessen the danger of the boiling over of the water in the system, and make it possible to secure a higher temperature in the water of the coils than when the tank is not thus elevated. Trouble from the boiling of the water in the heater is most likely to occur when the flow or return pipes are too small, and when the fire surface in the boiler is composed of small, wrought-iron pipes or drop tubes. When there is a proper adjustment between the size of the boiler and the radiating surface, and the return connections are of sufficient size, there will be little danger from it.

Estimating Hot Water Radiation.—Owing to the great variations in temperature and the differences in the construction of greenhouses and in their exposures, it is impossible to give an explicit rule regarding the amount of radiation to be required under all conditions; but experience has shown that, in well-built houses, any desired temperature can be secured, for various minimum outside temperatures, when there is a certain ratio between the amount of radiating surface and the amount of exposed glass and wall surface, supposing, of course, that there is a proper adjustment between the size of the boiler and radiating surface, and that the system is so arranged as to give good results. Thus, when a temperature of 40° is desired in sections where the mercury does not drop below zero, it will be possible to maintain a temperature of 45° inside the Greenhouse when there is 1 square foot of radiating surface to $1\frac{1}{2}$ square feet of glass. Under the same conditions, 50° can be secured when there is 1 foot of pipe to 4 of glass, and 55° , 60° , 65° and 70° can be obtained when there is, respectively, 1 square foot of pipe to each $3\frac{1}{2}$, 3, $2\frac{1}{2}$ and 2 square feet of glass. For outside temperatures slightly under or above zero, there should be a proportionate increase or decrease in the amount of pipe used, and if the houses are poorly constructed, or in an exposed location, it will be desirable to provide increased radiating surface. Under the best conditions the temperatures mentioned could be obtained with a slightly smaller amount of radiation, but the greatest economy, so far as both coal consumption and labor are concerned, will be secured when the amount of radiation recommended is used. In determining the amount of exposed glass surface, the number of square feet in the roof, ends and sides of the houses should be added, and to this it is always well to add one-fifth of the exposed wooden or other wall surface, and if this sum is divided by the number which

expresses the ratio between the area of glass and the amount of radiation, it will give the number of square feet of heating pipe to be required. The unit of measurement of wrought-iron pipe is the interior diam-



1001. Carnation house, 100 x 23 ft. 6 in., piped for hot water.

eter, while its radiating surface is determined by its outside circumference; and, although it will vary slightly according to the thickness of the pipe, it is customary to estimate that 1-inch pipe will afford about .344 square feet of radiating surface per linear foot, while $1\frac{1}{4}$ -, $1\frac{1}{2}$ -, 2-, $2\frac{1}{2}$ - and 3-inch pipe will supply, respectively, .434, .497, .621, .759 and .916 square feet of radiation for each foot in length of pipe. The best results can be secured only when the pipes are in straight runs. The use of ells and tees should be avoided whenever possible, but

if they must be employed, special hot-water fittings should be secured.

In conservatories with high side walls, it is desirable to place the flow pipes at the plate and the returns on the wall or under the tables. Figs. 1001, 1002 and 1003 illustrate the lay out of pipes for water in a carnation, rose and violet house.

Hot Water Under Pressure.—In some large Greenhouses the hot water systems have been placed under pressure by closing the expansion tank. To prevent any danger of the blowing up of the system, a safety-valve, with a weight set so as to allow the water to escape before the danger point is reached, is attached either to the tank or expansion pipe. The system being completely closed, the water as it warms is placed under pressure, and steam cannot be formed. This makes it possible to raise the temperature of water in the coils quite a number of degrees higher than when an open tank is used. As there is even more danger from an explosion of a system when the water is under pressure than when steam is used, care should be taken to see that the safety-valve is in good working order, and that it is set at a point well below the danger limit.

When water is carried under pressure, it permits of the use of smaller flows and returns, and a considerable reduction in the amount of radiating surface. On the other hand, it is less economical in fuel than the open system, and requires rather more attention. The pressure system cannot be recommended for use under all conditions, and it will generally be best to have the piping adapted for all except the most severe weather, and then to have it so arranged that the system can be closed, if it becomes necessary to do so in order to maintain the desired temperature.

Piping for Steam.—The arrangement of the heating pipes for use with steam need not be unlike that above described for hot water, except that smaller flow and return pipes

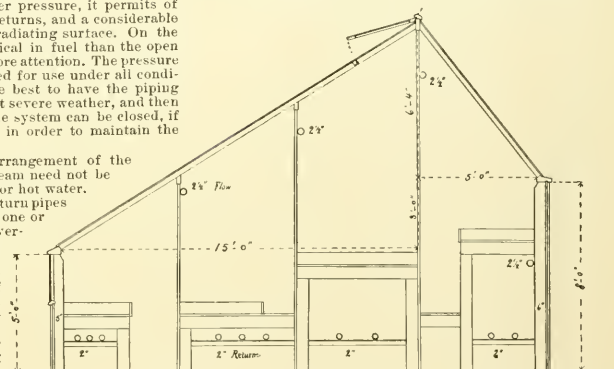
are used. When there is but one or two houses it is well to use overhead flow pipes, as a rule only one being required in a house. A 2-inch flow pipe will be sufficient for 400 square feet of radiation, and 2½-, 3-, 3½- and 4-inch supply pipes will answer, respectively, for 700, 1,000, 1,400 and 1,900 square feet of radiation. For long houses it will be best to use 1½-inch pipe for the coils, but 1-inch pipe will answer for houses 100 feet or less in length. The coils should, of course, run down hill, but if overhead supply pipes are not used the connection may be made at the end of the house nearest the boiler and the return pipe may be placed underneath the coil. In order to prevent the water from backing up in the coils it is desirable that they should be at least 18 or 20 inches above the level of the water in the boiler, while 3 or 4 feet would be even better. There should be an automatic air valve at the lower end of each coil, and, in order to regulate the amount of steam, a shut-off valve should be placed in both flow and return pipes. Unless there are several coils in each house it will always be well to have valves upon a number of the pipes in the coils, so that all but one or two can be cut off if desired. To prevent the water from being forced out from the boiler when the steam is turned into the houses, there should be a check valve in the return pipe near the heater.

The amount of radiation which will be required to secure any desired temperature will vary to some extent with the amount of pressure that is carried in the boiler, but, as a rule, this is not more than five pounds, and often no pressure at all is used. It will ordinarily be best to have the radiation sufficient to furnish the temperature desired in ordinarily cold weather without carrying any pressure, and then by raising the pressure to from five to ten pounds secure the heat that is needed during cold waves.

In determining the amount of radiation for a steam-heated house, 1 square foot of pipe will answer for 9 square feet of glass, when 40° is desired, and for 7, 5 and

3 where 50°, 60° and 70°, respectively, are required. Fig. 1004 illustrates piping for steam in a rose house.

Heating by Flues.—Where fuel is cheap, and when either a low temperature is desired in the house or the outside temperature does not drop much below the freezing point, hot-air flues may be used, but while the cost of constructing them is not large, the danger from fire is so great that they are not always economical. A brick furnace is built at one end of the house, and from this a 10- or 12-inch flue is constructed to carry the smoke and hot gases through the house to the chimney, which may be at the farther end, or directly over the furnace, the flue in the latter case making a complete circuit of the house. When the houses are more than 60 feet long, it is advisable to have a furnace at each end, and the flue will then extend only to the center of the house and return to the end from which it started. The first 30 feet of the flue should be of fire brick, but beyond that it can be constructed of sewer pipe. While either hard or soft coal may be used, the best results will be secured with 3- or 4-foot lengths of hard wood. Where the temperature does not drop more than 10 or 12° below zero, a temperature of 40° may be maintained in



1002. Rose house, 150 x 20 ft., piped for water.

a house 20 feet wide with one circuit of 12-inch sewer pipe. Care should be taken that the flue in no place is in contact with woodwork, and that there is a gradual rise in the flue from the point where it leaves the furnace to where it enters the chimney. L. R. TAFT.

Greenhouse Management.—Persons usually learn to grow plants under glass by rule of thumb. Such knowledge is always essential, but better and quicker results are obtained if underlying truths or principles are learned at the same time. Even if no better results in plant-growing were to be obtained, the learning of principles could never do harm, and it adds immensely to the intellectual satisfaction in the work. There is no American writing which essays to expound the principles of Greenhouse management, although there are excellent manuals giving direct advice for the growing of various classes of plants. The best single recent American book in this line is Taft's "Greenhouse Management," which brings together in one volume concise directions for the growing of the leading kinds of Greenhouse subjects. There are two kinds of principles to apprehend in Greenhouse management,—those relating to the management of the plants themselves, and those dealing primarily with the management of the house.

The first principle to be apprehended in the growing of plants under glass is this: *Each plant has its own season of bloom.* Every good gardener knows the times and seasons of his plants as he knows his alphabet, without knowing that he knows. Yet there are many failures because of lack of this knowledge, particularly



Greenhouse ; showing a good arrangement for general effect

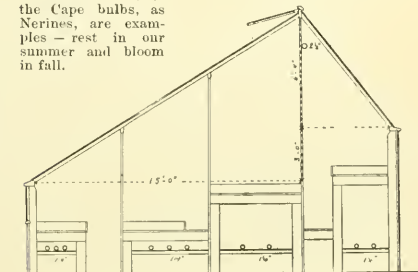
among amateurs. The housewife is always asking how to make her wax-plant bloom, without knowing that it would bloom if she would let it alone in winter and let it grow in spring and summer. What we try to accomplish by means of fertilizers, forcing and other special practices may often be accomplished almost without effort if we know the natural season of the plant. Nearly all Greenhouse plants are grown on this principle. We give them conditions as nearly normal to them as possible. We endeavor to accommodate our conditions to the plant, not our plant to the conditions. There are some plants which it is possible to make bloom in abnormal seasons, as roses, carnations, lilies: these we may force (see *Forcing*). But these forcing plants are few compared with the whole number of Greenhouse species. The season of normal activity is the key to the whole problem of growing plants under glass; yet many a young man has served an apprenticeship, or has taken a course in an agricultural college, without learning this principle.

The second principle from the plant side is this: *The greater part of the growth should be made before the plant is expected to bloom.* It is natural for a plant first to grow; then it blooms and makes its fruit. In the great majority of cases, these two great functions do not proceed simultaneously, at least not to their full degree. This principle is admirably illustrated in woody plants. The gardener always impresses upon the apprentice the necessity of securing "well ripened wood" of Azaleas, Camellias, and the like, if he would have good flowers. That is, the plant should have completed one cycle of its life before it begins another. From immature and sappy wood only poor bloom may be expected. This is true to a large degree even in herbaceous plants. The vegetative stage or cycle may be made shorter or longer by smaller or larger pots, but the stage of roid growth must be well passed before the best bloom is wanted. Fertilizer applied then will go to the production of flowers; but before that time it will go to the production of leaf and wood. The stronger and better the plant in its vegetative stage, the more satisfactory it will be in its blooming stage.

Closely like to the last principle is the law that *checking growth, so long as the plant remains healthy, induces fruitfulness or floriferousness.* If the gardener continues to shift his plants into larger pots, he should not expect the best results in bloom. He shifts from pot to pot until the plant reaches the desired size; then he allows the roots to be confined, and the plant is set into bloom. Over-potting is a serious evil. When the blooming habit is once begun, he may apply liquid manure or other fertilizer if the plant needs it. The rose-grower or the cucumber-grower wants a shallow bench, that the plants may not run too much to vine.

Most plants demand a particular season of inactivity or rest. It is not rest in the sense of recuperation, but it is the habit or custom of the plant. For ages, most

thick rhizomes always signify that the plant was obliged, in its native haunts, to carry itself over an unpropitious season, and that a rest is very necessary, if not absolutely essential, under domestication. Instinctively, we let bulbous plants rest. They usually rest in our winter and bloom in our spring and summer, but some of them — of which some of the Cape bulbs, as Nerines, are examples — rest in our summer and bloom in fall.



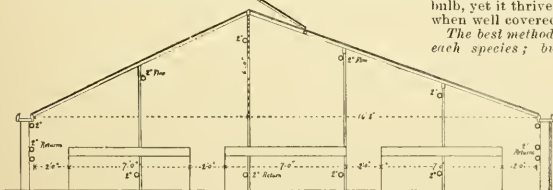
1004. Rose house, 150 x 20 ft., piped for steam.

The natural habitat of the plant is significant to the cultivator; it gives a suggestion of the treatment under which the plant will be likely to thrive. Unconsciously the plant-grower strives to imitate what he conceives to be the conditions, as to temperature, moisture and sunlight, under which the species grows in the wild. We have our tropical, temperate and cool houses. Yet, it must be remembered that the mere geography of a plant's native place does not always indicate what the precise nature of that place is. The plant in question may grow in some unusual site or exposure in its native wilds. In a general way, we expect that a plant coming from the Amazon needs a hothouse; but the details of altitude, exposure, moisture and sunlight must be learned by experience. Again, it is to be said that plants do not always grow where they would, but where they must. Many plants which inhabit swamps thrive well on dry lands.

The upshot of all this is, that the habitat and the zone give the hint: with this beginning, work out the proper treatment. Examples are many in which cultivators have slavishly followed the suggestion given by a plant's nativity, only to meet with partial failure. Because the *Dipladenia* is Brazilian, it is generally supposed that it needs a hothouse, but it gives best results in a coolhouse. Persons often make a similar mistake in growing the pepino warm, because it is Central and South American. *Ixia* is generally regarded in the North as only a glasshouse subject because it is a Cape bulb, yet it thrives in the open in parts of New England, when well covered during winter.

The best method of propagation is to be determined for each species; but, as a rule, quicker results and stockier plants are obtained from cuttings than from seeds. Of necessity, most Greenhouse plants are grown from cuttings. In the great majority of cases, the best material for cuttings is the nearly ripe wood. In woody plants, as Camellias and others, the cutting material often may be completely woody. In herbaceous plants, the proper material is stems which have begun to harden. Now and then better results are secured from seeds, even with perennials, as in *Grevillea* and *Impatiens Sultanii*.

Coming, now, to some of the principles which underlie the proper management of the house, it may be said, first of all, that the grower should attempt to imitate a natural day. There should be the full complement of continuous sunlight; there should be periodicity in temperature. From the lowest temperature before dawn, there should be a gradual rise to midday or later.

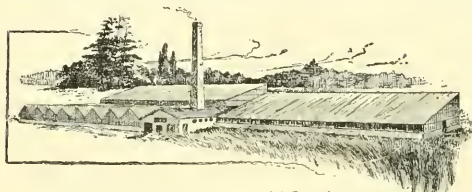


1003. Violet house with water heating.

plants have been forced to cease their activities because of cold or dry. These habits are so fixed that the plants must be humored when they are grown under glass. Some plants have no such definite seasons, and will grow more or less continuously, but these are the exceptions. Others may rest at almost any time of the year; but most plants have a definite season, and this season must be learned. In general, experience is the only guide as to whether a plant needs rest; but bulbs and tubers and

As a rule, the night temperature should be 10-15° Fahr. below the maximum day temperature in the shade. A high night temperature makes the plants soft and tends to bring them to maturity too early. It makes weak stems and flabby flowers. The temperature should change gradually; violent fluctuations are fatal to good results, particularly to plants which are grown at a high temperature.

In Greenhouse cultivation, *every plant is to receive individual care.* In the field, the crop is the unit; there we deal with plants in the aggregate. In the greenhouse, each plant is to be saved and to receive special care; upon this success depends. There should be no vacant places on the Greenhouse bench; room is too



1005. Range of modern commercial Greenhouses.

valuable. All this means that every care should be taken to so arrange the house that every plant will have a chance to develop to its utmost perfection. Patient hand labor pays with greenhouse plants. The work cannot be done by tools or by proxy. Therefore, the gardener becomes skillful.

Every caution should be taken to prevent the plants from becoming diseased or from being attacked by insects. The greater part of insect and fungous troubles in the Greenhouse are the result of carelessness or of mistakes in the growing of the plants. Determine what diseases or pests are likely to attack any plant; discover under what conditions these diseases or pests are likely to thrive; then see that those conditions do not arise. Keep the house sweet and clean. Destroy the affected parts whenever practicable. Then if trouble come, apply the fungicide or the insecticide. Remember that the very protection which is given the plants, in the way of equable conditions, also protects their enemies; therefore, it is better to count on not having the difficulties than on curing them. If diseases or pests have been troublesome, make a complete change of soil or stock before the next season, if practicable. At least once every year there is an opportunity to rid the place of pests. Many gardeners carry their troubles year by year by trying to fight them, when they might succeed by trying to avoid them.

The higher the temperature and the more rapid the growth, the greater the care necessary to insure good results. Plants grown under such conditions are soft and juicy. They are easily injured by every untoward circumstance, particularly by drafts of cold air. Let a draft of cold air fall on cucumbers or rapid-growing roses, and mildew will result in spite of Bordeaux mixture and brimstone.

In dark weather, grow the plants slow. If given too much heat or too much water, they become soft and flabby, and fall prey to mildew, green fly and other disorders. A stocky plant is always desirable, but particularly in the dull weather and short days of midwinter; at that time, take extra precautions in the management of the house.

Watering plants under glass requires more judgment than any other single operation. *Apply water when the plants need it,* is a gardener's rule, but it is difficult to apply because one may not know when they need it. Yet, if the gardener will put the emphasis on the word *need* he will at least be cautioned; novices often apply the advice as if it read, *Apply water when the plants will stand it. Water thoroughly at each application.* Mere dribbling may do more harm than good. Many people water too frequently but not enough. Remember that in benches evaporation takes place from both top

and bottom of the soil; and in pots it takes place from all sides. *Water on a rising temperature.* This advice is particularly applicable to warmhouse stuff. Watring is a cooling process. *The foliage should not go into the night wet,* particularly if the plant is soft-growing or is a warmhouse subject. *Water sparingly or not at all when evaporation is slight,* as in dull weather.

In all Greenhouse work, see that the soil is thoroughly *combed and that it contains much sand or fiber.* The amount of soil is small; see that it is all usable. In the garden, roots may wander if good soil is not at hand; in pots they cannot. The excessive watering in Greenhouses tends to pack the soil, particularly if the water is applied from a hose. The soil tends to run together or to puddle. Therefore, it should contain little silt or clay. The gardener's practice of adding sand to his Greenhouse soil is thus explained.

Ventilation is employed for the purpose of reducing temperature and of lessening atmospheric moisture. Theoretically, it is employed also for the purpose of introducing chemically fresh air, but with the opening and shutting of doors, and the unavoidable leaks in the house, it is not necessary to give much thought to the introduction of more fresh air. Ventilating reduces the temperature by letting out warm air and letting in cool air. The air should be admitted in small quantities and at the greatest distance from the plants in order to avoid the ill effects of drafts on the plants. Many small openings are better than a few large ones. Ventilate on a rising temperature.

Most plants require shading in the summer under glass. *Shading is of use in mitigating the heat more than in tempering the light.* A shaded house has more uniform conditions of temperature and moisture. If plants are grown soft and in partial shade, they are likely to be injured if exposed to bright sunlight. Sunscalding is most common in spring, since the plants are not yet inured to bright sunshine and strong sun heat. The burning of plants is due to waves (not bubbles) in the glass. It should be said that, other things being equal, the larger the house the easier is the management of it. It is less subject to fluctuations of temperature and moisture. In the "nesting" of houses, one house protects the other from the weather. A good commercial American Greenhouse plant is shown in Fig. 1005.

L. H. B.

GREENS, CHRISTMAS. The Christmas Greens industry has developed to an enormous extent within a few years. Some twenty years ago, when florists began to use lycopodium, a dozen barrels were all that was used in a single season in many of our lower cities. To-day the output in the United States is probably nearly 200 tons—about 40 car loads.

The materials now used, mentioned in something like their order of commercial importance, are holly, lycopodium (also known as bouquet green, ground pine, club moss, etc.), mistletoe, laurel, and cedar clippings. Other articles of similar utility are wild sunlex, hardy ferns, needle pines, outdoor palm leaves, Florida moss, galax leaves and leucothoe sprays: these all come from the South.

Lycopodium is one of the oldest and commonest of decorative materials. During seasons of long continued "Indian summer," a surplus is frequently gathered by careless pickers and dumped on the market. The choicest picked stock being obtainable only through the regular and well established trade channels, such sources are usually the only ones in case of early snow storms, which prevent the gathering of it. Choice stock from eastern Vermont, northern New York and Pennsylvania has been usually handled in large sugar barrels, tied in carefully arranged bunches, weighing perhaps one-half to one pound each. These bunches are packed in the barrels in layers, with roots toward the center. The quantity is always limited and the price 25 to 35 per cent higher than the Wisconsin and Michigan stock. Lycopodium, as handled in the West, comes almost entirely from northern Wisconsin, and is gathered from the north end of Lake Michigan, in the vic-

city of Sturgeon Bay, west nearly to St. Paul. The green belt in that state annually moves northward as the country becomes settled, and as the woods and swamps are depleted. This plant seems to thrive best in moist, shaded localities, and when plucked out by the roots, as is done when gathering, is not replaced by new growth of its kind. More open situations and drier ground produce lycopodium of a lighter and yellowish color, and consequently of less decorative value. Indians pick the best green, but are unreliable when exact dates must be met. The average season's output from Wisconsin is perhaps 35 car loads, or 150 to 200 tons.

The use of holly in a commercial way has grown from a very small beginning to its present proportions within fifteen years. Until the last six years most of the holly was handled by wholesale seedsmen and florists. With in that time the sale of holly has been taken up by the produce commission houses in large cities, thereby trebling the volume, but reducing the quality. Delaware and Maryland furnish the best stock of what is known as eastern holly, while Tennessee and some other parts of the South ship what is usually an inferior quality. Holly is almost always packed in uniform cases 2 x 2 x 4 ft. Freezing, while packed in cases, damages it but little, provided the holly be allowed to thaw out in a very cool and preferably dark place, where the temperature is not allowed to exceed 45° F. If, however, frozen holly is shipped in warm express cars, the foliage may turn black in a night.

English holly has occasionally been imported into the United States and into Canada, but never satisfactorily commercially. The eastern cities use mistletoe from England and France, brought over in fast steamers. The berries are much larger than those of the American mistletoe, which grows chiefly in Tennessee, Kentucky, Arkansas, Texas and New Mexico. It is usually shipped in crates of about 125 pounds, and the suttry quarters on ship-board often cause the loss of the leaves. The western states use probably not more than 8,000 to 10,000 pounds of American-grown stock from the localities named. It is also shipped in other kinds of packages. Mistletoe is very liable to damage from frost.

Cedar clippings are now but little used during the holiday season, but on other occasions, where open air decorations are desired, they are frequently made into roping or wreaths. Laurel from Maryland and Virginia is mostly used in eastern states.

Wild smilax, in light cases, usually in three sizes, is shipped by express mostly from Alabama and Georgia. It is as liable to injury by freezing as mistletoe, but is not damaged if allowed to thaw out gradually before removal from the case. About \$10,000 worth is used annually.

Eight million hardy ferns were recently offered by one wholesale dealer in Christmas Greens. These ferns are largely gathered in Massachusetts and Michigan.

Among the newest and most artistic materials for Christmas decoration are galax leaves and lencothoë sprays, which are here figured and are elsewhere fully described. Galax grows in the mountains from North Carolina to Georgia, and nowhere else in the world.

For further particulars concerning this industry, see American Florist 14:598-600 (1898). For the artistic side of Christmas decoration, see illustrated articles by F. Schuyler Mathews in American Florist 8:484 and 9:493.

J. C. VAUGHAN.

GREENS, EDIBLE, or POT-HERBS. This term Greens is generally applied in America to any Pot-herb, that is to say, to any green herbage which is cooked and served separately from the other principal and secondary dishes of a square meal. The term *Greens* is usually used for the mess of cookery which is brought to the table. It is not so often applied to the plants growing in the garden. In the garden, perhaps, they are herbs—Pot-herbs—though this term is not so much employed as it conveniently might be. Greens are served early in the spring, when the appetite craves anything which tastes like out-of-doors.

All sorts of plants are used as Pot-herbs. Almost anything which shows a succulent growth in the spring is likely to be tried by somebody. Turnip tops, potato leaves, pig-weed, purslane, and many other apparently

impossible herbs, are often impressed into the service. The really good Pot-herbs are comparatively few, however. Probably the best are dandelion, spinach, mustard (various species), endive, chard, beet-top and kale.

The following plants have been more or less used as Pot-herbs:

- Buck's-horn Plantain, *Plantago Coronopus*.
- California Peppergrass, *Brassica Japonica*.
- Cardoon, *Cynara Cardunculus*.
- Chard, *Beta vulgaris*.
- Chervil, *Anthriscus Cerefolium*.
- Chicory, *Cichorium Intybus*.
- Chinese Amaranth, *Amarantus Gangeticus*.
- Chinese Artichoke, *Stachys Sieboldii* (S. *afinis* or S. *tuberosa*).
- Chinese Cabbage, *Brassica Pe-Tsai*.
- Chinese Cabbage, *Brassica Chinesis*.
- Chinese Mustard, *Brassica juncea*.
- Chives, *Allium Schoenoprasum*.
- Corn Salad, *Faleriella obtusifolia*.
- Cress, *Lepidium sativum*.
- Meadow Cress, *Cardamine pratensis*.
- Pará Cress, *Spilanthus oleracea*.
- Upland Cress, *Barbarea vulgaris* and *precox*.
- Other so-called Cresses, as *Lepidium Chiloense*, *Lepidium pasdium*, *Lepidium Virginicum*, *Senbiera plantifida*, *Nasturtium Indicum*, *Gymnandropsis pentaphylla*.
- Dandelion, *Taraxacum officinale*.
- Dock, *Rumex*, several species.
- Endive, *Cichorium Endivia*.
- Globe Artichoke, *Cynara Scolymus*.
- Good King Henry, *Chenopodium Bonus-Henricus*.
- Goosefoot, *Chenopodium*, mostly C. *album*.
- Ice Plant, *Mesembryanthemum crystallinum*.
- Italian Corn Salad, *Faleriella erioearpa*.
- Kale, *Brassica oleracea*.
- Lettuce, *Lactuca* (especially the wild species, some of which are excellent).
- Malabar Nightshade, *Basella alba* and *Basella rubra*.
- Mustard, *Brassica* species.
- Nasturtiums, *Tropaeolums*.
- Orach, *Atriplex hortensis*.
- Parsley, *Apium Petroselinum*.
- Pepper-grass, *Lepidium* species.
- Pigweed, *Amarantus* species.
- Pokeweed, *Phytolacca esculenta*.
- Quinoa, *Chenopodium Quinoa*.
- Rocket Salad, *Eruca sativa*.
- Rosella, *Hibiscus Sabdariffa*.
- Salad-Burnet, *Porterium Sanguisorba*.
- Sorrels, various, *Oxalis crenata*, O. *tetraphylla*.
- Spinach, *Spinacia oleracea*.
- Tuberous-Rocket Chinese Mustard, *Brassica napiformis*.
- Turkish Rocket, *Bunias orientalis*.
- Turnip, *Brassica Rapa*.
- Winter Purslane, *Montia perfoliata*.

Culture.—Pot-herbs are wanted at the earliest possible moment in the spring. They are, therefore, often grown in hotbeds, frames, or in greenhouses (see *Spinach*, *Dandelion*, *Mustard*, etc.). They must be succulent and tender. It is necessary, on this account, that they be quickly grown in loose, very rich, well-drained soil, with plenty of water. Specific directions for the cultivation of the various plants will be found under the several heads.

F. A. WAUGH.

GREENWEED. *Genista tinctoria*.

GREGORIA. See *Douglasia*.

GRENADIN or GRENADINE. A type of Carnation.

GREVILLEA (Chas. F. Greville, once vice-president of the Royal Society of England, and a patron of botany). *Proteaceae*. Trees or shrubs, of nearly 200 species, mostly Australian, of which one is everywhere cult. in this country as a decorative pot-plant. Fls. small, perfect, mostly in pairs in the clusters or racemes, apetalous, the calyx with 4 recurved parts; stamens of 4 sessile anthers borne on the sepals; style 1, long and curved; lvs. alternate, of many forms: fr. a follicle, with 1 or 2 winged seeds.

robusta, Cunn. SILK OAK. Fig. 1006. One of the most popular of all fern-leaved pot-plants, and easily grown from seeds (which are imported in large quantities). When young (from 2-5 ft. high) it makes a most graceful subject. In glasshouses it is not grown to large size, and, therefore, little is known of the great size which it attains in its native forest. According to Von Mueller, it is "indigenous to the subtropical part of

East Australia, rising to 150 feet, of rather rapid growth, and resisting drought to a remarkable degree; hence one of the most eligible trees even for desert culture, though naturally a sylvan plant. The wood is elastic and durable, valued particularly for staves of casks, also for furniture. The richly developed golden yellow trusses of flowers attract honey-sucking birds and bees through



1006. *Grevillea robusta* (× 1/2).

several months of the year. The seeds are copiously produced and germinate readily. Rate of growth in Victoria, 20-30 ft. in 20 years. In Ceylon it attained a stem-circumference of 5 ft. in 8 years." In California and S. Fla. it is a valuable lawn tree. When grown in the open, it will stand some frost. As a glasshouse plant it is grown almost wholly from seeds, and is used in its young state; as the plant becomes old, it loses its leaves and becomes ragged below. It thrives in the temperature suited to geraniums or roses, and it stands much hard usage and neglect. It is popular as a window subject. Best results with *Grevillea* are usually secured by raising a fresh stock every year, from seed sown late in winter or in spring. The following winter or spring they will be in 4-6-in. pots, and will be in their prime. The young plants need frequent repotting to keep them in good condition. *Grevillea robusta* has come to be generally known as a florists' plant within the past ten years. Lvs. twice-pinnatifid, the ultimate divisions narrow and pointed and sometimes lobed, pubescent. B.M. 3184. A.G. H:115. A.F. 4:413. — In the West Indies the plant is much grown, and it is often trimmed to desired shape. In exposed places the foliage becomes golden in cast.

There are no other *Grevilleas* in the Amer. trade, but following are accessible portraits of other species: *G. acanthifolia*, Cunn. B.M. 2807. — *G. alpestris*, Meissn. (G. alpina, var. Lindl.). B.M. 5007. R.H. 1887:108. R.E. 23:145. — *G. amulifera*, Muell. B.M. 6687. — *G. arenaria*, R. Br. (G. canescens, R.Br.). B.M. 3185. — *G. asplenifolia*, Knight. B.M. 7070. R.H. 1882, p. 245 (as *G. longifolia*). — *G. Banksii*, R. Br. B.M. 5870; G.C. II. 16:15. — *G. Caleni*, R. Br. B.M. 3153. — *G. canescens*, R.Br. — *G. arenaria*. — *G. eriifolia*, R. Br. B.M. 6361. — *G. fasciculata*, R.Br. B.M. 6105. — *G. Julliana*, Muell. B.M. 7524. — *G. Hookeriana*, Meissn. B.M. 6879. — *G. intricata*, Meissn. B.M. 5919. — *G. juniperina*, R. Br. (G. sulphurea, Cunn.). G.C. II. 26:469. — *G. linearis*, R. Br. B.M. 2661. — *G. longifolia*, R.Br. — *G. asplenifolia*. — *G. macrostyla*, Muell. B.M. 5915. — *G. Prasnei*, Meissn. B.M. 8837. — *G. pulchella*, Meissn. B.M. 5979. — *G. punctata*, R.Br. B.M. 6698. — *G. rosarinifolia*, Cunn. B.M. 5971; G.C. II. 5:529. — *G. sericea*, R.Br. (G. dubia, R.Br.). B.M. 3798. — *G. sulphurea*, Cunn. — *G. juniperina*. — *G. Thelmanniana* Hueg. R.H. 1882:456. L. H. B.

GRÉVIA (Nehemiah Grew, of Coventry, 1628-82. author of a work on anatomy of plants). *Tiliaceae*. This includes two little known plants slightly cult. in S. Fla. A genus of about 60 species of trees and shrubs in the warmer parts of the Old World, often having

stellate pubescence: lvs. entire or serrate, 3-7-nerved; fls. yellow or rarely purple, in axillary few-fl. cymes or terminal panicles; petals 5, with pits or glands inside at the base; stamens indefinite; drupe 1-4-stoned. *G. Caffra*, Meissn., from Natal, was int. by Reasoner Bros. in 1891. A bushy plant, with pink star-shaped fls. borne during most of the year. *G. denticulata*, Wall., from India, was never described. Under this name Reasoner cultivates a plant "resembling a mulberry in growth, which bears enormous quantities of acid drupes, about the size of cranberries; used for pickling."

GRÉVIA (after Sir George Grey, once Governor of Cape Colony). *Sapiindaceae*. A monotypic genus, containing a small tree from Natal, which bears large pikes of pendulous, 5-petaled, scarlet fls., and is cult. outdoors in S. Calif. and abroad under glass in many botanic gardens. In R.H. 1894:252 the plant is shown at its best, with a spike 6 in. long and 2-3 in. wide, containing probably over 100 fls., each three-fourths of an inch across. In France this tree flowered from the end of autumn throughout the winter. The long-exserted stamens with reddish purple anthers make a striking feature. The structure of the fls. is so peculiar that Harvey referred the genus doubtfully to the saxifrage family. In European greenhouses *Greyia* is a shrub requiring full sunlight, thorough ripening of the wood and a season of rest before flowering. In Natal it flowers in August or September, which is early spring there. Europeans recommend a sandy loam. Prop. by seeds or by cuttings from half-ripened wood.

Sutherlandi, Hook. & Haw. Small tree, with thick, naked branches; lvs. clustered at the ends of the branches, 2-3 in. long, orbicular, ovate or oblong, deeply cordate at base, toothed; petiole 9-12 in. long; disk cup-shaped, with 10 marginal teeth, each crowned by a petate gland; stamens 10; ovary laterally 5-lobed, 5-celled; ovules numerous, in 2 series in the inner angle of the cells; fr. capsular, 5-valved; seeds albuminous. B.M. 6040. R.H. 1894:252. G.C. II. 19:625. J.H. III. 30:101.

GRIFFINIA (after William Griffin, who brought these plants from Brazil). *Amaryllidaceae*. Seven species of Brazilian bulbs, with distinct foliage and fls. about 2 1/2 in. across, which are more or less tinged with lilac or rose. Like many other genera of the amaryllis family, bulbs of flowering size are too costly for general use. Lvs. usually petioled, and with a very broad blade; perianth tube none or very short; the 3 lower segments narrower than the upper; ovary 3-celled; stigma capitate, rarely 3-lobed; umbel 6-15-fl. *Griffinia* is distinguished from many other genera by its 2 ovules, which are basal and collateral. See Baker, *Amaryllidaceae*.

As there seems to be no recorded American experience with these fine bulbs, the following English experience is taken from W. Watson's article in *The Garden* 50, p. 209: "Griffinias are called stove plants. They do not always thrive under cultivation, but where they do they are strikingly ornamental. Herbert states that in Brazil they are buried 8 inches deep in strong loam, the scape and leaves rising to the height of 2 feet, whereas in our stoves they rot when potted in strong soil. He recommends light peat and sand for them. But they thrive when planted in fibrous loam three parts, leaf-mold one part, and a good sprinkling of silver sand. The bulbs should be partly buried and the pots carefully drained. During winter the plants rest and require no water. They should be placed on a dry shelf in a warm or intermediate house and kept there until about March, when growth recommences and the flower-spikes push up. The plants ought to be at their best in May, though they do not appear to flower at any definite time under cultivation. They may be made to flower in winter by forcing, but the probable result of this is the sickening of the bulbs. The lvs. are deciduous, new ones being developed along with the flower-spikes, as in the *Hippeastrums*. The plants require moderate supplies of moisture, both at the root and overhead, and a light position. They do not ripen seeds under cultivation, but may be propagated by means of offsets from the bulbs."

A. *Stigma capitate.*

hyacinthina. Herb. Bulb globose; lvs. 6-9 in. long, 2-3 in. broad, rounded at the base to a channeled petiole as long as the blade; scape 1-2 ft. long; pedicels none or very short; stamens much shorter than the segments. B.R. 2:163 (as *Amaryllis hyacinthina*). Upper segments tinged blue, lower ones nearly white). J.H. III. 31:371. Var. **maxima**, Gr. 50, p. 209, is probably the best garden form. Called "Blue Amaryllis" in some catalogues.

AA. *Stigma distinctly 3-cted.*

Blumenavia, K. Koch & Bouché. Bulb ovoid; lvs. 4-5 in. long, cuneately narrowed, a petiole shorter than the blade; scape 6-8 in. long; pedicels $\frac{1}{2}$ in. long; stamens as long as the perianth. B.M. 5666 (veins rose-colored). R.H. 1867:32. Gn. 50:1083 (veined and flushed with rose).

GRINDELIA (Prof. Hieronymus Grindel, of Riga and Dorpat). *Compósita*. This genus contains 2 plants from which a fluid-extract is obtained that is used externally against poisoning by "poison ivy." They are hardy plants sometimes cult. for their showy yellow fls., which are $1\frac{1}{2}$ -2 in. across and borne freely all summer. A genus of about 14 species of American herbs, sometimes shrubby, of coarse habit, mostly natives of the U. S. west of the Mississippi. Lvs. sessile or partly clasping and usually serrate and rigid; heads terminating the branches. The plants often have a sticky balsam, especially the heads before and during flowering, whence they are called "Gum-plants" in California, particularly *G. robusta*, which is the common one. The 2 species described below have roots that are perennial and short-lived, but sometimes annual. These plants are also wholly glabrous, and have firm or rigid leaves.

Grindellias are of the easiest culture, and are prop. by division, cuttings or seed. *G. squarrosa* is hardy in the East; *G. robusta* is sold in Calif. They are best for wild places and trying situations. J. W. Manning says that *G. squarrosa* grows freely in all soils. J. W. Keller writes that it does best in a light, open, moderately rich soil. In California it is common on dry hills. According to John S. Wright, both species grow in salt marshes and on alkaline soil, being indiscriminately gathered for medicinal purposes. The extract is also tonic and sedative, and is used in asthma. The rays are numerous, sometimes 30, about $\frac{1}{2}$ in. long.

squarrosa, Dunal. Shrubby, branched from base, 1-2 ft. high; outer akenes usually squarely truncate and even at summit B.M. 1706.

robusta, Nutt. GUM-PLANT. Herbaceous; lvs. larger and more rigid; akenes all, or some outer ones, 1-toothed or bordered at the summit. Fls. throughout the Californian winter. Collected stock is offered. W. M.

GRISELÍNIA (after Franc Griselini, Venetian botanist, middle of eighteenth century). Including *Decostea Cordace*. This includes a tree and a shrub with large, glossy, laurel-like foliage, rarely cult. in the South, and nearly hardy at Washington. A genus of 8 species of trees, shrubs or climbers from New Zealand, Chili and Brazil, with lvs. alternate, often unequal-sided, leathery; fls. minute, in glabrous or pubescent racemes or panicles.

litoralis, Raoul. Tree, 30 ft. high; lvs. ovate or oblong, wedge-shaped or narrowed into a petiole; veins obscure beneath. New Zealand.

lucida, Forst. f. Shrub, 10-12 ft. high; lvs. obovate or oblong, very unequal at the base; veins distinct beneath. New Zeal. Not cultivated here. Var. **macrophylla** (*G. macrophylla*, Hort.) is a large-leaved form. *G. lucida* is prized in Europe for apartments. Showy. Requires shade and moisture.

GROMWELL. *Lithospermum*.

GROUND CHERRY is *Physalis*; in the Old World *Prunus Chamæcerasus*, **Ground Hemlock** or American Yew, is *Taxus Canadensis*. **Ground Ivy**, *Nepeta Glechoma*. **Ground Laurel**. Old World name for *Epi-*

gæa repens. **Groundnut**, *Apios* and *Panax*; also Old World name for peanut or goober (*Arachis*). **Ground Pine**, *Lycopodium*. **Ground Pink**, *Phlox subulata*.

GRUNDESEL. See *Senecio*. **Grundeisel Tree**, *Baccharis halimifolia*.

GRUMICHAMA. *Eugenia Brasiliensis*.

GRUMÍLEA. All referred to *Psychotria*.

GUAÍACUM (native West Indian name). *Zygophyllaceæ*. Guaiacum is kept in every good drug store, and the tree which produces the resin used in medicine has a hard, heavy wood, used for blocks and pulleys, tulers, etc. It is cult. to a very slight extent in S. Calif. and in tropical Fla. for ornamental value. The genus has 8-10 species of trees or shrubs, mostly tropical American, and all have hard wood and abundant resin; lvs. opposite, abruptly pinnate, leathery; fls. 2-14, entire; peduncles borne in pairs between the deciduous stipules, 1-fld.; fls. blue or purple; sepals 4-5, deciduous, unequal; petals 4-5, broadly obovate; stamens 8-10, inserted in the short, inconspicuous disk.

officinale, Linn. Middle-sized or low tree, inhabiting arid plains from the Fla. keys to Venezuela. Lifts in pairs, evergreen, a quarter to half an inch long.

GUAM, ISLAND OF. See *Ladrones*.

GUAVA (species of *Psidium*, which see). Fig. 1007. The Guava, in its various species, is so easily cultivated and spreads so readily from seeds that it is almost a weed in tropical countries. In Florida and other sections near the tropics it is at home, and succeeds admirably on any soil not too wet. It usually bears in its second year from seed, or after frosting down, hence if a winter passes without seriously damaging the tops, a considerable amount of fruit is produced the succeeding summer and autumn. The strictly tropical species and varieties are the best for all purposes, and make the finest of jelly and preserves. The Cattley and the Chinese are now cultivated in Florida; when dormant they will stand a temperature as low as 22° F. The foliage of these two sorts is very ornamental, being a rich, glossy green, not unlike that of *Camellia Japonica*.

The Guava is most readily propagated from seed, but is quite variable, hybridizing so easily that to secure a certain fine variety recourse must be had to grafting or



1007. Cattley Guava.

propagating from cuttings. Grafting is performed after the usual methods. Propagation by cuttings is difficult, but possible, and the best results seem to be had from half-ripened wood, using bottom heat in a frame or house. Large cuttings are occasionally rooted in the open ground, after the same method of rooting figs or willows. If grown from seed, the young plants should

be potted off when very small, and kept growing in pots until wanted for permanent setting in the orchard, as the plants in open ground do not transplant well. Rooted cuttings, of course, should be treated the same as seedling plants as to final handling.

Guavas grow well on any soil, sandy or clayey, rich or poor, dry or moist; but they will not live in a bog. On too rich soil the growth is apt to be rank and the quality of the fruit injured. This fruit tree is as easily grown under sheds as is the pine-apple in Florida, and when thus protected is certain to bear abundantly, even well out of the tropics.

E. N. REASONER.

GUAZUMA (name of Mexican origin). *Stereuliaceae*. Seven or eight tropical American (one also Javan) trees, with small white, pink or yellow fls. in short-peduncled, axillary cymes. Petals 5, often 2-parted; stamens 10, united into a tube or column, some of them sterile; styles 5; fr. a 5-lobed nut the size of a filbert; lvs. 2-ranked, serrate. Allied to Theobroma, but that genus has a berry-like fr., entire lvs., fasciated or solitary fls., and a different staminal column. *G. ulmifolia*, Lam., the "Guacima" of Mexico, is offered by Franceschi. It becomes a large tree; branchlets powdery; lvs. ovate to oblong-lanceolate, somewhat pointed, oblique at base, powdery beneath when young but becoming glabrous; nut nearly globular, with 5 furrows. The tree is said to yield medicinal preparations.

GUELDER ROSE. See *Viburnum Opulus*.

GURNESEY LILY. *Nerine Sarniensis*.

GUFINA. See *Gevuina*.

GUILIELMA. See *Bactris*.

GUINEA HEN FLOWER. *Fritillaria Meleagris*.

GUIZŌTIA (after Guizot, the celebrated historian). *Compositae*. This genus has 5 species of annual herbs from tropical Africa, one of which has some economic interest from its oil-producing seeds. Neither this nor closely allied genera have much ornamental value. The plants have yellow heads, about 2 in. across, with 8 broad, 3-toothed rays and a leafy outer involucre. Seeds can be obtained by the pound from S. Fla., and they are listed among miscellaneous agricultural seeds in a few of the largest European catalogues. The plant is cult. in India for the oil.

Abyssinia, Cass. (*G. oleifera*, DC. *Verbesina sativa*, Roxb.). Lvs. opposite, lanceolate, clasping, remotely serrate. B.M. 1017.

GUM TREES. See *Eucalyptus* and *Acacia*.

GUNNĒRA (J. Ernst Gunner, 1718-1773, was a Swedish bishop and botanist, and wrote a local flora, *Haloragaceae*. The little family Haloragaceae comprises about 100 widely scattered and heterogeneous species in 9 genera. In the northeastern states are the aquatic genera Callitriche, Proserpinaca, Hippuris, Myriophyllum. These comprise small and mostly inconspicuous plants. In the Australian region are the endemic genera Loudonia and Meionectes; and there remain Scirpella, Gunnera, and Haloragis, with very wide and disjointed distributions. Gunnera has perhaps a dozen known species in S. Afr., Abyssinia, Java, Tasmania, Hawaii and S. Amer. In general appearance the Gunneras are wholly unlike our native haloragaceous plants. The lvs. are gigantic and more or less orbicular, radical; fls. perfect or imperfect, small, packed in a great cob-like spike; petals 2 or none; calyx none, or with 2-3 lobes; stamens 1 or 2; ovary 1-lobed, bearing 2 filiform styles; fr. a drupe. They are perennial herbs, and with protection the two following species may be grown even in some of our northern states.

Gunneras are perhaps the noblest of all lawn foliage plants. To produce satisfactory effects, rich, moist ground is indispensable. The plants must never suffer for want of water. Full exposure to sun is advisable, but they should be sheltered from severe winds, else the leaves will be damaged. Ample winter protection

should be provided for. A liberal covering of leaves or litter, held in place by brush or branches, will generally keep them from harm. Apply the covering in December and remove early in spring. Prop. by division. Seeds are also employed, and they can now be readily secured.

manicata, Lind. Stem thick and very short, the titanic crown of lvs. rising from the ground; petioles often as tall as a man, prickly; blades becoming 5 to 10 ft. across, orbicular in general outline, variously lobed, crenate, furrowed and channelled along the great veins; fls. green; spikes dense and tapering, often more than 1 ft. in diam, and 3-4 ft. tall. S. Brazil. L.H. 31:531. Gn. 45, p. 21; 50, p. 455; fl. p. 385. G.C. III. 14:589. G.F. 8:55.—The crown of lvs. sometimes measures from 25-35 ft. across. This is the better species.

Chilensis, Lam. (*G. scabra*, Ruiz & Pav.). Not so robust, the lvs. smaller and less spiny, and the fls. spikes less tall; fls. reddish. R.H. 1862, p. 310; 1894, p. 397. Gn. 49, p. 151. G.C. II. 26:425; III. 8:665.—Longer known in cult. Thrives in drier soil.

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

GUTIERREZIA (personal name). *Compositae*. About 18 species of herbs or subshrubs, often resinous, all American, mostly western N. American. They are much branched from the base, and have narrow, entire lvs. and clusters of small yellow heads.

Euthamia, Torr. & Gray. More or less woody at base, seldom over 1 ft. high; involucre turbinate, 2 lines long; rays and disk-fls. each 3-9; akenes silky-pubescent; pappus of about 9 chaffy scales. N. W. N. Amer.

GUZMÁNIA (A. Guzmán, Spanish naturalist). *Bromeliaceae*. Includes *Caragata*. About 70 tropical American Bromeliads, of which several are fairly well known ornamental glasshouse subjects. They closely resemble the erect-growing Tillandsias, but differ in technical characters: fls. in a simple spike-like terminal cluster, tubular, the outer segments or calyx oblong and obtuse, the inner or petals shorter than the tube; anthers inserted on the throat of the tube, and united by their edges around the style. Grown in the warmhouse, along with *Billergeria* and *Tillandsia*, which see for culture. Closely allied to *Echmea*. Many species are cult. in fanciers' collections in the Old World. For *G. picta*, see *Nidularium*. For *G. Legrelliana*, see *Isokenbergia*. *G. rosea*, a name which has appeared in the Amer. trade, is probably an *Echmea*. Monogr. by Mez, DC. Monogr. Phaner. 9 (1896).

A. Corolla (or segments) purple or red.

lingulata, Mez (*Caragata lingulata*, Lindl. *C. splendens*, Bouché. *C. lingulata splendens*, Hort.). Epiphyte; lvs. many, lanceolate or ensiform, 1½ ft. long, remotely toothed; spike becoming drooping, showily red-bracted; expanded fl. about as long as the long-pointed bracts, the tube yellowish and the limb blue-purple. W. Indies, Cent. Amer., and adjacent S. Amer. B.R. 13:1068. F.S. 11:1091.—Handsome. Var. **cardinalis**, André (*Caragata cardinalis*, André). Bright scarlet; very showy. Columbia. L.H. 27:374. R.H. 1883:12.

AA. Corolla (or segments) white.

tricolor, Ruiz & Pav. (*G. fragrans*, Hort., at least in part. *G. grandidi*, Hort., in part. *G. maculata*, Hort., in part. *G. monostachya*, Rusby). Lvs. several to many, broad and more or less recurved, entire on the edges, usually shorter than the stout, erect spike; lower bracts green streaked with black, upper ones red-tinged; corolla white. W. Indies, Cent. Amer., S. Amer. L.B.C. 5:462. F.S. 9:918. B.M. 5220.—Interesting because of its combination of green, red and white. Some, at least, of the horticultural plants which pass as *G. fragrans* belong to *Echmea eburnea*, Baker (*Cavistrum Lindenii*, Mez. *Nidularium Lindenii*, Regel). This species is further mentioned under *Nidularium*.

Devasayána, Morr. (*Caragata Devasayána*, Morr.). Lvs. about 20, narrow linear or ensiform, brown-striped on the back; fls. white, in a dense, oblong spike, the scarlet bracts oval. Equador.

AAA. *Corolla (or segments) yellow.*

Melinónis, Regel (*Caraguata Melinónis*, Morr.). Lvs. strap-shaped, green above and brown-tinted beneath; fls. yellow, subtended by oblong red bracts. French Guiana. L. H. B.

GYMNOCLADUS (Greek, *naked branch*; referring to the naked branches, which in winter are destitute of twigs). *Leguminosæ*. A genus of 2 species, one of which is a scarce native tree, the Kentucky Coffee Berry, so called because its seeds were used for coffee west of the Alleghanies before and during the Revolutionary War. It is a desirable shade tree for city streets, and is bright and graceful in appearance and free from disease, growing from 30-60 ft. high in cultivation, and not leafing out until the middle of May, after the other trees are in full foliage. It is thornless and has compound foliage. Grows with erect divisions, making narrow, pyramidal head. Branchlets very stout and destitute of spray; fls. white, dioecious or polygamous, in terminal racemes; pods long, hanging. Grows naturally in bottom lands and richest soils. May be planted in any soil, but thrives best in deep, rich, or rather humid soil. Prop. by seeds and cuttings.

Canadensis, Lam. (*G. ilicica*, C. Koch). KENTUCKY COFFEE TREE. Fig. 1008. Height in the wild, 75-100 ft.: lvs. large, twice pinnate with 4-7 pairs of partial leaf-stalks, each partial leaf-stalk with 5-13 ovate, acute lfts., except the lowest of 1 ft., 1-3 in. long, standing edge-wise. Racemes many-fl. and elongated, nearly white, terminating branches of the season; staminate clusters 3-4 in. long; pistillate 10-12 in., and compact; ovary sessile; pods 6-10 in. long, flat, scythe-shaped, dark reddish



1008. *Gymnocladus Canadensis*—Kentucky Coffee Tree.

brown, hanging unopened all winter. Early summer. S. Ontario to Penn., Tenn., Minn., Neb. and Indian Terr. S.S. 3:123, 124. R.H. 1897, p. 491. B.E. 2:261.
G. chinensis, Ball., with smaller, more numerous lfts. and much thicker pods, is not cult. A. PHELPS WYMAN.

GYMNORAMMA (Greek, *a naked line*; referring to the sori). Also written *Gymnogramme*. *Polypodiaceæ*. An unnatural aggregate of plants of very dissimilar

habit, agreeing in the possession of naked sori, which extend along the veins in various lines. A large number of the species are coated on the under surface with a white or yellow waxy powder, which has given the names of Gold Ferns or Silver Ferns. Two species occur in the West, the "golden-back" of California, and a species less common from Arizona and other parts of the Southwest. Over 80 species of wide distribution have been included in the genus, which by many is divided into a series of natural genera. The name *Gymnogramma* itself is probably not tenable.

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A. Under surfaces of lvs. not powdery.
B. Lvs. pentagonal, hairy on both sides.

1. *hispidia*, Mett. A low plant, 5-8 in. high, with pentagonal, palmate lvs. 1 in. or more either way, densely covered on both sides, but especially below, with strigose hairs. Has been incorrectly referred to *G. Ehrenbergiana*. Tex., Ariz., Mex.—Hardy.

BB. Lvs. triangular-lanceolate, naked; ultimate segments narrow.

2. *schizophylla*, Baker. Lvs. 18-24 in. long, quadripinnatifid, the stalks, rachises and divisions slender, the ultimate segments finely cut. A comparatively recent introduction; very graceful in cultivation. Jamaica. A. G. 18:421. G.F. 2:533. A. F. 10: 827. I.H. 31:522. Gn. 48, p. 417. Var. *elegantissima* (*G. elegantissima*, Hort. W. Bull.), has reddish brown rachises.

AA. Under surfaces with wax-like powder. (*Gold and Silver Ferns.*)

B. Powder yellow: lvs. about as broad as long.

3. *triangularis*, Kaulf. Fig. 1009. Lvs. 2-5 in. wide and long, on stalks 6-12 in. long, dark green above, below deep golden yellow, or occasionally white; lower pinnae much larger than the others, deltoid; the upper lanceolate. A white powdered variety with a viscous upper surface and coarser cuttings (var. *viscosa*, D. C. Eaton) is found in S. Calif.



1009. *Gymnogramma triangularis* (x 1/2).

BB. Powder yellow: lvs. lanceolate, several times as long as broad.

c. Lvs. scarcely more than bipinnate.

4. *chrysophylla*, Kaulf. Lvs. 12-18 in. long, with blackish stalks and rachises, the segments slightly pinnatifid at the base; powder golden yellow. W. Indies to Braz. R.H. 1856:201. G.C. 111. 23:373.—Often considered a var. of *G. calomelanos*. Var. *Laucheana* (*G. Laucheana*, Hort.), has triangular lvs. except in its sub-variety gigantea. Gn. 48, p. 437.—By many this species is considered a variety of *G. calomelanos*.

cc. Lvs. tripinnatifid to quadripinnate.

5. *sulphurea*, Desv. Lvs. 6-12 in. long on chestnut-brown stalks, the pinnae long, tapering, less than 1 1/2 in. wide at base, the pinnales compact, with 3-7 divisions; powder sulfur-yellow. W. Indies.

6. *aërea*, Desv. Lvs. 6-12 in. long, 7-10 in. wide, deltoid; pinnae deltoid, 2-3 in. wide at base, the ultimate divisions cuneate. Madagascar.—By some this is referred to *G. argentea*, Mett., a similar fern with white powder.

7. *decomposita*, Baker. Lvs. 1½ ft. long, 1 ft. broad, deltoid, quadripinnate or even 5-pinnate; pinnae close, lanceolate, with the ultimate divisions linear and 1-nerved; powder rather scanty. Andes. F.R. 2:25. G.C. III. 11:265. F. 1874, p. 148.

BBB. *White; lvs. lanceolate.*

D. *Segments acute.*

8. *calomelanos*, Kaulf. Stalks and rachises nearly black; lvs. 1-3 ft. long, with lanceolate pinnae; segments often with a large lobe-like auricle at the upper side of the base. West Indies to Brazil. A.G. 14:303.—The most variable species of the genus. *G. magnifica*, Hort., is probably one of the many garden varieties. Var. *chrysophylla* is here considered a distinct species. (See No. 4.)

DD. *Segments obtuse, rounded.*

9. *Peruviana*, Desv. Lvs. 6-12 in. long, 3-5 in. wide, with dark chestnut-brown stalks; pinnae somewhat regularly pinnatifid on both sides below. Mexico to Peru. By some considered a var. of *G. calomelanos*. Var. *argyrophylla* (*G. argyrophylla*, Hort.), is silvery on both sides.

10. *Tartaria*, Desv. (*G. Tatirica*, Hort.). Lvs. 9-18 in. long, 2-5 in. broad, with closely set pinnae, tapering gradually to a point; pinnules scarcely divided or cut, mostly merely crenate. Trop. Amer. from Mex. southward.

DDD. *Segments fan-shaped or wedge-shaped.*

11. *pulchella*, Linden. Lvs. 6-12 in. long, 4 in. wide, the lower pinnae much the largest; pinnules imbricated; texture rather thin. Venezuela. Var. *Wettenhalliana*, Moore (*G. Wettenhalliana*, Hort.), is a garden variety, with pale sulfur-yellow powder.

G. *Japonica*. See *Dietyogramma Japonica*.

L. M. UNDERWOOD.

Gold and Silver Ferns are amongst the choicest and most distinct of all ferns in cultivation, by reason of the beautiful golden or silvery powder that covers the backs of the fronds. The best Gold Fern is *G. chrysophylla*; the best Silver Fern is *G. calomelanos*. Unfortunately, however, these fine subjects scarcely thrive anywhere but in a warm conservatory. The finest Gold or Silver Fern will present an unsightly appearance if syringed or watered overhead, as the water carries off the farina. Moreover, many a fine specimen is spoiled by overwatering at the roots in winter time or directly after repotting. The Gold Fern shown on Plate XI, which was considered one of the finest specimens of *Gymnogramma* ever raised in America, a plant that had been carefully kept for many years, was destroyed one winter by overwatering. In the summer time, when these ferns are growing freely, there is little danger of overwatering, always provided the drainage be thorough. In the winter Gold and Silver Ferns should have a drier atmosphere, and less water will suffice. Plants in small pots should be lowered into a pail of water. Do not soak them again until they show indications of dryness. Large specimens should never be watered with the hose; always use the watering can. A critical time with Gold and Silver Ferns is after repotting, and many promising specimens are ruined as a result of premature watering at this time. When the plants are well established and the roots have taken fresh hold in the new soil they will need more water.

Gold and Silver Ferns like a drier atmosphere than the majority of ferns, particularly in winter. Hence they should not be placed on low benches. Elevate them in some way so that they can get the warmer and drier air of the conservatory. Young specimens should be placed on shelves or brackets near the light. Older plants may be set upon a large inverted pot or fern pan. A plant grown from spores shows its true character early. A year's growth produces fine little ferns, in 2 or 3-in. pots, with fronds 4 or 5 in. long, the young ferns being 2 or 3 in. high. Another year's care will give handsome specimens a foot or more high.

The first thing to do with Gold and Silver Ferns is to give them a special place where they can receive special care. For potting a light mixture is desirable. In the Old World, loam is usually not recommended, but for large specimens the writer has had best success in using 2 parts of fibrous loam, 1 part peat broken or chopped

in good sized pieces, and 1 part leaf-mold, with a little sand and some charcoal to keep the soil porous. These ferns can hardly have too much light, and need slight shade only in summer. In winter the night temperature should be 55° to 60°, with a day temperature 5° to 10° higher. Be sure to give these ferns a drier atmosphere and less moisture at the roots in winter than in summer. However, the plants must not be allowed to get too dry.

The writer prefers to grow large specimens in pans rather than in pots, as the roots have more room to spread. Surface rooting can be encouraged by a light mulch of chopped moss, some fine peat and sand. Keep the crown of the plant a little elevated. It is necessary to have plenty of drainage. A good potting soil for young plants consists of 2 parts peat and 1 part sand. Repot in February, before the young growth has started. If repotting is delayed too long the young fronds will be injured. ROBERT SHORE.

GYMNOÉTALUM (Greek, *naked petal*). *Cucurbitaceae*. A genus of 6 species of tropical oriental vines, of which one, *G. Cochinchinense*, is cult. chiefly for its ornamental gourds. It is a tender perennial plant, and is said to have small white fls. borne in late summer and autumn. It is advertised only in the largest seed catalogues, under the name of *Scotanthus tubiflorus*. *Scotanthus* was formerly thought to be a closely allied genus, differing only in the staminate fls. possessing bracts and 3 bristle-like rudiments of an ovary, while the staminate fls. of *Gymnometalum*, by the old definition have no bracts or minute ones, and but 1 rudiment of an ovary. The latest monograph of the *Cucurbitaceae* is by Coigneaux in DC. Mon. Phan. vol. 3, 1881. He includes *Scotanthus* in *Gymnometalum*, and distinguishes *G. Cochinchinense* from the 5 other species by the following characters: fls. monocious, white; calyx teeth long linear-awl-shaped; calyx shortly villous, not tomentose; lvs. ovate, angled or slightly lobed; fr. 10-ribbed.

Cochinchinense, Kurz (*Scotanthus tubiflorus*, Naud.). Musk-scented; stem much-branched, slender, grooved, creeping or climbing, 5-7½ ft. long; lvs. about 1½-2½ in. long, 1-2 in. wide; fr. bright red, ovoid, rather acute at the base, produced at the apex into a long point which withers and remains, 2 in. long, more than 1 in. thick.

GYMNOPTERIS. See *Acrostichum*.

GYMNOSPÓRIA (Greek, *naked seeds*; because in some species the seeds have no false coat, or aril). *Celastraceae*. This includes a pretty evergreen spiny shrub, cult. in S. Calif., and suitable for hedges. A genus of about 60 species of shrubs or small trees, growing in warm regions; branches often spiny; lvs. alternate, without stipules; fls. in small, forking cymes; sepals, petals and stamens 4-5, the last inserted underneath the disk, which is broad, wavy or lobed; style 2-3-lobed; capsule obovoid or nearly globose; seeds 1-2 in each cell. *G. serrata*, from Himalayas, is cult. at Santa Barbara, Calif., from seeds sent to *F. Franceschi* by the Botanic Garden of Rome.

GYMNOSTÁCHYUM stands as a good genus, but for the trade forms, see *Pittonia*.

GYMNÓTRIX. See *Pennisetum*.

GYANDRÓPSIS (Greek words: the stamens look as if they were borne on the ovary). *Cappariaceae*. This genus includes a tender annual plant with 5-7 leaflets, and flowers resembling the spider flower, or Cleome. It is known to the trade at present as a Cleome, but *Gyandropsis* is distinguished by having a long torus (or receptacle), which is produced into a slender body (or gynophore) which is elongated at the middle, and bears the pistil to which the filaments are united. Cleome has a short torus, which often has an appendix on the back. Stamens about 6 in *Gyandropsis*; in Cleome 4-5, often 10. *Gyandropsis* has about 10 species, found in the warm parts of the world. Leaflets 3-7; fls. white or purplish; sepals deciduous; petals entire or crenulate, obovate, with a slender claw; seeds

kidney-shaped or orbicular, compressed, with a wrinkled or tubercled coat. For culture, see *Cleome*.

speciosa, DC. (*Cleome speciosa*, HBK.). Rather velvety towards the top: lfts. 5-7, subserrulate, oblong, acuminate. Mex. W. M.

GYNERIUM (Greek, *woolly stigmas*). *Gramineae*. This genus was until 1897 held to include the Pampas Grass (*Gynerium argenteum*), which has long been considered the finest of all tall, plummy grasses, as also the most important, commercially, of all ornamental grasses. Plumes of Pampas Grass are shipped in large quantities from California to Europe, and are dyed various colors. In nature the plumes are silvery white, with varieties ranging from rose to carmine, violet and purple. They are often 2-3 ft. long. Pampas Grass is grown commercially only in California. The plumes are not collected in South America or shipped therefrom. The plumes of the male plants are much inferior to those of the females, and California growers exercise the greatest care to allow no male plants in the plantation. In this country the plumes are sold chiefly to persons of foreign birth. (See *Everlastings*.) As a border plant, the Pampas Grass is not perfectly hardy in the North, the best substitute for it being *Eriarthus Ravenna*. Horticulturally, Pampas Grass is not to be compared with the Giant Reed (*Juncus Donax*), as the two things represent two different types of beauty. The Arundo is valued for its bold habit, of which the tall, reedy stems are an important feature, while its plumes are wholly incidental, being smaller than those of the Pampas Grass, and often not produced before the northern frosts.

The plumes of Pampas Grass and of Uva Grass (*G. saccharoides*) are both sold in London, and are presumably distinguished in the trade. Uva Grass is too tender to be grown even in southern California. In England Pampas Grass is generally hardy, while Uva Grass is known only to a very few hothouses. Uva Grass is the original species of Gynerium, and is now considered to be the only species in that genus, the Pampas Grass having been removed in 1897 to the new genus *Cortaderia*. Pampas Grass should henceforth be catalogued by nurserymen as *Cortaderia argentea*. Uva Grass should be tried in southern gardens, as also another plant said by critics to be far more beautiful than either, namely, *Cortaderia jubata*, which is chiefly known to the trade as *Gynerium arcuato-nebulosum*.

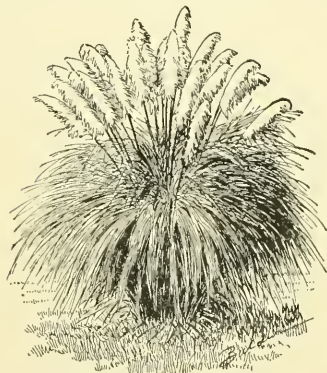
Pampas Grass can be grown in sheltered spots as far north as Rochester, N. Y., if well protected in winter. A box well filled with dry leaves, hay or straw, and inverted over the clumps, will generally keep them from harm. Perfect specimens can be obtained only in light, rich soil, with moderate moisture, at least in the early stages of growth. Prop. readily by division in spring, or by seeds, which may produce flowering plants in 2 years.

The popular name "Pampas Grass" is now unchangeable, but the plant does not grow on the pampas or vast grassy plains of South America, but in the mountains. "All the evidence tends to show that it is confined to the neighborhood of water courses and to depressions where there is a constant and sufficient supply of underground water." The manner in which this misleading name became fixed is explained by O. Stapf, of Kew, in his excellent monograph of this group in G.C. III. 22:358, 378, 396 (1897). In this place Stapf gives 5 species of *Cortaderia*, and another is added in B.M. 7607. In S. America the Pampas Grass and some of its allies are called *Cortadero*; hence the generic name *Cortaderia*. *Cortaderias* are widely distributed in S. America.

Cortaderia argentea, Stapf (*Gynerium argenteum*, Nees). **PAMPAS GRASS**, Fig. 1010. Grows in individualized, large, thick tussocks; rhizome very short; culms biennial, 3-6 ft. high, excluding the panicle; lvs. mostly crowded at the base; sheaths increasing in length from the base upwards from 2 in. to 2½ ft., several to many times longer than the internodes; sexual dimorphism of the spikelets slight (apart from the genitalia); spikelets 3-6 fld., the uppermost florets more or less rudimentary. For habit sketches, see R.H. 1890,

p. 489. Gng. 5:89. G.C. III. 26:654. J.H. III. 35:43. A.G. 14:323. F.S. 12, p. 179.

None of the following varietal names have botanical rank, but they probably are fairly distinct horticulturally, and so far they have appeared only in connection with the name *Gynerium*. Var. **monströsum** is perhaps the most robust, and var. **nanum** (which grows about 3 ft. high), the dwarfest. The others here mentioned are supposed to be the same height as the type. A slender form with narrower foliage is var. **elegans**, with lvs. a fourth of an inch wide



1010. Pampas Grass. (See *Gynerium*.)

and stalks 5-7 ft. high. R.H. 1862, p. 150. It has sub-varieties with white striped foliage, var. **elegans-niveolineatum**, and spotted with white, var. **elegans-niveovittatum**. The preceding varieties, except where noted, have the height of the type and white plumes. The next four varieties differ from the type in having colored plumes: vars. **roseum**, **violaceum**, **purpureum** and **carmineum**, the names indicating the different colors. Varieties with white-striped foliage are **album variegatum** and **Stenackeri foliis variegatis**. Varieties with yellow-striped foliage are **aureum variegatum** and **Weserlingi variegatum**. Var. **Roi des Roses** was said by John Sault to have foliage striped with rose, but others describe it as a rose-plumed variety.

When advertised under *Cortaderia*, these names should all have the feminine endings, as **monströsa**, etc.

Cortaderia jubata, Stapf (*Gynerium jubatum*, Lem. *G. arcuato-nebulosum*, Hort.). Differs from Pampas Grass in the rather laxer, more graceful plume, with longer, more flexuous, nodding branches, somewhat smaller spikelets, more delicate plumes, and in the longer, very slender staminodes of the pistillate fls. The plume is lavender-colored, and the plant has been killed by a temperature of 3° F. Grows in a dense tuft, perennial, but with biennial culms; spikelets 3-5 fld. The plume is 1-2 ft. long. B.M. 7607. G.C. III. 26:658. Gn. 55, p. 93. R.H. 1885, p. 200. Gn. 15, p. 179. Int. by Lemoine, of Nancy, France. Probable synonymy are *G. roseum Rendlateri* and *G. argenteum carminium Rendlateri*. F.S. 20:2075.—Not so well known as the other two species.

Gynerium saccharoides, Humb. & Bonp. **UVA GRASS**. Rhizome creeping; culms perennial, 12-30 ft. high; lvs. rather evenly distributed over the culm, those near the base gradually withering away, leaving the stem naked 4-14 ft. above ground; sheaths nearly equal (except the lowest), about 6 in. long, slightly longer than the internodes; sexual dimorphism of the fls. very conspicuous; spikelets 2 fld. B.M. 7552.—Essentially a more tender plant than the Pampas Grass.

J. B. KELLER and W. M.

The growing of Pampas plumes for profit in California has been carried on for over 25 years. Pampas Grass was introduced into the United States about 1848. In the northern states it is frequently planted on the lawn in summer, and upon the approach of cold weather transferred in a tub to a cellar for winter protection. In California, a hill will sometimes attain a height of 20 ft., a diameter as great, and a weight of 2,000 pounds. Such plants would be quite inconvenient for our northern friends to handle in the cellar.

Plants are easily produced from seed, but as the sex and variety are very uncertain, stock is usually increased by dividing the female plants, the plumes of which are much more beautiful than those of the male. The growing of Pampas Grass on a commercial scale dates from 1874, when the difference in sex was discovered.

In 1872 the writer sowed seed which in two years gave several hundred plume-bearing plants. Even then the variations in color and fineness were very marked.

In 1874, it was found that by pulling the immature plumes from the sheaths and exposing them to the hot sun the male plumes would hang heavily like oats, while the female plumes would become fluffy, and light and airy. In November, 1874, samples of the female plumes were sent to Peter Henderson & Co., New York. Three hundred were ordered at once, and the following day instructions were received to double the order and send by express. This was the first lot of good plumes ever sent east from California, and was the beginning of the present Pampas industry. The writer's plantation was increased each year until 1889, when it comprised about 5,000 hills. There were a number of other extensive plantations in the neighborhood of Santa Barbara. The crop of 1889 was estimated at 1,000,000 plumes. The demand has been good, but the prices have never been as high as at the beginning of the industry. The first prices were \$200 per 1,000 plumes. The decrease in price was gradual until 1886, when sales were slow at \$30 per 1,000 plumes. Some of the growers did not harvest their crops that year, and destroyed their plants. In the fall of 1887 plumes were in demand at \$40 per 1,000, and in 1888 they were scarce at \$50 and \$60 per 1,000. The following spring there was an increase in acreage. Since then the industry has had its ups and downs, and the price has ruled low for several years, the present prices being \$13.50 and \$14 for first-class, and \$8 to \$9 for second size.

Pampas grass should be put on the best valley land, and set 10 by 16 feet apart. Before planting, the ground should be deeply plowed and put in first-class condition. In selecting stock, divide only female plants that produce the finest white plumes. Young hills produce the best plants. From old hills the best plants are obtained around the outside, those in the center of the stool being mostly worthless unless planted in large clumps. Some plumes will be produced the first year after planting. They will not be first-class, but are worth saving. The second year, if well grown, they should produce 80 to 150 plumes to the hill. Not all plantations will yield this much. The third and fourth years there will not be much change in the yield. As a plant gets older the plumes are larger but the yield is less. After 8 or 10 years a quantity of dead matter will have accumulated, and the hills should be trimmed or burned.

The appearance of the plumes is a signal for great activity among those who have large fields. The grass should be so trimmed early in September, before the plumes appear, that each hill will be easy of access. Young plants ripen their plumes two or three weeks earlier than old ones, and some varieties are earlier than others. It requires exercise of judgment to pick the plumes at the proper time. They are generally ready when they are exposed from the husk a few inches and have a fluffy look. It is well to try a few at this stage, and if they cure well at the stem end when dry they are all right, but if they do not become fluffy at the stem end they have been picked too young. If the plume looks dark and seedy at the top when cured, it was too old when picked. Some varieties, especially those producing very long plumes, should be allowed to remain somewhat longer on the plant than those of the short-plumed

varieties. By trying a few of each variety, the time of ripening can soon be ascertained. Some varieties are pulled from the husk in the field; others have to be hauled to husking benches, where the husk or sheath is removed. Some planters husk them like corn; others use a knife set in such a way as to split the husk without injuring the plume. When the husk has been split, a quick jerk or strike on the table will extract the plume. The plumes are then taken to the drying ground and evenly spread in long rows. This ground should be made smooth and free from any trash that is liable to adhere to the plumes. Clean stubble ground is the best. The plumes are left on the ground three days and two nights to cure, and are turned and shaken once each day. They are next packed away as broadly and smoothly as possible on shelves in a dry building, where they should lie ten days or two weeks, or until the stems are thoroughly dried, at which time they are ready for market. They are packed in two grades: the first-class, having plumes 26 inches long and over, clear of stem (sometimes as long as 45 inches), is packed in cases that measure three-quarters of a ton and contain 3,000 plumes; second class stock is packed in cases of the same size, the plumes being 17 to 26 inches long clear of stem, and 6,000 in each case. If shipping by express, the writer uses bales of about 2,000 plumes, covered with canvas or burlap and some light strips of wood at the corners. If the plumes are packed smoothly and evenly they will withstand heavy pressure. Careful all-round cultivation is necessary to produce good plumes. About three-quarters of a million plumes are grown at Santa Barbara at the present time.

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

JOSEPH SEXTON.

GYNURA (name refers to the tailed stigmas). *Compositae*. Twenty or more herbs (rarely somewhat shrubby) of tropical Asia, Africa and Australia. Lvs. alternate, entire or lobed, numerous; heads discoid, the florets commonly all fertile, not very showy. The Gynuras are attractive glasshouse herbs, usually requiring a moderately high temperature. Genus allied to Senecio and Cineraria.

aurantiaca, DC. VELVET PLANT. Stout and branchy, 2-3 ft., with almost succulent stems, densely clothed with violet or purple hairs; lvs. large and soft, ovate, jagged-toothed, hairy, short petioled or the upper ones clasping, overlaid with iridescent purple; heads in a terminal cluster, yellow or orange. Java. LII. 28:436.—One of the handsomest of recent foliage plants. In winter it may be grown in the conservatory or warm-house, but in the summer it may be bedded out in a warm and protected place. It grows rapidly, and makes a most satisfactory display of colored leafage. It is readily propagated by cuttings in the house, as geraniums are.

Other species, but not known to be in the Amer. trade, are: *G. auriculata*, Cass. (*G. ovalis*, DC. *Cacalia ovalis*, Ker.).



1011. *Gypsophila muralis*.

Only slightly villous; lvs. oval, entire or repand, green both sides; fls. yellow, fragrant. China. B.R. 2:101.—*G. bicolor*, DC., 2-3 ft., of looser growth than the above, glabrous; lvs. lance-ovate, somewhat downy, short-petioled, deep-toothed or pinnatifid, green above and purple beneath; fls. orange. Moluccas. B.M. 512.—*G. ordii*, DC.—*G. suriculata*.—*G. sarmentosa*, DC. Climbing, with purple glabrous stems; lvs. narrow, ovate to lanceolate, acuminate petioled, remotely small-toothed, green and purple-ribbed. Warmhouse plant from Malayan Is. B.M. 7244.

L. H. B.

GYPSOPHILA (*gypsum-loving*, because it likes calcareous soils). *Caryophyllaceae*. European and Asian herbs, bearing a profusion of small fls., and useful for mist-like effects in mixed borders and as trimming in bouquets. There are perhaps 60 species. Sepals 5, united below, but the calyx naked at the base (not bracted, as in some related genera): petals 5, clawed, very small, usually white; styles 2; pod 4-valved; lvs. small, entire, opposite. Very branchy or spreading, slender herbs, with scant foliage when in bloom. Of easiest culture, in open, rather dry places. They are desirable for rockwork. They make an excellent effect as filling amongst shrubbery; also good for covering unkempt places with a mass of delicate bloom. Hardy.

A. *Plant annual.*

1012. Gypsophila elegans. *muràlis*, Linn. Fig. 1011. Very diffuse and branchy, mostly with shorter joints than *G. elegans*, of finer appearance: lvs. linear, spurry like; fls. small, rosy; 1-1½ ft. Eu.—Makes a dense little mound when well grown.

elegans, Bieb. Fig. 1012. Repeatedly forked-branched, glabrous; lvs. sessile, the uppermost linear, the lower oblong or spatulate; fls. white or sometimes (*G. rosea*, Hort.) rosy; 1 ft. Caucasus.—Much cult., and handsome.

AA. *Plant perennial.*B. *Lvs. short, spatulate: plant pubescent.*

cerastioides, D. Don. Low, densely pubescent; lvs. pubescent, the radical ones long-petioled, the others spatulate or obovate, obtuse or nearly so; fls. large (often ¾ in. across), white or lilac, pink-veined. Himalayas.

B.M. 6699. Gn. 47, p. 422.—Of creeping habit; excellent for rockwork.

BB. *Lvs. long: plant glabrous or nearly so.*

paniculata, Linn. BABY'S BREATH. Fig. 1013. Diffuse and rather tall-growing (2-3 ft.), forking; lvs. linear-lanceolate, the largest 3 in. long, but becoming smaller towards the inflorescence, sharp-pointed; fls. white, very numerous; pedicels 2-3 times as long as the calyx. Eu.—A very popular plant, especially for use in the trimming of bouquets. A most graceful subject. Stems stiff and wiry, therefore excellent for cutting. A picture of its use in floral arrangement will be found in A.F. 6:340.

acutifolia, Fisch. Very like the last, but the plant greener, the lvs. narrower (indistinctly 3-nerved) and the pedicels scarcely longer than the calyx. Caucasus.—*G. paniculata* seems sometimes to be cult. under this name.

Stèveni, Fisch. (*G. glauca*, Hort.). Lower than *G. paniculata*, glaucous-green; lvs. linear-lanceolate and carinate, mostly radical; fls. rather larger, white, the panicles smaller than those of *G. paniculata*; petals shorter than the calyx. Caucasus.

repens, Linn. Stems trailing or prostrate, ascending at the ends, not glaucous; lvs. linear, sharp-pointed, glabrous; fls. rather large, white or rose, the petals about twice longer than the sepals and the pedicels usually much longer. Alps and Pyrenees. B.M. 1448.—Best adapted to the rockery.

1013. *Gypsophila paniculata*.

L. H. B.

H

HABENARIA (Greek, a *rein* or *strap*; referring to the shape of parts of the flower). *Orchidaceae*, tribe *Ophrydeae*. REIN ORCHIS. Terrestrial leafy herbs, resembling orchids in habit: tubers usually undivided, rarely lobed: fls. in terminal racemes or spikes, rarely solitary; sepals subequal, free or cohering at base, erect or spreading; petals usually smaller, often 2-lobed; lip spreading or drooping, long- or short-spurred at base, its blade entire or 3-5-fid; column very short, sessile; rostellum usually 1-toothed or lobed; glands naked; anther cells parallel or divergent: capsule ovoid or oblong, erect. The lateral lobes are sometimes fringed, giving the flower a graceful appearance. Species about 400, very widely distributed in temperate and tropical regions.

Few species of *Habenaria* are of much horticultural importance, especially in this country. Some of the exotic kinds enjoy some favor as stove plants in England, while there are a number of hardy North American species which can be recommended for outdoor cultivation in boggy places. *H. Susanæ*, *carnea*, *militaris* and

until after flowering. These *Habenarias* are much like *Bletia* in their requirements.

The most popular species at present seem to be *H. ciliaris*, *fimbriata* and *psycodes*, but these give a very imperfect conception of the beauties of the genus, although in the opinion of the writer, *H. ciliaris* is the showiest orchid in temperate North America. The native species are procurable through collectors and dealers in native plants; foreign species through Dutch bulb growers; and *H. radiata* through dealers in Japanese plants.

Index of species described below:

bifolia, 29.	Elwesii, 18.	nivea, 13.
blepbariglotlis, 15.	fimbriata, 4.	obtusata, 27.
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bracteata, 24.	gracilis, 33.	orbiculata, 28.
carnea, 6.	Hookeriana, 30.	peramœna, 3.
chlorantha, 29.	Hookeri, 30.	psycodes, 5.
ciliaris, 8.	hyperborea, 31.	pusilla, 11.
cinnabarina, 10.	integra, 7.	radiata, 21.
conopsea, 1.	lacera, 23.	rhodochela, 12.
conopsea, 1.	leucophaea, 22.	Susanæ, 17.
cristata, 9.	leucostachys, 14.	tridentata, 25.
dilatata, 35.	longicaucata, 16.	Unaschensis, 34.
elegans, 32.	militaris, 11.	virescens, 26.

A. Fls. purple: lip 3-parted: stems leafy.

B. Segments of lip entire: bracts nearly equaling the flowers.

1. *conopsea*, Benth. (*Gymnadenia conopsea*, R.Br. *G. conopsea*, French authors). DEADMAN'S FINGERS. Fls. violet-purple to flesh-colored, rarely white, fragrant, medium-sized; spur longer than ovary, sometimes twice as long. June, July. Europe, N. Asia.—There is an *H. conopsea* of Reichenbach dating from 1854, whereas Bentham's dates only from 1880.

2. *odoratissima*, Franch. (*Gymnadenia odoratissima*, A. Rich.). Fls. intensely red-purple, aromatic, only half as large as in the preceding; spur shorter than ovary. May, June. Europe.

BB. Segments of lip toothed.

3. *peramœna*, Gray. Rather tall: fls. large and showy, violet-purple; middle segment of lip 2-lobed. July, Aug. N. J. to Va. and Ill. B.B. 1:466.

BBB. Segments of lip deeply and copiously fringed.

4. *fimbriata*, R.Br. Fls. lilac, rarely white, fragrant; petals laterally toothed. Summer. New Brunswick to Mich. and Mts. of N. C. A.G. 12:152. G.F. 10:483. B.B. 1:466.

5. *psycodes*, Gray. Three ft. or less high: fls. many, crowded, much smaller than in *fimbriata*, lilac, rarely white, fragrant. July, Aug. Newfoundland to Minn. and high mountains of N. C. B.B. 1:466.

AA. Fls. pink throughout: lvs. all radical.

6. *carnea*, N. E. Brown. Fig. 1014. Lvs. dull green, spotted with white: fls. few, loosely clustered, light pink, fading nearly white; lip large; spur over 2 in. long. Penang. G.C. III. 10:729. Ga. 47:3605. G.M. 36:642. G.F. 4:487. J.H. III. 33:319. R.E. 21:44.—This species, one of the most beautiful of the genus, is apparently not yet in American trade.

AAA. Fls. orange.

B. Color orange-yellow throughout.

c. Lip nearly or quite entire.

7. *integra*, Spreng. Two ft. or less high, leafy: fls. small, crowded. July. N. J. to La., near the coast. B.B. 1:463.

cc. Lip fringed or lacinate.

8. *ciliaris*, R.Br. YELLOW FRINGED ORCHIS. Fig. 1015. Fls. crowded, brilliant orange; petals fringed at apex; spur about twice as long as lip; lip long-fringed. Aug. Eastern U. S. B.M. 1668. B.B. 1:464.—A striking species.



1014. *Habenaria carnea*.

other East Indian species are best grown in a moderately warm house, needing good light and a fair amount of water. It is recommended to pot them after the resting season in a compost of peat, moss, loam and crock dust, with the tuber resting upon the crocked up bottom of the pot and the growing point just beneath the soil. They should then be given a good supply of water

9. *cristata*, R. Br. Smaller: fls. much smaller; petals merely toothed; spur little exceeding the lip. July. N. J. to La. near the coast. B.B. 1:464.

BB. *Color cinnabar-orange, the sepals red-spotted outside.*

10. *cinnabarina*, Rolfe. Small: stem leafy; lip 3 lobed; spur straight, nearly equaling ovary. Madagascar. — Not in Amer. trade.

AAAA. *Fls. with green sepals and petals: lip brilliantly colored.*

11. *militaris*, Reichb. f. (*H. pusilla*, Reichb. f.). Bluish glaucous; fls. numerous; lip scarlet, trifid, middle lobe bifid; spur long and very slender, greenish white. Cochinchina. R.H. 1888:396. J.H. III. 33:53. G. M. 36:436. — The author says of this fine plant: "No English soldier can boast a jacket of a deeper scarlet than the lip of our plant." Not in Amer. trade.

12. *rhodochella*, Hance. Nearly related to *militaris*, but fls. fewer and subcorymbose; petals almost helmet-shaped; lip varying from deep rose-pink to cinnabar and madder; spur dull yellow. China. B.M. 7571. — Not in Amer. trade.

AAAAA. *Fls. white to green or greenish yellow.*

B. *Color pure white.*

c. *Lip entire.*

13. *nivea*, Spreng. Lvs., except 1 or 2 lowest, bract-like: fls. numerous, loosely clustered, small; spur very slender. Summer. Del. to Ala. B.B. 1:462.

14. *leucostachys*, Wats. Usually tall and stout: lvs. several: fls. many, rather large. Idaho to Ariz., Calif. and Oreg. Mn. 6:81. — Nearly related to *H. dilatata*, but distinguished by its spur greatly exceeding the sepals.

cc. *Lip fringed.*

15. *blephariglottis*, Poir. Fls. much as in *clivaris*, but somewhat smaller; petals slightly erose at apex; spur about 3 times as long as lip. July. Newfoundland to N. C. and Minn. B.B. 1:465. Mn. 8:113. — One of our finest natives.

ccc. *Lip 3-parted.*

16. *longecalcarata*, A. Rich. Lvs. all radical: fls. 1-3, large, long-stalked; middle lobe of lip narrow, lateral ones broader, unevenly fringed; spur twice as long as ovary, with pedicel. July, Aug. India. B.M. 7228. — Not in Amer. trade.

17. *Susanna*, R. Br. (*H. gigantea*, Don). Stem tall, stout, leafy: fls. 3-5, very large, fragrant; broad, fan-shaped side lobes of lip deeply fringed; middle lobe tongue-shaped, entire; spur more than twice as long as ovary and pedicel. India, Malaya, China. B.M. 3374. G.C. III. 16:279. J.H. III. 29:226. — This and the preceding are among the largest-fl. and showiest *Habenarias*. Not in Amer. trade.

nb. *Color partly or wholly green, or greenish yellow.*

c. *Lip deeply 3-lobed or 3-parted.*

D. *Petals cleft or parted into 2 lobes or segments.*

18. *Elwesii*, Hook. Erect, leafy: fls. few, large, greenish yellow; petals cleft almost to base into long, slender, sickle-shaped, hairy segments; lip smooth, the segments long and slender. India. B.M. 7478. — A remarkable species.

19. *Bonatea*, Reichb. f. (*Bonatea speciosa*, Willd.). Stout, leafy: fls. rather large, light green and white;

lobes of lip, especially central one, tubular towards base. S. Afr. G. C. III. 17:743. — Cult. like *Disa grandiflora*.

DD. *Petals not cleft or parted.*

E. *Spur sac-shaped: lobes of lip entire.*

20. *chlorantha*, Spreng. Lvs. clasping; fls. not exceeding bracts, greenish. Mascarene Islands.

EE. *Spur long and slender.*

F. *Middle lobe of lip entire, the others fringed.*

21. *radiata*, Spreng. Petals exceeding sepals; spur greenish white, about equaling the ovary. Aug., Sept. Japan.

FF. *All lobes of lip deeply fringed.*

22. *leucophaea*, Gray. Four ft. high or less: fls. large, whitish or greenish, fragrant; petals erose; spur exceeding ovary. July. N. Y. to Minn. and Ark. B.B. 1:465.

23. *lácera*, R. Br. RAGGED ORCHIS. Smaller: fls. greenish yellow; spur not equaling ovary. June, July. Nova Scotia to Ga. and Mo. B.B. 1:465.

cc. *Lip merely toothed or slightly lobed: fls. inconspicuous.*

D. *Fls. much shorter than the conspicuous bracts: spur sac-shaped, short.*

24. *bracteata*, R. Br. Fls. greenish; spur often white. Summer. Northeastern U. S. to B. C., Eu. B.B. 1:463.

DD. *Fls. nearly equaling or exceeding bracts: spur long and slender.*

E. *Lvs. 1-2 near base of stem.*

25. *tridentata*, Hook. Fls. greenish, loosely clustered; lip wide at apex, 3-toothed; spur incurved. July, Aug. Newfoundland to Minn., Fla. and La. A.G. 12:153. B.B. 1:463.

EE. *Lvs. 3 or more.*

26. *viréscens*, Spreng. Leafy: fls. greenish; lip only slightly exceeding petals, with 2 lateral teeth and a nearly basal wart. July. Range of preceding. B.B. 1:464.

ccc. *Lip entire: fls. inconspicuous.*

D. *Large lvs. all basal.*

E. *Leaf solitary.*

27. *obtusata*, Richards. Spike loosely-fl. : fls. yellow-green; lip deflexed; spur about equaling lip. Summer. Across B. Amer., south to N. Y. and Col. B.B. 1:461.

EE. *Leaves 2.*

F. *Spur much exceeding ovary.*

28. *orbiculata*, Torr. Lvs. orbicular, lying on the ground: fls. numerous, loosely clustered, greenish; lip white, obtuse. July, Aug. Across B. Amer. and Minn. to mountains of N. C. B.B. 1:461.

29. *bifolia*, R. Br. BUTTERFLY ORCHIS. Lvs. oblong: fls. white, with tips of spur and lip greenish, fragrant in the evening. May, June. Eu.

FF. *Spur about equaling ovary.*

30. *Hookeriána*, Gray (*H. Hookeri*, Lindl.). Lvs. oval, obovate or orbicular: fls. greenish yellow; lip acute. Summer. Nova Scotia to N. J. and Iowa. B.B. 1:461.

DD. *Large lvs. several above the base.*

E. *Spike commonly dense.*

31. *hyperborea*, R. Br. Fls. greenish; petals, obtuse lip and slender spur all about equally long. Summer. Northern U. S. to Nova Scotia and Alaska. B.B. 1:462.

32. *élegans*, Boland. Large lvs. all on lower part of stem: fls. numerous, small, greenish; sepals 1-nerved, all alike; spur filiform. Vancouver Island to Calif.

EE. *Spike commonly loose.*

F. *Spur short, sac-shaped.*

33. *gracilis*, S. Wats. Three ft. high or less: spike long, many-fl. : fls. greenish; spur about equaling lip and sepals. Ore. and Wash.



1015. *Habenaria clivaris*, or Yellow Fringed Orchid. (× 1/2.)

FF. *Spur not sae-shaped.*

34. *Unalascensis*, Wats. Fls. white or greenish; sepals, petals and lip about equal; spur slender, barely to nearly twice longer than lip. Summer. Unalaska to Calif. and Utah. — Near *H. elegans*, but more slender, with a longer and more open spike. It is referred by some to the genus *Hernimium*.

35. *dilatata*, Gray. Fls. greenish white; lip widened or even auricled at base; spur about as long as, or curved. Summer. Cooler parts of N. Amer.; A.G. 12:153. B.B. 1:462. — More slender and narrower-leaved than *H. hyperborea*.

T. H. KEARNEY, JR.

HABERLEA (after a professor of botany at Pesth, who died in 1831). *Gesneriaceae*. This includes a dainty little hardy herbaceous perennial plant, which is tufted and bears in spring a few scapes 4-6 in. high, with 2-5 nodding, violet-colored, 5-lobed, tubular fls., each about 1 in. long and 1 in. across. Only 1 species is known, and it is found wild only in a few miles of a single valley in Thrace, where it abounds on the southern slope of the Balkans on shaded schistose rocks. Only 4 species of *Gesneriaceae* are found wild in Europe, and 3 of them are said to be confined each to one spot. The allied genus *Ramondia* has the same habit and is equally desirable. The corolla of *Haberlea* has a conspicuous tube, which is thrust out of the calyx nearly $\frac{1}{2}$ in., and 5 lobes, 2 of which are much smaller than the others, while in *Ramondia* the flower seems to be wheel-shaped, with 5 equal petals, because the corolla tube is very short and inconspicuous and the lobes deeply cut.

Haberlea has 4 included didynamous stamens and a bell-shaped calyx. *Ramondia* has exserted, equal stamens and a wheel-shaped calyx. *Haberlea* was int. to cult. about 1881 by Leichtlin, and few, if any, of our skilled amateurs know the plant. It is not advertised in America. For culture, see *Ramondia*.

Rhodopensis, Riv. Clothed everywhere with soft, spreading hairs, except the corolla: lvs. 2-3 in. long, obovate or ovate-oblong, obtuse, coarsely crenate, thick, leathery, few-nerved; calyx 5-cleft; corolla pale lilac. B.M. 6651.

W. M.

HABRANTHUS. Included in *Hippeastrum*.

HABROTHAMNUS is all referred to *Cestrum*. *H. fasciculatus*=*C. fasciculatum*; *H. elegans* and *H. coccineus elegans*=*C. elegans*; *H. Newellii*=*C. Newellii*.

HACKBERRY. *Celtis occidentalis*.

HACKMATAK, or TAMARACK. *Larix Americana*.

HĒMÁNTHUS (*blood flower*). *Amaryllidaceae*. BLOOD LILY. Between 30 and 40 African bulbous plants, of which the greater part are natives of the Cape region. Fls. showy, often numerous, in umbels; perianth straight and erect, with a short, cylindrical tube; segments longer than the tube, narrow, equal; stamens 6, inserted in the throat of the perianth, usually exserted, the anthers versatile; style filiform and erect, on a 3-lobed ovary: fr. berry-like, indehiscent. The fls. are red or white, on a solid scape, which is little, if any, longer than the cluster of root-lvs.: they lack the corona of many amaryllidaceous plants. Monogr. by Baker in *Amaryllidaceae*, 1888; but the S. African species are revised by him more recently in *Flora Capensis*, vol. 6. See, also, *Flora Trop. Africa*, vol. 7.

Hemanthus, like most Cape bulbs, are summer- and autumn-flowering; or, when started indoors or in frames, blooming in spring or early summer. The fls. often precede the lvs. The foliage is usually large and luxuriant, and the scape is often handsomely colored. The fls. are sometimes as much as 2 in. across, and produced in great ball-like heads nearly or quite a foot through. Yet the species are essentially curiosities in this country. The culture given Nerine suits them well. Their season of growth is usually not more than three or four months, and the remainder of the year they may be laid away in the pots. When growing, give plenty of rather weak liquid manure, keep in an intermediate or warm house, and when in bloom keep them somewhat cooler. Avoid overpotting. Prop. by offsets, which usu-

ally form freely; and until they do form, the bulbs will probably not need repotting. Separate the offsets when growth is beginning. In this country they are sometimes flowered in pots plunged in a warm, protected border, blooming in summer and fall. For *H. toricavrus*, see *Buphane disticha*.

A. *Leaves thin or membranaceous.*

B. *Spathes and perianth segments spreading.*

multiflorus, Martyn (*H. tenuiflorus*, Herb. *H. Kälbreyeri*, Baker). Bulb globose, 3 in. or less in diam.: lvs. 3-4 on a short, separate stem, the petiole short and sheathing, the oblong blade 6-12 in. long, with 6-8 veins each side of the midrib: scape straight, 1-3 ft. high, green or red-spotted; umbel often 6 in. in diam., containing 30-100 fls., which are usually blood-red, with linear 3-nerved segments twice or more as long as the tube; red filaments long-exserted, bearing prominent yellow anthers. Trop. Africa. Variable. B.M. 961, 1935, 3870. L.B.C. 10:912; 20:1948 (erroneously as *H. puniceus*). F.S. 1:58; 23:2377. L.H. 26:354. Var. *superbus*, Hort., is an improved brilliant-colored form.

Katherinae, Baker. Bulb globose, 2-3 in. in diam.: lvs. 3-5, on a short, separate stem, appearing with the fls., with a short, spotted petiole, the blade oblong, 9-14 in. long and 4-6 in. broad, the lateral veins 8-10; peduncle 1 ft. tall, spotted toward the base; umbel sometimes 9 in. in diam., densely many-fl.: fls. bright red, 2-2½ in. long, the lanceolate reflexing segments little longer than the cylindrical tube; red filaments exserted. S. Afr. B.M. 6778. — Name spelled both *Katherinae* and *Katharinae*, even by Baker; but the former spelling is the original. In cult. the lvs. become "about 3 ft. in length and of a bright pale green color—apple-green, as it is usually called—and the venation is more strongly marked than is usual in *H. multiflorus*, *H. cinnabarinus* and other allied kinds." Burbidge, Gn. 49, p. 160, with figure.

Lindeni, N. E. Brown. Lvs. 6-8, in 2 ranks, arising from a thick, solid rootstock, nearly or quite evergreen; petioles long, winged; blade 10-12 in. long and 3-5 in. wide, long-ovate, lanceolate or ovate-oblong, acute, the base rounded or subcordate, with a longitudinal fold either side of the midrib; scape ½ ft. tall, arising from the side of the lvs., flattened on one side, more or less spotted; umbel globular, 6-8 in. in diameter, with 100 or more scarlet fls. opening in succession: fls. 2 in. across, the tube ¾ in. long, the lobes long and linear-lanceolate and acute. Congo. G.C. III. 8:437; 13:483. L.H. 37:112; 40:172. Fig. 1; 41, p. 18. Gt. 46, p. 217. G.M. 36:220. J.H. III. 28:73. — Handsome.

BB. *Spathes and perianth segments erect or ascending.*

puniceus, Linn. Bulb nearly globular, 2-3 in. in diameter: lvs. 2-4, from the bulb, the petiole one-half the length of the blade, the blade 6-12 in. long and 2-4 in. broad, oblong, strongly undulated, the main veins about 6 on each side of the rib; scape 6-15 in. tall, spotted; umbel globose and dense, 3-4 in. in diameter, bearing many scentless, pale scarlet, yellowish red or rarely white fls. 1 in. long; perianth tube cylindrical, shorter than the lanceolate 3-nerved segments; filaments red, 1 in. long. S. Africa. B.M. 1315.

AA. *Lvs. thick and fleshy.*

B. *Bracts and fls. white.*

albiflos, Jacq. Bulb or tuber compressed sidewise, with thick, 2-ranked scales: lvs. 2-4, appearing with the fls., nearly erect, obtuse, 6-8 in. long and nearly half as broad, narrowed to the base, green and glabrous, but ciliate on the edges; scape less than 1 ft. tall, pale green, bearing a dense, globular umbel 2 in. in diameter: fls. ¾ in. long, the linear segments much exceeding the tube. S. Africa. B.M. 1239. L.B.C. 7:602. Var. *pubescens*, Baker, has lvs. hairy above. L.B.C. 8:702. B.R. 5:382. *H. Clarkei*, Hort., is a hybrid of this species and *C. coccineus*.

BB. *Bracts and fls. red.*

coccineus, Linn. Bulb compressed sidewise, 3 in. in diam., the scales many, thick, 2-ranked: lvs. 2, suberect, ligulate, reaching 2 ft. long and 8 in. broad, narrowed to the base, green and glabrous, not ciliate: scape 6-10

in. tall, compressed, mottled: bracts large and thick, ascending and forming a cup, in which the red fls. are borne: fls. 1 in. long, with linear segments and a short tube. S. Africa. B.M. 1075. L.B.C. 3:240. Var. *coarctatus*, Baker, has smaller lvs. and shorter bracts. B.R. 3:181.—Odd plants.

tigridus, Jacq. Lvs. ciliate on the margins, 1 ft. or less long, spotted on the lower part of the back; scape 6 in., red-spotted: umbel dense, 2 in. or less in diam.; bracts shorter than in the last (not over 2 in. long); bright red: fls. 1 in. or less long, with very short tube. S. Africa. B.M. 1705. L. H. B.

HÆMÀRIA (Greek, referring to the blood-red under surface of the lvs.). *Orethidaceæ*. A genus of 4 species of terrestrial orchids, known to the trade chiefly as Goodyera. They are really dwarf stove foliage plants, and are to be cult. like Anectochilus. In Hæmaria the lower lip is swelled above its base into a wide claw and is provided with a pouch-like sac at base, and a blade of 2 divergent lobes; in Goodyera the blade of the lip is small and not clawed. Both genera belong to a large group in which the lip either has no spur or sac, or if the latter is present, it is included between the sepals; while in Anectochilus the lip has a prominent sac or spur projecting between the lateral sepals.

The leaves of *H. discolor* are green above and red below. It is, however, not nearly so brilliant as *Hæmaria Dawsoniana*, which has the same red color beneath, and is beautifully netted above with red or yellow. In both species a dozen or more small fls., chiefly white, are borne on a densely hairy scape. Alfred Rehder writes that these plants seem much easier to cultivate than Anectochilus. He has succeeded in growing Anectochilus only under hand glasses, but has grown Hæmaria without a hand glass in large, shallow pans, with the rhizomes creeping in sphagnum.

A. Lvs. not netted-veined above.

discolor, Lindl. (*Goodyera discolor*, Ker.). Blade of lvs. oblong, 3 in. long, $\frac{3}{4}$ in. wide. China (Brazil, according to Loddiges). L.B.C. 2:148. B.M. 205. B.R. 4:271.—John Saul's plants had white longitudinal markings.

AA. Lvs. brilliantly netted-veined above.

Dawsoniana, (G. Dawsonii, Boxall. *Anectochilus Dawsonianus*, Low). Blade of lvs. elliptic, 3 in. long, $\frac{1}{4}$ in. wide. Burma, Philippines. B.M. 7486 (veins of 2 lvs. blood-red; of the other almost wholly yellow).—John Saul says "golden purple" veins.

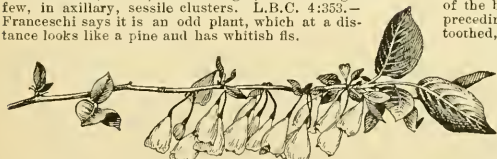
H. HASSELBERG.

HAIRBELL or HAREBELL. *Campanula rotundifolia*.

HÀKEA (after Baron von Hake, German friend of botany). *Proteaceæ*. A genus of Australian shrubs, slightly cult. indoors abroad and outdoors in S. Calif. The genus is too polymorphous and unimportant to be described at length here. Ninety-five species are fully described in English, with an elaborate key in Flora Australiensis 5:489 (1870).

A. Length of lvs. 1-2 inches.

pugioniformis, Cav. Height usually 2-4, rarely 8 ft.: lvs. all entire, terete, smooth, rigid, 1-2 in. long: fls. few, in axillary, sessile clusters. L.B.C. 4:353.—Franceschi says it is an odd plant, which at a distance looks like a pine and has whitish fls.



1016. *Halesia tetraptera* ($\times \frac{3}{4}$).

AA. Length of lvs. 4-8 in.

B. Nerves many.

multilineata, Meisn. Tree or tall shrub: lvs. flat, 6-8 in. long, with many very fine nerves: fls. pink, in

an oblong raceme which is 1-3 in. long. G.C. III. 19:85.—Int. in 1899 by Mrs. T. B. Shepherd, who says that there are 5 or more racemes in a bunch.

BB. Nerves few, 1-3.

C. Fls. red, in globular heads.

laurina, R. Br. Tall shrub, attaining 10 ft.: lvs. 4-6 in. long, 3- or 5-nerved, often sickle-shaped, often sickle-shaped, on long petioles: fls. in a globular head, $\frac{1}{2}$ -2 in. thick, from which the numerous showy white stigmas project 1 in. or more in every direction. Blooms in the Californian winter. B.M. 7127. G.C. II. 23:149.—Called SEA URCHIN on the Riviera.

cc. Fls. pink, in long racemes.

ulicina, R. Br. Lvs. usually linear-lanceolate or linear, pungent, 4-8 in. long, prominently 1-3-nerved beneath: perianth and pedicels glabrous: fr. rarely above $\frac{1}{2}$ in. long, with a short straight beak.—The foliage resembles the European furze. W. M.

HALESIA (Stephen Hale, 1677-1761, author of a famous work on "Vegetable Statics"). Syn., *Mohrodendron*, *Stryacææ*. SILVER BELL SNOWDROP TREE. The common Snowdrop Tree (*H. tetraptera*) is a fine, hardy, small-sized tree, which is covered with a bewildering, cloudy mass of small, snowy white flowers, borne about the middle of May, before the foliage of the tree appears. The genus has only 4 species, and is exclusively North American, if we place the Japanese *H. hispida* in the genus *Pterostyrax* by reason of the subterminal inflorescence and smaller and fleshier fruit. Small trees and shrubs, more or less stellate pubescent: lvs. rather large, membranous, ovate-oblong, acuminate, more or less denticulate, slender-petioled, deciduous, light green: inflorescence lateral: fls. snow-white, bell-shaped, drooping, on slender pedicels, 3-fascicles or short racemes along the whole length of the branches, borne in the axils of lvs. of the preceding year: calyx obconical, slightly 4-8-toothed, adnate to the 3-4-celled ovary; corolla bell-shaped, epignous, 4-5 cleft or parted nearly to the base; stamens 8-16: ovary 2-4-celled, 4 ovules in each cell: fr. a drupe, dry, oblong, longitudinally 2-4-winged, tipped with the style and minute calyx teeth.

The common Snowdrop Tree, *H. tetraptera*, is found in woods and along streams, but thrives in almost any good soil. Its habit is round-headed, irregular and somewhat pendulous, rather light and twiggy. It is adapted to shrubberies and lawns in almost any position, but prefers a somewhat sheltered place and a well-drained, rich soil. It is easily transplanted. It often grows in bush form, but may be grown as a tree when cut to one shoot and given ample room. The flowers



1017. *Halesia tetraptera*, var. *Meehani*.

are rather short-lived, except in var. *Meehani*. Prop. most commonly by layers, also by root-cuttings in spring and autumn; and by seeds, which should be kept constantly moist, as they rarely germinate until the second year if allowed to dry. *H. diptera* is hardy as far north as Philadelphia, but of doubtful hardiness farther north, though it may become acclimatized. Thrives best in a cool, deep loam. Prop. by seeds, which should never be allowed to dry, and by grafting on *H. tetraptera*.

tetraptera, Linn. Fig. 1016. A small tree or shrub 8²-10², whose fls. resemble those of a snowdrop. Lvs. ovate or ovate-oblong, finely serrate, dark green and glabrous above, pale green and stellate-pubescent below, 2-4 in. long; fls. in lateral clusters of 2-4; corolla 4-lobed, 1 in. long; ovary 4-celled; drupe ellipsoidal, longitudinally 4-winged, 1-1½ in. long. Va. S. and W. B.M. 910. Mn. 5, p. 194. S.S. 6:257. Gng. 2:247. A.G. 14:211; 18:438. M.D.G. 1899:352-3. Var. *Meehani*, Sargent (*H. Meehani*, Hort.). Fig. 1017. Habit wholly unlike that of the type, round, bushy and more upright, from a distance looking like an apple tree, 12 ft. high. Has thicker, rugose, dark green lvs., on young plants glandular serrate, and smaller, more numerous fls with short calyx-tubes and cup-shaped corollas, without the narrow base. Seems barren, but is not a hybrid. Growth smaller. G.F. 5:535. Gug. 2:247.

diptera, Ellis. A small tree or shrub from the South not easily distinguished from *H. tetraptera*. The lvs. are larger, ovate, green on both sides, coarsely serrate and downy; fls. white, on long pedicels, in racemes of 2-4, more showy than those of *H. tetraptera*; petals 4, nearly distinct, 1 in. long; ovary 3-celled; drupe with 2 large opposite wings and 2 obsolete. Early June. S.S. 6:259.—Plant not so large as of *H. tetraptera*; lvs. larger and fls. more showy.

H. corymbosa, Mich.—*Pterostyrax corymbosa*.—*H. Mapida*, Mast.—*Pterostyrax hispida*.—*H. parviflora*, Michx. Much like *H. tetraptera*, but shrubby, with smaller fls. and 2-winged fr. Ga. and Fla. A. PHELPS WYMAN.

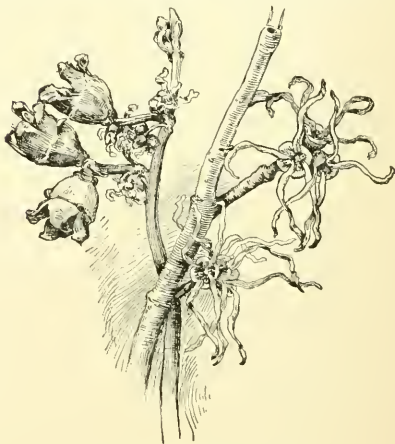
HALIMODENDRON (Greek, *salt tree*; referring to the maritime habit of the plant). *Leguminosae*. A genus whose sole representative is a hardy deciduous shrub 4-10 ft. high, growing in the dry, barren salt-fields of Siberia. It is characterized by the small, equally pinnate lvs. ending in sharp, stinging spines, and composed of 1-2 pairs of clean lfts., and by the rather large rose-purplish fls., in 2-3-ld. lateral fascicles from the old nodes at the base of the summer shoots, appearing from May-July. The branches are whitish and prickly, with very small petiolar spines. In cultivation the shrub is very hardy, enduring both drought and cold, and, while it thrives in sandy soils, it succeeds, also, in saline or alkaline. The rosy fls. and the airiness of the fine lvs. make it very ornamental. It is propagated by seeds, layers and cuttings, or may be grafted upon the common *Laburnum*, upon *Caragana arborescens*, or *Colutea arborescens*.

argenteum, Fisch. **SALT TREE**. Lvs compound; lfts. spatulate or long-oval, mucronate, blue-green, more or less pubescent; fls. irregular, papilionaceous; calyx cup-shaped, with 5 short teeth; petals of nearly equal length; standard orbicular, with the sides turned backward; keel obtuse, straight; stamens diadelphous, unequal; ovary stipitate, few-ovuled; style filiform; pod inflated, ovoid, hard, depressed in the seed-bearing portion, 6-7 in. long; seeds oval, sub-compressed. B.M. 1016. R.H. 1876:30, as *H. speciosum*. A. PHELPS WYMAN.

HALLERIA (Albrecht von Haller, 1708-1777, Swiss physician and naturalist, and professor at Göttingen). *Scrophulariaceae*. About 6 species of shrubs from Africa and Madagascar, one of which is cult. indoors abroad and outdoors in S. Calif. *H. lucida*, Linn., grows 4-6 ft. high, has opposite, ovate, acuminate, serrate lvs., and axillary clusters of about 6 reddish, tubular fls., each about 1 in. long. The fls. are bulged on one side, with 2 short teeth in one lip and 3 in the other, and sometimes yellowish at the base. Stamens 4, didynamous, exserted. B.M. 1744.—Sometimes called African Honeysuckle.

HALOPHYTUM. See *Ioplophytum*.

HAMAMELIS (Greek, *hama*, together, and *melon*, apple or fruit; fruits and flowers at the same time). *Hamamelidaceae*. **WITCH HAZEL**. Hardy ornamental shrubs or small trees, with deciduous, alternate, short-petioled lvs., yellow fls. in axillary clusters, appearing late in fall or early in spring, and with capsular fruits. Valuable on account of their blooming at a time when hardly any other shrub outdoors is in flower; well adapted for shrubberies; of compact, bushy habit and with handsome foliage, turning bright yellow, orange or purple in fall. It thrives best in somewhat moist, peaty and sandy soil. The Japanese species likes a more sunny position than the American, and is less moisture-loving. Prop. by seeds, which do not germinate until the second year, or by layers; rarer kinds also by grafting on seedlings of *H. Virginiana* in spring in the greenhouse. Three closely allied species in eastern N. Amer., China and Jap. Lvs. stipulate, crenate-dentate; fls. in short-peduncled, nodding, axillary, few-ld.



1018. Witch Hazel, *Hamamelis Virginiana*. Showing flowers and fruits. Natural size.

clusters, perfect; calyx 4-parted; petals 4, linear, crumpled; stamens 4, very short; fr. a dehiscent, woody, 2-celled capsule, with 2 shining black seeds. The seeds are shot out with considerable force. Occasionally writers spell the common name *Wych Hazel*, but there seems to be little historical reason for it. *Witch*, as used in *Witch Hazel* and *Witch Elm*, is probably allied to *weak*, referring to a drooping or straggling habit.

Virginiana, Linn. Fig. 1018. Shrub or small tree, attaining 25 ft.: lvs. oblique and cordate at the base, obovate, coarsely crenate, pubescent on the veins beneath, 4-6 in. long; petals bright yellow, ½-¾ in. long; calyx dull brownish yellow inside; fr. surrounded by the calyx to one-half. Sept., Oct. Canada to Fla., west to Neb. and Tex. Em. 472. S.S. 5:198. B.M. 6684. L.B.C. 6:598. A.G. 11:657 and 17:771.

Japonica, Sieb. and Zucc. Shrub or small tree, to 30 ft.; lvs. roundish to oblong-ovate or obovate, sinuately crenate, prominently veined beneath, glabrous or pubescent, 2-4 in. long; petals ¾ in. long, yellow; calyx lobes revolute, purplish or yellow inside; fr. only at the base surrounded by the calyx. Feb.-April. Japan.—There are 2 varieties. Var. *arbores*, Rehd. (*H. arbores*, Mast.). Lvs. larger, usually more roundish and of firmer texture; petals golden yellow; calyx deep purple inside; of more vigorous growth. B.M. 6659. R.H. 1891:472.

G.C. II. 1:187 and 15:205 and III. 9:247. G.M. 34:94. Var. *Zuccariniana*, Arb. Kew. Lvs. smaller and thinner; petals canary yellow; calyx pale or brownish yellow inside. G.F. 4:257. Gb. 17, p. 251. ALFRED REHDER.

HAMÉLIA (Henry Louis DuRoi de Mousseau, 1700-1782, prominent French botanical author), *Rubiaceae*. This genus contains a tender shrub with large clusters of scarlet-orange fls. much prized in Fla., and recently used for northern conservatories under the name of "Scarlet Bush." About 13 species of tropical and subtropical American shrubs, glabrous or pubescent; lvs. opposite or in whorls of 3-4, petioled, ovate-oblong, acute at both ends; fls. in terminal, 2-3-forking cymes, yellow, reddish or scarlet, with pedicels short or none; corolla tubular or almost bell-shaped, about 5-ribbed; limb with 5 short lobes; stamens 5; ovary 5-celled; berries small, ovoid, 5-lobed, many-seeded. *Hoffmania* is distinguished by its 2-3-celled berry.

Hamelia patens, a native of the West Indies and S. Florida, along the coast, a beautiful and almost unknown plant, should become a favorite in greenhouse culture. The lvs. have a purplish hue at some seasons of the year, and the fls. are of a bright orange-red color. In Florida it must surely become a favorite for open-air planting, as it is there rarely killed down by frost, and when it is it sprouts up readily from the root, and blooms the following summer. It is in bloom for many months, and without doubt could be forced at any season. With age it becomes a woody shrub, 5-12 ft. in height. The fls. are succeeded by handsome black berries, which are retained a long while.

A. Fls. scarlet-orange: berries ovoid, black.

patens, Jacq. Lvs. typically in 3's, rarely 2-5, more or less villous-pubescent; cymes 2-3-forked, disposed in a pedunculate, terminal umbel. B.M. 2533.

AA. Fls. orange-yellow: berries globular, purple.

sphaerocarpa, Ruiz & Pav. Lvs. in 3's, oblong, hirsute on both sides; lvs. disposed in terminal panicles: corolla tubular, distinctly 5-cornered; berries hispid. Woods of Peru. E. N. REASONER and W. M.

HAPLOPÁPPUS is *Aplopappus*.

HAPLOPHÝLUM. See *Ruta*.

HARBINGER OF SPRING. *Erigenia bulbosa*.

HARDENBÉRGIA (after Franziska, Countess of Hardenberg, sister of Baron Haugel, a well known traveler.) *Leguminosae*. Three Australian twining herbs or subshrubs, with long racemes of small fls., ranging from white through pink and rosy purple to violet-blue, often with 1 or 2 green or yellowish spots on the standard. The genus is told from *Kennedyia* by the different habit, smaller, more numerous, differently colored fls., short calyx teeth and by the keel, which in the 2 species described below is much shorter than the wings. Both are cult. abroad under glass by those who are skilled in managing Australian woody plants. The species first mentioned is cult. outdoors in Calif.; the second was once offered by John Saul, of Washington, D. C. These plants can be trained into bush form. Monograph in *Flora Australiensis* 2:246 (1864).

A. *Leaflets solitary: pods flat, with dry pulp inside. monophylla*, Benth. Lfts. usually 2-3, or even 4 in. long, obtuse, varying from broadly cordate-ovate to narrowly lanceolate: fls. less than $\frac{1}{2}$ in. long, in 2's or rarely 3's, as many as 35 in a raceme, and the upper racemes often forming a terminal panicle: pod flat, with dry, pithy pulp inside. B. 2:84. B.M. 263, 2169. L.B.C. 8:758 and 20:1940. B.R. 11:944 and 16:1336. R.H. 1896, p. 431. R.B. 22:169.—Has many synonyms. The fls. range from white through rose and purplish to pure violet, but are never distinctly blue. Var. *alba* is cult.

AA. *Leaflets 3 or 5; pod turgid, without pith or pulp. Comptoniana*, Benth. Lfts. 3 or 5, and in the latter case the side ones in 2 opposite pairs, which are not distant as in other 5-leafleted members of the tribe: fls. in pairs or clusters of 3-4 along the racemes. B.R. 4:298,

22:1862 and 26:60. R.H. 1882, p. 344. J.H. III. 30:361.—The fls. are said to have the same size, color and structure as in *H. monophylla*, but in cultivation the blue or violet-blue form has probably been most popular. Var. *alba* is cult.

H. retusa, Benth., is an anomalous species not cult. All other names in this genus are synonyms of the 2 species described above. W. M.

HARDHACK. *Spiraea tomentosa*.

HARD HEADS. *Centaurea nigra*.

HARDY PLANTS. The word "hardy" covers many distinct ideas. It is used to distinguish plants that can be cultivated outdoors the year round from plants that must be grown under glass part or all of the year. For example, in this Cyclopaedia plants are spoken of as hardy as far north as Washington, D. C., New York, Boston or Montreal, meaning that the plants are not killed by the winters at these places. In its widest sense, "hardy" indicates resistance to all kinds of unfavorable conditions. Thus, while all the common geraniums are tender plants, one variety may be harder than another because it withstands intense heat and drought and general neglect. In general, however, the unqualified word "hardy" indicates that the plant is able to withstand the winter of the given place. See the articles *Border* and *Landscape Gardening*. Smaller divisions of the subject of Hardy Plants are discussed under *Alpine Gardens* (including Rock Gardens) and *Aquatics* (including Bog Plants).

HAREBELL. *Campanula rotundifolia*.

HARICOT (French name for *Phaseolus vulgaris*). Same as Kidney Bean of the English. It is the common garden bean of America, as distinguished from the Windsor or Broad bean, the Lima bean, etc. See *Bean*.

HARINA. See *Wallichia*.

HARLEQUIN FLOWERS. *Sparaxis*.

HARPÁLUM. All referred to *Helianthus*.

HARRIS, JOSEPH (Fig. 1019), agricultural author, was born June 29, 1828, in the village of Shawbury, England, and died at his home at Moreton Farm, near Rochester, N. Y., Nov. 18, 1892. His father and forefathers from several generations were farmers; it is, therefore, but natural that he should have inherited a keen interest in everything pertaining to rural life. From early youth he showed a remarkable fondness for investigation and experimentation, in the pursuit of which he found gratification by his study of agricultural chemistry with Messrs. Lawes & Gilbert, on their famous experiment farms at Rothamsted. It was during this period that he laid the foundation of his future usefulness in the cause of rational and scientific agriculture and horticulture. In the year 1849 he came to America, and soon became



1019. Joseph Harris.

one of the foremost and most reliable writers for the rural press. His "Walks and Talks on the Farm," which appeared in the "Genesee Farmer" in 1864-65, attracted general attention, and in 1866, when the "Genesee Farmer" was purchased by the "American Agriculturist," Mr. Harris joined the editorial staff of this paper and continued his "Walks and Talks" in each number up to 1876. After an intermission of eight years,

he resumed them again until the increasing demands of his seed business upon his time prevented him from continuing them. In all there were 171 chapters. It is to be regretted that these "Walks and Talks" have never been published in book form, as they constitute a decidedly unique feature in our agricultural literature. These articles were written in the form of conversations with the "Deacon," who was his neighbor and one of the oldest farmers in the town, and, as has often been supposed, a fictitious character. They are narratives of actual experiences on the farm, and talks about things that occupied his thought for the time, and have, therefore, an intensely practical character throughout. He lets the Deacon state that farming is a poor business, and then patiently talks him out of it, and convinces him that the only farming that pays is "high farming," making a garden of the entire farm. He cherished the idea that the intelligent farmer must put his questions to the soil and not to his neighbor, and then have the patience to wait and read the answers when they come. He had an abiding belief in manures and clean land, and in all his writings he earnestly endeavored to impress upon his readers that the real source of fertility must be looked for in the stores of plant-food lying dormant in the soil, and that tillage, underdraining and thorough cultivation are the means by which we develop and render this plant-food available, and that the real basis of success is faith accompanied by good works. His books, "Harris on the Pig," "Talks on Manures," and "The Use of Nitrate of Soda" are all of the same practical stamp. His last book, "Gardening for Young and Old," as its title indicates, is intended as a guide for the boy and his grandfather at the same time, but with the mental reservation that it should be principally for the young folks. Mr. Harris realized the need of more gardening and better gardeners, and had strong faith in the promising future of seed-growing in this country. In the development of these industries he saw bright opportunities for the boys, because they were young and could afford to wait, and especially because they would be more liable to adopt new processes. In this work he makes a strong plea for a more general cultivation of flowers, losing no opportunity to convince the reader that the beauty of flowers elevates the tastes, and their cultivation gives health and pleasure. These and similar sentiments pervade all his writings, and may well serve as a keynote to his life's aim. Whatever work he undertook he did with a full heart and convincing earnestness. His writings and teachings have left an indelible impress upon legions of cultivators of the soil, because he was sound in principle and honest in his convictions. In summing up his life-work, it is safe to assert that no one has done more in this country to dignify rational and profitable agriculture and horticulture than Joseph Harris.

F. M. HEXAMER.

HARTWEGIA (Theodor Hartweg collected in Mexico for the Horticultural Society of London, and found these plants near Vera Cruz). *Oreohidæceæ*. A genus of 2 species of tender epiphytic orchids from tropical America, growing about a foot high and bearing purple fls. The genus has the habit of *Epidendrum*, section *Amphiglotis*, but differs in having the labellum sessile at the base, in which respect the genus approaches *Poneria*; however, *Poneria* has a very different habit. *H. purpurea* was once advertised by John Sank. Rest them in a coolhouse Oct. to Mar. Growing temperature should be 65-90°.

purpurea, Lind. Lvs. solitary, leathery, ovate-lanceolate, equally terete with the stem, many times shorter than the thread-like peduncle; fls. small, purple; sepals acute, a little larger than the petals; limb of the lip white at the base, callous. Mex.

H. gemma, Reichb. f. "This is a most lovely gem," wrote Reichenbach, and "much better than its predecessor." *Gemma*, therefore, does not mean "twin," as sometimes stated. Lvs. solitary, semi-terete, thick, acute, channelled, blotched with blackish violet; fls. amethyst-purple, in a small, 1-branched panicle; odd sepal acute, obtusely strap-shaped; equal sepals oblong-acute. Cent. Amer.

HARVEST BELLS. *Gentiana Pneumonanthe*.

HASSOCK GRASS. Consult *Deschampsia*.

HASTINGSIA (S. Clinton Hastings, promoter of Californian botany). *Liliidæceæ*. Two bulbous plants of the Pacific slope, with white or greenish fls. in many-d. panicles or racemes; perianth segments distinct, each obscurely 3-nerved; stamens 6; style short. *Hastingsias* have strong, nearly naked stems, arising from a scaly bulb; lvs. thick. The two species are offered by collectors, but they are little known in cult. Treatment as for *Camassia*. *H. álba*, Wats., is 2-3 ft. high; lvs. $\frac{1}{2}$ in. or less wide; raceme simple or nearly so, 1 ft. long, densely fld., the fls. $\frac{1}{4}$ in. or less long, white or greenish white; stamens equaling the segments. N. Calif. northward. *H. bracteosa*, Wats. Bracts narrow and nearly equaling the fls., which are larger than in the other, and white; stamens half as long as segments; lvs. longer. Oregon.

L. H. B.

HAW, or HAWTHORN. Consult *Crataegus*.

HAW, BLACK. *Viburnum prunifolium*.

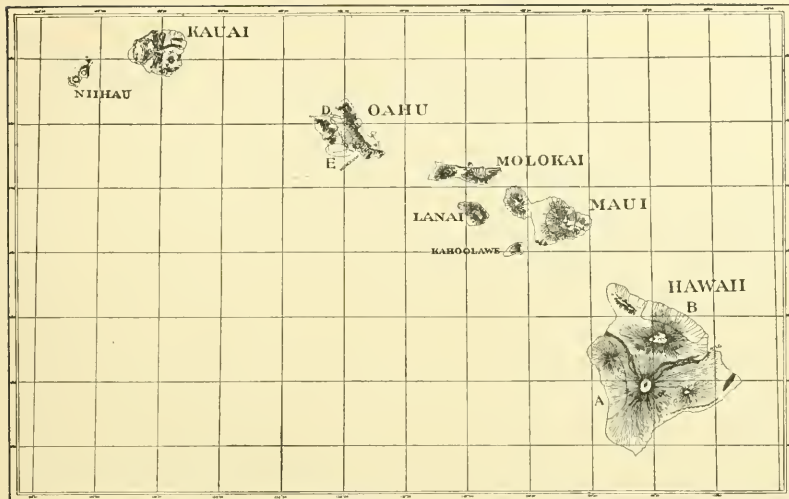
HAWAIIAN ISLANDS, HORTICULTURE IN. Fig. 1020. The group known as the Hawaiian or Sandwich Islands is located about 2,100 miles from San Francisco, in a southwesterly direction. It lies between the parallels 18° 50' and 23° 5' north latitude and between the meridians 150° 40' and 160° 50' west longitude.

AREA.—The five most important islands have an area of about 6,200 square miles, or rather less than that of Massachusetts, and extend about 380 miles from northwest to southeast.

CLIMATES.—It is hardly possible to speak of the climate of Hawaii (as the whole group is sometimes called), for there are so many different climates in this small area. The extent of the rainfall, for example, which forms so important a factor in the horticultural conditions of a country, is decidedly different in different regions and even in localities within a few miles of each other. To understand the climatic conditions, it is necessary to recall that these islands are of volcanic formation, their central parts and the larger part of their area being occupied by rugged and high mountains, with valleys lying between the ranges and narrow plains near the coast. Being in the path of the northeast trade winds, the windward side of the islands receives an abundant rainfall throughout the year, while the southwest shores are comparatively dry. Thus, at Honolulu, on the southwest shore of Oahu, the annual rainfall averages about 38 inches, while that of the city of Hilo, on the windward side of the island of Hawaii, measures 12 feet. Even within a very narrow range, as, for example, the limits of the city of Honolulu, there is great variety of rainfall, certain localities receiving frequent rains throughout the year, while others only two or three miles distant practice irrigation constantly. Some of the great sugar-cane plantations depend wholly upon the natural supply of water, while others could not grow cane at all without their expensive systems of artesian wells and irrigation.

Similarly there is a great variation in the temperature in different parts of this small but important country, but exceedingly slight variations with the changing seasons. The windward side is cooler than that which is sheltered by the mountains, but in no part of the islands is the heat so intense as would be expected from their location within the tropics. Only rarely, in the hottest localities, does the mercury rise to 90° F. Again, the variation in elevation from sea level to many thousand feet gives a like variation in temperature, so that some of the mountains of the largest island are covered with snow during a part of the year. In short, so far as climate is concerned, the Hawaiian Islands offer all that could be asked for great and diversified horticultural industries.

HORTICULTURAL DISTRICTS.—Only a small percentage of the total area of the country is suitable for cultivation. The tillable portions are, in general, the plains along the coast and the valleys among the mountains. By far the larger part of such lands is now occupied by sugar-cane plantations, which are to be found on every important island of the group. There



1020. Hawaiian Islands. The chief horticultural regions are at A, B, D, E.

are some extensive coffee sections on the island of Hawaii, particularly the district of Kona, whose coffee has established a reputation for peculiar excellence of flavor. There are no large areas devoted to horticulture, but perhaps the most important horticultural regions, at the present time, are on the islands of Hawaii and Oahu. Some of the elevated lands of Maui help to supply the Honolulu market with potatoes. The main horticultural areas are designated on the map by the letters A, B, D, E.

PRESENT STATUS OF HORTICULTURE.—As will be seen from the foregoing statements, horticulture is as yet quite undeveloped. Almost all the scientific effort and investigation in agriculture (using that term in its wider meaning) have been devoted to sugar-cane, for until recently the sugar planters' experiment station has been the only agricultural institution in the islands. There is, however, some considerable variety of horticultural products, and the cultivation of some of these has assumed commercial proportions. Among the latter in the field of pomology is the banana, of which there are many different varieties in the country. Some of these grow wild in the woods, as do also oranges and limes. Bananas and a few pineapples are the only fruits grown to any extent for export, though the people are awakening to the horticultural possibilities, and some are planting other fruits. The export of bananas for the year 1898 amounted to 76,000 bunches, and the home consumption, though no record is taken of it, would doubtless be found considerably greater. These are raised chiefly by the Chinese, but there are also white men in the business who, by their superior skill, produce a finer fruit.

The oranges are seedlings almost without exception, but some of these are, in the writer's opinion, well worthy of propagation, having a flavor which many prefer to that of the fruit imported from California. The island of Hawaii produces most of the home-grown oranges in the market, but the gardens of all the islands have their orange trees.

Grapes for the Honolulu market are grown for the most part by the Portuguese within the limits of the city. The Isabella and the Concord are the only two varieties that have succeeded thus far, but there can be no

doubt that this is due merely to the lack of scientific and persistent effort. Peaches thus far have failed, and possibly for the same reason. They, however, do not take any decided season of rest. Grapes are pruned twice per year frequently—in fact usually—and are made to produce two crops per year. Among the other fruits which are much esteemed are the cocoanut, papaya (*Carica Papaya*), alligator pear (*Persea gratissima*), mango, fig, guava, lime, and other tropical and subtropical fruits. Apples have been grown on the higher elevations of Hawaii, but plums, pears and apricots have not yet been made to succeed to any extent.

Vegetable gardening is conducted chiefly by the Chinese, who grow most of the commoner and more easily managed vegetables. These are marketed from house to house in baskets, balanced on a pole over the shoulder. The taro (*Colocasia*), which when manufactured into "poi" forms the chief food of the natives, is also now grown chiefly by the Chinese.

In floriculture, asters and carnations and a few other flowers are produced by the Portuguese and natives in the vicinity of Honolulu for sale in the flower market, which consists of the open sidewalk lined with Hawaiian men and women sitting against the buildings sleeping or smoking or making "leis." These "leis" (lays) are solid wreaths of flowers, which, according to Hawaiian custom, are thrown about the shoulders of friends departing on a voyage. This is mentioned here since more flowers are probably sold in this form than in any other way. Many plants, such as carnations, violets, pansies and the like, when grown on the lower lands, are cultivated in boxes raised some distance from the ground, for the ground temperature seems to be rather too high to produce the best results. Hawaii is not quite so much a "land of flowers" to-day as in years gone by, for in recent years a most devastating pest, commonly known as the Japanese beetle, has driven the rose and other plants almost completely out of cultivation. This, which is the most important insect enemy to horticulture, has been combated with its natural enemies in the way of fungi, and, though still a serious pest, its numbers are not so great as formerly.

Landscape gardening may be mentioned, since it bears so close a relation to horticulture. Much money has

been spent in the "improvement" of home grounds, and some architectural gardening is to be found, but naturalistic landscape gardening is, as yet, in its infancy in the islands, though nature furnishes so many excellent types.

POSSIBILITIES OF HORTICULTURE.—There can be no doubt that the climates and the qualities of the soils are such as to give to this country a very brilliant future in the production of varied and superior horticultural products. The amount of available land, however, is limited, since the larger tillable tracts are already used in the production of sugar-cane, and will probably remain so occupied. Still there are a good many small areas admirably adapted to horticulture.

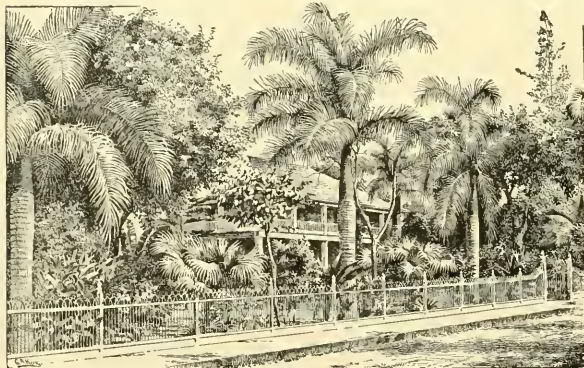
Then, too, the matter of market is one which must be considered, since for all articles which cannot be shipped on a six days' voyage, the cultivator is limited at present to but one city of about 30,000 inhabitants and another good-sized town. Again, the highly developed horticulture of California lies between Hawaii and the great American markets. These home towns, however, are likely to double and treble their present population during the next few years, and while there are to-day many tons of fruit and vegetables imported from California on every cold-storage steamer which arrives, there does not seem to be immediate cause for alarm regarding the market. An outlet for fruits and vegetables during the winter season is hoped to be found in California, and a colony of American settlers is now developing this trade.

Many minor industries are being tried, such as the cultivation of the vanilla bean, various fiber plants, the castor oil bean, and the like, and doubtless some of these will prove valuable additions to the agriculture of the country. The future of Hawaiian horticulture is not an easy subject upon which to prophesy at the present time, but one upon which many greatly interested in the country's welfare are now thinking. A government experiment station is greatly needed to aid in the solution of some problems connected with the subject.

J. E. HIGGINS.

HAWKWEED. *Hieracium*. Various species of *Crepis* are known as HAWKSEAR.

HAWORTHIA (A. H. Haworth, an English botanist of the beginning of the century, who wrote much and well on succulents). *Liliaceae*, tribe *Aloineae*. Acaulescent or short-stemmed succulents: lvs. mostly rather small, crowded in short or less commonly elongated rosettes: fls. white, rosy-striped, with somewhat irregular spreading limb, the style and stamens included. Cape region. Cultivation and propagation as for *Aloe*, *Gasteria* and *Apiera*, to which the genus is closely related.



1021. Hawaiian vegetation. Showing the Royal Palm as it grows in Honolulu.

Latest monograph, Baker, in *Flora Capensis*, vol. 6, 1896-7.

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A. *Foliage on an elongated stem. (Aspect of Apiera.)*

B. *Lvs. conceva, never coarsely white-dotted.*

c. *Arrangement of lvs. 5-ranked.*

1. *viscosa*, Haw. (*Aloe viscosa*, Linn. *A. triangularis*, Lam. *Apiera viscosa*, Willd.). Lvs. broad and short, densely imbricated, appressed, with spreading apex, minutely scabrous or viscidly punctate. B.M. 814.—In the type the leaf rows are vertical, but several marked varieties occur, in some of which they are prominently spirally twisted.

2. *tortuosa*, Haw. (*Aloe tortuosa*, Haw.). Lvs. more elongate, less crowded, not spreading at apex, in strongly twisted rows, scabrous. B.M. 1337 (as *Aloe rigida*).—Varies into several named forms.

cc. *Arrangement of lvs. many-ranked: stem shorter.*

3. *rigida*, Haw. (*H. expansa*, Haw. *Aloe rigida*, Ker-Gawl. *A. expansa*, Haw.). Lvs. spreading or recurved, somewhat attenuate, scabrous on the back. L. B. C. 15:1430.

4. *scabra*, Haw. (*Aloe scabra*, Schult. f.). Lvs. suberect in a shorter rosette than usual, thick and rather obtuse, nearly plane above, both faces rugose-scabrous.

BB. *Lvs. mostly biconvex, white-dotted.*

5. *Reinwardtii*, Haw. (*Aloe Reinwardtii*, Salm-Dyck). Fig. 1022. Lvs. erect, often plano-convex, inflexed at apex, very acute, somewhat veined beneath, the back or both faces with numerous elevated white tubercles in more or less evident rows.

6. *coarctata*, Haw. (*H. Reinwardtii viridis*, *Aloe coarctata*, Schult. f.). Lvs. thicker, clearer green and more succulent, strongly biconvex, the back with a few scattered, scarcely elevated whitish dots.

AA. *Foliage in a compact rosette.*

B. *Margin of lvs. not horny.*

C. *Shape lvs. lanceolate. (Aspect somewhat of Aloe humilis.)*

D. *The lvs. coarsely white-tuberculate.*

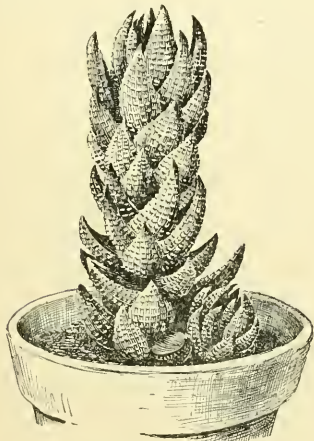
7. *attenuata*, Haw. (*Aloe attenuata*, Haw. *Apiera attenuata*, Willd.). Lvs. thick, attenuate, rigidly spreading, rather concavo-convex, scabrous or often white-dotted above, the back with the white tubercles mostly in transverse rows. B.M. 1345 (as *Aloe Radula*).

8. *fasciata*, Haw. (*Aloe fasciata*, Salm-Dyck. *Apiera fasciata*, Willd.). Lvs. more turgid, suberect, merely acute, not scabrous, the large white dorsal tubercles confluent in rather distant transverse bands.

9. *margaritifera*, Haw. (*H. major*, Duval. *Alde margaritifera*, Burm.). Lvs. turgid, spreading, merely acute, both faces with scattered coarse white tubercles, which often turn green on the upper surface. P.G. 57. Varies into several named forms.

DD. *The lvs. less conspicuously white-tuberculate.*

10. *rugosa*, Bak. (*Alde rugosa*, Salm-Dyck. *H. Riddula asperior*). Lvs. long attenuate, spreading, plano-convex, both faces with irregularly placed, rather coarse greenish tubercles.



1022. *Haworthia Reinwardtii*.

11. *subulata*, Bak. (*Alde subulata*, Salm-Dyck). Like the preceding, but the scattered or rugosely confluent tubercles very small, whitish.

12. *radula*, Haw. (*Alde Radula*, Jacq. *Aplera Radula*, Willd.). Lvs. shorter, the white tubercles finer. Cape.

13. *hybrida*, Haw. Lvs. short, more turgid, the upper face somewhat rugose, the lower with scattered green tubercles. Cape?

cc. *Shape of lvs. ovate to deltoid, succulent, not tuberculate, spreading, the rosette often somewhat elongated.*

14. *tessellata*, Haw. (*Alde tessellata*, Schult. f.). Lvs. acute or acuminate, setosely denticulate, scabrous beneath, the smooth upper surface with pale lines anastomosing in squares.

15. *recurva*, Haw. (*Alde recurva*, Haw. *Aplera recurva*, Willd.). Lvs. entire, scabrous beneath, the smooth upper surface longitudinally pale striate. B.M. 1353.

16. *cymbiformis*, Haw. (*H. concava*, Haw. *Alde cymbiformis*, Haw. *A. cymbifolia*, Schrad. *Aplera cymbifolia*, Willd.). Lvs. entire, smooth, rather obtuse, longitudinally striate. B.M. 802.

ccc. *Shape of lvs. cuneately prismatic, pellucid.*

d. *The lvs. erect, obliquely truncate, with deltoid, pale-striate apex.*

17. *mirabilis*, Haw. (*Alde mirabilis*, Haw. *Aplera mirabilis*, Willd.). Lvs. ciliate-denticulate on margin and keel, sparingly tuberculate beneath. B.M. 1354.

18. *asperula*, Haw. (*Alde asperula*, Schnit. f.). Lvs. entire, finely scabrous.

19. *retusa*, Haw. (*Alde retusa*, Linn. *Aplera retusa*, Willd. *Caterula retusa*, Medic.). Lvs. entire, smooth. B.M. 455.

DD. *The lvs. erecto-spreading, pointed, smooth.*

20. *cuspidata*, Haw. (*Alde cuspidata*, Schult. f.). Lvs. stout, rather concave, entire, nearly erect, the setulose apex obscurely longitudinally or reticulately striate and sometimes truncate, but very obliquely so.

21. *turgida*, Haw. (*Alde turgida*, Schult. f.). Lvs. small, spreading, very turgid, acute, entire, longitudinally striate.

22. *reticulata*, Haw. (*Alde reticulata*, Haw. *A. pumila*, Linn. *A. herbacea*, DC. *A. arachnoides reticulata*, *Aplera reticulata*, Willd.). Lvs. as in the last, or slightly ciliate on the angles, the striations anastomosing. B.M. 1315. L.B.C. 14:1354.

23. *altilinea*, Haw. (*H. mucronata*, *H. limpida* and *H. aristata*, Haw. *Alde altilinea*, Schult. f.). Lvs. entire, aristately pointed, longitudinally striate.

24. *arachnoides*, Haw. (*Alde arachnoides*, Mill. *Aplera arachnoides*, Willd. *Caterula arachnoides*, Medic.). Lvs. more flattened-triangular, aristately pointed, the angles ciliate-toothed. B.M. 756.

BB. *Margin and keel of lvs. horny-bordered.*

25. *albicans*, Haw. (*H. lavis*, Haw. *Alde levigata*, Schult. *A. albicans*, Haw. *A. marginata*, Lam. *Aplera albicans*, Willd.). Lvs. broad, 3-sided, acute, entire, smooth or with a few dorsal tubercles, white-bordered. B.M. 1452.

WILLIAM TRELEASE.

HAWTHORN. See *Crataegus*.

HAWTHORN, EAST INDIAN. *Raphiolepis ovata*.

HAZARDIA (Barclay Hazard, Californian botanist). *Compositae*. This includes a small Californian subshrub, with silvery leaves and peculiar, not pretty, heads of fls., borne in August. It is suitable for rockeries and bedding out, but there are better woolly-leaved plants in cult. The genus has about 4 species of stout, tomentose, deciduous shrubs of the islands off the coast of Calif.: heads white-tomentose, numerous, in large cymose panicles, which terminate the branches; rays 5-8, neutral, very short, ligulate or irregularly 5-toothed or lobed, pale yellow changing to brownish purple. In 1887 E. L. Greene made this new genus, remarking that it differs from *Diplostegium* mainly in habit, the paucity, reduced size, and different color of its rays. It also lacks the tuft of hairs characteristic of the style-tips of *Cotretogyne*.

detönsa, E. L. Greene. (*Cotretogyne detönsa*, Greene). Lvs. of firm texture, 3-5 in. long, obovate-oblong, coarsely serrate; upper surface of older lvs. partly divested of the white tomentum which covers all other parts of the plant.

F. FRANCESCHI and W. M.

HAZEL. See *Corylus*. Chilean Hazel is *Gevunia Avellana*.

HEAL-ALL. *Brunella*.

HEART'S EASE. Old English name for Pansy, *Viola tricolor*.

HEARTSEED or BALLOON VINE. *Cardiospermum*.

HEATH, HEATHER. The common Heather of Old World literature is a hardy plant, *Calluna vulgaris*. The greenhouse Heaths are from the Cape of Good Hope and Europe, and belong to the genus *Erica*. For St. Daheoc's Heath, see *Daboecia*.

HEATING is discussed under *Greenhouse Heating, Construction and Management*.

HEBECLINIUM. All referred to *Eupatorium*.

HECHTIA (J. G. H. Hecht, who died in 1837). *Froemelideae*. A genus of 15 species of Mexican succulent plants, one of which is perhaps cult. in a very few fanciers' collections of tender plants for its dense rosettes of recurved spiny lvs., which are purple above from the middle to the tip and silvery beneath. The genus is distinguished by having diocious fls. The fls. have no decorative value, being one-third of an inch across, white, in

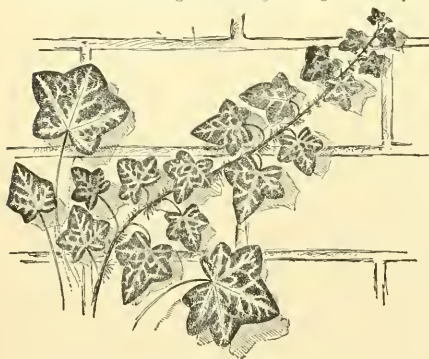
small sessile, axillary, yellow-bracted heads, borne at intervals of an inch or so on a very slender scape 2 ft. long. Give perforated pots and high temperature. Mon. by C. Mez in DC. Mon. Phan. 9:543-551 (1896).

glomerata, Zucc. (*H. Ghiesbreghtii*, Lem.). Lvs. 10-18 in. long, rigid, leathery, 9-12 lines wide at base, narrowed gradually to the sharp-pointed apex; bracts sheathing, acuminate; corolla 3-lobed nearly to the base; stamens 6; ovary 3-celled. B.M. 5842. I.H. 10:378. — Soil of chopped moss, old manure and charcoal.

HEDERĀ (Greek, *sweet smell*). *Labiata*. AMERICAN PENNYROYAL. This is a plant of no ornamental value, but the seeds are offered by our nurserymen to those who cultivate the plant for its medicinal oil, which is commonly sold in drug stores. It is claimed to be offensive to mosquitoes, and the plant can be easily naturalized in dry, sandy spots. It is common in woods and along roads. The genus has about 16 species, all American. The Pennyroyal of the Old World is *Mentha Pulegium*, sometimes cult. for its lvs. and tops, which are used as culinary herbs.

pulegioides, Pers. AMERICAN PENNYROYAL. ANNUAL, 6-18 in. high; stem very slender, much branched, pubescent; lvs. opposite, ovate to oblong-obovate, sparingly serrate in the upper portion, mostly obtuse at the apex and narrowed at the base, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. long; fls. in axillary clusters; corolla purple, 2-lipped, the lower one with 3 large lobes. July-Sept. B.B. 3:106.

HEDĒRA (ancient Latin name of the Ivy). *Araliaceae*. IVY. Ornamental evergreen climbing shrubs, with alternate, entire or palmately 3-5-lobed, long-petioled lvs., inconspicuous greenish fls. in terminal, peduncled umbels, appearing in fall, and black, rarely yellow, red or whitish berries. Some small-lyd. forms may be grown North if protected during the winter, but most of the larger-lyd. and variegated forms are too tender north of the middle states. The Ivy is a very valuable plant for covering walls, rocks, trunks of trees and trellis-work, and sometimes climbs very high. It may also be used for covering walls in cold greenhouses, for screens in drawing-rooms and for hanging baskets. It is a popular window-garden plant, enduring many uncongential conditions and thriving without bright sunlight. In shady



1023. *Hedera Helix* ($\times \frac{1}{2}$).
Form with white-ribbed leaves.

places under trees it makes a handsome evergreen carpet, and is also often used for borders of shrubberies or flower beds. It grows in almost any soil, but best in a somewhat moist and rich one, and in shaded positions. The climbing or creeping branches do not flower; fls. are produced on erect, bushy branches, appearing on old, high-climbing plants only. Prop. by cuttings of half-ripened wood at any time of the year in the greenhouse or in frames, or, in more temperate regions, in

the open ground in fall; gentle bottom heat will hasten the development of roots considerably; also increased by layers and by seeds. The slow-growing forms, especially the shrubby ones, are often grafted on cuttings of strong-growing varieties. Two species in En., N. Afr. and Asia. Fls. perfect; calyx 5-toothed; petals and stamens 5; ovary 5-celled; fr. a 3-5-seeded berry. Many Araliads have been described formerly as species of *Hedera* which are now referred to other genera. A good popular monograph is Shirley Hibberd's "The Ivy: A Monograph, comprising the history, uses, characteristics, and affinities of the plant, and a descriptive list of all the garden Ivies in cultivation." London, 1872.

Helix, Linn. IVY. ENGLISH IVY. Fig. 1023. High climbing or creeping; lvs. usually 3-5-lobed, dark green above, pale or yellowish green beneath, — those of the flowering branches entire, generally ovate; calyx with minute teeth; calyx, pedicels and tips of young branches covered with grayish white stellate hairs; fr. black, sometimes yellow. En., Canaries, N. Afr., Asia. — A very variable species, of which more than 60 varieties are cult. in European gardens. Some of the most remarkable are the following: Var. *Algeriensis*, Hort. Lvs. roundish or broadly ovate, entire or slightly 3-lobed, rather large, bright green; a variegated form has the lvs. edged yellowish white. Var. *arborescens*, Loud. (*H. arborea*, Hort.). Not climbing, forming an erect, low shrub; lvs. ovate to elliptic, entire. This variety is gained by using flowering branches for propagation. There are also some variegated forms, as *Silver Queen*, with silvery variegated lvs. Var. *aurantiaca*, André. Lvs. rather small, ovate or triangular-ovate, entire or 3-lobed, the middle lobe often with few coarse teeth, greyish green; fr. orange-red. R.H. 1884:84. Var. *Canariensis*, DC. Lvs. large, roundish ovate, entire or slightly 3-lobed, bright or yellowish green, to 8 in. broad, those of flowering branches often broader than long. Canaries. Tender. Var. *Cæventisii*, Hort. (var. *marginata minor*, Hort.). Slow-growing, with rather small dull green lvs., edged creamy white, striped red or pink in fall. Var. *chrysocarpa*, Ten. (*H. chrysochloria*, Walsh. *H. poëtarum*, Bertol.). Lvs. rather small, usually 3-lobed, grayish green; fr. yellow. Var. *conglomerata*, Hort. Slow-growing; lvs. crowded, small, entire or 3-lobed, undulate. R.H. 1890, p. 163. Var. *oreñata*, Hort. (*H. vitifolia* and *H. digitata nova*, Hort.). Similar to var. *digitata*, but lobes shorter and broader, crenate at the margin, light green. Var. *deltoides*, Hort. Lvs. rather small, bluntly deltoid, almost entire, blackish green, changing to dull purplish bronze in fall. Var. *digitata*, Loud. Lvs. rather small, deeply palmately lobed, with narrow lobes and prolonged middle lobe. M.D.G. 1897:229. S.H. 2:237. Var. *Doneraiensis*, Hort. Lvs. small, usually 3-lobed, with rather short, spreading lateral lobes; of compact growth. Var. *gracilis*, Hort. Lvs. rather small, with broad, short lobes, dull green, bronzy in fall. Var. *Hibernica*, Koehne (*H. Scötica*, Hort.). Lvs. large, with short and broad lobes. Var. *lobata major*, Hort. Similar to the preceding, but lvs. somewhat smaller, more deeply lobed and lobes narrower. Var. *maculata*, Hort. (*H. latifolia maculata*, Hort.). Similar to var. *Hibernica*; lvs. spotted and striped yellowish white. Var. *Maderensis variegata*, Hort. Similar to var. *Canariensis*; lvs. not or slightly lobed, edged white. Tender. G.C. II. 15:657. Var. *marginata*, Hort. Lvs. broadly triangular-ovate, irregularly bordered, yellowish white, striped red or pink in fall; of somewhat slow growth. Var. *marginata rubra*, Hort. (vars. *tricolor*, *elegantissima*, *Chilisi*, Hort.). Like the preceding, but edges of lvs. becoming red in fall. Var. *marmorata*, Hort. Similar to var. *Hibernica*, but lvs. irregularly blotched yellowish white. Var. *palmata*, Hort. Similar to var. *digitata*, but lobes broader, and the middle lobe not much prolonged. Var. *rhombæa*, Arb. Kew. (*H. rhombæa*, Sieb. & Zucc.). Lvs. rather small, generally broadly ovate, entire or slightly lobed, those of flowering branches elliptic or rhombic-ovate, narrowed toward the base. Japan. Var. *rhombæa-variegata*, Hort. (*H. submarginata*, Hibberd. *H. Japonica variegata*, Hort. *H. Japonica argentea*, Hort.). Lvs. like those of the preceding, but with narrow white margins. Var. *sagittifolia*, Hort. Lvs. rather small, with triangular middle lobe and short, blunt lateral lobes,

dull dark green. Var. *variegata*, Hort. Lvs. lighter green, edged and blotched yellowish white.

Cólichica, C. Koch (*H. Regneriana*, Hort. *H. coriácea*, Hibberd). High climbing, but usually less high than the common ivy. Lvs large, broadly ovate, cordate, almost entire, rarely slightly 3-lobed, bright green, of firm texture, those of flowering branches generally oblong-ovate: calyx lobes triangular-ovate, conspicuous; calyx, pedicels and tips of young branches coated with golden yellow scales: fr. black. W. Asia. Var. *dentáta*, Hibberd (*H. dentáta*, Hort.). Lvs. with remote small teeth, of somewhat thinner texture. G.M. 30: 388. Var. *purpúrea*, Hibberd. Lvs. purplish.

ALFRED REHDER.

HEDGES. Living green fences are used for two distinct purposes—defense and ornament. Ornamental Hedges may be rendered defensive by stretching tightly 2 or 3 strands of barbed wire through the center of the Hedge. So far, no plant has yet been tested that meets all the requirements of the farmer for a truly impassable barrier, although the Osage orange (*Machaera aurantiaca*) possesses more recommendable features than any other hardy tree. This tree, however, is not hardy in the northernmost states. Next to this, perhaps, ranks the honey locust (*Gleditsia triacanthos*), with many warm admirers and advocates. The hawthorn of Europe (*Crataegus Oxyacantha*) may not be planted in this country with any chance of success, owing to fungous enemies, and all of the large-sized thorny shrubs fail in important characters. A perfect thorn Hedge requires unremitting care, and must conform to an established rule, the most important being entire freedom from weeds and a systematic pruning. The preparation of the soil for a Hedge consists in thoroughly plowing and cultivating an area 6 feet wide and the length the Hedge is proposed to extend. If this space should be fertilized and cropped the year previous to planting, vegetation will be greatly accelerated. The plants must be shortened, both top and root, and set 9 inches apart in a single row. The double row, as formerly advised by some growers, is now practically obsolete, and justly so, being difficult to cultivate and preserve free from weeds. A trench or furrow is opened through the center of the cultivated strip of a sufficient depth to admit the roots without bending. In setting, the soil must be made firm with the aid of a rammer, a practice unexcelled for aiding growth, and, indeed, preserving plant-life after removal. Pruning is simply an annual necessity from the first, excepting when the Hedge is intended to be plashed, and even in such cases, after the laying process, pruning must never be omitted during summer. This work is greatly accelerated and consequently cheapened by shearing when the plants are young and tender, say during the month of July. As to the best outline, a plain triangle, or what may be more slightly, the curvilinear or Gothic arch, is desirable, and a flat top is to be discouraged, as a body of snow lodged on the latter invariably injures the symmetry and beauty of any Hedge. The ornamental Hedge proper may be either evergreen or deciduous, and yet in the so-called California privet (*Ligustrum ovalifolium*) are united, to a certain extent, both conditions. Taking into consideration its almost faultless character for the purpose, we may assign it a prominent position at the head of the list.

Among strictly evergreen plants, the Norway spruce (*Picea excelsa*) succeeds most satisfactorily. For a combination of cheapness and general utility, the American arborvitæ (*Thuja occidentalis*) may be placed next, although for decided beauty nothing can supplant the common hemlock (*Tsuga Canadensis*). The number of available deciduous trees and shrubs suitable for Hedging is so extensive that to specify even a few is unnecessary. Flowering shrubs may, however, claim preference, and such attractive species as *Cydania Japonica*, *Deutzia scabra*, some of the spiræas, viburnums, etc., may be employed with good effect. Species of *Berberis* are occasionally used with marked success, especially the purple-leaved variety, although rather formal in character. The most serious annoyance to the Hedge grower is the presence of unwelcome woody vines, such as poison ivy (*Rhus Toxicodendron*), Japan evergreen

honeysuckle (*Lonicera Japonica*), etc., and the only remedy is to persistently remove them by hand as soon as discovered. The attacks of insects may be treated similarly to those which injure our trees and shrubs. The charming little *Berberis Thunbergii* is a model of beauty and utility, owing to the brilliant autumn tints of its foliage and abundant crops of scarlet fruit. Other good plants for special uses are Russian mulberry, *Rhamnus*, and *Ligustrum Itoa*. JOSIAH HOOPES.

HEDYCHUM (Greek, *sweet snow*: the large white fls. are sweet scented). *Scitaménoe*. BUTTERFLY LILY. GINGER LILY. GARLAND FLOWER. Something like 25 tropical Asian erect, leafy, rhizomatous herbs allied to canna and ginger. Fls. in a terminal spike or thyrse; stamen 1, with a 2-lobed anther surrounding the style; staminodia sometimes present; flower-tube slender, with six divisions, one of which is enlarged and lip-like. Hedychiums are strong-growing plants, very ornamental, both in foliage and in flower. They are essentially fall bloomers, although they may be made to bloom more or less continuously under glass. After blooming, gradually dry off the rhizomes, and let them rest for a time. Pot them up in spring or early summer, and give them rich soil and plenty of water and an occasional supply of liquid manure. The rhizomes may be divided every two or three years. They need an abundance of water. In fact, the pots may be set half their depth in water, and *H. coronarium* is often immersed until only the crown is emersed. The common white-flowered species is *H. coronarium*. This requires warmhouse treatment for best results, although it often flowers well when plunged in a warm, half-shady place in the open. The species do not stand frost, but they may be left out in the South if well protected. The flowers are very fragrant; in fact, their odor may be too heavy for a small room.

A. Fls. white.

coronarium, Koenig. Three to 5 ft.: lvs. canna-like, green, pointed; fls. very large (3-4 in. across), long-tubed, pure white or the lip sometimes blotched green, the 3 outer segments narrow, the lip large and erect and more or less lobed. India. B.M. 708. L.B.C. 6:507. —Handsome and worthy. Needs warm quarters. Said to have been sold as *Myrosma caruifolia*, but that name belongs to a wholly different plant.

AA. Fls. yellow or red.

flávum, Roxbg. Fls. large, orange; corolla tube cylindrical, 2½ in. long; segments spreading, the outer ones linear, acute and an inch or so long, the lip very large and rounded, retuse; stamen not exerted. India. B.M. 3039 (and 2378 ?).

Gardnerianum, Roseoc. Tall; fls. light yellow, odd, short-stalked in the terminal spike, but the red filament long-projected beyond the segments; lip oval and short 3-toothed, the other segments narrow; fr. thin, red and showy. India. B.M. 6913. B.R. 9:774. J.H. III. 32:239 (in fruit). G.C. III. 11:176 (plate erroneously labeled *H. coronarium*). —The best of the genus, and hardier than *H. coronarium*.

occineum, Bueh.-Ham. Fls. rather small, scarlet, the filament long-projected; lip nearly or quite entire: filaments conspicuous. India. L.B.C. 8:705. L. H. B.

HEDYSARUM (Greek for *sweet smell*). *Leguminósar*. Two or 3 North American herbs, and about 60 in the Old World. Perennial herbs or subshrubs, with odd pinnate lvs., and often showy racemes of red, purple or white, small pea-like fls.; calyx 5-cleft, the teeth nearly equal. Standard obovate or obovate; keel nearly straight and longer than the wings; stamens 9 and 1; fr. a flattened jointed pod. Very closely allied to *Diosmodium*, but the latter genus has 3-foliate lvs. Many of the Hedyсарums are attractive border plants. They are of easiest culture in a light and open, well-drained soil. Give a sunny place. Hardy. Prop. by division and seeds. For the Sainfoin, sometimes known as *H. Onobrychis*, see *Onobrychis*.

A. Fls. normally red (varying to white).

coronarium, Linn. FRENCH HONEYSUCKLE. Perennial or biennial, 2-4 ft. tall, branched. An old garden plant

with red, fragrant fls., crowded in axillary spikes or racemes: lvs. with 3-7 pairs of elliptic or roundish, somewhat pubescent lfts. Eu. Var. *album*, Hort., has white fls.

AA. *Fls. normally purple (varying to white).*

multijugum, Maxim Hardy perennial of angular, straggling growth, 2-5 ft. high, very showy, and worthy of general cult. Fls. violet or purplish magenta, with yellow blotches, in racemes 8-18 in. long, all summer: lvs. 4-6 in. long, containing 6-12 pairs of grayish green oval, small lfts. Mongolia. Gr. 53:117-70. G.C. Ill. 18:8, 9.—Of recent introduction. Very fine for rockwork.

borale, Nutt. (*H. Americhium*, Britt.). Erect or half-decumbent herb, simply or nearly so, 1-3 ft.: lfts. 5-10 pairs, glabrous, oblong or oblanceolate: fls. violet-purple, varying to white, the calyx teeth ovate-acute and shorter than the tube. Labrador and northern N. England across the continent.

Mackenzii, Richards. Much like the last, but somewhat pubescent: fls. larger, calyx teeth awl-like and acuminate, and longer than the tube. Colo. N. and W.

L. H. B.

HEDYSCEPE (Greek, *sweet covering*). *Palmaceæ*. **UMBRELLA PALM.** This includes one of the many palms known to the trade as a *Kentia*, and resembles that genus in habit and foliage, but is distinct in flower. In *Kentia* the fls. are arranged in 4 ranks, and the ovule is fastened at the bottom of the cell, while in *Hedyscepe* (and its cultivated allies, *Kentiospis*, *Veitchia*, *Neuzea*, *Archontophoenix*, *Rhoplostylis* and *Dietyosperma*) the fls. are spirally arranged in the branches of the spadix, and the ovule is fastened at the side. From the allies above mentioned *Hedyscepe* is distinguished by the following characters: staminate fls. with narrowly lanceolate sepals, 9-12 stamens, with long filaments; pistillate fls. with petals like the sepals and valvate at the apex. As a house plant, *H. Canterburyana* is dwarfier and more spreading than the two *Howeas*, and has a lighter shade of green.

H. Canterburyana, a very handsome palm, is the only species belonging to the genus, and, like the important *Howea* (or *Kentias* of commercial horticulture), is only known in a wild state on Lord Howe's Island, where it



1024. *Hedyscepe Canterburyana*.

is known as the "Umbrella Palm" from the recurving habit of its foliage. It grows at a greater altitude than the *Howeas*, not appearing below the 900-foot level, and from this it may be inferred that a slightly lower temperature is more suitable for this palm; but in a general way the same conditions as those required by the so-called *Kentias* will give good results with this subject, namely, a night temperature of 60° to 62° F., moderate shading throughout nearly the whole year, plenty of water, and a rich and rather heavy soil. These palms respond freely to generous treatment. As a commercial palm, *H. Canterburyana* is not very popular as yet, partly owing

to the higher cost of seeds and the frequently low percentage of germination, and partly from the fact that in a young state this palm is by no means a rapid grower. In regard to hardness of foliage, it is fully equal to the *Kentias*, and for gracefulness and symmetry of growth will compare favorably with any of the commercial species. In S. Calif. it is cult. outdoors.

Canterburyana, H. Wendl. & Drude (*Kentia Canterburyana*, F. Muell.). **UMBRELLA PALM.** Fig. 1024. Tall, spineless palm, with a thick, stout caudex: lvs. terminal, dense, equally pinnatisect, the numerous segments linear-lanceolate, acuminate, the lower nerves recurved at the base, rather remote from the margin; rachis arched, recurving: spadix with a short peduncle, and thickened, flexuose branches; areole lvs. fls. medium: fr. ovoid, large. R.H. 1873, p. 218. F.R. 1:85. The illustration (Fig. 1024) is adapted from Martius.

JARED G. SMITH and W. H. TAPLIN.

HEERIA (commemorative of Oswald Heer, Swiss botanist). *Melastomaceæ*. Includes *Heterocentron*. According to the latest monographer (Cogaiaux, DC. Monogr. Phaner. 7), the genus has 6 Mexican and Central American species. They are herbs or shrubs, erect or prostrate, with opposite membranaceous pinnately nerved (rarely 3-nerved) entire lvs., and white, rose or purple irregular fls. in panicles or rarely solitary. Not to be confounded with *Centradenia*, which has winged stems, unequal-sided lvs. and calyx teeth small and much shorter than the calyx tube. Stamens 8, very unequal, the 4 larger ones with long appendages or connections: ovary loculed: petals 4.—Warmhouse plants, requiring the culture of *Centradenia*, but grown chiefly for the fls., whereas *Centradenia* are grown also for foliage. *H. rosea*, Triana (*Heterocentron Mexicanum*, Naud., *H. roseum*, Br. & Bouché) is the only species in general cult. A foot or more high, with 4-angled (but not winged) stem: lvs. elliptic, obtuse or acute, pinnate-nerved: fls. bright rose, in a large, terminal panicle, showy. B.M. 5166. L.H. 3:97. **Var. alba**, Hook., is a white-fl. form.

L. H. B.

HELENIÓPSIS. See *Heloniopsis*.

HELENIUM (possibly the author had in mind *Helenus*, the son of Priam, but he left no record of the application of this name). *Compositæ*. **SNEEZEE WEED.** About 25 species of hardy annual and perennial herbs, bearing yellow fls. from early summer to late autumn. Only the perennials are in cultivation. Stem erect, usually branching above: lvs. alternate, narrowly to broadly lanceolate, entire or toothed, glandular-dotted; petiole and stem sometimes winged: heads solitary or corymbose, yellow or brownish.

The genus closely resembles *Helianthus*, but differs in having elongated, often top-shaped fruits, which are never compressed and are usually silky villose; while the fruits of *Helianthus* are generally more or less 4-sided and are smooth. In *Helenium* the receptacle is naked; in *Helianthus* it bears paleaceous bracts, which subtend the florets.

Heleniums thrive best in a rich, moist soil, with a sunny aspect, and are propagated by seeds, cuttings or division. All the species are very easily grown, the only serious difficulty being a white aphid which sometimes attacks the roots. If plants look unhealthy they should be lifted, washed with an insecticide and reset in a new place. The commonest species in cult. is *H. autumnale*, but perhaps the most valuable species for general planting is *H. Hoopesii*, which is one of our earliest blooming composites, and is also desirable for the border or for cut-flowers. *H. Hoopesii*, *Bolanderii* and *autumnale* will give bloom in succession from May-Oct. The first two are also attractive when grown in pots, but they do not flower from seed the first year, either in pots or in the open.

A. *Stem and branches winged.*

B. *Disk yellow.*

autumnale, Linn. (*H. grandiflorum*, Nutt.). Fig. 1025. Stem 2-6 ft. high, roughish, leafy: lvs. mostly toothed, smooth: heads 1-1½ in. across, numerous, borne at the end of short, very leafy stalks; rays drooping, 3-bleft, lemon-yellow to rich orange; disk yellow. July-Oct.

Moist places, Can. to Fla. and west to B. C. and Ariz. B.M. 2994. Gu. 29:533; 55:1216. A.G. 12:682. G.C. III. 10:433.—Very showy. It has distinct merit for the back of borders, but is more appreciated in Europe than in America. There are several garden forms: var. *pumilum* is 1-2 ft. high, a very free bloomer, and is largely grown for cut-flowers in some places; var. *grandiflorum*

H. Douglasi, Hort. = *Monolopia major*.—*H. tenuifolium*, Nutt. Annual. A weed in the southern Atlantic and south-western states. Stem 8 in. to 2 ft. high, very leafy; lvs. thread-like, entire, sessile, often whorled. Va., Fla., west to Mo. and Tex. S. W. FLETCHER.

HELIANTHÉLLA (Greek, resembling *Helianthus*). *Compositae*. Eleven species of hardy perennial herbs from North Amer., with showy yellow fls. borne in autumn. The species described below is advertised by a western dealer in native plants. Stem commonly unbranched; lvs. mostly scattered and sessile, linear or lanceolate, entire; heads solitary or few, with yellow rays and a yellow or brownish disk. The single species in cultivation is easily grown in a variety of soils, and is propagated by seeds or by dividing the rootstocks.

Helianthella belongs to a group of genera distinguished from *Helianthus* by having the fruits laterally compressed instead of thick and obtusely angled. Other cultivated genera of this group are *Actinomeris*, *Encelia* and *Verbesina*, which are distinguished from one another by combinations of fruit and pappus characters.

quinquenervis, Gray. Stem 2-4 ft. high, nearly smooth; lvs. mostly opposite, 4-9 in. long; heads 3-5 in. broad, long-stalked, solitary or a few below in the axils of the lvs., with an involucre of large, leafy bracts; rays pale yellow, 1½ in. long. June-Sept. Rocky Mts. S. W. FLETCHER.

HELIANTHEMUM (Greek for sun flower). *Cistaceae*. ROCK ROSE. SUN ROSE. FROSTWEED. Herbs or subshrubs in temperate and warm climates of Old and New Worlds. The species are confused, and estimates of their numbers vary from 30 to more than 100. Fls. opening in the sun, mostly yellow, usually in terminal clusters; petals 5, soon falling; stamens many; ovary imperfectly 3-lobed, containing numerous seeds; style 1; stems hard and more or less woody; lvs. small, linear or oblong, entire, often grayish. *Helianthemum* are evergreens or nearly so, forming low mats of herbage and bearing a profusion of fls. in hot weather. They are especially adapted for rockwork and borders. They thrive in rather poor soil. Although the following species are fairly hardy in the North, they profit by a protection of mulch. Prop. mostly by division; also by seeds and by cuttings of half-ripe wood. See *Cistus*. Sweet's "Cistineæ" (1825-1830, London) is the monumental work on these plants. See, also, Nicholson in Gn. 26, p. 420, for a running account of the garden forms.

Canadense, Michx. FROSTWEED. Diffuse, 2 ft. or less high, caulescent; lvs. oblong, linear, or oblanceolate, nearly sessile; fls. solitary or 2 together, 1 in. across, bright yellow, the sepals hairy. In rocky and sandy soil, Me. to N. C. and Wis. G.W.F. 29.—Sold by collectors. The later axillary branches produce small apetalous fls.

Chamaecistus, Mill. Usually less than 1 ft. tall, procumbent, forming mats; lvs. linear-lanceolate or broader, numerous at the base of the plant, small, hoary beneath but green and hairy above; fls. normally yellow, in loose, more or less nodding racemes, on hairy pedicels. En., N. Afr., W. Asia.—This is the commonly cult. species, running into many forms. It is much less grown in this country than in Eu. It is an excellent rockwork plant. There are double-flowered forms; also forms with red and copper-colored fls. The following names occurring in trade lists are to be referred to this species-group: *angustifolium*, *diba-pleno*, *aurantea-pleno*, *ercoem*, *cypreum*, *grandiflorum*, *rhodanthemum*, *lutea pleno*, *mutabile*, *purpurea-pleno*, *rhodanthemum*, *rhodanthemum*, *varieabile*, *vulgare*.

ocymoides, Pers. (*H. Algarvense*, Dun. *Cistus Algarvense*, Sims). Shrub, 2-3 ft., twiggy, nearly erect, hoary-pubescent; lvs. opposite, linear-oblong or spatulate, the tips recurved; fls. bright yellow with a purple eye, 1½ in. across, in corymbose clusters. Spain and Portugal. B.M. 5621.—Little known in this country. Hardy in England.

formosum, Dun. (*Cistus formosus*, Curt.). Spreading, much-branched, tomentose, but becoming nearly or quite glabrous with age; lvs. elliptic to lance-ovate,



1025. *Helenium autumnale*. Commonly known as Suezweed.

and var. *superbum* are unusually vigorous and large-fl.; var. *striatum* has a maroon and gold disk, with yellow rays variously striped and splashed with rich crimson.

J. H. III. 31:293. This should be distinguished from the striped forms of *H. nudiflorum*.

BB. Disk brown or purplish.

c. Lvs. all entire: heads solitary or few, long-stalked.

Bigelovii, Gray. Stem 2-3 ft. high, nearly smooth; upper lvs. narrow to oblong-lanceolate, lower spatulate; heads commonly 1½-2½ in. broad; rays ¾ in. long; flower-stalk slender. Aug. Wet ground, Calif. S.H. 1:373.

Bolanderi, Gray. Stem 1-2 ft. high, stout, somewhat pubescent; lvs. oblong to ovate-lanceolate, the lower obovate; heads commonly 3 in. wide; rays often 1 in. long; flower-stalks thick, hollow. June-Sept. Low ground, N. E. Calif. Gn. 29, p. 191. R.H. 1891, p. 377.—Sometimes grown as *H. grandiflorum*.

cc. Lower lvs. toothed: heads numerous, corymbose, short-stalked.

nudiflorum, Nutt. Stem 1-3 ft. high, roughish, leafy; lower lvs. spatulate, toothed; heads 1-1½ in. across; rays wedge-shaped, drooping, yellow, brown-purple or striped with both colors. July-Oct. Moist soils, N. C. to Fla., west to Ill. and Tex.—A garden form, var. *grandicephalum striatum*, has fls. over 2 in. across.

AA. Stem and branches not winged.

Hoopesii, Gray. Stem 1-3 ft. high, stout, slightly tomentose when young, but soon smooth, branching above into an umbel of several to many fls.; lvs. thickish, entire; heads usually borne singly on long stalks, commonly 3 in. wide; rays but slightly drooping; disk yellow. May-Sept. Rocky Mts.—A very fine border plant, and especially valuable for cut-fls.

short-stalked: fls. large (2 in. across), yellow, with black eye, on slender, hairy pedicels. Portugal. B.M. 264. Gn. 26:466; 53, p. 131. G.M. 34:246. — Perhaps the most showy of the genus. Excellent for rockwork. The branches are erect, reaching 3-4 ft. Not hardy North.

umbellatum, Mill. Diffuse, 1-2 ft. tall: lvs. small, linear or linear-lanceolate, revolute on margins, more or less viscid: fls. umbellate or whorled, white. En.

L. H. B.

HELIANTHUS (Greek, *helios*, the sun, and *anthos*, a flower). *Compositae*. SUNFLOWER. This genus includes the common annual Sunflower, and about 15 hardy herbaceous perennial plants, rather coarse in habit, with yellow fls., which are mostly large, numerous and borne in autumn. Altogether there are about 80 species, mostly N. American. Lvs. generally opposite below and alternate above, but this is not a constant character: heads pedunculate, solitary or corymbose, terminating the stem or branches: disk-fls. perfect, yellow, brown or purplish, with a tubular 5-lobed corolla; rays neutral, yellow. The genus is very variable, and there are also many natural hybrids; hence the species are difficult to delimit. The old notion that the flower-heads follow the sun from east to west has recently been substantiated for *H. annuus*. (See Botanical Gazette, vol. 29:197.) Garden monographs are found in Gn. 27, p. 66; 45, p. 372; 49, p. 326 and 55, p. 146.

Sunflowers are of the easiest culture, and are adapted to a variety of soils. They are seen to best advantage when planted in masses, rather than as solitary specimens, and should be given plenty of room, being gross feeders.

Most Sunflowers, especially *H. annuus*, are too coarse to be harmonious near the house, but find an effective setting in the background, against the shrubby border. A few species, however, especially *H. orgyalis* and *H. debilis*, are worth growing for their foliage alone. The annual species are prop. by seeds or cuttings; the perennial chiefly by division. All varieties of *H. multiflorus* root readily from both soft and hardwood cuttings. The double forms rarely produce fertile seeds and must be prop. by division. The seeds of annuals may be planted directly in the border, but it is best to start them indoors in March. Perennial kinds, particularly forms of *H. multiflorus*, should be taken up in late fall or early spring, every two years, and the root-stocks divided and replanted; otherwise the roots will ramble away, and the flowers will deteriorate. All thrive in a light, dry soil; but *H. annuus* and *H. giganteus* may be used to advantage for drying malarial spots. Sunflowers do not thrive in very shady places.

S. W. FLETCHER.

Sunflowers (*H. annuus*) are cultivated extensively in Russia, India and Egypt; less widely in Turkey, Germany, Italy and France. The seeds from the large-seeded variety are sold upon the streets in Russia as we do peanuts, except that they are eaten raw. The small-seeded variety is preferred for the manufacture of oil. When cold-pressed, a citron-yellow, sweet-tasting oil, considered equal to olive or almond oil for table use, is produced. The resulting oil-cake, when warm-pressed, yields a less edible fluid, which is used for lighting, and in such arts as woolen dressing, candle- and soap-making. The oils dry slowly, become turbid at ordinary temperatures and solid at 4° F. For stock and poultry feeding, and for other purposes, Sunflower oil-cake is about equal in value to that of flax- and cotton-seed. The cake is largely exported by Russia to Denmark and Sweden, and to some extent to other European markets. Sunflower stems and heads make an excellent paper, and the stems furnish a fine fiber that compares favorably with silk. They are, however, generally used for fuel, since the above industries have not been developed.

Sunflowers grow readily in many soils, but best results are obtained upon light, rich, calcareous or alluvial land, well supplied with moisture and unshaded by trees. White, clayey and poor soils are unfavorable. Preparation of the soil should be thorough; deep fall plowing followed by spring harrowing being preferred to spring preparation. The seeds are generally sown in drills running north and south, 30 in. apart, 9 in. asunder in the drill, and 1 in. deep. Sometimes they are transplanted from nursery beds when 4-6 in. tall. About

a week after the plants appear they are thinned to 18 in. asunder. From 4 to 6 pounds of the seed will sow an acre. Cultivation is the same as for corn, except that when the plants reach a height of 3-4 ft., the inferior



1026. *Helianthus debilis*. Nearly half size.

flower heads should be removed, leaving only 4 or 5 on the principal stem. In windy climates hilling is sometimes necessary to prevent blowing down.

On some farms the roots are harvested as they ripen and placed upon floors or movable pole racks to dry. Upon larger areas they are cut to the ground when most of the heads have ripened and piled, heads up, to cure. The former method insures a much higher grade of oil, and is therefore preferred. Every effort is made to prevent fermentation, either in the heads or in the pile of seeds, since this injures the quality of the oil. When thoroughly dry the heads are either placed on racks or piled, face downward, on a floor and beaten with flails. The seeds are then spread thinly, shoveled over occasionally, and allowed to become perfectly dry before being sent to the mill. The average yield is about 50 bushels to the acre. The percentage of husks ranges from 40 to 60; and the oil from 15 to 28. As a general rule, 100 bushels of seed will yield 33 bushels of kernels, 100 bushels of kernels from 280 to 320 gallons of oil of both qualities.

Russian Sunflower, a large-seeded variety, producing a single head, grows 8 ft. tall, but is less esteemed for oil production than the small-seeded varieties.



The common Sunflower, *Helianthus annuus*

In America the Sunflower industry may be said to have hardly commenced, there being at present but two well-developed markets for the seed. M. G. KAINS.

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- C. *Stem smooth below, the branches often slightly rough or pubescent.*
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2. **argophyllus**, Torr. & Gray. SILVERY-LEAVED SUNFLOWER. Stem usually 4-5 ft. high, soft grey, with a dense, silky pubescence, especially the upper branches. Otherwise like *H. annuus*, into which it seems to vary under cultivation if the seedlings are not constantly selected for their silky character. Texas. The var. *Texana*, Hort., which does not differ botanically from the type, is an attractive form of this species. R. H. 1857, p. 431. Gn. 12, p. 280; 27, p. 67; 55, p. 147.

3. **debilis**, Nutt. (*H. cucumerifolius*, Torr. & Gray). CUCUMBER-LEAVED SUNFLOWER. Fig. 1026. St. 1-4 ft. high, hairy throughout; branches often mottled with purple or white, each one bearing a fl.; lvs. 1-4 in. long, ovate to triangular, generally with a cordate base, thin, glossy, irregularly toothed or entire; fls. 2-3 in. wide, on slender peduncles. July-Sept. Fla. to Texas and westward. G.C. III, 17:167. Gr. 44, p. 571. B.M. 7432. Gn. 49:1064.—This is one of the best for cut-fls. It needs a sandy soil.



1027. Clump of *Helianthus orgyalis*.

4. **orgyalis**, DC. Fig. 1027. Stem 8-10 ft. high, strict, smooth, very leafy; lvs. 8-16 in. long, slightly rough, drooping; fls. numerous, lemon-yellow. Sept., Oct. Dry plains, Neb. to Tex. and westward. Gn. 27, p. 67; 55, p. 147. F.R. 2:146.—This species has distinct and

1. **annuus**, Linn. COMMON SUNFLOWER. Stem 3-12 ft., rough-hairy, often mottled; lvs. 4-12 in. long, broadly ovate, acute, the lower cordate, coarsely serrate, rough on both sides; fls. 3-6 in. wide in wild specimens, often 14 in. cult. July-Sept. Minn. to Tex., west to Wash. and Cal. Gn. 27, p. 68. Gr. 43, p. 95 (as *H. lenticularis*). B. R. 15:1265 (as *H. lenticularis*).—A valuable economic and ornamental plant. The lvs. are used for fodder, the fls. yield a yellow dye, the seeds furnish an oil and are used for food. It is grown for food chiefly in Russia. *H. annuus* has long been in cult. as an ornamental, and has varied into many distinct forms. Common varieties are: Var. *Californicus*, very large and double; var. *citrinus*, with primrose-colored rays (Gn. 49, p. 327); var. *globosus fistulosus*, having enormous globular heads; var. *nanus fl. pl.* (Globe of Gold), dwarf and double, valuable for borders; **Russian Giant**, 10-12 ft. high, single, grown mostly for seed; var. **variegatus**, with variegated lvs., but not especially attractive.

attractive foliage, which is not at all coarse. A well grown plant will produce spikes of fls. nearly 4 ft. long.

5. *angustifolius*, Linn. SWAMP SUNFLOWER. Stem 2-6 ft. high, simple or branching above, slightly rough; lvs. 2-7 in. long, somewhat tufted, drooping, with rolled edges, smooth or slightly rough; fls. 2-3 in. wide, few or solitary. Aug.-Oct. Wet land, N. Y. to Fla., west to Ky. and Tex. B.M. 2051.

6. *rigidus*, Desf. (*H. Missouriensis*, Schwein.). St. 1-3 ft. high (rarely 5-8 ft.), strict, sparingly branched, rough or hairy; lvs. 6-12 in. long, oblong to ovate-lanceolate, firm, thick, rough-hairy, entire or slightly toothed; fls. 2½-4 in. wide, showy, long-stalked; rays numerous, about 1½ in. long; disk sometimes yellow at first, turning brown. Aug.-Oct. Mich. to Tex. and west to Col. B.R. 6:508 (as *H. atro rubens*). B.M. 2020 (as *H. diffusus*). B.M. 2668 (as *H. atro rubens*). Gn. 27, p. 68.—After *H. decapetalus* this species is one of the best perennial Sunflowers. It varies under cultivation chiefly in the direction of doubling and in lengthening the blooming period. Some of the best garden varieties are *æstivâlis*, *grandiflorus*, *semi-plenus* and *Miss Lelish*.

7. *atrorubens*, Linn. PURPLE-DISK SUNFLOWER. St. 2-5 ft. high; lvs. usually thin, sometimes hoary beneath; fls. about 2 in. across; rays few (10 to 16), rarely over 1 in. long; disk dark red. Otherwise like *H. rigidus*, to which it is inferior. Va. to Fla., west to Ohio and La.

8. *lævigatus*, Torr. & Gray. Stem 2-5 ft., simple or branched above; lvs. 3-6 in. long, lanceolate, smooth, entire or slightly toothed; fls. 1-1½ in. broad, few or solitary; rays 6-10, usually less than 1 in. long. Aug.-Oct. Va. to N. C.



1028. *Helianthus decapetalus*, var. *multiflorus*.
(See species No. 11.)

9. *strumosus*, Linn. St. 3-7 ft. high, usually branching, often glaucous; lvs. 2-8 in. long, ovate-lanceolate, rough above, entire or toothed; fls. 2½-4 in. across; rays 8-15, 1-1½ in. long. July-Sept. Open woods, Can. to Ga. and west to Wis. and Ark. Var. *mollis*, Torr. & Gray. Lvs. downy beneath. B.M. 3689 (as *H. mollis*, Lam.).

10. *grösse-serratus*, Martens. St. 6-10 ft. high, very smooth, glaucous; lvs. long-lanceolate, slender-petioled,

rough above; fls. many, cymose, 1-3 in. broad. Aug.-Oct. Pa. to Mo., south to Tex.—Passes into *H. giganteus*.

11. *decapetalus*, Linn. Stem 2-5 ft. high, branched above; lvs. 3-8 in. long, ovate-lanceolate, sharply serrate, thin, rough above, finely pubescent beneath; fls. 2-3 in. across, numerous; rays generally more than 10, in spite of the specific name. July-Sept. Moist soils, Quebec to Ga., west to Mich. and Ky. G. C. H. 16:601.—Under cult. it has given rise to the horticultural var. *multiflorus* (*H. multiflorus*, Hort.). Fig. 1028. B.M. 227. G. C. H. 10:421. Gn. 27:476, pp. 71, 74; 45, p. 573. Gt. 43, p. 554 (Gn. 3:83. F.R. 2:413). The many garden forms of var. *multiflorus* differ mainly in the extent of doubling, season of blooming, habit of plant and size of fl. Among the best are: Var. *floræ plèno* and var. *grandiflorus*, almost completely double; var. *mâjor*, fls. larger than common; var. *maximus*, very large, single fls. with pointed rays; *Soleil d'Or*, with quilled florets, like a Cactus Dahlia. *Multiflorus* varieties are the most popular of perennial Sunflowers, and deservedly so. If the double forms are grown on poor soil, or are allowed to remain for several years without being divided, they become single.

12. *divaricatus*, Linn. Fig. 1029. Stem 1-6 ft. high; lvs. sessile, rough above, pubescent beneath, standing out nearly at right angles to the stem; fls. few or solitary, 2 in. across. July-Sept. Dry woodlands, Can. to Fla., west to Neb. and La.

13. *giganteus*, Linn. INDIAN POTATO. Stem 3-12 ft. high, stout; lvs. 3-7 in. long, lanceolate, very rough, serrate or nearly entire; fls. usually several, 1½-3 in. broad, mostly long-stalked; rays 10-20, barely 1 in. long, cupped, pale yellow; seeds smooth. Aug.-Oct. Wet ground, Can. to Fla., west to Neb. B.M. 7555. D. 165.—Var. *subtuberosus*, Bourgeau. A northern form with unusually fleshy roots, which were formerly collected by Indians for food. Hence "Indian Potato."

14. *Maximiliani*, Schrad. Stem generally 2-4 ft. high, sometimes 8-10; lvs. inclined to be trough-shaped; fls. on short, densely pubescent peduncles; rays 15-30, generally 1½ in. long, deep yellow. Otherwise like *H. giganteus*, of which it is probably the western form. Aug.-Oct. Dry plains, west of Mississippi river.

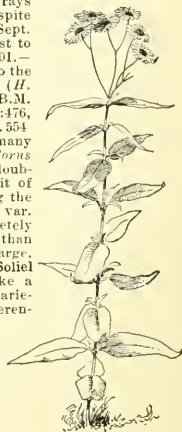
15. *tuberosus*, Linn. JERUSALEM ARTICHOKE. Stem 5-12 ft., branched above. lvs. 4-8 in., usually ovate, acuminate, serrate, rough above, finely pubescent beneath; fls. several or numerous, 2-3 in. across; rays 12-20; seeds pubescent. Gn. 27:68. B.M. 7545.—Frequently cultivated for its edible tubers. See *Artichoke, Jerusalem*.

16. *doronicoides*, Lam. Stem 3-7 ft. high; lvs. 4-8 in. long, ovate oblong, narrowed towards both ends, rough on both sides; fls. numerous, in loose panicles; rays 12-20, broad. Otherwise as *H. multiflorus*. Aug., Sept. Dry soils, Ohio to Mo. B.M. 2778 (as *H. pubescens*).

17. *mollis*, Lam. Stem 2-5 ft. high, stout, very leafy, hoary villose, at least when young; lvs. 3-5 in. long, ovate-lanceolate, white-pubescent or rough on upper side; fls. solitary or few, 2-3 in. broad; rays 15-25. July-Sept. Barren soils, Ohio to Ga., west to Ia. and Tex. Gn. 55:1212.

18. *pàmilus*, Nutt. Stem rough and hairy throughout; lvs. only 5-7 pairs, 1-4 in. long, ovate-lanceolate; fls. few, short-peduncled. Eastern Rocky Mts. and adjacent plains.

19. *lætiflorus*, Pers. SNOW SUNFLOWER. Stem 4-8 ft. high, leafy; lvs. 4-10 in. long, ovate-lanceolate, more or less serrate, rough on both sides; fls. several. 2-4 in.



1029.
Helianthus divaricatus.

broad, short-peduncled; rays 15-25, about 1½ in. long, showy. Prairies, Ind., Ill. Wis. Gn. 45:960. G.M. 31:204.—A desirable Helianthus. The garden form *H. semiplenus* is better than the type. Resembles tall-growing forms of *H. rigidus*, but disk yellow.

20. *Californicus*, DC. Stem 3-8 ft. high. Lvs. lanceolate, rough on both sides; fls. loosely paniculate. Calif.—Most of the plants grown under this name are a garden form of *H. annuus*.

21. *hirsutus*, Raf. Stem 2-4 ft. high, densely hairy; lvs. ovate-lanceolate, thick, very rough, pubescent and pale beneath; fls. several, 2-3 in. across. July-Oct. Dry soils, Pa. to Ga., west to Wis. and Texas.

22. *trachellifolius*, Mill. Resembles strumosus, but stem and fl.-stalks usually rough-hairy and lvs. thinner, green on both sides. Aug., Sept. Dry soil, Pa. to Wis.

S. W. FLETCHER.

HELICHRYSUM (Greek for *sun* and *gold*; referring to the flower heads). *Compositae*. Syn., *Ellichrysium*. Nearly 300 Old World herbs or shrubs, mostly African and Australian. Some of them are grown for everlasting plants, being, with *Helipterum*, amongst the most important plants for that purpose. Easily grown as hardy annuals in any garden soil. Fls. of two kinds, the outermost ones with pistils only; involucre dry and chaff-like, the stiff overlapping scales glabrous, often colored; heads large, terminating the branches, normally yellow, but now varying into many colors in long-cultivated forms.

A. Lvs. oblong or narrow; grown for everlastings.

B. Heads large, solitary.

bracteatum, Andr. Fig. 1030. Stout annual, 1½-3 ft. tall, somewhat branched, the terete stems nearly or quite glabrous; lvs. many and rather large, oblong-lanceolate, narrowed to a short petiole, entire, green; heads terminating the branches, 1-2½ in. across, yellow or orange, the short and obtuse involucre-scales imbricated. Australia.—Perhaps the most important single everlasting fl. grown in this country, particularly for bold or heavy design work. It is very variable, particularly in color. The heads are pure white in var. *album*, Hort. (*H. album*, Hort. *H. niveum*, Grah. B.M. 3857); scales tipped with red in var. *bicolor*, Hort. (*Ellichrysium bicolor*, Lindl. B.R. 21:1814); dark scarlet in var. *atrocoecineum*, Hort. (*H. atrocoecineum*, Hort.); dark blood-red in var. *atrosanguineum*, Hort. (*H. atrosanguineum*, Hort.). The forms with very large heads are often known as *H. macrodanthum*, Hort. The double forms are often known as *H. monströsum*, Hort. Other portraits of this species will be found in B.R. 24:58. R.H. 1851:101.

BB. Heads medium to small, in clusters.

C. Color yellow or orange.

arenarium, DC. A foot or less high, herbaceous; lvs. plane, white-woolly, the lower ones oblong-ovate and long-attenuated into a petiole, the upper ones linear-lanceolate and acute; heads globular, in compact little corymbs, bright yellow. Perennial, in sand, France.—Apparently not cult. in this country. See *Everlasting*.

orientale, Gært. (*Gnaphalium orientale*, Linn.). Stem simple, 1½ ft. or less tall; lvs. oval-oblong to lanceolate, obtuse, sessile, rather small; heads bright yellow, small, globular, in corymbs. S. Eu. to Asia Minor.—Much cult. in Mediterranean regions, but little known in this country.

apiculatum, D. Don. Perennial, 1-2 ft., tomentose, leafy below; lvs. lance-spatulate, the base more or less spatulate; heads ½ in. across, in small heads or clusters, orange-yellow, the scales sharp-pointed. Australia.—Little known in this country.

C. Color white or nearly so.

grandiflorum, Less. Perennial, somewhat woody, decumbent at the base; lvs. crowded near the base, sessile, obovate to oval or oblong, obtuse, woolly on both sides; heads hemispherical, in corymbose clusters, glossy, cream-color, ¾ in. across. S. Afr.

diosmeifolium, Sweet. Tall, upright; lvs. very small, narrow-linear (¾ in. or less long), the margins revolute;

heads small and numerous, white.—Cult. in S. Calif. by Franceschi. Australia; sometimes grows 20 ft. high.

AA. Lvs. ovate or broader; border and vase plant.

petiolatum, DC. (*Gnaphalium lanatum*, Hort.). Tender perennial, cult. for its long, woolly stems and woolly lvs., either as an edging in ribbon borders or as



1030. *Helichrysum bracteatum* (× ½).

One of the choicest everlastings.

an ornament in lawn vases: lvs. petiolate, ovate and broad at the base, obtuse; heads (not often seen in cult.) in branched cymes, the involucre scales obtuse, cream-white. S. Afr.—An old garden plant. Prop. by cuttings from stock plants carried over winter.

L. H. B.

HELICODEA. See *Billbergia*.

HELICODICEROS (Greek, *spirally 2-horned*). *Ardeae*. The extraordinary plant shown in Fig. 1631 is known as the "Hairy Arum" and sold by the bulb dealers as *Arum crinitum*. When in flower it has a disgusting odor, which attracts carrion flies and bright green insects, as uncleanly as the plant itself. The plant is the only species in its genus, the hairiness of the spadix being a very distinct character. *Helicodiceros* and *Draucunculus* are alike in having few ovules, which are fastened at the top and bottom of the cell, but in the latter the staminate and pistillate fls. are close together, while in the former they are separated by a sterile portion. Arum differs from both genera in having the ovules fastened in 2 series at the side of the cell. The lvs. of Arum are spear- or arrow-shaped, while in the other two they are pedately cut. Latest monograph in Latin by Engler in D.C. Mon. Phan. 2:604 (1879).

This plant is worth growing once, since it is one of the great curiosities of horticulture. It may be secured

from bulb dealers in the fall and flowered under glass in the spring. It is a most vile-smelling plant when in full flower. The plucky artist who drew the accompanying picture of this arum wrote at the bottom of his drawing, "Air 'em."



1031. *Helicodiceros muscivorus* ($\times 1\frac{1}{2}$).

muscivorus, Eng. (*H. erinitus*, Schott. *Arum erinitum*, Ait. *Dracunculus erinitus*, Schott.). Fig. 1031. Height $1\frac{1}{2}$ ft.: spathe-limb purple, covered with purple hairs. Corsica. B.R. 10:831. P.S. 5:445. W. M.

HELICONIA (Mt. Helicon, in Greece, seat of the Muses). *Scitamineae*. Foliage plants allied to *Musa*. Perhaps 25 to 30 species in tropical America. The plants are grown in a warmhouse along with *Alocasias*, *Anthuriums* and *Calatheas*; the directions given for the cultivation of *Calatheas* apply very well to *Heliconia*. Under the name of Wild Plantain or Balisier, *H. Bihai* is cult. outdoors in S. Fla. and along the Gulf of Mex. It is an evergreen shrub rivaling the bananas in foliage and scarlet and black flower-sheaths. E. N. Reesener classes it among plants that sprout up readily in the extreme South if killed by frost, and recommends it as a house plant for the South.

From *Musa*, *Heliconia* differs chiefly in having a dry, often dehiscent, 3-loculed, 3-seeded fruit. Fls. in clusters below the lvs., subtended by bracts after the way of *Musa*; sepals 3, linear, free or somewhat joined to the corolla; corolla short-tubed; stamens 5; staminodium 1: lvs. large and striking, often beautifully marked; stems arising from a strong rootstock. Various species have been introduced into cult., but the following are the only ones appearing in the Amer. trade.

Bihai, Linn. **BALISIER**. WILD PLANTAIN. Becoming 10-15 ft. tall, banana-like: lvs. oval or oblong-oval, long-petioled, transversely ribbed, the blades 3-5 ft. long; blossom sheaths very large, scarlet and black, the fls. red or orange. W. Indies and S.—A most striking plant, but rarely seen in glasshouse collections. It is naturalized in the Old World tropics.

aureo-striata, Hort. Perhaps a form of the preceding: lvs. beautifully striped along both midrib and transverse veins with golden yellow; stems striped with yellow and green; leaf-limb oval-acuminate. I.H. 29:464; 42, p. 289 (where a list of the best kinds will be found). S.H. 2, p. 133. F.R. 3:493.—Very handsome. The best known kind.

illustris, Hort., is of the general style of the last, but the rib and veins are marked with pink. Var. **rubricaulis**, Hort., has more red, the petiole being bright vermilion. R.H. 1896:36 (where a review is made of the species). R.B. 21, p. 69. Gn. 52, p. 359.

angustifolia, Hook. Dwarfier: lvs. long and narrow, $1\frac{1}{2}$ -2 $\frac{1}{2}$ ft. long, 3-6 in. wide, green; fls. yellowish green, 6-10 in each red bract. S. Amer. B.M. 4475. L. H. B.

HELIOPHILA (Greek, *sun-loving*). *Cruciferae*. This genus includes a blue-flowered half-hardy annual, that grows about 3 in. high and is advertised at present only in the very large catalogues of flower seeds. The genus contains about 61 species of annual and sub-shrubby perennials, natives exclusively of S. Africa. There are no near allies of garden value. The dehiscent pod is an important character of the genus. Other important generic characters are pods sessile or pedicelled, 2-celled, 2-valved; seeds in a single row, often winged. The racemes are long and leafless, and the fls. yellow, white, rosy or sky-blue. Latest monograph in English by Sonder in *Flora Capensis* 1: 35-54 (1859-60). For general culture, see *Annuaire*.

The plant in the trade is known as *H. araboides*, Sims, which Sonder refers to *H. pilosa*, Lam., var. *inclusa*, Sonder. *H. pilosa* is a very variable species, with stem 6-24 in. high, erect or diffuse, simple or unbranched from the base; lower lvs. often opposite, the rest alternate; fls. normally sky-blue, with a yellow center, but the natural varieties include lilac and yellow. The typical *H. pilosa* has a stem that is rough with spreading hairs: lvs. hairy, either oblong or linear, entire or sometimes lobed near apex, cuneate at base; pods linear, erect or spreading. Var. *inclusa*, Sonders, has lvs. linear-cuneate, 3-cut at the apex, rarely 5-cut, the lobes linear or acuminate. B.M. 496. W. M.

HELIOPSIS (Greek, *like the sun*). *Compositae*. About 10 species of hardy herbaceous plants, bearing numerous yellow fls. in autumn, and all native to N. America. They are all perennials except one, and that is not cultivated. They are not common in gardens because of the more attractive forms in *Helianthus*. *H. laevis*, var. *Pitcheiriana*, however, deserves wider popularity. *Helioopsis* has no pappus, while in *Helianthus* the pappus has 2 awns. In *Helioopsis* the rays have pistils, but may be fertile or sterile. In *Helianthus* the rays have no pistils at all. Stem erect, loosely branching; heads yellow, long-stalked, borne in loose terminal or axillary panicles: lvs. opposite, petioled, 3-ribbed, oblong-ovate to ovate-lanceolate, coarsely toothed. For culture, see *Helianthus*.

laevis, Pers. Stem 3-5 ft. high: lvs. 3-5 in. long, thin, smooth on both sides or roughish above: fls. numerous, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. broad, long-stemmed. July-Oct. Open places, Can. to Fla., west to Ill. and Ky. B.M. 3372. Var. *Pitcheiriana* (*H. Pitcheiriana*, Hort.). A dwarf, more branching and bushy form, 2-3 ft. high, with a spread of 3-4 ft.: fls. produced much more freely than in the preceding and a deeper yellow. One of the best hardy plants for the perennial border, being especially valuable for cutting and for planting in dry places. Int. 1895 by Pitcheir & Manda. A.G. 16:323. F.R. 2:259.

scabra, Dunal. Differs from *H. laevis* chiefly in being rough throughout: upper lvs. sometimes entire: heads few, often solitary. Dry soils, Me. to N. J. and west to Mo. J.H. 33:359. B.R. 7:592 (as *H. canescens*).—Passes into *laevis*. S. W. FLETCHER.

HELIOTROPE. See *Heliotropium*.

HELIOTRIPIUM (*heliotropic*; *turning to the sun*). *Borraginaceae*. A widely spread genus in warm regions, of more than 100 species. Herbs or rarely shrubs, with small flowers in terminal, forking clusters and alternate simple leaves: corolla short funnel-form or salver-shape, the throat mostly open (sometimes constricted); stamens 5, attached to the tube, not exerted, the filaments very short; ovary 4-loculed and splitting into 4 nutlets (or two 2-loculed nutlets) when ripe, surmounted by a simple style. There is a *Heliotrope* (*H. Curassavicum*, Linn.) native to the S. Atlantic states, with white fls. and oblong or linear lvs.; also a naturalized species (*H. Indicum*, Linn.) with bluish-scented fls. and lance-ovate rugose lvs. The florists' *Heliotropes* seem to be derived from 2 species, *H. Peruvianum*, Linn., is perhaps the leading species. Fig. 1032. Lvs. oval or oblong-lanceolate, very veiny, not conspicuously narrowed at the base: fls. small, in a close cyme, the corolla tube little longer than the calyx. Peru. B.M. 141.—Vanilla-scented. *H. corymbosum*, Ruiz & Pav.



The common garden Heliotrope

(*H. grandiflorum*, Don), has longer and relatively narrower lvs., which are distinctly narrowed to the base, flower-clusters larger and more open, fls. nearly twice larger and the corolla tube nearly twice longer than the calyx; calyx teeth longer and narrower. Fern, B.M. 1609. Narcissus-scented. Many of the large-trussed and large-flowered garden varieties are apparently of this species rather than of the former; or possibly the two are hybridized. Originally both species were violet-flowered, but the colors are now in various shades of



1032. *Heliotropium Peruvianum*.
($\times \frac{1}{2}$.)

purple, and there are white-flowered forms. **H. Voltairéanum**, Hort., occurs in our trade-lists. It is a compact garden form, said to be a hybrid. P.M. 16, p. 100. Another species, **H. Europium**, Linn., is rarely seen in old collections, particularly South, and it is sparingly naturalized. It is a hoary-downy herb 6-18 in. high, with long-petioled oval lvs., and white fls. in scirpioid racemes. L. H. B.

The Heliotrope is a warmth- and sun-loving plant, preferring a rich, light soil, good drainage and plenty of water. It needs to be kept growing, and suffers more than many other plants from becoming dry. It wilts easily, and should never be allowed to lack for moisture in soil and air. Quickly becoming pot-bound, it requires frequent shifting.

The Heliotrope strikes readily from terminal cuttings of the tender shoots in about eight or ten days. Florists root the cuttings in pure sand. Cuttings should have a temperature at night of about 50°, with 5°-10° of bottom heat. They should be kept from flagging by careful watering and shading as needed. When the cuttings have formed roots about half an inch long, they should be transplanted to small pots or shallow boxes of light soil, placed where they will have a night temperature of about 60°, sheltered from currents of air, watered and shaded as needed until established.

The Heliotrope may also be grown readily from seed. These should be sown in shallow flats in light soil, in a temperature of about 65°, covered lightly and kept nicely moist. When well up they may be treated as cuttings.

For forcing, the Heliotrope should have a good exposure to the sun, a temperature of about 60° at night, rich soil, good drainage and careful watering. The plant is preferably grown in benches in 6 inches of soil. A plant easily covers an 18-inch square.

In the open ground plants should have a sunny situation and moist soil. Here it covers a space 2½ ft. square, and attains a height of 2-3 ft. They should not be set out till danger of spring frosts is past.

The plant is comparatively free from diseases and insect pests. Cuttings and seedlings are sometimes destroyed by the damping-off fungi, and under conditions of neglect, plants sometimes become infested with mealy-bugs, aphides, or the red-spider. Sometimes plants are ruined by a disease known among florists as the "black rust," an ailment similar to or identical with that affecting the Verbena. It usually appears on plants in an enfeebled condition, resulting from being pot-bound, from sour soil or over-potting, followed by too low temperature, as well as from other causes. Badly diseased plants should be destroyed. Others are sometimes benefited by syringings and waterings with fresh and tolerably strong tobacco tea, in place of the usual waterings. Repotting and occasional applications of weak manure water, with perhaps a higher temperature, will also be found helpful. ERNEST WALKER.

Apart from its use as a border plant and for bedding, being a universal favorite, it usually forms part of the stock in trade of florists who do a local business, rank-

ing next to the Geranium as a pot-plant for spring trade. For cut-flowers in winter it is equally popular, but its lasting qualities when cut are uncertain. Successful growers assert that for best results, strong stems and good keeping qualities, it should be grown in a moderately cool, airy house. Some of the best the writer has seen were grown in a house suited to violets and mignonette, in which the temperature seldom rose to 50° F. at night.

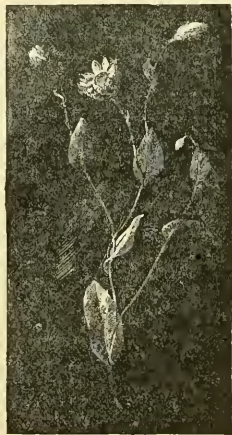
Stout, soft cuttings make the best plants, and root easily in a temperature of 60° F. From the time they are inserted, sufficient water must be given to prevent wilting. A propagating bed is not required. Ordinary flats will do—the medium half-leaf soil and sand. They must be well shaded for a week or so. They are very liable to the cutting bench fungus, and should be potted or boxed off as soon as rooted, which should be in ten or twelve days. Any light soil will do, and it need not be rich for the first shift.

For winter flowers, cuttings may be taken in July and treated as above. Some of the plants among the spring batch with straight stems may be grown along for standards by taking out the side shoots until 2 ft. high. These make handsome drooping specimens. By pruning about midsummer they may be kept in good condition for years. Stock intended for spring cuttings is better grown continuously in pots, as the plants lift badly in the autumn.

The plants do not lift well. The writer prefers to grow a few left-over bedding plants for stock. Cuttings struck in June or July and grown continuously indoors make the best plants for winter flowers. Tall young plants may be grown into standards by taking out the side shoots until they reach 2 or 3 feet in height, and then letting them branch out. Shifted along, they make large specimens in 12-inch pots, and may be kept in good condition for years by judicious pruning, top-dressing and the use of manure water.

Heliotrope is extensively used as a bedding plant, is a favorite in window-gardens, and is much grown by florists for cut-flowers. The ease with which it may be grown either in pots or the garden, the color and fragrance of its dainty flowers, and the continuity of bloom, have all contributed to make it a general favorite.

There have been numerous garden varieties and a number of hybrids—white and the different tints of blue predominating. Floral catalogues rarely mention, however, more than 6-8 varieties. Madame de Blonay has for years been a favorite white, while Queen of Violets is perhaps the finest of the blues. Chieftain is a lighter tint. Albert Delaux is a variety with golden variegated foliage, but variegated Heliotropes are undesirable. Among seedlings double forms occasionally appear. They have no special merit, and are seldom perpetuated. T. D. HATFIELD.



1033. *Helipeterum Manglesii* ($\times \frac{1}{2}$).
Generally known as Rhodanthé.

HELIPETERUM

(Greek for sun and wing; said to refer to the light-plumed pappus). *Compositæ*. Including *Acarolinium* and *Rhodanthé*. About 50 species in Australia and S. Africa, of which a few are cult. as everlasting or immortelles (see *Everlastings*). The cult.

kinds are annual herbs (or grown as such), of easiest cultivation in any garden soil. Fls. mostly perfect, with 5-toothed open corollas: akenes woolly, bearing a papus of many plumose bristles: involucre glabrous, obovate or top-shaped, silvery or rose-colored: plants mostly glabrous. This and *Helicrhysum* are amongst the most important of everlasting flowers.

- A. Heads large, many-flowered.
B. Lvs. broad.

Mänglesii, Muell. (*Rhodanthe Mänglesii*, Lindl. *Roccardia Mänglesii*, Voss). Fig. 1033. Neat glaucous annual, 12-18 in. tall, with very slender, long pedicels, bearing pretty nodding heads: lvs. thin, oval or elliptic, clasping: involucre silvery-chaffy, the ray florets originally clear, handsome pink, but now varying to white (*R. alba*, Hort.), and to dark red (*R. atrosanguinea*, Drum.). Var. **maculatum** (*R. maculata*, Drum.). *Roccardia Mänglesii*, var. **maculata**, Voss), is usually larger, with shorter lvs. and involucre flecked with red: rays pink or white. Austral. B. R. 20:1703.—A charming plant, and one of the few everlastings which retains much of its grace and beauty after being dried. There are double-fl. forms, i. e., those with all or nearly all the florets ligulate. Excellent also for pot culture. Seeds of the mixed vars. are sometimes sold under the name *Rhodanthe varius*.

BB. Lvs. linear.

roseum, Benth. (*Aerolinum roseum*, Hook. *Roccardia rosea*, Voss). Fig. 1034. Annual, 1-2 ft. high, glabrous, with many strict simple branches from the crown, each stem terminated by one large head: lvs. numerous, alternate, small and linear: rays many, pointed, bright



1035. *Helipterum Humboldtianum* ($\times \frac{1}{2}$).



1034. *Helipterum roseum* ($\times \frac{1}{2}$).

pink (or varying to white in *H. album*, Hort.). Austral. B. M. 4801.—A very serviceable and handsome plant.

AA. Heads small, clustered.

Humboldtianum, DC. (*H. Sainfoirii*, Hook. *Roccardia Humboldtiana*, Voss). Fig. 1035. Annual (or cult. as

such), erect or with a decumbent base, the stems somewhat branching: lvs. (and stems) white-tomentose, linear or lance-linear, pointed, alternate: heads small, oblong, yellow, in a dense corymbose truss. Australia. B. M. 5350.

corymbiflorum, Schlecht. (*Roccardia corymbiflora*, Voss). Annual, lower than the last, more branched: lvs. broader: heads 2-3 times larger, top-shaped, in small corymbs, the prominent rays white. Australia.

L. H. B.

HELLEBORE. See *Helleborus*.

HELLEBORUS (ancient name of *H. orientalis*, meaning unknown). *Rennunculeae*. Hardy herbaceous perennials, about 8 species, natives of Europe and western Asia. Erect, with large palmately divided lvs., the basal long-petioled, the upper sessile and sometimes reduced to bracts: fls. large, white, greenish red, purple, or yellowish; sepals 5, broad, petal-like, mainly persistent; petals small, tubular, furnished with claws; stamens many; carpels 3-10, sessile, forming leathery, many-seeded capsules, dehiscent at the apex.

All the kinds will thrive in ordinary garden soil, but for the best results use a soil of rich loam and coarse sand, with a top-dressing of rotten manure. A moist, well-drained, partially shaded situation is preferable. The species may be planted in shrubbery borders, and in rockeries, or if wanted for cut-flowers they should be planted in beds. An important point is not to disturb the plants when once established, as they are very sensitive to frequent changes of location. All the species bloom before spring arrives; a few mild days in December or January will bring out the buds of *H. niger* varieties, and the others are not far behind. They are easily forced under glass. Strong plants should be taken up into large pots and gradually inured to a warm temperature. Blossoms may thus be brought forth at any time desired in winter. Prop. best by division in fall or spring; but if seeds mature they will germinate well if planted immediately in pans or in rich, open ground. Seedlings should bear flowers the third season. Monographs by J. G. Baker in G. C. II. 7:432 (1877) and by Thos. Moore in G. C. II. 11:431 (1879).

A. Lvs. dying annually, thin.

viridis, Linn. Stem scapose: rootstock creeping; 1 basal leaf 8-12 in. broad, on petiole 6-10 in. long; segments 7-11, oblong, acute, sharply serrate; fl-stem hardly exceeding the basal leaf, bearing 3-6 fls. on a large, leaf-like bract: fls. large, yellowish green; sepals broadly oblong, obtuse, spreading: capsules about 4, as long as the sepals, transversely ribbed; style erect. Eu. Nat. in eastern states. G. C. II. 25:553.—Not so much used as the other species here given.

Var. **purpurascens**, Waldst. & Kit. Differs chiefly in the central leaf-segments being deeply palmately cleft, and the fls. much tinged with purple, especially on the outside. Hungary. B. M. 3170.

AA. Lvs. evergreen, coriaceous.

B. Flower-stem never more than once forked: fls. 1 or 2
niger, Linn. CHRISTMAS ROSE. Fig. 1036. Stemless: rootstock short, black: only 1 leaf somewhat irregularly divided into lobes, toothed on the outer half; petiole 5-7 inches long: flower-stem simple or once branched: fls. very large; sepals white, or flushed with purple: capsules 6-8. Rocky places, Eu. B. M. 8. Gn. 55, p. 13.

Var. **angustifolius**, Hort. (var. **minor**, Hort.). Plant and leaf similar, but fls. small. Very pretty. G. C. II. 21:85, and III. 21:19.

Var. **altifolius**, Hayne (var. **major**, Hort. Var. **major**, Hort.). Petiole reaching 1 ft. in length: fls. the largest in the genus, 3-5 in. across, and often several on same stem. Gn. 14:142; 48:1021. G. C. II. 20:693. A. G. II. 63.

BB. Flower-stem forked 2 or 3 times: fls. several or many.

orientalis, Lam. Stemless; short creeping rootstock: 1 radical leaf, 7-9-lobed; segments 6 in. long, 1½-2 in. broad, acute, serrate in the outer half, pubescent, with strongly raised veins beneath; petiole 1 ft. long: flower-

stem over 1 ft. high, forked above, 2-6 fld., large, leaf-like bracts; sepals roundish, imbricated, white, purple beneath and purple edges, spreading; capsules oblong, shorter than the sepals, transversely ribbed; style erect or incurved. Asia Minor. Gn. 47, p. 136.—There are numerous varieties of this beautiful species.

c. Purple-fl. varieties.

Var. *Colchicus*, Regel. Stem purple-spotted, quite glaucous; 1 leaf to each flower-stem; fls. 3-6 on a stem, deep bright purple, both inside and out. Asia Minor. B.M. 4581 (as *H. atropurpureus*). Gt. 1860:293. Var. *Colchicus-punctatus*, T. Moore. Fls. deeper plum-purple, more glaucous, exquisitely mottled inside with innume-



1036. Christmas Rose, *Helleborus Niger* ($\times \frac{1}{2}$).

able dark dots. Gn. 16:189, f. 8.—One of the handsomest of all the Hellebores.

Var. *Abchasicus*, A. Braun. Much like var. *Colchicus*, but differing in having 2 or more lvs. to a flower-stem. Caucasus region. Gt. 1866:496 (as *H. Caucasicus*, var. *Abchasicus*, Regel).

Var. *atropurpureus*, Waldst. & Kit. Only 1 leaf on a flower-stem, glabrous, thinner in texture than in the rest of the orientalis group; segments narrow; fls. 2-4 on a stem; sepals dark purple outside, greenish purple within. Hungary. R.H. 1865:231.—A connecting link between the *viridis* and *orientalis* groups.

Var. *rübro-purpureus*, Hort. (*H. atropurpurea*, Hort.). A seedling of var. *atropurpureus*, with bold foliage and purple flower-stems; fls. spreading, deep purple. Characters well fixed and very handsome. Gn. 16:189, f. 1. R.H. 1884:564.

Purple-fl. hybrids of the varieties of *H. orientalis* are found in the trade under the following names: Var. *elegans*; var. *iridescens*; *F. C. Heinemann*, fls. very large, imbricated, deep purple and mottled; *Frau Irene Heinemann*, fls. rose-purple outside, greenish white, with dark lines and dots inside; *Grechen Heinemann*, red-fl., strong grower; *Hofgarten-Inspector Hartwig*, fls. rose-purple without and greenish within; *Apotheker Bogren*, rose-purple, very large.

cc. White-fl. varieties.

Var. *Olympicus*, Lindl. Glabrous; fls. small, but spreading, very numerous; sepals green on outer surface, white within. Bithynia. B.R. 28:58.—Hybrids closely allied to this have been given the trade names: *Willy Schmidt* and *Prof. Dr. Schleicher*.

Var. *guttatus*, A. Braun. Glabrous, green stem; sepals green outside, white within and elegantly spotted with purple crimson dots. Caucasus region.—Two allied hybrid forms are named: *Commerz Benary* and *Albin Otto*. Gn. 16:189, f. 4.

Var. *antiquorum*, A. Braun. Glabrous, green mottled stem; fls. as in var. *Olympicus*, but more imbricated, maintaining the bell-shaped form. B.R. 28:34 (as *H. orientalis*, Lindl.). Gn. 16:189, f. 3.

ccc. Green-fl. variety.

Var. *Caucasicus*, A. Braun. Lvs. very glossy; segments more oblong than in the type, often 3 or 4 in. broad; sepals round, pale green, much imbricated. Caucasus region. K. C. DAVIS.

HELMET FLOWER. *Aconitum*, *Coryanthes* and *Scutellaria*.

HELONIAS (Greek, *swamp-loving*). *Liliaceae*. SWAMP PINK. This genus includes a rare hardy perennial bulbous plant which grows in bogs from northern N. J. to N. C., and is sold by dealers in native plants. In very early spring it bears a hollow scape 1-2 ft. high, crowned by a raceme 1-3 in. long, composed of perhaps 30 pink or purplish fls., each $\frac{1}{2}$ in. across, 6-lobed, and with 6 blue anthers. The genus has probably only one species, the other plants called Helonias being largely referred to other genera, which are distinguished in Britton and Brown's Illustrated Flora 1:399. The genus is placed by Britton and Brown in Melanthaceae, an order included in the Liliaceae by Bentham and Hooker. Helonias has a short, stout rootstock like a leek. The allied *Heloniopsis* is also in the trade.

bullata, Linn. SWAMP PINK. STUPE PINK. Lvs. several or numerous, thin, dark green, clustered at the base of the scape, 6-15 in. long, $\frac{3}{8}$ -2 in. wide, with fine parallel nerves; scape stout, bracted below. Apr., May. B.M. 747. L.B.C. 10:961. B.B. 1:402.—Int. by H. P. Kelsey.

Helonias, which is perfectly hardy, is so easily propagated by division that it is hardly worth while to grow from seed. Under cultivation, also, it seems to rarely mature perfect seed. It multiplies itself rapidly from offsets, a single plant often providing a dozen others in a season. It is found growing in dense shade and also in the full glare of the sun, always in wet sphagnum bog in the latter case, while in the shade it sometimes spreads to dry ground. Although one of the showiest of all American bog plants, it is comparatively little known here, though better in England. It makes an elegant pot-plant. HARLAN P. KELSEY and W. M.

HELONIOPSIS (Greek, *like Helonias*). *Liliaceae*. This includes an herbaceous plant resembling our swamp pink, *Helonias bullata*, in the color of its fls. and stamens, but the fls. are larger and fewer, and the lvs. numerous and tufted. The style in *Heloniopsis* is a conspicuous feature, being long and red, tipped with a purple undivided stigma, while in *Helonias* the style is very short and 3-cut. Both genera are separated from numerous allied genera by the septical dehiscence of their capsules. The fls. are bell-shaped, drooping, deep pink, 6-lobed, with 6 red filaments and purple-blue stamens. The genus has about 4 species. The following grows in the mountains of Japau at an altitude of 2,000-7,000 ft., and is presumably hardy. It was once offered by John Saul, of Washington, D. C.

Japonica, Maxim. Rootstock short, stout, with long root fibers; lvs. oblanceolate, persistent, green tinged purple; seeds small, very numerous, with a conspicuous tail at each end. B.M. 6986.

HELWINGIA (after G. A. Helwing, 1666-1748, a German clergyman, who wrote on the botany of Prussia). *Araliaceae*. A curious deciduous shrub, remarkable for the reason that the small, inconspicuous greenish fls. are borne in clusters on the midribs of the lvs. at about the center of their upper surfaces. Of not much decorative value and therefore rarely cultivated, but interesting on account of the unusual position of the fls.; ten-

der North. It seems to grow in any soil that is somewhat moist. Prop. by greenwood cuttings under glass. Two species in Jap. and Himal. Fls. dioecious, short-pedicelled, with obsolete calyx, 3-5 petals and stamens and 3-4-celled ovary: fr. a berry-like, 3-4-seeded drupe.

Japónica. A. Dietr. (*H. rusciflora*, Willd.). Bushy shrub, 3-5 ft. high: lvs. petioled, ovate or elliptic-ovate, acuminate, serrate, stipulate, 1½-3 in. long: fls. in June, the staminate generally with 3, the pistillate with 4 petals. Jap. S. Z. 86. A.G. 13:8.

A. PHELPS WYMAN.

HEMEROCALLIS (Greek, *beautiful by day*; because the blossoms close at night). *Liliaceae*. **YELLOW DAY LILIES.** This genus includes the Lemon Lily (*H. flava*), which is one of the hardiest and most delightful of all herbaceous perennial plants. It easily ranks among the 50 most popular plants for the home garden. All the blue and white Day Lilies belong to the genus *Funkia*: all the yellow and orange Day Lilies belong to *Hemero-callis*. The Yellow Day Lilies have narrow, grass-like foliage, and their flowers have wider funnels. The blue and white Day Lilies have very broad foliage, which is not at all grass-like. The flowers of *Funkia* are borne in racemes; of *Hemero-callis* in corymb-like panicles.

Hemero-callis has only 7 species, all of which are cultivated. The plants are all remarkably free from enemies, and need no protection of any kind, even in the severest winters. The roots are bundles of fleshy tubers, and are sometimes classed with bulbs in catalogues of nurserymen. Small plants will flower freely the first year. Clumps can often be left undivided for 4 or 5 years without a loss in size or number of flowers, but as a



1037. Lemon Lilies—*Hemero-callis flava*.

general thing all robust-growing herbaceous perennials should be divided every second year. In old clumps the roots often become firmly matted near the middle, and the wasteful competition between the too-numerous roots weakens the vitality of the plant. Next to *H. flava*, the oldest garden favorites among the Yellow Day Lilies is *H. fulva*, sometimes called Brown Day Lily, and erroneously in some catalogues the Lemon Lily. *H. fulva* is a taller plant, with later and orange-colored fls. and wavy inner segments. Within five years a new species, *G. aurantiaca*, has come into great prominence, and its var. *major* by some connoisseurs is considered the finest of all Day Lilies. As a rule, double forms are not as popular as the types, and for the writer they lack the simplicity and definite character of the single flowers. Yellow Day Lilies have a wholesome fragrance. The individual flowers are short-lived, but there is a good succession. The plants thrive in almost any garden soil, but are most luxuriant along the borders of ponds or moist places, and in partial shade. The flowers are excellent for cutting. Plants prop. by division.

R. B. Whyte gives the succession of bloom at Ottawa, Canada, as follows: *H. Dumortierii*, June 4; *minor*, *Middendorffii* and *Thunbergii*, June 11; *rutilans*, June 18; *fulva*, July 2; *aurantiaca*, var. *major*, July 9; *fulva*, var. *Kuwano*, July 23, and *disticha fl. pl.*, July 30. He

adds that *H. Dumortierii*, *aurantiaca* var. *major* and *H. rutilans* differ from all others in the fls. being reddish brown outside, which is very marked in the bud.

A. Fls. fragrant.

B. Inner segments of perianth firm: veins not joined by cross veins: color yellow.

C. Blossoms in June.

flava, Linn. **LEMON LILY.** Fig. 1037. Lvs. 18-24 in. long, 6-8 lines wide: scapes longer than the lvs.: corymb 6-9 fld.: pedicels 12-24 lines long: tube 6-15 lines long. Europe, temperate Asia. B.M. 19. A.G. 17:437. Gn. 48, p. 400.—In some important works on gardening the color is erroneously given as orange.

CC. Blossoms in July.

Thunbergii, Baker. "Except for its later flowering, *Thunbergii* does not differ materially from *flava*." Baker. Lvs. 6-7½ lines wide: corymb loose, 8-10 fld., with 1 or 2 fls. lower down: tube nearly 1 in. long: fls. lemon-yellow, opening widely, 3 in. across: segments membranous, crisped. Japan. Int. 1890.—Rare. R. B. Whyte writes that the fls. are not nearly as large as those of *H. flava*, appear in June, and that *H. Thunbergii* differs from all others in having the upper 6 to 10 in. of the scape thickened and flattened.

BB. Inner segments membranous and waxy at the margin: a few veins joined.

C. Lvs. 2-3 lines wide: tube and pedicel long: color of fls. yellow.

minor, Mill. (*H. graminea*, And., not Schlecht. *H. graminifolia*, Schlecht.). Lvs. 15-18 in. long, darker green than in the other species: scapes about as long as the lvs.: corymb 3-6 fld.: pedicels 3-24 lines long. July, Aug. N. Asia. B.M. 873.

CC. Lvs. 6-8 lines wide: tube very short: color of fls. orange.

Dumortierii, Morren (*H. rutilans*, Hort.). Height 1½-2 ft.: lvs. 12-15 in. long: scapes hardly as long as the lvs.: corymb 2-3 fld.: pedicels 3-6 lines long: fls. 2-2½ in. long, while they are 3-4 in. long in all the other species; inner segments 5-6 lines wide. Jap. B.H. 2:43. Gn. 31:589.—*H. Sieboldii* is now practically abandoned as a trade name. The yellow-fl. species of this name is *H. Dumortierii*; the blue-fl. species pictured in L.B.C. 19:1869 and P.M. 5:25 is *Funkia Sieboldii*. Var. *flöre pleno* (*H. disticha pleno*, Hort.) is less cult. This species is the earliest to blossom. R. B. Whyte considers *H. rutilans* distinct.

CCC. Lvs. 8-12 lines wide.

D. Color of fls. orange: tube 8-9 lines long.

aurantiaca, Baker. Height 2½-3 ft.: lvs. more than 12 lines wide: corymb 6-8 fld.: fls. bright orange, opening less widely than any other species. July, Jap. or E. Siberia!—The type was introduced to cult. in 1890 and has rapidly given way to var. *major*, Baker, introduced 1895, which is larger in all parts. Lvs. 12-18 lines wide: tube 9 lines long: fls. when expanded 5-6 in. across. July-Sept. Jap. G.C. III. 18:71. Gn. 48:1041 and 50, p. 17. J.H. III. 31:157. A.G. 18:179.—Closest to *Dumortierii*, from which it is chiefly distinguished by its much larger, later and more reddish fls. and longer tube.

DD. Color of fls. yellow: tube 5-6 lines long.

Middendorffii, Traut. & Mey. Name variously misspelled. Height 1-1½ ft.: lvs. 15-18 in. long, 8-12 lines wide: scapes about as long as the lvs.: corymb 2-4 fld.: pedicels almost none: inner segments 9-12 lines wide. Amur region. Gt. plate 522. R.H. 1897, p. 139.

AA. Fls. not fragrant.

fulva, Linn. (*H. disticha*, Don). Lvs. 18-24 in. long, 9-15 lines wide: corymb 6-12 fld.: fls. orange; pedicels short; inner segments with waxy margins, with numerous veins joined by cross veins. July, Aug. Eu., temperate Asia. B.M. 64 (central band of white). Mn. 5, p. 193. Var. **Kuwano** (*H. Kuwano*, Hort.), the "Double Orange Lily," blooms longer than any single-fl. form, according to Mehan. Gt. 500. It has a sub-

variety with variegated lvs. Var. *flöre pléno*, Hort., is shown in F.S. 181891, with a red spot on the middle of each segment. Gn. 48, p. 401. R.H. 1897, p. 129. Var. *variegata* has a stripe of white down the middle of each leaf. W. M.

HEMICÛCLIA (Greek, *semi-circular*; referring to the scar or furrow on the seed). *Euphorbiaceæ*. This includes a spreading tree, attaining a height of 40 ft., which is cult. in S. Calif. by Franceschi, who values it for its "beautiful holly-like lvs. and red fruits." The genus has about 9 species, natives of India, Ceylon and the Eastern Archipelago, with no near allies of garden value. Trees or shrubs: lvs. alternate, petioled, entire, leathery when full grown; fls. dioecious; petals none; sepals of staminate fls. 4-5, the inner often larger and somewhat petal-like; fr. a globose or ovoid, indehiscent drupe; seed by abortion, usually solitary. *H. Australica* is told from the other 2 Australian species by its very short filaments and glabrous ovary.

Australica, Muell. Arg. Lvs. broadly ovate to ovate-oblong, obtuse, $1\frac{1}{2}$ -7 in. long, finely veined below; fr. nearly $\frac{1}{2}$ in. long, very smooth, red and succulent, enclosing a stone.

HEMIONITIS (Greek, *mule*; the plants erroneously supposed to be sterile). *Polypodiaceæ*. A genus of tropical ferns, with copiously netted veins and naked sori following the veins. Eight or 9 species occur in the tropics of both hemispheres. The plants are dwarf, and are grown in Wardian cases by a few fanciers in the Old World. For culture, see *Ferns*.

H. palmata, Linn. Lvs. palmate, 2-6 in. wide, with 5 nearly equal triangular divisions, those of the sterile lvs. less acute; surfaces pubescent. W. Indies, Mex., S. Amer.—*H. elegans*, Dav. Lvs. 4-10 in. wide, with a broad sinus at the base and 5 long slender, lanceolate divisions; plant smooth. Mex. G.F. 4:485.

L. M. UNDERWOOD.

HEMITËLIA (Greek, *with half a roof*; referring to sori). *Cyatheaceæ*. A genus of tree ferns of the tropics, with round or semiglobose sori and an inferior indusium, consisting of a scale which is often indurated and deciduous. Some 20 species occur in both hemispheres. For culture, see *Ferns*.

H. Guianensis, Hook. Rachis slightly scaly and hispid; lvs. bi-tripinnate, the secondary rachis distinctly winged, especially at the upper portion; sori few in each segment, usually 2-3; indusium ciliate and often lobed. Var. *Paradei*, Hort., is the form commonly in cultivation. British Guiana. I. H. 24:280.—*H. Lindenii*, Hook. Lvs. pinnate, the pinnae distant and slightly stalked, 6-12 in. long, 1-1 $\frac{1}{2}$ in. broad, the base truncate or wedge-shaped; sori in 2-3 irregular lines near the margin. Venezuela. I. H. 42:46.

L. M. UNDERWOOD.

HEMLOCK in Old World literature is what we call Poison Hemlock, an umbelliferous herb named *Conium maculatum*. By Hemlock, Americans mean Hemlock Spruce, an evergreen tree, *Tsuga Canadensis*.

HEMP. Common Hemp is *Cannabis sativa* (which see). Bowstring H., see *Sansevieria*. Manilla H., *Musa textilis*. Sisal H., *Agave rigida*, var. *Sisalana*.

HEN-AND-CHICKENS. A proliferous form of the English daisy, *Bellis perennis*; also, the thick-leaved rosettes of Cotyledon, used in carpet-bedding and known as Echeveria.

HENBANE. *Hyoscyamus niger*.

HENDERSON, PETER (Plate X.), 1822-1890, market-gardener, florist, seedsman and author, was born at Pathhead, near Edinburgh, Scotland, in 1822, and died in Jersey City, Jan. 17, 1890. He was trained in Old World methods of gardening, came to America in 1843, worked under Geo. Thorburn and Robert Buist, and in 1847 began business in Jersey City as a market-gardener, with a capital of \$500, saved by 3 years' hard work. He continued to live there until his death. The publication of "Gardening for Profit" in 1865 marks an era in American horticulture. It was the first American book devoted entirely to market-gardening, and it helped to induce many persons to enter the business. By the time

of his death about 150,000 copies of the book are said to have been distributed. It was written in an aggregate of 100 hours, when the author was working 16 hours a day, largely at manual labor. At the noon intervals and late at night he wrote this work lying on his back, with a pillow under his head. The secret of its success, and of the author's, was the invention of new methods adapted to operations on a large scale. The second edition in 1874, and the third in 1887, are both thorough revisions.

"Henderson's Practical Floriculture," 1868, was an epoch-making book in commercial floriculture. Up to this time most works on flower-gardening had been written for the amateur. This point of view is necessarily the commoner one, and Henderson's contribution to it was "Gardening for Pleasure," 1875. In the compilation of "The Handbook of Plants," 1881, he was largely aided by C. L. Allen, and in the second edition, 1890, by W. J. Davidson. "Garden and Farm Topics" was issued in 1884, and in the same year appeared "How the Farm Pays," a stenographic report of conversations between Wm. Crozier and Peter Henderson. It is claimed that nearly a quarter of a million copies of his various works have been sold. His seed business was founded at New York in 1865. Lately more than 200,000 copies of the various catalogues have been distributed annually.

Few men, if any, have done so much to simplify and improve methods of handling plants for commercial purposes. His greenhouses were an object lesson to many visitors, his methods were widely copied, and his business successes were the goal of ambitious market-gardeners and florists, among whom he was for many years the most commanding figure. He was a frequent contributor to the horticultural and agricultural magazines, and during his forty-two years of business life is supposed to have written or dictated at least 175,000 letters. Two-thirds of these letters were written with his own hands, and he always replied promptly to inquiries about methods of cultivation. A self-made man, simple and abstemious in his habits, he was a tireless worker. He combined in a high degree the faculties of growing plants and of business ability. His mastery of details was complete. His books are exceptionally readable, his powerful personality appearing through every page. The records of his personal experience are practical, ingenious and fertile in suggestion. An account of his life is published in a memoir of 48 pages by his son, Alfred Henderson.

W. M.

HÉNFREYA. See *Asystasia*.

HEPÁTICA (*liver-like*, from the shape of the leaves).

Ranunculaceæ. **HEPATICA**. LIVER LEAF. A genus of

3 species, natives of the north temperate zone. Stemless, low perennials: lvs. 3-lobed and sometimes toothed; appearing after the flowers and remaining green over winter; scapes 1-fl., with an involucre of 3 small sessile lvs. simulating a calyx; sepals petal-like, white, pink or purple; aneskenes short beaked, pubescent. Fig. 1038. The plants prefer shade, but do fairly well in open places. They should remain undisturbed from year to year, in rich, well-drained loam. Well suited to the north or east slope of a rocky. Plants kept in pots in a coldframe until midwinter will quickly bloom at any time desired if removed to a warm room or greenhouse. Prop. by division or seed.

tritoba, Choix. (*Hepatica Hepatica*, Karst. *Anemone Hepatica*, Linn. *A. tritoba*, Hort.). Scapes 4-6 in.; lobes of lvs. obtuse; fls. $\frac{1}{2}$ -1 in. across; sepals oval or



1038. Flower of Hepatica.
Natural size.



1039. *Hepatica acutiloba*
at night.

The flowers of *Hepatica* droop
and close at night.

oblong, obtuse. Earliest spring. Eastern U. S., Eu. and Asia. B. M. 10. B. R. 5:387 (as *H. Americana*). White, blue and pink-fl. forms have been fixed in cultivation, and are known as var. *alba*, Hort.; var. *caerulea* fl.-pl., Hort.; var. *rubra* fl.-pl., Hort. Gn. 26:448. G. C. 1873, p. 645 (var. *marmorata*, Moore).

acutiloba, DC. (*H. triloba*, var. *acuta*, Pursh. *Anemone acutiloba*, Lamson. *H. acuta*, Britt.). Fig. 1039. Much like *H. triloba*, but with the lobes of the lvs. ovate and acute, occasionally the lateral lobes 2-cleft (rarely the middle one); akenes slightly stipitate. Eastern U. S.

angulosa, DC. (*Anemone angulosa*, Lam.). Plant tufted as in the other *Hepaticas*, hairy; lvs. 3-5-lobed, lobes often serrate; involucre near the fl. toothed; fls. large, blue, whitish or reddish. Hungary. B. M. 5518. G. C. 1865:698. Gn. 26, p. 25. K. C. DAVIS.

HEPBURN, DAVID, was joint author with John Gardiner of the second American book on horticulture. This was published at Washington, D. C., in 1804. The name of Gardiner appears first on the title page, but it may be inferred that the practical experience in the book is almost wholly Hephburn's. He had had 40 years of experience in gardening, half of the time in England and half in America. He was employed by General J. Mason for 6 years on Mason's Island, Georgetown. He had also been employed by Governor Mercer. The book was well made for the time. It is a 16mo., and contains 204 pages of practical directions. The calendar style is used. The first part (100 pp.) is devoted to the kitchen garden. The second part consists chiefly of "Fruits, Flowers, and Shrubs" (82 pp.). This is followed by a few pages on hops, hothouses and greenhouses. The

second edition (Georgetown, 1818) contains 248 pages. It includes "A Treatise on Gardening, by a citizen of Virginia." This occupies 80 pages. The copy owned by the Massachusetts Horticultural Society possesses this manuscript note: "This treatise is by John Randolph, of Williamsburg, father of Edmund Randolph, Secretary of State during the administration of General Washington." Robert Manning writes that this note may have been made by General Dearborn. A third edition was published at Washington in 1826, and contained 308 pp. W. M.

HERACLEUM (named for Hercules, who used it in medicine, according to Pliny). *Umbellifer*. This includes 3 hardy herbaceous plants sometimes called Giant Parsley or Giant Cow-parsnip. They are not suited for general gardening, but are sometimes grown in wild gardens or parks, or as single specimens on lawns, where a very bold and striking object is desired. They are coarse herbs, growing 5-6 ft. high, with broad foliage, which is their chief beauty. According to J. Woodward Manning, they are adapted to all soils, but prefer a rich, moist soil, and hence do well at the edge of running water. Manning adds that these plants should never be allowed to go to seed. J. B. Keller writes that if these plants are grown on an open, sunny lawn, they should be liberally supplied with water at all times. Prop. by division or seed. The genus *Heracleum* has 50-70 widely scattered species and no near allies of garden value.

A. *Plant perennial.*

lanatum, Mich. Lvs. trisect, tomentose beneath; segments petiolulate, rotund, cordate, lobed; leaflets of the involucre lanceolate; fr. oval-orbicular. N. Amer., W. Asia. Mn. 4, p. 164.

villosum, Fisch. (*H. giganteum*, Fisch.). Height 8-12 ft.; lvs. sinuate-pinnatifid, sharply serrate, acuminate, woolly-tomentose beneath; leaflets of involucre short, bristly, deflexed; umbels sparingly rayed; fr. elliptic, ciliate, woolly on the back. G. C. III, 3:437 and 20:271. — Keller says the fls. are nearly white, and borne in Aug. and Sept., in denser umbels than those of *H. Sibiricum*.



1040. The Goose Tree of the herbalists.

AA. *Plant biennial.*

Sibiricum, Linn. Lvs. scabrous to hirsute, pinnate or deeply pinnatifid; segments lobed or palmately parted, serrate; petals about equal; fr. subrotund-oval, deeply notched at the apex. En., N. Asia.—Keller says this bears yellowish green fls. in July and Aug. W. M.

HERBA IMPIA of the old herbalists is *Filago Germanica*.

HERBALS. Books on plants, published from the fourteenth to the middle of the eighteenth century, were largely written from the medicinal point of view, and were often called Herbals. The scientific point of view of plant-knowledge is conveniently dated from 1753, when Linnaeus published his "Species Plantarum." Of the herbalists, John Gerard is probably read most at the present time. His style is chatty, quaint and personal. One of the notions accepted by the early herbalists was that of the vegetable lamb, which is pictured in this work under *Cibotium* (Fig. 470). Another idea that fascinated these worthy plant-lovers was that of the barnacle goose tree. Fig. 1040 is reproduced from a book by Duret, 1605, and shows how the fruits that fall upon dry land become "flying birds," while those that fall into the water become "swimming fishes." Other conceptions of this goose tree are reproduced in the Gardeners' Magazine 35:749 (1892). Almost every large library possesses a few Herbals, as Matthioli's, Baulin, L'Obel and Fuchs's. The largest collection of Herbals in America is the one given by the late E. Lewis Sturtevant to the Missouri Botanical Garden at St. Louis.

HERBARIUM. A collection of dried plants systematically named and arranged. Every horticulturist who takes delight in his profession should have an Herbarium, as it increases immensely the value and pleasure of his work. Every amateur, nurseryman and florist is hereby strongly urged to make a collection of dried specimens of the plants in which he is particularly interested. It need not be expensive nor consume much time, and the process of drying a plant is simple and easy. An Herbarium is like a reference library, and is equally invaluable.

Unfortunately, lovers of cultivated plants rarely care for pressed specimens because they are so lifeless and colorless. Yet there is no surer way for a nurseryman to keep his stock true to name than by making an Herbarium. There are many universities and colleges in America where botanists are glad to verify the names of plants for the sake of the duplicate specimens. This is one of the most practical and useful ways in which botanists and horticulturists can cooperate. The unnecessary waste in time and money caused by confused nomenclature and confused labels is one of the difficulties of a large collection of growing plants.

Even in the largest nursery of hardy plants specimens can be taken by one man in two days in late spring, of everything that is in characteristic condition at that time. Three hundred specimens can be secured in two days in our best nurseries. Even after the spring rush is over there is time to get most of the important spring-flowering plants in flower or fruit, and from that time two or three hours a week is enough to keep up with the procession of flowers. Sometimes interest can be aroused in a young student, who will be glad to do all the work for the sake of duplicates.

Use merchandise tags or cheap substitute in the form of pieces of paper about 7 in. long, 1 in. wide, with a longitudinal slit a little more than 1 in. long near one end. Pass one end of this piece of paper through the slit, and draw it close about the stem of the plant, leaving plenty of room for the trade name of the plant, the date, and the color of the flowers. It is very useful also to add the height of the plant, and anything else that is not likely to show in a dried specimen. When a basketful is gathered, place each specimen between a



1041. A common method of mounting Herbarium specimens.

folded newspaper page. Each newspaper page, with its enclosed specimen, is then placed between "driers." These are large pieces of felt paper, a kind which is even more absorbent than blotting paper. A hundred driers cost a dollar. Put a board on top of each pile and weight it with stones. Shift the driers daily for a week or so, and then at longer intervals, until the specimens are wholly dry. A better way of drying plants, particularly in a small way, is to use a frame press (to be purchased of dealers in botanists' supplies), provided with cords and straps for tightening the bundle and giving the requisite pressure. Specimens are discouraging looking objects while in press, but when they are carefully prepared and properly mounted on standard size paper ($11\frac{1}{2} \times 16\frac{1}{4}$ in.), with neat labels giving the name, locality, habitat, date and collector, they not only become attractive but are of great scientific value.

The finer and more artistic quality in Herbarium work differs only in the degree of care bestowed at every stage of the process. Some of our elementary botanists give full instructions for making an Herbarium. See, also, the "Horticulturist's Rule Book." Herbaria are notably poor in cultivated plants. For the critical study of garden plants, an Herbarium is a necessity. The sheets are kept in heavy manila paper folders or covers, each genus by itself. The regulation size for this genus cover when folded is $11\frac{1}{4} \times 16\frac{1}{4}$ in. Lay the sheets flat (Fig. 1041). Take pains to select specimens which show flowers, leaves and fruits; and herbs should show the roots. WALTER DEANE.

HERBERTIA (Wm. Herbert, 1778-1847, Dean of Manchester, distinguished botanist, author of "Amaryllidaceae," and ardent lover of bulbs). *Irididaceae*. Seven species of American bulbous plants, with fugitive blue or lilac fls. borne in summer. One species is procurable through Dutch growers. It grows less than a foot high. The bulbs may be started in coliframes. The genus is distinguished by the complete absence of a

perianth tube. The showy outer segments are about 1 in. long, and obovate, the inner ones about as long as the stamens. For culture, consult *Bulbs and Tigrida*, Mon. by Baker, Iridac., 1892.

pulchella, Sweet. Bulb globose, $\frac{1}{2}$ in. thick or more; tunics brown: lvs. about 4, linear, plaited, 3-6 in. long; apathes $1\frac{1}{2}$ in. long; outer segments lilac, with a white claw spotted lilac. Chile. B.M. 3862.

HERB LILIES. *Alstræmeria*.

HERB OF GRACE. *Ruta graveolens*.

HERB-PARIS. *Paris quadrifolia*.

HERB-PATIENCE. See *Rumex*.

HERB-ROBERT. *Geranium Robertianum*.

HERBS. An Herb is a plant which dies to the ground each year. It may be annual, as bean, candytuft, pigweed; biennial, as mullein, parsnip; perennial, as burdock, foxglove, rhubarb. To the gardener, however, the word Herb is ordinarily synonymous with herbaceous perennial; and he usually has in mind those particular perennial Herbs which are grown for ornament, and which remain where they are planted. Goldenrods, bleeding heart, sweet william, hollyhock, daffodils are examples. To many persons, however, the word Herb is synonymous with Sweet Herb, and it suggests sage and tansy.

Herbs have two kinds of values,—their intrinsic merits as individual plants, and their value in the composition or the mass. It is usually possible to secure both these values at one and the same time. In fact, the individual beauty of Herbs is enhanced rather than diminished by exercising proper care in placing them. Planted with other things, they have a background, and the beauties are brought out the stronger by contrast and comparison. It is quite as important, therefore, to consider the place for planting as to choose the particular kinds of plants. The appreciation of artistic effects in plants is a mark of highly developed sensibilities. Happily, this appreciation is rapidly growing; and this fact contributes to the increasing popularity of landscape gardening and ornamental gardening. Some of the best effects in Herb planting are to be seen in the wild, particularly along fences, roads and streams. In interpreting these native effects, the planter must remember that Herbs are likely to grow larger and more bushy in cultivation than in the wild. He should cover the bare and unseemly places about the borders of his place (Fig. 1042). He may utilize a rock or a wall as a background (Fig. 1043). He may hide the ground line about a post (Fig.

boundaries. The hardy border is the unit in most planting of herbs. See Figs. 1042, 1046. A rockwork Herb border (Fig. 1047) is often useful in the rear or at one side of the premises. Fill some of the corners by the house (Fig. 1048). In remote parts of the grounds, half-wild effects may be allowed, as in Fig. 1049. A pond or



1043. Planting against a rock back-ground.

pool, even if stagnant, often may be utilized to advantage (Fig. 1050). A good Herbut of place may be worse than a poor Herb in place. But when Herbs are grown for their individual effects, give plenty of room and good care: aim at a perfect specimen (Figs. 1051, 1052). For further hints on related subjects, see *Landscape Gardening*; also *Border*.

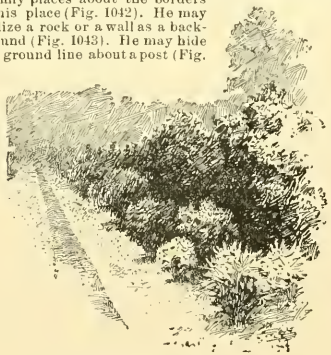
L. H. B.

HERBACEOUS PERENNIALS FROM THE LANDSCAPE ARCHITECT'S POINT OF VIEW.—No clear definition can be drawn between herbaceous perennials, biennials and annuals, between Herbs and woody plants, for there are tender Herbs that would in a warmer climate become shrubs or even trees, biennials that become perennials from stolons or offsets, and annuals that become biennials from seed germinating late in the season. Strictly speaking, however, herbaceous perennials are plants having perennial roots with tops that die to the ground annually, such as the columbines, larkspurs, day-lilies, peonies, and most sedges, grasses and ferns. It is customary, however, in publications relating to this class of plants as well as in actual use, to include closely allied species with evergreen foliage, such as statice, yucca, sempervivum and certain pentstemon, together with plants having more or less woody and persistent above-ground stems, such as the suffruticose artemisias and the evergreen creeping species of phlox, veronica, vinca, the iberis, the helianthemum, and many alpine plants, while most bulbous-rooted plants which are true herbaceous perennials are separately classified and grown as bulbs.

Herbaceous perennials are an exceedingly important element of landscape, for they predominate in the mat of grassy or sedge plants, covering dry or wet open fields and in the surface vegetation under woods and shrubby thickets, either as a grass crop, composed of a comparatively few species cultivated for economic purposes, or as a wild growth made up of many species. The most attractive of these native plants are being cultivated and improved more and more from year to year for ornamental purposes, and are planted in the flower garden, in artificial plantations of shrubbery and in the wild garden. It is to such natives and to exotics of the same class, which are cultivated for a similar purpose, that reference is to be made hereafter.

Fifty years ago nearly every well-to-do family maintained a flower garden, in which there were from 50 to 150 species and varieties of herbaceous perennials, and there were few of the humbler families that did not have a dozen or more species established about their homes. Such plants were distributed by exchange among neighbors and were propagated and offered at retail by dealers, who, however, gradually allowed their stock of plants to run low or abandoned them altogether, until many kinds dropped out of cultivation or were neglected in favor of the tender "bedding out" plants that were brought suddenly into favor by the displays at the Philadelphia Centennial Exposition.

There has been, particularly during the last 15 years, such an increasing interest in herbaceous perennials that there are now offered in the catalogues of American

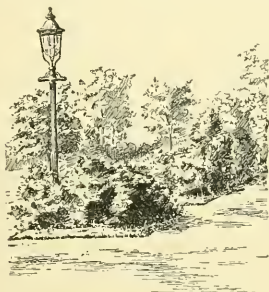


1042. An informal Herb border.

1044) or along a fence. Some of the commonest Herbs are handsome when well grown and well placed. (See Fig. 1045.) Always plant where the Herbs will have relation to something else,—to the general design or banding of the place. This will usually be about the

nurserymen and collectors of native plants, nearly 3,000 species and varieties, exclusive of the many garden forms that are distinguished chiefly by the color of their flowers.

In use, the species and varieties of herbaceous perennials may be broadly separated into three groups.



1044. One may hide the ground line with Herbs or Shrubs.

First, plants for the garden that require the favorable conditions of a highly cultivated ground, and careful attention to attain perfection and to persist and increase from year to year. This would include many exotics, some native species and most of the horticultural varieties. Many of such species which would find a congenial place only in the garden have attractive flowers which are so fugitive that they can only be enjoyed on the plant. Other species which are suitable to cut flowers from can hardly be grown in the flower garden in sufficient quantity to liberally meet the floral requirements of the home, and they should be grown in quantity in the kitchen garden or in a special cut-flower garden, for their crops of flowers. Included among plants of difficult cultivation with fugitive flowers are the rock or alpine plants, many of which are offered in European catalogues but few of which will thrive here, and for such as will succeed more favorable conditions are usually found in a well-drained border than in an artificial rockery.

Second, plants for the shrubbery, having aggressive habits, which make them rather objectionable in the flower garden, but fit them to withstand successfully the crowding of shrubs. This class of plants will give variety and prolong the flowering season of shrub borders about lawns, and would be made up chiefly of strong-growing natives and a few of the more persistent exotics.

Third, plants for the wild garden, including the species that require for success some one of the many special conditions prevailing in uncultivated or uncultivable land, or which are so rampant as to require the restraint that some one of these natural conditions will provide. This class of plants would be made up chiefly of natives and a few of the more persistent exotics, and they would be used to enrich groups of native plants under woods, in meadows, streams and ponds and on hedges and poor soil. These are attractive plants that will and do grow successfully under all these conditions without special cultivation, and many of them may be already on the ground. If every plant in a group of natives is watched for at least a year, it will be found that many are so attractive at one season or another that they will be retained and developed in beauty by the gradual removal of the less desirable kinds, for which others that are more desirable may be substituted. (See also the article *Wild Gardening*.)

In arranging plants in new plantations, or in modifying existing plantations in gardens, lawns or woods, much more effective landscape compositions and more agreeable color effects can be

secured by using large quantities of a few sorts than by using a few individuals of many kinds. Groups of different species should be selected that will give from period to period during the flowering season effective and dominating masses of foliage and color, and all other plants of the garden which appear at the same time should be made subordinate to these. (Consult, also, the article *Border*.)

Herbaceous perennials are propagated by divisions and from offsets, cuttings and seed. Some kinds, as dielamms and papaver, may be propagated by root cuttings. The exotic species of gardens and many of the more readily grown natives can be obtained in wholesale quantities from nurserymen. A few exotics and a very large number of attractive native species can be procured in wholesale quantities from collectors of native plants, many of whom also offer nursery-grown plants of the best natives and of a few exotics. The attractive native plants in any region can be transplanted with little difficulty if they are collected with a good soil of earth about the roots.

WARREN H. MANNING.

THE CULTURE OF HERBACEOUS PERENNIALS.—A good number of the herbaceous perennials in cultivation are exceedingly easy of cultivation, thriving well in any moderately rich soil of suitable physical condition, and enduring our winter cold and changeableness and summer heat and drought. There are, however, other species which do not grow well in our American climate, except during more moderate seasons or when placed where the climate is locally modified. Whether the plants one desires to grow be easy or difficult of culture, one should aim first of all for a luxuriant growth, for any time or labor saved by poorly preparing the soil, or any money saved by the use of weak or started plants, will be regretted later. Unless it is intended to imitate the effect of certain barrens in nature, a garden without luxuriance is lacking in an essential quality.

The preparation of ground for planting consists, in the order of their importance: in making the soil by openness and fineness suitable for root penetration to a depth of from 18 in. to 2 ft.; in providing underground drainage at a depth of at least 2½ ft.; in making the soil sufficiently fertile; and in making the surface soil not liable to "baking."

Depth and physical condition of soil are very important, and should be one's first care. If the season is short and work must be rushed, it is better to omit the mounding and to devote all one's energy to securing a deep feeding area for the roots and a fine physical condition of the soil. In the hardy border the roots of plants are able to penetrate far more deeply into the soil than they do usually in a wild state or in ordinary field culture. This vigor of root growth reaching to good depth, as compared with that of equal vigor but nearer the surface, gives not only greater endurance of drought but aids the plant to



1045. A good effect with Rhubarb.

endure changeableness of weather, and particularly adds to its hardiness. There are many plants which are hardy only if protected until the roots are thoroughly established. This is more often noticed with trees and



1046. A mixed Herbaceous border.

strong-rooted plants which are able to penetrate deeply into the subsoil, but the same applies to herbaceous plants, except that it is usually necessary to loosen the subsoil to ensure penetration by their finer roots to a satisfactory extent. It is not necessary to make the subsoil equal in richness to the upper portion, but it should preferably be mixed with a portion of the surface soil.

The fine roots are the feeding roots and the surfaces of the soil particles are their feeding ground, so that in making the soil particles smaller the feeding surface in the soil is increased, thus allowing for more roots and making available a greater part of the plant-food in the soil. A fine physical condition can usually be obtained by turning the soil over a few times. No soil should be turned or handled when too moist to crumble, as the clay in the soil is quick to become puddled, and therefore impervious to feeding roots.

Underground drainage is necessary, since roots cannot grow in soil filled with stagnant water. Where the natural subsoil drainage is not sufficient, artificial means should be used. Unless the drainage is good many plants will be injured during the rainier seasons or killed during winter. Plants that are not firmly established are often easily killed by excess of moisture about the roots during their dormant season; for instance, many bog plants otherwise perfectly hardy will winter-kill if planted late in the fall. A further fact showing the effect of water on dormant roots is that many plants, if cut down low enough in the fall to allow water, as from melting snow, to reach the root through the hollow plant stems, will often be entirely rotted by spring. Thus, when it is necessary to destroy golden-rod the dry stems can be mowed in late fall with a sharp scythe. The vulnerability of the root to water coming through the plant-stem may be easily seen by comparing in the spring roots of corn, the stalks of which were cut at different heights the previous fall.

The subject of feeding plants in general is treated at some length under *Fertilizers* and *Fertility*, which see. In the hardy border no large amount of coarse or highly fermentable material should be used. The enrichment of the soil should, if possible, be made while preparing the border, and any fertilizers used should be well mixed with the soil. Even if a liberal amount of stable manure is available, it is well to use some potash or phosphoric acid in connection with it. A light top-dressing of manure given in the fall will keep up the fertility of the soil and afford a slight winter protection, which is appreciated by even the hardiest plants. Over-richness as well as poverty

of soil tend to make plants in general less hardy, but usually a great abundance of plant-food should be given, especially for the hardier species, with vigorous constitutions and long season of growth. Many plants having a season of rest in late summer do best in soil not overly rich, especially if the position be moist.

A loose and open surface soil prevents baking after rains and waterings; saves some of the labor necessary to keep the soil open and friable; allows the growth of many smaller, finer-rooted or creeping plants which cannot grow well in a stiff soil; permits the sowing of many annuals in the border. Many low-growing plants are injured on clayey soil by having the under surfaces of the leaves coated with soil by spattering of rain. A clay soil may be made more loose by the addition of manures, sawdust, coal ashes, sand or almost any such material. A light, fine mulch should be kept on the surface of a clay soil.

The points to be borne in mind in planting should be healthy plants, careful planting and sufficient thickness of planting. Plants should be obtained which have not been stunted, as a weakened plant will never make as good a specimen as if rightly treated from the start. When plants are received from the nursery they may be heeled-in if necessary, but every day plants are left where they have no root hold on the soil is an injury to them, in proportion to the suitability of the weather for root growth. If plants must remain any considerable length of time before being placed in their permanent position, it is best to plant them in reserve ground, and to remove them when desired with balls of earth.

Symmetry of top growth is to some extent, at least, dependent on symmetry of root growth, so that by careful planting the roots not only become more quickly and strongly active, but give us hope for a more symmetrical plant than can be obtained by careless planting. The proper way to place a plant in the ground is equally to distribute the roots about the plant, leaving the tips pointed downward, and then to firm the soil sufficiently about the roots.

A perennial border should be planted rather thick, so that when in foliage it shall appear as one mass. Any showing of soil between plants is not only unattractive, but destroys the beauty of the border as a whole.

Winter Protection of Herbaceous Perennials.—The protection of species not reliably hardy may be accomplished with any material suitable for keeping out frost which is not naturally too moist or close. The material should preferably be heaped over the crown of the plant, to shed part of the rain as well as to prevent quick changes of temperature, or to wholly exclude frost, as the plant may need.

The material to be used will be decided by the plants



1047. An Herb-covered rock work

to be protected, by what is on hand or easily obtainable, and by the presence or not of mice or other vermin, which often work under such material as straw and destroy the plants. Protected plants should be examined

during the winter, and if mice are present they may be killed or driven away by placing a few drops of carbon bisulphide in each hole found. (This is also a good way to rid coldframes of these pests. Plenty of ventilation should be given at the time, as the gas evaporated is destructive to vegetation. As the gas is heavier than air, it sinks for the most part down the holes.) If, however, mice are not troublesome, there is no better material for keeping out cold and shedding water than straw. Nature's plan for plant protection is to use the foliage and stems of the plants themselves, the whole ground surface being covered as the weather grows colder with successive coatings of snow, which protection again grows lighter as spring approaches. This is still the ideal winter protection for plants, but snows are likely to disappear in midwinter, and mice are well adapted to live under nature's laws. Where mice are

troublesome a light material may be made by composting leaves, manure rakings from lawns, greenhouse waste, weeds not in fruit as pulled during the season, and the like. The material should be earthy enough to keep mice out, and loose enough to permit of easy removal in spring. It should also be loose enough not to hold too much water in winter. Sawdust and charcoal are examples of such material. Most of the plants that are largely cultivated need no protection, but all herbaceous perennials, unless they are evergreen or easily smothered, are benefited by a slight covering to protect the soil from alternate freezing and thawing. When the plants are evergreen a covering to supply shade is often desirable. Other plants, such as *Helianthus decapetalus* fl. pl., really need protection, not to exclude frost, but to lessen considerably the severity of the winter. Still others, as many of the lilies, are best covered to the exclusion of frost. In general, the plants we endeavor to grow which need complete protection have crowns below the surface, and so may be covered with any amount or kind of material. When it is desired to thoroughly protect crowns on the soil surface, flats may be first placed over the crowns before adding the protection.

Late fall plantings should, in almost all cases, be protected to some extent, since plants are less hardy when poorly established in the soil.

Propagation of Herbaceous Perennials.—The methods of propagation most used are by seed, by plant division, and by cuttings.

Propagation by seed is generally not of use for the perpetuation of horticultural varieties, though to a varied extent with different species any variety tends to reproduce its varietal characteristics more perfectly the longer it becomes established as a variety. However, some of our garden



1049. A tame-wild corner. Asparagus and Boneset.

plants have been separated into their present number of varieties or forms mainly by continual propagation by seed and plant selection, and such may be satisfactorily increased by seed. An example might be taken in the hollyhock, although, if a group be left to reseed itself, or no seed selection be maintained, it will soon become mainly composed of single-flowered plants by reason of their greater seed production. In general, propagation by seeds is satisfactory for all established species and for such varieties and forms as have been thoroughly established either by nature's slow processes or by man's continual selection.

Seed-sowing is not, however, always an easy way to increase many of our garden plants, as there are often a few small items necessary to know concerning a species before success can be assured. Seeds of some perennials remain dormant for a long season after sowing, and, in general, they are very much slower in starting than annuals. Some require more heat than others to germinate, while others require a very cool soil. Many plants brought into cultivation from foreign countries or milder parts of our own land do not produce seed which will remain sound over winter in the soil, nor do seedlings of all hardy perennials withstand the colder season: for instance, *Papaver orientale*, a hardy plant itself, produces a great quantity of seed which germinates readily as it falls, but the seedlings will not survive the winter unprotected.

A general rule for seed sowing would read: Sow the seed when ripe, and then maintain such conditions of temperature and moisture as the seed would receive in the native habitat of the plant.

Native American plants not from decidedly milder parts and many foreign species may be easily increased by sowing of seed when ripe in the open ground. Among such might be included *rubbeckia*, *aquilegia*, *coreopsis*, *monarda*, *asters* (perennial), *delphinium*, *digitalis*, *Dianthus barbatus*, and *phlox*, all of which will bloom the following season.

Plants generally have one or rarely two particular seasons for blooming, and unless of sufficient size and suitable condition when that season approaches they will wait for its recurrence before showing flowers; so that by sowing seed early in the spring and giving good cultural attention to the plants, we may expect to flower many plants naturally blooming late in the year, or such as are somewhat floriferous at nearly all seasons: for instance, *Lobelia cardinalis* and other *lobelias*, many native *asters*, *Guillardia aristata*, *Bellis perennis*, etc.



1048. A rear corner, embellished with weeds.

The propagation of plants by division is simply the separation of a larger clump of roots and crowns into smaller plants. In the case of plants having buds on the roots, this division may be carried further, and small pieces of the root used to grow other plants.

The separation of plants as practiced in the garden is not usually so much for the purpose of increase as to avoid over-crowding of roots and crowns, with loss of vigor to the plant; for instance, a plant of iris having been undisturbed for a number of years, becomes a tangled circular mat of rootstocks, which in the center cannot find room to grow, and so the plant appears as a large clump of roots, throwing up foliage only on the outer ring. The period during which a plant may remain in any one place without needing separation will vary with the vigor of growth of the plant in each position; for instance, a group of plantain lily in a favorable situation will need separation every two years, while in a poorer place it might remain four. However, the average length of time for a few typical species may be given thus: *Bellis perennis*, pompon chrysanthemums, and other strong-spreading, shallow-rooted and easily established plants do best with yearly separation; *Phlox maculata* and monarda every two years; helianthus, asters and many of the composite and *Phlox decussata* about every three years; *Convallaria majalis* and many spring-flowering bulbs every four years; while such plants as peonies may be left for a longer period.

In general, better flowers are obtained from a plant with but one crown than when two or more are left, but unless the new growths are crowding out the central portions or are themselves too numerous to make a vigorous growth possible, division is not necessary. In fact, many plants require a better establishment in the soil than can be given by transplanting or than they can quickly obtain, and such are best undisturbed until quite over-crowded. The question is whether by dividing a plant better flowers and foliage may be obtained than by allowing it to become more thoroughly established.

The time of the year for separation will vary as to the blooming season of the plant; that is, for early-blooming plants late summer or early fall, and for late-blooming plants either late fall or spring, preferably the latter, as many otherwise hardy plants are either weakened or killed if disturbed in the fall.

Propagation by cuttings is rarely useful for the amateur, in the case of herbaceous perennials, but it is an important commercial method. Plants may be obtained from almost any plant having foliage stems by taking a short piece of the growing wood with a bud, either lateral or terminal, and placing the lower end in moist sand or other material suitable for root growth. It is usually necessary to have the lower end of the cutting a node of

the stem, and to make the temperature of the material in which it is placed higher than that of the atmosphere (which is the relation of the soil and air in sunshine), and to diminish the evaporation from the exposed parts of the cutting by maintenance of a moist atmosphere



1051. A healthy clump of Joe Pye Weed.

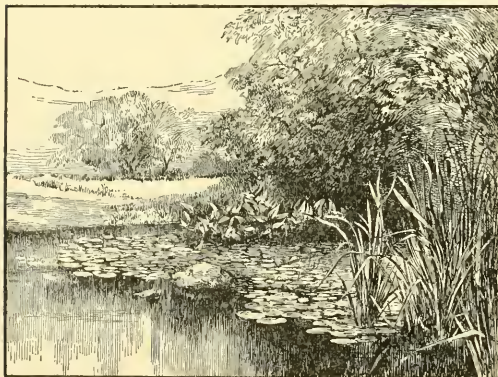
and by removal in part of the foliage on the cutting. Some experience will be necessary to know the best temperatures for sand and atmosphere and the most desirable degree of ripeness in the wood to be taken, as they will vary somewhat with species. In general, any cutting of growing wood will form roots in moist sand at a temperature suitable for vigorous root growth of the plant. The increase of plants by cuttings has the advantages of being rapid and of allowing the perpetuation of any variation noticed on a portion of any plant. See *Cutting*.

Whichever method of propagation is used, selection of stock for increase should be practiced. If by seed, then the best seed from the best plant should be taken. It is considered by many growers that seeds borne the least number of nodes from the root tend to produce dwarfer and earlier-blooming plants, while the opposite is equally certain. All plants vary, and often the seeds which will produce the most striking variations are the slower to germinate and weaker as seedlings, but any mistreatment of young plants is apt to be against any desirable improvement. The double flowered and highly colored forms of our garden plants are generally the results not only of intercrossing of species or selection, or both, but of intense and perfect culture. A poor, starved plant may not retrograde itself, but it is apt to produce seed which will vary to suit its location.

In propagating by division, the aim should be not only to secure vigorous plants but to select for increase such plants as appear to be the best. Cuttings also should be obtained from selected plants—and the more so since the method is rapid.

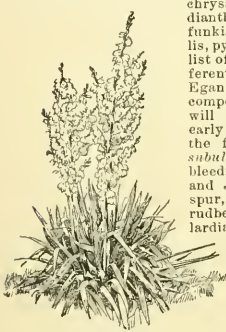
F. W. BARCLAY.

THE MOST POPULAR KINDS.—If all hardy herbaceous perennials were divided into 3 groups, based upon their popularity, the first group would perhaps include 10-12 kinds, the second 30-50, and the third would be too numerous to list in detail. Several of the largest dealers in these plants were asked for such selections, basing their judgment on actual sales and general experience. Replies were received from Ellwanger & Barry, J. Woodward Manning, and the Shady



1050. Pool made attractive by planting of Herbs.

Hill Nursery Co. These reports agree as to the 6 most popular hardy herbaceous perennials. These are anemone, hollyhock, larkspur, iris, peony, phlox. The next 4 favorites are columbine, poppy, rudbeckia and sunflower. These are probably the 10 most popular plants of their class in America. To fill out the list to a dozen, one might choose 2 of the following 10:



1052. A good subject—
Yucca filamentosa.

chrysanthemum, coreopsis, dianthus, dicentra, eulalia, funkia, gailardia, hemoerocalis, pyrethrum. The following list of 12 is selected on a different principle by W. C. Egan, who writes that a bed composed of the following will produce flowers from early spring to late fall in the following order: *Phlox subulata*, lily-of-the-valley, bleeding heart, iris (German and Japanese), peony, larkspur, platycodon, phlox (tall), rudbeckia Golden Glow, gailardia, *Boltonia latifolium*, sunflower. In the South the 12 most popular kinds would make a very different list. P. J. Berekman writes that the following are hardy at Augusta, Ga., and are probably most popular in the South: Canna, carnation, chry-

santhemum, dahlia, helianthus, verberna, German iris, Japanese iris, funkia, violet, phlox, hollyhock.

An analysis of 4 northern lists gives the following 33 as favorites of the second rank. The agreement would have been much closer if bulbs, grasses and subshrubs had been excluded:

Achillea,	Gailardia,	Monarda,
Aconitum,	Geranium,	Oenothera,
Alyssum,	Gypsophila,	Platycodon,
Asclepias,	Helenium,	Ranunculus,
Aster,	Helleborus,	Sedum,
Astilbe,	Heuchera,	Silene,
Boltonia,	Hibiscus,	Spiraea,
Campannula,	Iberis,	Statice,
Dicentra,	Kniphofia,	Trollius,
Dietamnus,	Lobelia,	Veronica,
Digitalis,	Lycblis,	Vinca.

W. M.

SELECTIONS FOR SPECIAL PURPOSES.—The following lists are intended to be suggestive, not complete (not all of them in Amer. trade):

1. *For shady places*.—Only those which really need shade are here mentioned. Other important kinds succeed in full sunlight and also in partial shade.

A. *Requiring deep shade.*

Anemone alpina,	Cortusa Matthioli,
" dichotoma,	Hepatica,
" nemorosa,	Hornium Pyrenaicum,
" sylvestris,	Oursia coccinea (stiff soil).

AA. *Requiring partial shade.*

Actea,	Liparis,
Adonis,	Lycblis fulgens,
Anemone Apennina,	" Haageana,
" Caroliniana,	Omphalodes Lucida,
" ranunculoides,	" verna,
Arisaema,	Orchis spectabilis,
Arnebia echinoides,	Phlox divaricata,
Argemone Italicum,	Ranondia,
" maculatum,	Ranunculus acontifolius,
Calypto (moist),	Saxifraga,
Goodyera,	Tiarella,
Habenaria,	Trillium,
Helleborus,	

2. *For dry places*.—The following will endure extremely dry locations, and are therefore desirable for naturalization. They can endure neglect and drought:

Alyssum,	Draha
Antennaria,	Erinus sagittalis,
Asclepias tuberosa,	Genista agnifolius,
Carlina,	Helianthemum,
Cheiranthus alpinus,	Linaria,
Dianthus arenarius,	Reseds glauca.

The following are desirable for dry situations, but are not as hardy in this respect as the preceding:

A. *Blooming in spring.*

Jethonema,	Hepatica,
Anemone Caroliniana,	Iberis,
" nemorosa,	Iris pumila,
" Pulsatilla,	Lotus corniculatus,
Cerastium,	Saxifraga,
Daphne Cneorum,	Peony,
Erysimum,	Phlox (creeping).

AA. *Blooming in summer.*

Anthemis,	Galtonia,
Aquilegia,	Gypsophila,
Arenaria,	Heliotropis,
Aster amellus,	Hieracium,
Campannula,	Inula,
Coronilla Iberica,	Iris Germanica,
Cytisus,	Ononis,
Dietamnus,	Pyrethrum Tchihatchewi,
Eryngium,	Statice,
Euphorbia corollata,	Yucca.

AAA. *Blooming in autumn.*

Aster,	Erodium,
Calandrinia,	Galalia,
Callirhoe,	Geranium Ibericum, etc.,
Cassia,	Helianthemum,
Centaurea dealbata,	Linum,
Coronilla varia,	Oenothera,
Corydalis,	Platycodon,
Desmodium,	Sedum.

3. *For moist and wet places*.—In the following subgroups those marked with a star (*) demand the treatment indicated; the others will also thrive with a less degree of moisture:

A. *Near the water's edge.*

Acorus,	Monarda didyma,
Anemone Apennina,	Myosotis,
" rivularis,	Polygonum amphibium,
" Virginiana,	Sachalinense,
*Butomus,	*Ranunculus aquatilis,
*Calla palustris,	" fluitans,
*Carex riparia,	" hederaceus,
*Iris pseudacorus,	Typha.
" levigata,	

AA. *Moist grounds.*

Achillea Ptarmica fl. pl.,	Helenium,
Aconitum,	Lobelia,
Anemone alpina,	Lithrum,
" palustris,	Mertensia,
*Arenaria Balearica,	Phlox divaricata,
Arisaema,	Podophyllum Emodi,
Arnica,	Polygonatum,
Arnica,	Polygonum,
Arundo,	Primula,
Astilbe,	Pyrethrum uliginosum,
Boltonia,	*Saxifraga rivularis,
*Cardamine pratense fl. pl.,	" umbrosa,
Chelone,	" Virginicensis,
Umicifraga,	Spiraea,
*Corydalis solida,	Trillium,
Dodecatheon,	Trollius.
Funkia,	

4. *For carpets and edgings*.—The following are all more or less low and dense:

A. *Blooming in spring*

Jethonema,	Heuchera (spring to fall),
Ajuga,	Iberis,
Alyssum,	Lotus corniculatus,
Arabis,	Phlox amoena,
Armeria (spring to fall),	" reptans,
Asperula,	Asperula,
Aubrietia,	Polemonium,
Daphne,	Viola cornuta (spring to fall),
Erysimum,	

AA. *Blooming in summer.*

Achillea Clavenna,	Hieracium,
Arenaria,	Saponaria,
Aster alpinus,	Silene acaulis,
Campannula (dwarf),	" subulata,
Dianthus,	" alpestris,
	Elisabethae.

AAA. *Blooming in autumn.*

Achillea aurea,	Ceratostigma Larpentae,
Armeria,	Silene Schaffte,
Erodium,	Tinnia Saxifraga,
Helianthemum,	Viola cornuta.
Heuchera,	

5. For cut-flowers. — In the following lists 1 stands for spring, 2 for summer, and 3 for autumn:

A. Blooming in spring.

Æthionema,	Omphalodes,
Alyssum,	Papaver (1-2),
Anemone sylvestris,	Peony,
Astilbe (1-2),	Phlox divaricata,
Centaurea montana,	Primula,
Doronicum,	Pyrethrum hybridum
Hesperis (1-2),	(1-2),
Hebeche (1-3),	Pyrethrum Tchihatchewi
Iberis,	(1-3),
Lycinus Viscaria,	Ranunculus (1-2),
Lupinus (1-2),	Spiraea (1-2),
Mysotis (1-2),	Viola odorata.

AA. Blooming in summer.

Anthericum Liliastrum,	Gypsophila,
Aquilegia,	Hemerocallis,
Campanula,	Iris,
Centaurea Ruthenica,	Linaria,
Cheiranthus,	Rudbeckia,
Clematis,	Statice,
Delphinium,	Traleticum,
Dianthus,	Trollius,
Eryngium,	Valeriana,
Euphorbia,	Veronica.

AAA. Blooming in autumn.

Achillea (2-3),	Heuchera (1-3),
Aronium (2-3),	Lilium (2-3),
Anemone Japonica,	Lycinus Flos-cucullii,
Anthem. tinctoria (2-3),	" vespertina,
Arenaria graminifolia,	Phlox paniculata,
Aster,	" suffruticosa,
Boltonia,	Platycodon (2-3),
Cedronella,	Polygonum affine,
Centranthus,	" cuspidatum,
Chrysanthemum maxi-	Pyrethrum uliginosum,
imum (2-3),	Salsvia farinacea (2-3),
Coryopsis (2-3),	Saponaria (2-3),
Crococmia,	Saponaria (2-3),
Gaillardia (2-3),	Senecio (2-3),
Helianium (2-3),	Stokesia (2-3),
Helianthemum (2-3),	Viola cornuta (2-3).

6. For bold effects. — The following have striking and characteristic habit, and are desirable for prominent positions as single specimens or as exclusive groups. Some are foliage plants, the flowers being inconspicuous or not to be counted upon. Tall means 5 ft. or more; the others are of medium height, 2-4 ft.:

A. Flowers incidental.

Acanthus,	Ferula,
Arundo (tall),	Gunnera (tall),
Bamboos,	Heracleum (tall),
Elymus (tall),	Polygonum (tall).

AA. Flowers more or less conspicuous.

B. Tall.

Boeonia,	Erianthus,
Cephalaria,	Euhalia,
Cnicifraga,	Hellianthus argyralis,
Crambe,	Rudbeckia Golden Glow.

BB. Medium.

Anemone Japonica,	Punkia,
Bamboos,	Ligularia,
Clematis recta,	Symphytum (variegated),
Dictamnus,	Yucca.

7. For forcing and greenhouse decoration. — The following are good subjects for potting. Helleborus and Saxifraga can be forced for Christmas. Those in the first list can be forced for Easter. Those in the second list are desirable for indoor decoration between Easter and the burst of spring outdoors:

A. For forcing.

Alyssum,	Lycinus Flos-cucullii,
Arabis,	Lycinus Viscaria,
Astilbe,	Saxifraga,
Cheiranthus alpinus,	Peony,
Dianthus,	Polygonatum multiflo-
Funkia (variegated),	Primula, [rum,
Heuchera sauginea,	Spiraea,
Iberis,	

AA. For indoor decoration.

Acorus gramineus,	Hepatica,
Aster alpinus,	Mysotis,
Abrietta,	Phlox amurensis,
Campanula,	" reptans,
Dodecatheon,	" subulata.

J. B. KELLER.

HERBS, ORNAMENTAL. See *Herbaceous Perennials*.

HERBS, POT. See *Greens*.

HERBS, SALAD. See *Greens* and *Salad Plants*.

HERCULES' CLUB. *Aralia spinosa*. Also *Zanthoxylum Clava-Herculis*.

HERMODACTYLUS (Greek, *Mercury's fingers*; from the arrangement of the tubers). *Iridaceæ*. SNAKE'S-HEAD IRIS. This is a hardy tuberous plant closely allied to Iris, the fls. purplish black and green, of a quaint and peculiarly attractive beauty. The plant is procurable from Dutch and Italian growers. The genus differs from Iris only in the 1-celled ovary with 3 parietal placentæ; Iris has a 3-celled ovary.

tuberosus, Salisb. (*Iris tuberosa*, Linn.). Tubers 2-4, digitate, 1 in. long; stem 1-fl'd., 1 ft. or more high; lvs. 2-3, glaucous, 4-angled, 1-2 ft. long; outer perianth segments 2 in. long, dark purple; inner ones green. Apr. B.M. 531. F.S. 11:1083. G.C. 11. 23:672.

J. N. GERARD.

HERNANDIA (Francisco Hernandez, physician to Philip II of Spain, traveled in West Indies 1593-1600, and wrote on natural history of Spain). *Laurææ*. JACK-IN-A-BOX. This includes *H. ovigera*, a tree from Mauritius, which grows 40 ft. high, and is cult. in S. Calif. by Franceschi, who says it has light green, glossy lvs. with a red spot in the center, and large, whitish, egg-shaped fruits. The genus has 9 widely scattered species of tropical trees; lvs. alternate, entire, ovate or peltate, 3-7-nerved; fls. in a loose panicle, the extreme branches terminated by a 4-5-bracted involucre. Of the 3 fls. in an involucre, the central one is pistillate and sessile, the lateral ones staminate and pedicelled. *H. sonora*, Lam., from India, is much used in Europe for subtropical bedding, and produces a juice that removes hairs from the face without pain. Its staminate fls. have their parts in 3's or 4's and the filaments have one gland at the base, while in *H. ovigera* the floral parts are always in 3's and there are two glands at the base of each filament. *H. sonora* has peltate or cordate lvs. 7-12 in. long and 4-6 in. wide.

ovigera, Linn. Lvs. 6-7 in. long, 4½-6 in. wide, oblong, acuminate, palminnerved; fr. an egg-shaped drupe, borne on a stalk and obscurely ribbed.

HERNIARIA (Greek; supposed to cure hernia or rupture). *Illecebrææ*. HERNIARY. RUPTURE-WORT. This includes a hardy herbaceous perennial plant, which grows about 2 in. high and produces inconspicuous greenish fls. in summer. It makes a dense mat of moss-like foliage, which turns a deep bronzy red in winter. It is much used in carpet-bedding and to a less extent in rockeries and for edgings of hardy borders. Recommended for covering graves. It thrives in the poorest soils, makes a solid covering, and is by some regarded as one of the most valuable of hardy trailers. Prop. by division or seed. Grows wild in England, and is kept in many large collections of hardy plants.

The genus has 8-23 species, which are widely scattered, but all grow in sandy places, chiefly near the sea. It has no near allies of great garden value, but 2 species of Paronychia are cult. for the same purpose and are easily told apart by general appearance. *Herniaria* and *Paronychia* are alike in their 5-parted perianth and 2 stigmas, but in *Herniaria* the segments are blunt, while in *Paronychia* they are hooded near the apex and have a horn or small sharp point on the back near the apex. *Herniaria* is composed of annuals or perennials with roots of short duration, and they are all much branched, trailing plants, either glabrous or hirsute; lvs. opposite, alternate or clustered, small, entire; fls. minute, crowded in the axis; sepals, petals and stamens 5: seed solitary.

glabra, Linn. Lvs. obovate, rarely orbicular, glabrous except a few hairs at edges, which are usually recurved; fls. in a leafy spike or the lower ones at considerable intervals. July, Aug. Eu., Asia. W. M.

HESPERANTHA (Greek, *evening flower*). *Iridaceae*. Twenty-six species of Cape bulbs, 3 of which are procurable from Dutch growers. They belong to the *Ixia* tribe and are much inferior to *Ixia* for general cultivation, but have fragrant flowers, opening at evening. The genus is still more closely allied to *Geissorhiza*, and differs only in having longer style-branches and spathe-valves always green instead of sometimes brownish above. The corms are $\frac{1}{2}$ in. thick or less: lvs. 2-5: fls. 2-10 in a lax, distichous spike; inner segments white; outer ones red outside. For culture, see *Ixia* and *Bulbs*. Mon. by Baker in *Irideae*, 1892, and in *Flora Capensis*, vol. 6, 1896-7.

A. *Foliage hairy*.

pilosa, Ker. Corm globose: lvs. 2, linear, erect, strongly ribbed, 3-6 in. long: outer segments claret-red. B.M. 1475 (outer segments speckled with color).

AA. *Foliage not hairy*.

B. *Lvs. spreading, 2-3 in. long*.

falcata, Ker. Corm conic: lvs. 2-4, lanceolate: outer segments claret-red. B.M. 566, as *Ixia falcata*.

BB. *Lvs. erect, 4-6 in. long*.

graminifolia, D. Don. Corm globose: lvs. 3-5, linear: outer segments reddish brown. B. M. 1255, as *Grissorhiza setacea*.

HESPERIS (Greek, *evening*, same root as *vesper*; flowers more fragrant at evening). *Cruciferae*. This includes the Dame's Rocket, a vigorous, hardy herbaceous perennial plant, forming clumps 2-3 ft. high, branched from the base, and covered with showy terminal pyramidal spikes of 4-petaled flowers, resembling stocks. The colors range from white through lilac and pink to purple. The double forms are most popular. Rockets bloom from June to Aug., and have long been cult. in cottage gardens. J. B. Keller writes: "The ordinary single forms are not worth growing in the border, but may be used in wild gardens. The double Rockets are considered amongst the best hardy plants, being very productive of bloom and extremely useful for cutting."

The genus has about 20 species in Europe, Asia Minor and Siberia. Herbs, biennial or with a stem that is perennial at the base, pilose, the hairs simple, forked or glandular: stem-lvs. usually sparse, ovate or oblong, entire, dentate or lyrate: fls. in loose racemes, often fragrant; petals 4, long-clawed: pods long, linear, cylindrical: seeds numerous, winged or not. The genus is allied to the stocks, but has a somewhat different habit and the hypocotyl incumbent not accumbent.

matronalis, Linn. ROCKET. SWEET ROCKET. DAME'S VIOLET. DAMASK VIOLET. Fig. 1053. Lvs. ovate-lanceolate, 2-3 in. long, toothed: pods 2-4 in. long, straight, much contracted between the seeds. Eu., N. Asia. Escaped from gardens in Eng. Gm. 53, p. 293 and 49, p. 339 (a lovely garden view). W. M.

HESPEROCALLIS (Greek, *evening beauty*). *Liliaceae*. This genus of only one species belongs to the group of desert plants of the Lily family, of which the common *Yucca filamentosa* is the best hardy type. It is a native of Colorado, and is also said to grow in Calif. and Mex. Franceschi writes that the large, waxy white or greenish fls. are very fragrant, and that the bulb should be deeply planted in perfectly drained soil. This genus, like *Yucca* and *Cordylina*, has an indefinite number of ovules in each cell, while in *Dracena* the ovules are solitary and in *Dasyliirion* 3 in each cell. *Hesperocallis* bears its fls. in an unbranched raceme, while the other genera named here bear their fls. in panicles. All have woody stems. Other important generic characters of *Hesperocallis* are the funnel-shaped perianth and the loculicidal dehiscence of the capsule.

undulata, Gray. Bulb large, corm-like: stem stout, 1-2 ft. high, 5-8 fld.: lvs. linear, fleshy, keeled, 3-6 lines wide, wavy margined: fls. $1\frac{1}{2}$ -2 in. long; segments 5-7-nerved.

HESPEROCHIRON (Greek, *hesperos*, originally evening, but here western, i. e., in the direction of the setting sun, and *Chiron*, a centaur distinguished for his knowledge of plants; hence "Western Centaury," these plants belong to first placed in the Gentian family). *Hydrophyllaceae*. A genus of 3 species of northwest American tufted perennial herbs with scapes bearing solitary, rather large whitish fls. The nearest allied genera of garden value are *Phacelia* and *Emmenanthe*, which are



1053. Dame's Rocket or Sweet Rocket—*Hesperis matronalis* (X $\frac{1}{2}$).

very distinct in color of fls., general appearance and cymose inflorescence. It is still doubtful whether *Hesperochiron* is in the right order. Dwarf, stemless perennials or possibly biennials: lvs. entire, spatulate or oblong: fls. purplish or nearly white, with parts normally in 5's, rarely in 6's to 7's; style 2-ent; capsule 1-celled, loculicidal, 15-20-seeded: seeds minutely netted or wrinkled. Procurable through Californian specialists and collectors.

A. *Corolla lobes shorter than the tube*.

Californicus, Wats. Lvs. numerous: corolla somewhat oblong, bell-shaped. Hills and meadows. B.R. 10:833 (as *Nicotiana nana*).

AA. *Corolla lobes longer than the tube*.

pumilus, T. C. Porter. Lvs. fewer: corolla nearly wheel-shaped; tube densely bearded within. Springy and marshy grounds in mountains. W. M.

HESPEROSCORDERUM. Consult *Brodiaea*.

HETEROCENTRON. See *Heeria*.

HETEROMÉLES is included in *Photinia*.

HETEROPAPPUS (Greek, *two kinds of pappus*). *Composita*. This includes a plant that lovers of our native *Asters* and *Boltonias* should not neglect. It is a hardy herbaceous perennial plant that bears azure-blue aster-like fls. in summer. The genus is closely related to *Aster*, having the habit of the *Asters* of the section *Calimeris*. The plant in the trade is known as *Calimeris Tatarica*. *Heteropappus* is closely related to *Boltonia* and is not far from *Callistephus*, which contains the China *Asters*. The chief botanical distinction resides in the pappus, which in the large group containing *Callistephus* and *Aster* is composed of numerous bristles arranged in one or more series, while *Boltonias* and *Heteropappus* belong to a group in which the pappus is anomalous. In *Boltonia* it is composed of very short, somewhat chaffy bristles, with the addition usually of 2-4 awns not longer than the akene. In *Heteropappus* the pappus of the rays is composed of very short, somewhat chaffy bristles, while in the disk fls. it consists of numerous slender bristles arranged in 1 or 2 series.

Heteropappus is a genus of 2-4 species from Japan and China. Herbs, erect, branched above: lvs. alternate, entire or coarsely toothed; heads in loose irregular panicles or solitary at the tips of branches: rays white or sky blue. See *Calimeris*.

hispidus, Less. (*Callimeris Tatarica*, Lindl.). Stem roughish: lvs. linear, acute, pubescent; branches spreading, usually unbranched and bearing 1 head: involucre scales acuminate, hirsute, herbaceous, not white-margined. Japan. Sandy places of Mongolia.

HETEROPHRAGMA (Greek, *an odd kind of capsule*). *Bignoniaceae*. This includes a tropical tree that is very rare in cultivation. It grows 30-50 ft. high, with 5-7 leaflets, which are 7-9 in. long and about 5 in. wide, and swelling tubular 5-lobed fls. 2 in. wide and densely woolly outside. The plant was once offered in this country as *Bignonia adenophylla*, but *Bignonia* belongs to a tribe in which the dehiscence of the capsule is septifragal or septicial, while *Heterophragma* belongs to a tribe in which the dehiscence is loculicidal. *Heterophragma* is a genus of 3 species of trees from India and Africa. Lvs. opposite, arge, pinnate: fls. rosy, yellow or orange, glabrous or tomentose outside; calyx irregular, 3-5-lobed during anthesis: capsule long, cylindrical or compressed, falcate or twisted, loculicidally 2-valved; septum flat or 4-angular: seeds winged on both sides.

adenophyllum, Seem. (*Bignonia adenophylla*, Wall.). Leaflets broadly elliptic, pubescent when mature: fls. brownish yellow, densely woolly: capsule cylindrical, twisted, 1-3 ft. long, 1 in. wide, resembling a cork screw. India.

HETEROSMILAX (Greek, *another kind of Smilax*). *Liliaceae*. This includes an ornamental climber with the habit of *Smilax*, but the perianth is undivided (instead of 6-parted, as in *Smilax*) and the mouth is minutely dentate. It resembles *Smilax* in having dioecious fls., borne in umbels and tendril-bearing stalks. The genus contains 5 species of woody climbers from India, Malaya, China, and Japan: lvs. 3-5-nerved: fls. small or very small. Latest monograph in Latin in DC. Mon. Phan. I:41 (1878).

Japonica, Kunth. Lvs. with stalks about $\frac{1}{2}$ in. long, blades about 4-5 in. long; staminate fls. unknown. Japan, where it is cult. for the roots, which are used in medicine.

HETEROSPATHE (Greek, *a different kind of spathe*). *Palmaceae*. Also written *Heterospatha*. A genus of only 1 species, native of the small island of Amboyna, the Dutch headquarters in the East Indies. It is said by Sander and Co. to be a rare and highly ornamental palm, with graceful, spreading habit and pinnatisect leaves, the segments being long, slender and tapering. Its nearest allies of garden value are *Verschoffelia* and *Dypsis*, in which the stigmas are basilar in fruit, while

Heterospatha belongs to a group in which the stigmas are eccentric or lateral in fruit. Other important generic characters are the 6 stamens with versatile anthers and the 1-celled ovary. The plant is procurable from importers and from S. Fla.

elata, Scheff. Tall, unarmed: lvs. terminal, long-petioled, equally pinnatisect; segments numerous, lanceolate, narrowed at both ends, acuminate, 1-nerved, margins thickened and recurved at the base; rachis round on the back, flat on the face; sheath short, fibrous, swelled at the base; spathe 2, the lower 2-crested, the upper much longer. A very worthy palm.

HEUCHERA (Johann Heinrich von Heucher, 1677-1747, professor of botany at Wittenberg). *Saxifragaceae*. This includes *H. sanguinea* which probably ranks among the half-dozen best plants with small, red flowers. It is very desirable for the hardy border, where it blooms from spring to late fall. It is also useful to florists for cut-flowers and for forcing. All the *Heucheras* resemble our dainty wild flower, the Bishop's Cap (*Mitella*) in their habit, as they have a tuft of heart-shaped, 5-9-lobed, crenate leaves, from which spring a dozen or so slender scapes a foot or more high with small fls. borne in panicles, giving a delicate and airy effect.

Heuchera belongs to a group of genera including *Mitella* and *Tiarella*, in which the ovary is 1-celled. In *Heuchera* the petals are 5 or 6, and entire; in *Mitella* 5, 3-rid or pinnatifid; in *Tiarella* 5 and entire. *Heuchera* has 5 stamens; *Mitella* 5 or 10; *Tiarella* 10. The capsule of *Heuchera* is inferior, 2-beaked; in *Mitella* superior, not beaked; in *Tiarella* superior, compressed. *Heuchera* has about 20 species, all North American and ranging from Mexico to the arctic regions.

The attractive and petal-like portion of *H. sanguinea* is the calyx, the petals being small in all *Heucheras* (often shorter than the calyx). The other species are attractive by reason of their general habit, and particularly the graceful, open panicle. *H. sanguinea* came into prominence about 1884 and is now, according to J. B. Keller, one of the most popular of hardy perennials. The others are procurable from the largest dealers in native plants and from western collectors. They range from 3 in. to 3 ft. high, averaging about $1\frac{1}{2}$ ft., and bloom in summer, having greenish white or purplish fls. J. B. Keller writes that almost any good garden soil suits them, and that they are not particular as regards exposure to sunlight (though an open situation is preferable), and that they look well in borders, rockeries, separate beds and elsewhere. Prop. by division or seed.

A. Stamens and styles included (or in *H. pubescens* scarcely exerted).

B. Scapes hairy.

C. Inflorescence a panicle.

D. Calyx not prominently oblique, i.e., the lobes equal or nearly so.

E. Margin of lvs. pointed, with distinct teeth.

sanguinea, Engelm. CORAL BELLS. CRIMSON BELLS. Height 1-1 $\frac{1}{2}$ ft.; scapes pilose below, glandular pubescent above: fls. typically bright red, but in horticultural varieties ranging from white through pink and rose to dark crimson. New Mex., Ariz. The best pictures are B.M. 6929, Gn. 26:463. Others are Gt. 45, p. 577. L.H. 43, p. 334. Mn. 8, p. 75. A.G. 17:201. R.H. 1898, p. 431. R.B. 22, p. 246. S.H. 2:120. G.C. III. 4:125. P.G. 4:35. Var. **alba** (*H. alba*, Hort.) has pure white fls., and was int. about 1896 by Haage & Schmidt. Var. **splendens**, int. 1898 by the same firm, has dark crimson fls. Var. **robusta**, or **grandiflora**, Hort., according to J. B. Keller, is an improvement on the type, the bells being larger and the color brighter. Var. **hybrida** ("Rosy Morn"), Hort., according to D. M. Andrews, is "more robust than the type, foliage deeper cut and the divisions more pointed: fls. rosy pink." Andrews adds that var. **alba** comes true from seed.

EE. Margin of lvs. with crenations merely acute or blunt.

pubescens, Pursh (*H. rhipifolia*, Fisch. & Avé-Lall.). Height 9-12 or 15 in.: scapes densely glandular pubescent, at least above. Rich woods, Mts. of Penn. to N.

C. B. B. 2: 179. — "Evergreen foliage marbled with bronzy red." — *Woolson*.

DD. *Calyx prominently oblique*.

hispidia, Pursh. Height 2-4 ft. Woods, Va. to Idaho. B. B. 2: 180.

CC. *Inflorescence a spike*.

cylindrica, Dougl. Height 10-24 in. Yellowstone Park westward. B. R. 23: 1924.

BB. *Scapes not hairy*.

C. *Inflorescence a loose panicle*.

parvifolia, Nutt. Height $\frac{1}{2}$ -2 ft. New Mex. to Mont.

CC. *Inflorescence denser, spicate*.

bracteata, Ser. Height 3-6 in. Colo.

AA. *Stamens and styles much exerted, at least at first*.

B. *Length of calyx 3-5 lines*.

rubescens, Torr. Height 8-15 in.; scape usually leafless, glabrous or somewhat scabrous; margin of lvs. ciliate. New Mex. to Nev.

BB. *Length of calyx $1\frac{1}{2}$ -3 lines*.

Americana, Linn. ALUM ROOT. Height 2-3 ft.; scape leafless or with a few small lvs., more or less glandular-hirsute. Dry or rocky woods, Ont. to La. and Minn. B. B. 2: 179. R. H. 1898, p. 431. — "Has mottled foliage." — *Gillet*.

BBB. *Length of calyx 1-1 $\frac{1}{2}$ lines*.

C. *Scape villous, i. e., densely covered with long, soft hairs*.

villosa, Michx. Height 1-3 ft.; scape mostly leafless. Rocky places, Va. to Ga. and Tenn. B. C. 2: 179.

CC. *Scape thinly covered with minute glandular hairs*.

mierantha, Dougl. Height 1-2 ft. Calif. B. R. 15: 1302. R. H. 1898, p. 431.

The following names are seen in trade catalogues but not in Index Kewensis. *H. purpurascens* was advertised 1898, by H. Corveon, Geneva, Switzerland. Plants in American trade are not yet large enough for identification. — *H. Wheeleri* was found in the South some years ago, and Thomas Meehan, who has not examined it closely, says it looks like a form of *H. Canadensis* with variegated lvs.

W. M.

HEVEA (from the Brazilian name). *Euphorbiaceae*. This includes the tree that produces the Para rubber of commerce. The genus contains 11 species of tall trees from Brazil and Guiana, furnishing the milky juice called caoutchouc: lvs. alternate, long-stalked, the 3 leaflets entire, feather-veined, membranous or leathery: fls. small, monoecious. Important generic characters are the 3 leaflets, loose panicles, 5-toothed or 5-lobed calyx, and 5-10 stamens, the filaments united in a column under the rudimentary ovary. The nearest ally of garden value is *Jatropha*, in which the fls. have petals, while *Hevea* belongs to a group in which the petals are lacking. This plant may possibly be cult. under glass for its economic interest in a few botanical collections. It was once advertised by Reasner Bros., Oneco, Fla. The common "rubber plant," extensively cult. North as a house plant, is the East India Rubber Plant, *Ficus elastica*.

Brasiliensis, Muell. Arg. SOUTH AMERICAN RUBBER TREE. Height 60 ft.: lfts. membranous; staminate fls. with buds narrowly ovoid-conical and disc small,

urn-shaped, many-lobed, tomentose; anthers 10, in 2 whorls: floral lfts. 2-3 in. long, elliptic-lanceolate. Brazil.

HEXISEA (Greek, six equal things; because the attractive and bright colored parts of the flower are 6, and of equal size). *Orchidaceae*. Should have been written *Herisia*. This includes a small epiphytic plant which John Saul once advertised as "bearing profuse panicles of bright vermilion flowers twice a year." The genus belongs to a subtribe closely related to *Epidendrum* but with different pollinia. Stems terete or angled, with usually 2 lvs. at the apex of each annual growth. New growths arise in the axils of the lvs., the entire stem being thus made up of long, fusiform, apparently superimposed pseudobulbs, with 2 lvs. at each node. Lvs. few, narrow: racemes terminal, the short-peduncled furnished with overlapping, leathery scales: fls. orange or purple; anthers semi-globose; pollinia 4, in 1 series. Four species, ranging from Mexico to Guiana.

hidentata, Lindl. Height 6-8 in.; stem branched, forming spindle-shaped, many-grooved internodes: lvs. in pairs, 2-4 in. long, 3 lines wide, channelled, notched. Panama. B. M. 7031. G. M. 37: 19.

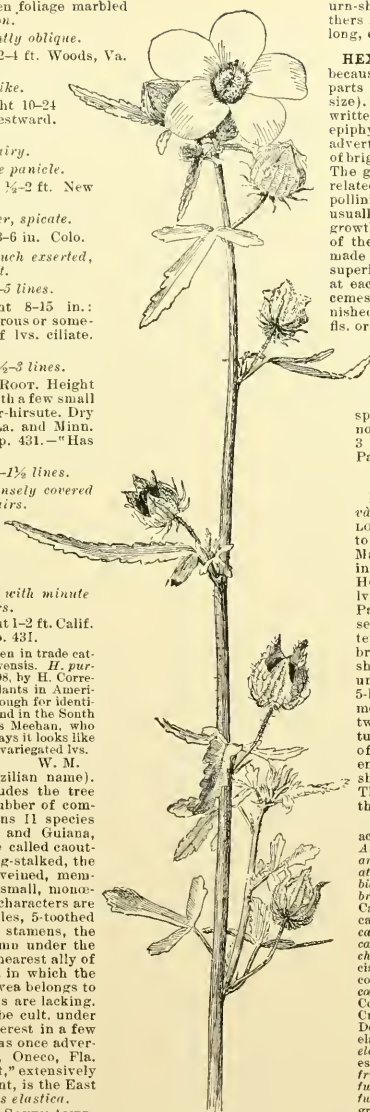
H. HAESELBRING.

HIBISCUS (old Latin name). *Malvaceae*. MARSH MALLOW. ROSE MALLOW. A polymorphous genus, allied to *Gossypium*, *Abutilon*, *Althaea* and *Malva*, the species widely distributed in temperate and tropical countries. Herbs or shrubs, or even trees, with lvs. palmately veined or parted. Parts of the fl. in 5's; calyx gamosepalous, 5-toothed or 5-cleft, subtended by an involucre of narrow bracts; corolla usually campanulate, showy, of 5 distinct petals; stamens united into a 5-toothed column; ovary 5-loculed, bearing 5 styles: fr. a dry, more or less dehiscent capsule. Between 150 and 200 species. Horticulturally, there are four general groups of *Hibiscus*—the annuals, the perennial border herbs, the hardy shrubs, and the glasshouse shrubs. The culture and treatment vary with these groups.

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1054. *Hibiscus vesicarius*—*H. Africanus* of gardens. ($\times \frac{1}{2}$.)



A. Annuals.

B. Plant low and diffuse.

1. *vesicarius*, Cav. (*H. Aricæus*, Hort.). FLOWER-OF-AN-HOUR. BLADDER KETMIA. TRAILING HOLLYHOCK. Fig. 1054. A foot or 2 high, bushy-spreading, the main branches becoming prostrate, usually hispid-hairy: lvs. 3-5-parted, the upper ones 3-parted, with the middle lobe much the largest, the lobes linear-oblong or sometimes widening upwards, coarsely notched, the root-lvs. undivided: fls. solitary in the upper axils, opening wide in the sunshine but closing in shadow, 1-3 in. across, sulfur-yellow or white, usually with a brown eye; pedicel elongating in fr., and the calyx becoming much inflated. Cent. Afr.—An interesting annual, blooming freely throughout the hot weather of summer, and thriving in any open, warm place. Seeds are usually sown where the plants are to stand. Excellent for rockwork.

2. *Triënum*, Linn., to which the above species is usually referred, has much wider and more spatulate and relatively shorter leaf lobes, which are round-toothed or lyrate lobed: fls. smaller. From S. Eu. and Afr. B. M. 209.—Sometimes a weed about cult. grounds.

BB. Plant mostly tall, strict and stout.

3. *Sabdariffa*, Linn. (*H. Rosella*, Hort.). JAMAICA SORREL. ROSELLE. Strong, 5-7 ft. high, nearly glabrous, the stems terete and reddish: root-lvs. ovate and undivided, the upper ones digitately 3-parted, the side lobes sometimes again lobed; lobes lanceolate-oblong and crenate dentate: fls. solitary and almost sessile in the axils, much shorter than the long leaf-stalks; calyx and bracts red and thick, less than half the length of the yellow corolla. Old World tropics.—Widely cult. in the tropics, and now grown somewhat in S. Fla. and S. Calif. for the fleshy calyxes, which, when cooked, make an excellent sauce or jelly with the flavor of cranberry. The green seed pod is not edible. The juice from the calyxes makes a cooling acid drink. Thrives in hot, dry climates.

4. *esculentus*, Linn. (*Abelmoschus esculentus*, Moench). OKRA. GUMBO. Mostly strict, 2-6 ft., the stems terete and more or less hispid: lvs. cordate in outline, 3-5-lobed or divided, the lobes ovate-pointed and coarsely toothed or notched: fls. solitary and axillary, on inch-long peduncles, yellow, with a red center; fr. a long ribbed pod (5-12 in. long), used in cookery. Trop. Asia.—For culture, etc., see *Okra*. A large-fld. form (var. *speciosus*, cf. *H. Manihot*) in Gt. 43, p. 623.

AA. Perennial herbs, mostly grown as border plants.

These plants are late summer and fall bloomers, with hollyhock-like fls. They send up new, strong shoots or canes each year. Many of them are perfectly hardy in the N., but even these profit by a mulch covering. Others are tender in the N., and the roots should be taken up after frost and stored in a dry, warm cellar. Keep them just moist enough to maintain life in them. Many times the roots of these herbaceous species are set in large pots in the spring, and they then make most excellent specimens. All the species require a deep, rich soil and plenty of water.

B. Foliage green and usually glabrous.

5. *Manihot*, Linn. Tall and stout (3-9 ft.), glabrous or hairy: lvs. large, palmately or pedately 5-9 parted into long and narrow oblong-lanceolate dentate lobes: involucre bracts oblong-lanceolate, falling after a time (as does the calyx): fls. large (4-9 in. across), pale yellow (sometimes white), with a purple eye; capsule oblong and hispid. Old World tropics, and spontaneous in S. states. B. M. 1702; 352 (lvs. more cut). S. H. 2:263.—This is apparently the Sunset Hibiscus of the trade; also the Queen of the Summer Hibiscus. In botanical works *H. Manihot* is said to be an annual, but as known to horticulturists it is a perennial. For a discussion of this point as related to the limitations of the species, see G. C. H. 22:249; Gu. 53, p. 127 (and plate 1157). Botanically, the species is allied to *H. esculentus*. Not hardy in the open in the North, but the roots may be taken up in the fall and carried over winter in a warm, dry cellar. In the middle states and South, it may be expected to survive if well mulched. Grows readily from seeds,

blooming late the first year if the seeds are started under glass.

6. *aculeatus*, Walt. Not very stout, 2-6 ft. tall, hispid all over but not tomentose nor whitish: lvs. roundish

1055. *Hibiscus Moscheutos* ($\times \frac{3}{4}$).

or roundish-ovate in outline, 3-5-lobed or -parted, the sinuses often rounded and enlarging, the lobes angled or toothed and blunt: fls. 3-4 in. across, yellow, with purple in the base. S. Car. south.—Not hardy North.

7. *coccineus*, Walt. (*H. speciosus*, Ait.). Green and glabrous throughout, 3-4 ft.: lvs. palmately lobed, or the lowest and sometimes all of them palmately compound, the divisions long-linear-lanceolate and remotely toothed: fls. very large (5-6 in. across), rose-red, the petals obovate and conspicuously narrowed at the base; column of stamens very long. (Ga. south. B. M. 360. R. H. 1858, p. 575; 1866:230.—Not hardy North. Take up roots and store in cellar.

8. *militaris*, Cav. Four to 6 ft., strong-growing, glabrous: lvs. rather small, usually hastate (2 short lobes at base), the middle lobe ovate-lanceolate or triangular-lanceolate, long-acuminate, equally crenate-toothed; involucre scales linear or awl-like, nearly or quite half as long as the calyx: fls. 3-5 in. across, white, bluish or pale rose, purple-eyed. Wet places, Pa. to Minn. and south to the Gulf. B. M. 2385.—A hardy and fine species. Forms occur with lvs. not lobed.

BB. Foliage soft-white-tomentose beneath and sometimes on top.

C. Lvs. not lobed (or only slightly so).

9. *Moscheutos*, Linn. (*H. palustris*, Linn.). Fig. 1055. Strong-growing, 3-5 ft. the terete stem pubescent or tomentose: lvs. mostly ovate, entire in general outline or sometimes shallowly 3-lobed at the top, blunt or crenate-toothed, very soft-tomentose beneath but becoming

nearly or quite glabrous above, the long petiole often joined to the peduncle; involucre bracts linear, nearly or quite as long as the tomentose calyx; fls. very large (4-7-8 in. broad), light rose-color (or white in var. *albus*), with a purple eye; capsule glabrous. Marshes along the coast from Mass. to Fla. and west to L. Michigan. B. M. 882. B. E. 171463; 33:7. Mn. 2:161. Gng. 2:227. *H. roseus*, Thore, of Europe, a rose-colored form, is considered to be a naturalized form of this American species. R. H. 1879:10.—One of the best of the Marsh Mallows, thriving in any good garden soil. Of easiest culture and perfectly hardy. Blooms in Aug. and Sept. The foliage is strong and effective. The most generally cultivated of the hardy herbaceous kinds. The form known as *Crimson Eye* (clear white with a crimson center) was introduced 1894 by Wm. F. Bassett & Son. It was found in a swamp in New Jersey. There is some question, however, as to whether it is specifically the same as *H. Moscheutos*. The fls. are pure white (except the center), expand wide, and the lvs. are bronze-tinted. The carpels are more attenuate.

10. *incanus*, Wendl. Much like *H. Moscheutos*, and sometimes passing for it in the trade; lvs. smaller and narrower, ovate-lanceolate, not lobed, serrate-toothed; fls. sulfur-yellow, with a crimson eye. S. Car. and south.—Seems to be hardy in the North with a mulch protection.

11. *Californicus*, Kell. Strong growing, 5 ft., the stem terete or slightly grooved above, more or less pubescent; lvs. distinctly cordate, ovate, shallow-toothed and not lobed, dull ashy gray beneath; involucre bracts hairy; corolla white or rose, with a purple eye, 3-5 in. across; capsule pubescent. Calif.—Gray regards this as a form of *H. lasiocarpus*, Cav. (var. *occidentalis*, Gray). A portrait of *H. lasiocarpus* will be found in G. F. 1:126. Although the name *H. Californicus* is common in the trade, it is a question how much of the stock, if any, is this species. Certainly some of it is *H. Moscheutos*. From *H. Moscheutos* this species is told by its cordate ashy-tomentose lvs. and hairy-ciliate involucre bracts. The plant known to the trade as *H. Californicus* is hardy.

CC. Lvs. strongly lobed.

12. *grandiflorus*, Michx. Tall and stout (3-8 ft.), the terete reddish stem becoming glabrous; lvs. large, 3-lobed, the lobes ovate-acuminate or ovate-oblong-acuminate, the side ones widely spreading, blunt-toothed or even again lobed; fls. very large (6-8 in. across), white or rose, with deeper eye. Ga., Fla. west.—Aside from the large fls. and lobed lvs., this is very like *H. Moscheutos*. It is doubtful if the true *H. grandiflorus* is in the trade.

AAA. Shrubs, hardy in the North (or in the middle states).

13. *Syriacus*, Linn. (*Althaea frutescens*, Hort.). SHRUBBY ALTHEA. ROSE OF SHARON. Figs. 1056, 1057. Shrub, 6-12 ft. high, much branched, nearly or quite glabrous; lvs. rather small, short-petioled, strongly 3-ribbed, triangular- or rhombic-ovate, mostly 3-lobed and with many rounded teeth or notches; fls. solitary in the axils on the young wood (late in the season), somewhat bell-shaped, 2-3 in. long, rose or purple, usually darker at the base; pod short, splitting into 5 valves. Asia. B. M. 83. R. H. 1845:133 (var. *speciosus*, with double fls.).—One of the commonest of ornamental shrubs, and hardy in Ontario. It is immensely variable in character of fls., the colors ranging from blue-purple to violet-red, flesh color and white; also full double forms. There are



1056. Capsule of *Hibiscus Syriacus*.

forms with variegated lvs. Colored plates of some of the double-fl. forms will be found in Gn. 52:150. The species thrives in any good soil. Prop. by seeds, by cuttings of ripened wood taken in the fall, and named vars. by grafting on the common

seedling stock. Nativity uncertain, but probably not Syrian, as Linnaeus supposed; probably native in China. To this species belong such trade names as *H. purpureus*, *H. speciosus ruber*, *H. rannunculiflorus*, *H. lotus albus*, *H. Leopoldii*, *H. pauciflorus*, *H. caulescens*, *H. violaceus*, *H. anemoneiflorus*, *H. atrobubens*, *H. bicolor*, *H. camelliaeflorus*, *H. elegantissimus*, etc.

14. *Hamabo*, Sieb. & Zucc. A Japanese species offered by importers but not yet tested in this country, and probably not hardy south of the southern-middle states; 6-10 ft. high, closely pubescent; lvs. roundish, with an abrupt short point, irregularly shallowly toothed, white



1057. *Hibiscus Syriacus* ($\times \frac{1}{2}$).

tomentose; involucre of scales united at the base; fls. solitary in the upper axils, large, yellow, with a darker base.

AAA. Shrubs of glasshouses, or permanently planted out in the far South.

B. Lvs. hoary beneath.

15. *elatus*, Swartz (*Paritium elatum*, G. Don). MOUNTAIN MAHOE. A West Indian tree, now introduced in S. Calif.: lvs. round-cordate, short-cuspidate, entire;

involute deciduous (with the calyx), 8-10-toothed; fls. 4 in. long, opening primrose color in the morning, then changing, as the day advances, to orange and deep red. — This species, the next, and probably others, yield the Cuba bast, used for tying cigars and for other purposes. Lvs. and shoots medicinal: wood durable.

16. *tiliaceus*, Linn. (*Paritium tiliaceum*, Juss.). Round-headed tree 20-30 ft. high; lvs. round-cordate and short-acuminate, entire or obscurely crenate; involucre persistent (with the calyx), 10-toothed; fls. 2-3 in. long, yellow. Old World tropics, but naturalized in the W. Indies and at Key West. — Offered recently by Reasoner. Evergreen. Sprouts from the base if frozen.

BB. Lvs. usually green both sides.

17. *heterophyllus*, Vent. Tall shrub of Australia, int. in S. Calif., where it is a free and showy bloomer; nearly glabrous; lvs. varying from linear to lanceolate and elliptic-oblong and from entire to 3-lobed, 5-6 in. long, usually serrulate and sometimes white beneath; fls. large (3-4 in. long), white, with a deep crimson eye, the calyx tomentose; capsule hairy.

18. *calycinus*, Willd. (*H. chrysanthus*, Hort.). Small shrub from S. Africa, and sparingly known in this country; pubescent; lvs. long-stalked, round-cordate, somewhat 3-5-angled and 5-7-nerved, crenate, hairy or velvety; fls. on axillary peduncles which are shorter than the petioles, large, yellow, with a dark center; involucre bracts 5, bristle-pointed; capsule tomentose. — To be grown indoors, but may be planted out in the summer with good results. Probably valuable for permanent planting in the extreme S.

19. *cislátinus*, St. Hil. Bushy, 3-5 ft.; stems glabrous but prickly; lvs. deltoid-lanceolate or deltoid-ovate, 3-lobed, coarsely toothed, sparsely hairy on the veins; fls. solitary, 4-5 in. across, light pink, with darker color in the eye and sometimes darker on the margins. Brazil (this side the Platte river, whence the specific name). B. H. 1898:480. Gng. 7:50. — Little known in this country. It is a late fall bloomer, and may be planted out in summer. It seeds freely, and these, sown as soon as ripe, will give blooming plants for the following fall. Handsome.

20. *Dénisoni*, Burb. Small glasshouse shrub, flowering when very small, glabrous; lvs. thick and rather stiff, slender-stalked, elliptic-ovate, entire or obscurely crenulate, acuminate, dull green; fls. terminal, large, white, 4-5 in. across. Nativity unknown, but int. from Austral. F. M. 1876:232. — A good greenhouse plant, requiring warm temperature.



1058. *Hibiscus Rosa-Sinensis* (X 1.5).

21. *Rosa-Sinensis*, Linn. (*H. Stuehnii*, Hort.). CHINESE HIBISCUS. SHOEBLACK PLANT. Fig. 1058. In glass-houses a shrub 3-8 ft. high, but reaching 20 ft. in sub-tropical regions, glabrous; lvs. rather large, thin and shining green, broad-ovate to lance-ovate, somewhat tapering to the base, acuminate, coarsely and unequally toothed; involucre bracts linear, free, as long as the calyx tube; fls. solitary in the upper axils of the new

growth, on peduncles which exceed the petioles, bright rose-red, 4-5 in. across, with a projecting red column of stamens and pistil. Asia, probably China; now distributed in warm countries, and one of the best known old-fashioned conservatory pot-plants. B. M. 158. I. H. 29:441. G. C. III. 2:529. Gn. 53, p. 127. — It is immensely variable. Forms are double-fl., and others are orange, yellow, bright red, magenta, and parti-colored. Var. *Cooperi*, Hort. (*H. Cooperi*, Hort.) has narrow white-marked lvs. and distorted corolla fls. Trade names belonging to this species are *H. brilliantissimus*, *H. carmūdatus*, *H. chrysanthus*, *H. fulgidus*, *H. fideus*, *H. kermesinus*, *H. luteus*, *H. miniatus*, *H. sub-violaceus*, *H. zebrius*. *Hibiscus Rosa-Sinensis* is a summer-flowering shrub which always attracts attention. It is often plunged in the open with other subtropical stuff. It is easy to grow in ordinary potting soil. In winter keep it slow by withholding water and keeping in a temperature not above 50°. In spring head the plants in and start them up to get the new wood on which the flowers are borne. Give plenty of water when growing, and syringe frequently. Prop. readily by softwood cuttings in spring, or by hard cuttings in fall.

H. Archeri, Hort. is a hybrid of *H. Rosa-Sinensis* and *H. schizopetalus*, raised by A. S. Archer, Antigua, West Indies. Much like *H. Rosa-Sinensis*. Fls. red. (Gn. 53:353) — *H. Arceuthoceras*, Knorke & Weste. Tall shrub, with heart-shaped 3-lobed lvs. and large, solitary, cream-colored, red-veined fls. Madag. B. M. 2936. The plant figured under this name in Gn. 53:1164 is probably a form of *H. Rosa-Sinensis* — *H. mutabilis*, Linn. Tree-like or tall shrub; lvs. cordate, 3-angled, toothed, downy; fls. axillary, opening white or pink but changing to deep red by night; involucre bracts shorter than calyx. China. Cult. in tropical and subtropical regions. Recently introd. in S. Fla. under the name of Cotton Rose and Confederate Rose. — *H. schizopetalus*, Hook. L. Allied to *H. Rosa-Sinensis*; fls. pendulous, the recurring petals beating fully out, the involucre none, the fruit long and bearing glabrous seeds. E. tropical Afr. B. M. 6524. F. S. 23:297-8. One of the handsomest of the genus. — *H. splendens*, Fras. Shrub, 12-20 ft. soft-tomentose, prickly; lvs. cordate-ovate, palmately 3-5-7-lobed; fls. very large, rose-red. Austral. B. M. 19:129. Handsome. — *H. Suratensis*, Linn. Trailing, with palmately 3-5-parted lvs.; fls. yellow; involucre bracts with odd nail-like spines. India, but widely distributed. G. C. III. 9:529. — *H. venustus*, Blume. Very like *H. mutabilis*, but involucre bracts broad. Java. B. M. 7183. — *H. villosus*, undetermined trade name. L. H. B.

HICKORY-NUT. Notwithstanding the high esteem in which the nuts of several species of Hickory have been held since the settlement of America by the white men, but little progress has been made in their domestication and improvement. Out of the 9 or 10 species recognized by botanists, not more than 3 or 4 have been found sufficiently promising from an economic standpoint to justify conspicuous effort at amelioration. Of these the Pecan (*H. Pecan*) stands easily first, followed in order of apparent value by the Shagbark (Little Shellbark), *H. ovata*; the Shellbark (Big Shellbark), *H. laciniosa*, and the Pignut, *H. glabra*. The Pecan differs in its requirements of soil and climate from the other species, and is described separately under *Pecan*. For the botany of the Hickories, see *Hicoria*.

In flavor and quality of kernel the Shagbark is esteemed by most Americans as the choicest of native nuts, though in these respects the Shellbark is but little inferior to it. The thinner shell and larger proportion of kernel have given the former precedence over the latter in most cultural efforts; though the thrifty growth, symmetrical form and luxuriant foliage of the latter render it one of the most handsome and useful of native trees for roadside or lawn planting. The Shagbark has the broader area of natural distribution, being found in localities throughout most of the United States to the eastward of the Great Plains, except on the lowlands of the South Atlantic coast and Gulf states. The Shellbark is mainly confined to the valley of the Mississippi and its larger tributaries, extending eastward, however, into eastern Pennsylvania and western New York.

The Pignut, which is similar to the Shagbark in area of distribution, is much inferior to the others in quality, but shows wider variation than either in this respect, and has disclosed at least one variety of distinct cultural merit.

As the Hickories, other than the Pecan, are slow-

growing species at best, they should not be planted on other than fertile soil. The Shellbark is native to river bottoms, and requires richer land than the others, which endure a rather wide range of soil characteristics, provided there is sufficient depth and good drainage. Deep, well-drained, fertile loams, either of sandy or clayey nature, are acceptable to all the species.

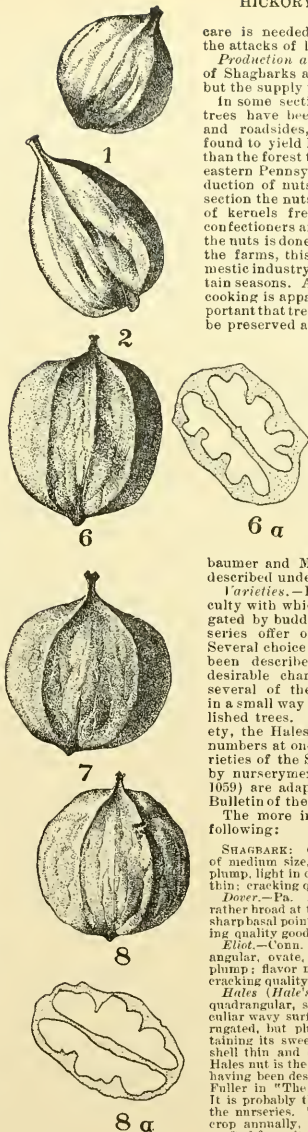
Propagation.—All the species are propagated by seed. Planting is frequently done in autumn, but, to lessen the destruction by rodents, is more safely done in early spring. In such case the freshly gathered nuts, after removal from the hulls, should be stored in slightly dampened sand during the winter, or stratified, as other tree seeds. Uniformity of growth is promoted by planting nuts where trees are to stand, as the transplanting process in ordinary seasons is accompanied by a considerable loss. If trees must be transplanted, it is probably best to transplant annually in nursery rows, in rich soil, to promote growth of fibrous roots and to lessen the shock of final transplantation to the permanent location.

The propagation of the Hickories by budding and grafting is exceedingly difficult, even the most experienced propagators of woody plants failing to secure more than a small percentage of success. Most growers favor cleft crown-grafting in the spring, on established stocks of the same species. The operation is performed just as stocks are starting into growth, using dormant cions with terminal buds and mounding up to the top bud with fine earth. As the stocks are in condition only for a few days, the process is uncertain and expensive.

One of the most successful propagators of woody plants, Jackson Dawson, of Arnold Arboretum, recommends the use of the Bitternut (*H. minima*) as a stock, growing seedlings in boxes 4 in. deep for one or two years, until of sufficient size for grafting. Under this plan the seedlings should be transferred to pots in the autumn and taken into the greenhouse about January 1. He advises side-grafting these close to the collar. As soon as the roots begin to start, the grafted trees in pots must be plunged in sphagnum to the top bud and left until March to callus. Root-grafting, as commonly practiced, has rarely been found to succeed.

One promising method of root-propagation suggested by Fuller consists in the "turning up or exposing at the surface of the ground of side roots, severed from the parent tree." Their lower extremities are left in place for one or two seasons, until a distinct top has been formed through the agency of adventitious buds on the exposed portions. Though a slow and expensive process, this is probably more certain than any other method yet developed. In some instances, where the tops of trees have been killed, the varieties have been perpetuated through this practice by promptly turning up and staking roots that were yet alive.

Planting should be done in autumn, or as early in spring as the ground can safely be worked. An abundance of rich soil should be used in the holes, as much of the success in transplanting depends upon a prompt and vigorous root-growth. If clean cultivation cannot be practiced, a heavy mulch should be applied, and be maintained for several years, until the tree is well established. After this, little



1059. Forms of *Hicoria ovata*.
 1. Ovate form. 2. Long-ovate form. 6, 6a. Meriden. 7. Jackson. 8, 8a. Milford. Nat. size.

care is needed, except to guard against the attacks of leaf-eating insects.

Production and Use.—Large quantities of Shagbarks are consumed in our cities, but the supply is mainly from the forests.

In some sections, choice second-growth trees have been preserved along fences and roadsides, and these are usually found to yield larger crops and finer nuts than the forest trees. In portions of southeastern Pennsylvania there is a large production of nuts from such trees. In that section the nuts are marketed in the form of kernels free from shells, for use by confectioners and bakers. The cracking of the nuts is done by women and children on the farms, this work constituting a domestic industry of some importance at certain seasons. As the use of Shagbarks in cooking is apparently increasing, it is important that trees bearing choice nuts shall be preserved and cared for. The characteristics that determine commercial value are: first, cracking quality; second, thinness of shell; third, size; fourth, plumpness and flavor of kernel; fifth, productiveness.

Numerous apparently natural Hickory hybrids have been brought to notice, but those thus far discovered have given little evidence of cultural value. The most important are the Nussbaumer and McCallister nuts, which are described under *Pecan*.

Varieties.—In consequence of the difficulty with which the Hickories are propagated by budding and grafting, few nurseries offer other than seedling trees. Several choice varieties of Shagbark have been described and named because of desirable characteristics, however, and several of these have been propagated in a small way by crown-grafting on established trees. Grafted trees of one variety, the Hales, can be obtained in small numbers at one or two nurseries. No varieties of the Shellbark have been offered by nurserymen. The illustrations (Fig. 1059) are adapted from the Nut-Culture Bulletin of the U. S. Dept. of Agric.

The more important varieties are the following:

SHAGBARK; Curtis.—Conn. A smooth nut of medium size, slightly compressed; kernel plump, light in color and of good quality; shell thin; cracking quality good.

Dover.—Pa. A medium-sized angular nut, rather broad at the base, but having a long and sharp basal point; shell moderately thin; cracking quality good; quality good.

Elliot.—Conn. Of medium size, compressed, angular, ovate, with prominent tip; kernel plump; flavor mild and pleasant; shell thin; cracking quality good.

Hales (Hale's Papershell).—N. J. Large, quadrangular, slightly compressed, with a peculiar wavy surface; kernel rather deeply corrugated, but plump and of good quality, retaining its sweetness for two years or more; shell thin and of fair cracking quality. The Hales nut is the first named variety of Hickory, having been described and illustrated by A. S. Fuller in "The Rural New-Yorker" in 1870. It is probably the only sort now obtainable at the nurseries. The original tree bears a fair crop annually, and numerous younger trees grafted from it are now in bearing.

Jackson.—Ohio. A compressed oval nut of large size; kernel large, plump, and of excellent quality; shell thin; cracking quality medium. Fig. 1059.

Leaning.—Mo. A large nut of fine flavor and excellent cracking quality, the kernel coming out in unbroken halves.

Meriden.—Conn. Large, oblong, compressed; kernel large and of good quality; shell rather thick, but cracks well. Fig. 1059.

Milford.—Mass. A compressed ovate nut, medium to large in size, with large, plump kernel of excellent quality; cracks well: one of the best nuts yet brought to notice. Fig. 1059.



1060. Foliage and pistillate flowers of *Hicoria Pecan*.

Rice.—Ohio. Angular, ovate, medium to large in size; kernel plump, bright and of fine quality; shell thin and of good cracking quality; tree regularly productive.

Woodbourne.—Pa. Long, compressed, ovate, large and smooth; kernel tender and of very high quality; shell rather thick, but cracks well.

FIGURE: Of the somewhat numerous sweet-flavored forms found in this species, the following one at least has been deemed worthy of perpetuation because of its delicate flavor, thin shell and excellent cracking quality.

Brackett.—Iowa. Roundish compressed, smooth and of grayish color, medium to large in size; kernel plump, sweet and of delicate flavor; shell very thin, and easily freed from the kernel.

WM. A. TAYLOR.

HICORIA (from its aboriginal name) *Syd.*, *Carya*. *Juglandaceae*. **НІСКОРІ.** Hardy ornamental trees, with rather large, deciduous odd-pinnate lvs., small greenish fls., the staminate ones in conspicuous pendulous racemes, and with rather large, green, dehiscent fruits

enclosing a mostly edible nut. The Hickories are among the most beautiful and most useful trees of the American forest, and are all very ornamental park trees, with a straight, sometimes high and slender trunk and a large, graceful, pyramidal or oblong head of generally light green foliage, turning from yellow to orange or orange-brown in fall. They are hardly North except *H. Pecan*, *aquatica* and *myristiciformis*, but *H. Pecan* thrives rarely in Massachusetts in sheltered positions. Most of the species have heavy, hard, strong and tough wood, much valued for many purposes, especially for handles of tools, manufacture of carriages and wagons, also for making baskets and for fuel. The nuts of some species, as *H. Pecan* and *H. ovata*, also *H. laciniata* and some varieties of *H. glabra* and *H. alba* are edible, and are sold in large quantities, mostly gathered from the woods, though in later years orchards of improved varieties have been planted. A large number of insects prey upon the Hickory, attacking the wood, foliage and fr., for which see the Fifth Ann. Rep. of the U. S. Entom. Com., p. 285-329. There are also some fungi, causing sometimes an early defoliation of the trees.

The Hickories generally grow best in rich, moist soil, but some, especially *H. glabra*, *H. alba* and *H. ovata*, grow equally well in drier localities. They are of rather slow growth, and difficult to transplant if taken from the woods; therefore the seeds are often planted where the trees are to stand, but if grown in the nursery and transplanted several times when young, trees 6-10 ft. high may be transplanted successfully. Prop. usually by seeds stratified and sown in spring in rows about 3 in. deep; named varieties may be grafted in spring in the greenhouse, on potted stock of *H. minima*, which seems to be the best species for this purpose, veneer- or splice-grafting being usually employed; sometimes also increased by root-sprouts. For further horticultural advice, see *Hickory-nut and Pecan*.

There are about 10 species of Hickory, all in E. N. America from Canada to Mexico. Branches with solid pith: lvs. alternate, without stipules, with 3-17 serrate lfts.: fls. monocious, apetalous, appearing with the lvs.; staminate fls. in axillary, slender, pendulous catkins, each fl. with 3-10 stamens, borne in the axil of a 3-lobed bract; pistillate fls. in a terminal, 2-10-fl. cluster or spike, consisting of a 1-celled ovary enclosed by a 4-lobed involucre; fr. globular to oblong, with a husk separating into 4 valves and a bony nut, incompletely 2-4-celled. See also Rep. Missouri Bot. Gard. 7, p. 28-42, pl. 1-25, and Rep. of U. S. Dept. of Agric. Div. of Pomol. Nut. Culture (1896), cited below as U. S. N. C. (the first number referring to the plate, the second and third to the figure).

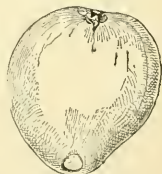
A. Scales of buds valvate, 4-6; fr. with winged sutures; nut usually thin-shelled; lfts. 7-13, usually falcate.

B. Nut mostly elongated, almost terete; husk thin, splitting to the base; kernel sweet.

Pecan, *Britt.* (*Carya oliviformis*, Nutt.). **PECAN.** Fig. 1060. Tall tree, to 170 ft., with the branches pubes-

cent when young; bark deeply furrowed, grayish brown; lfts. 11-17, short-stalked, oblong-lanceolate, acuminate, serrate or doubly serrate, tomentose and glandular when young, usually glabrous at length, 4-7 in. long; staminate catkins almost sessile; fr. 3-10 in clusters or spikes, oblong, 1½-3½ in. long; nut ovoid or oblong, smooth, brown, irregularly marked with dark brown, 2-celled at the base; kernel sweet. From Iowa and Ind. south to Alab. and Tex.; also in Mexico. S. S. 7: 338-39. A. G. 12:273-75. U. S.

N. C. 1, 8, 9.—This species is the most important as a fruit tree, and many named varieties are cultivated in the southern states, but it is tender North. The wood is less valuable than that of the other species. Hybrids of this species are known with *H. minima*, *alba*



1061. One form of **Pignut**—*H. glabra*. Natural size.

and *laciniosa*, for which see Rep. Mo. Bot. Gard. 7, pl. 20-23 and Gng. 2:226. See *Pecan*.

myristiciformis, Britt. (*Carya myristiciformis*, Nutt.). NUTMEG-HICKORY. Tree, to 100 ft. with dark brown bark, broken into appressed scales: lfts. 5-11, short-stalked or almost sessile, ovate-lanceolate, the uppermost much larger and obovate, serrate, scurfy-pubescent beneath when young and with brown scales above, at length dark green above, silvery and lustrous beneath, 3-5 in. long; staminate catkins peduncled; fr. generally solitary, short-ovoid or obovate, about 1½ in. long; nut ovoid, reddish brown marked with irregular spots and stripes, thick-shelled, 4-celled below; kernel sweet. From S. Car. to Ark. and Mex. S.S. 7:342-43.—A very decorative species on account of its handsome foliage, but not hardy North.

nb. Nut usually as broad as long, compressed with irregularly angled or reticulate surface, thin-shelled, 4-celled below: kernel bitter.

aquatica, Britt. (*Carya aquatica*, Nutt.). WATER-HICKORY. BITTER PECAN. Usually small tree, rarely to 100 ft., with light brown bark separating into long, thin plates: lfts. 7-13, sessile or short-stalked, lanceolate, long-acuminate, finely serrate, yellowish tomentose when young, glabrous at length. fr. 3-4, ovoid to broadly obovate, 1-1½ in. long; husk thin, splitting to the base; nut obovate, much compressed, irregularly angled and ridged, dull reddish brown; kernel very bitter. From Va. to Ill., south to Fla. and Tex. S.S. 7:344-45. U.S.N.C. 12, 7-8.

minima, Britt. (*Carya amara*, Nutt.). BITTER NUT. SWAMP-HICKORY. Tree, to 100 ft.: bark grayish brown, broken into thin scales: young branches and petioles glabrous: lfts. 5-9, ovate-lanceolate to lanceolate-acuminate, densely serrate, pubescent when young and glandular, almost glabrous at length, 3-6 in. long: fr. 2-3, broadly obovate or subglobose, winged from the apex to the middle, ¾-1½ in. long; husk thin, splitting somewhat below the middle; nut slightly compressed, roundish, abruptly contracted into a short point, irregularly



1063. *Hicoria glabra*, var. *microcarpa*—the false Shagbark.

AA. Scales of buds imbricate, more than 6: fr. not or slightly winged at the sutures; nut usually thick-shelled, 4-celled below: lfts. 3-9, not fat, the uppermost larger and generally obovate.
B. Buds small, ¼-½ in. long; husk thin: nut slightly or not angled.

glabra, Britt. (*Carya porcina*, Nutt.). PIGNUT. Figs. 1061, 1062. Tree, occasionally to 120 ft., with usually dark gray fissured bark and slender, glabrous branchlets: lfts. 3-7, almost sessile, oblong to oblong-lanceolate, long-acuminate, sharply serrate, almost glabrous, 3-6 in. long; fr. usually ovoid or obovate, the sutures usually slightly winged toward the apex and the husk splitting mostly only half way to the base; nut usually brownish, not angled; kernel mostly astringent. S.S. 7:352-53. A.G. 11:386-7. U.S.N.C. 12, 5.—A very handsome park tree, with rather narrow-oblong head and slender, often pendulous branchlets, especially in the following var. A very variable tree, and the following varieties are considered by some botanists as distinct species.

Var. *microcarpa*, Trel. (*Carya microcarpa*, Nutt.). Figs. 1063-6. Bark more or less shaggy: lfts. quite glabrous, often somewhat broader: fr. subglobose; husk splitting nearly to the base; nut grayish or whitish, angled, rather thin-shelled, often broader than long; kernel sweet. From Quebec to Mich., south to Fla. A.G. 11:381-88, 1, 2, 5, 8, 10. U.S.N.C. 12, 4, 6.—Often very distinct. Probably *H. borealis*, Ashe, belongs to this variety.

Var. *odorata*, Sarg. Similar to and often united with the former. Bark fissured,



1064. Fruit of *H. glabra*, var. *microcarpa*, the false Shagbark. Natural size.



1065. Twig of *Hicoria glabra*, var. *microcarpa*.



1062. Characteristic growth of the Pignut Hickory. *Hicoria glabra*.

reticulate; kernel bitter. Quebec to Minn., south to Fla. and Tex. S.S. 7:340-41. Em. 226.—A valuable park tree, with handsome, rather broad head, growing in cult. more rapidly than other Hickories.

not shaggy: lfts. generally broader, ovate or oblong-ovate, glandular: fr. more ovoid, splitting almost to the base; nut gray or brownish, slightly angled. S. S. 7:354 (partly). Var. *villosa*, Sarg. (*H. pallida*, Ashe). Bark deeply fissured: lfts. 5-7, hairy along the midrib beneath and the rachis covered with tufts of hair: fr. subglobose to ovoid; nut brown, thick-shelled. Mo. to Del. and Ala. S.S. 7:355. G.F. 10:305



1066. Habit of the false Shagbark.
H. glabra, var. *microcarpa*.

BB. Buds large, $\frac{1}{2}$ -1 in. long; nut angled; kernel sweet
c. Bark not shaggy; branches and petioles tomentose; outer bud-scales falling in autumn; husk not separating quite to the base.

alba, Britt. (*Carya tomentosa*, Nutt. Not to be confounded with *C. alba*, which is *H. ovata*). MOCKERNUT, BIG BUD HICKORY. Tree, rarely attaining to 100 ft.; lfts. 7-9, almost sessile, oblong-lanceolate, long-acuminate, usually finely serrate, glandular and tomentose beneath, very fragrant when crushed, 4-8 in. long; fr. globose to pear-shaped, $1\frac{1}{2}$ -3 in. long; nut light brown, globular to oblong, slightly compressed, angled, narrowed toward the apex, thick-shelled; kernel small, sweet. Mass. to Ontario and Neb., south to Fla. and Tex. S.S. 7:350-51. U.S.N.C. 12, 1-3. Em. 222.

cc. Bark shaggy, light gray; branches and petioles glabrous or pubescent; husk very thick, separating to the base; outer bud-scales persisting through the winter.

laciniata, Sarg. (*Carya sulcata*, Nutt. *H. acuminata*, Dippel). BIG or BOTTOM SHELLBARK-HICKORY. KING NUT. Tall tree, occasionally to 120 ft.; branchlets orange-red: lfts. 7-9, oblong-lanceolate, acuminate, serrate, pubescent when young, usually glabrous at length, 4-8 in. long; fr. generally oblong, 2-3 in. long; nut yellowish white, oblong, but sometimes as broad as long, slightly compressed and obscurely 4-angled, pointed at both ends; kernel sweet. N. Y. to Iowa, south to Tenn. and Ind. Terr. S.S. 7:348-49. U.S.N.C. 11.

ovata, Britt. (*Carya alba*, Nutt.). SHAGBARK-HICKORY. Also LITTLE SHELLBARK-HICKORY, although the

latter name by some is applied to the preceding. Figs. 1067, 1068. Tree, occasionally to 120 ft.: lfts. generally 5, sessile, oblong or oblong-lanceolate, acuminate, serrate, densely fimbriate, pubescent and glandular when young, glabrous at length, 4-6 in. long; fr. subglobose, about $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long; nut white, oblong to broadly obovate, 4-angled; kernel sweet. From Quebec to Minn., south to Fla. and Tex. S.S. 7:346-47. Em. 217. U.S.N.C. 10. A.G. 11:386, 6, 9; 387, 3; 388, 11. Gug. 7:51. A.P. 14:339.—Next to Pecan the best as a fruit tree, especially for the northern states, where Pecan is not quite hardy. Several named varieties are in trade, of which probably var. *Halesi*, Hort., with large, thin-shelled nut, is the best known. An ornamental, often very picturesque tree; the stout branches forming a rather broad, usually somewhat open head.

H. Carolinenseptentrionalis, Ashe. Allied to *H. ovata*; fr. smaller: lfts. 3-5, oblong-lanceolate, glabrous. N. C. to Ga.—*H. Merriana*, Engelm. Tree, with shaggy bark and tomentose-pubescent lvs.: fr. depressed, with rather thick husk and broad, sharply 4-angled, white nut. Mex. The only species not native to the U. S.—*H. Texana*, Le Conte. Similar to *H. Pecan*, but lfts. broader, less falcate, almost sessile; nut smaller, much darker, with somewhat rough surface; kernel bitter. Texas.

ALFRED REHDER.

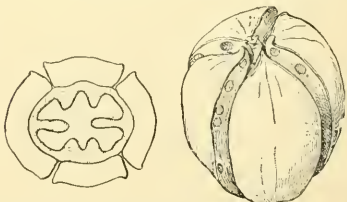


1067.
Twig of *Hicoria ovata*.

HIDALGOA ("after the Mexican Hidalgo"). Syn., *Chilidsia*. *Compositae*. This includes a tender herbaceous vine, allied to *Dahlia*, with scarlet fls. about $2\frac{1}{2}$ in. across, introduced in 1899 by John Lewis Childs, under the name of *Chilidsia Wrecklei*, or "Treasure Vine." *Hidalgoa* is closely allied to *Dahlia* and *Coccorepis*, but differs from both in the large, fertile cene of the rays and in the sterile disc-fls., the styles of which are entire or very shortly 2-lobed. Only 2 species were hitherto recognized, both from Central America. From these *H. Wrecklei* differs in its more compound lvs. and much larger heads. Suitable for cool, shady verandas.

Wrecklei, Hook. (*Chilidsia Wrecklei*, J. L. Childs). Tall, woody at base, much branched, climbing by petioles: lvs. opposite, pinnately ternatisect, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, 2 in. wide, the teeth tipped reddish brown; petiole $1\frac{1}{2}$ -2 in. long, coiled at base; peduncle axillary, as long as the lvs., 1-fld.; rays about 10. Costa Rica. B.M. 7684. J.L. Childs' Cat. Rare Flowers, etc., 1899, p. 1, with colored plate. A.G. 20:570. W. M.

HIERACIUM (Greek, *a hawk*; the ancients thought that hawks sharpened their eyesight by using the sap of these plants). *Compositae*. HAWKWEEDS. Over 250 species of hardy herbaceous perennials, mostly native to Eu. and S. Amer., some of which are bad weeds in



1068. Fruit of *Hicoria ovata*, the Shagbark Hickory. Natural size. The cross-section is to show structure, not to show a good horticultural fruit.

the eastern states. Lvs. often toothed, but never deeply lobed: heads usually small, loosely paniculate or cymose, rarely solitary: rays truncate, 5-toothed at the apex: seeds angular. The genus passes into *Crepis*.

from which it is distinguished by having stiff, usually brownish, rarely white pappus, and oblong or columnar seeds. The cultivated species bear in summer and autumn a succession of small yellow or orange-colored fls. There is one white-fl. species, *H. viride*. They are often worth growing in rockeries and waste places, but care should be taken to prevent them from crowding out more desirable plants. *H. villosum* is the most desirable species. Hawkweeds will grow in almost any soil or aspect. They are propagated chiefly by dividing the stolons, or by seeds, and if left to themselves will soon form a dense mat of herbage over the poorest of soils. The Old World species are much confused.

A. Flowering stem leafless or with 1-5 lvs.: lvs. mostly in a rosette at base of stem.

B. Scapes unbranched above, bearing but a single head.

Pilosella, Linn. **MOUSE-EAR HAWKWEED**. Stem slender, 4-12 in. high, stoloniferous, densely hairy throughout: lvs. entire, oblong or spatulate, narrowed into a petiole: fls. 1 in. broad, pale yellow, sometimes striped or tinged with red or purple. — Commonly flowers the whole season. — Int. from Eu. and common in door-yards and fields. Ont. to Pa. and Mich.

BB. Scapes branched above, bearing several to many heads.

C. Basal lvs. coarsely toothed.

vulgatum, Fries (*H. umbricosum*, Jord.). Stem 1-3 ft. high, slightly glaucous: basal lvs. 2-5 in. long, oblong to lanceolate, acute at both ends, petioled, petioles usually pubescent. July-Sept. Int. from Eu. Lab. to N. J.

CC. Basal lvs. entire or very finely toothed.

D. Lvs. mostly obovate to ovate, purple-veined.

venosum, Linn. **RATTLE-SNAKE WEED**. Stem 1-3 ft. high, slender, smooth or nearly so: lvs. 1-4 in. long, obovate to spatulate, subsessile: fls. $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, bright yellow. Aug., Sept. Dry woods, Mo. to Ga. and west to Man. and Neb. D. 133. — A common plant in woods. Advertised by one dealer in native plants.

DD. Lvs. mostly spatulate to oblong, green-veined.

aurantiacum, Linn. **ORANGE HAWKWEED**. Stem 6 in. to 2 ft. high, slender, somewhat hairy: heads $\frac{1}{2}$ -1 in. across, short-stalked, orange to orange-red. June-Oct. Nat. from Eu. by roadsides and in fields. Ont. to Pa. — A bad weed if allowed to spread. It is worthy of being established in high and dry parts of a rockery, where few other plants can grow.

praetium, Vill. (*H. stoloniferum*, Bess.). Plants usually spreading very rapidly by stolons: stem 2-3 ft. high, slender, glaucous, hairy at base: basal lvs. entire: heads $\frac{1}{2}$ in. across, in an open cyme, bright yellow. June-Sept. Nat. from Eu. along roadsides in N. Y.; sometimes troublesome in cult. land.

AA. Flowering stem leafy, at least below.

B. Stem branching from the base.

ramosum, Waldst. & Kit. Lvs. ovate to lanceolate, narrowed at the base, toothed, hairy on margin and beneath; lower lvs. petioled, upper ones subsessile. July-Sept. Eu.

nivale, Froel. **WHITE HAWKWEED**. Differs from *H. ramosum* chiefly in having white fls. and glaucous, somewhat leathery lvs., which are not hairy on the margin. A white Hawkweed is advertised and, according to Gray, this is the only white-fl. species in the genus. Tyrolese Alps.

BB. Stem unbranched below.

C. Whole plant silky-ribose.

villosum, Jacq. **SHAGGY HAWKWEED**. Stem 1-2 ft. high, often 4 ft. under cult.; basal lvs. oblong-lanceolate to lanceolate, narrowed at the base, finely toothed; stem-lvs. sessile, the upper half clasping; fls. 1 $\frac{1}{2}$ -2 in. across, bright golden. June-Aug. Eu. Gn. 46:994. — The silvery foliage and showy fls. of this species make it more desirable for the garden than any other Hieracium now in cultivation. It is easily kept from spreading.

CC. Plant smooth or slightly pubescent.

Candense, Michx. Stem 1-5 ft. high, slender: lvs. ovate-oblong to lanceolate, acute, serrate, sessile, the

upper with clasping base: fls. 1 in. across. June-Aug. Dry woods, N. S. to Pa., west to B. C. and Ore.

Gronovii, Linn. Stem 1-3 ft. high, stiff: lvs. hairy, the upper oval or oblong, broadly sessile, the lower obovate to spatulate, narrowed into a short petiole: fls. $\frac{1}{2}$ - $\frac{3}{4}$ in. wide. Sandy soils, Can. to Fla., west to Mo. and La.

S. W. FLETCHER.

HIEROCHLOË (Greek, *holy grass*; in northern Europe it is scattered before churches on saints' days). Also written *Hierochloa*. *Graminea*. This genus contains the fragrant Vanilla Grass, the sterile shoots of which are woven by the North American Indians into small mats, baskets and boxes. These retain their fragrance for years. It is a genus of 13 species of aromatic perennial grasses with creeping rootstocks, flat leaves and contracted or open panicles, found in temperate and frigid zones. The spikelets are 3-fl., only the terminal fl. perfect. Vanilla Grass is not a good forage plant, as most animals dislike it. The seed seems to be nowhere obtainable, and only one American dealer advertises plants of it. The odor is like that of the common annual sweet vernal grass, *Anthoxanthum odoratum*, but is more powerful. Hierochloë is closely allied to *Anthoxanthum*, but is distinguished by the 3-fl. spikelets and rather loose panicles. *Anthoxanthum* having 1-fl. spikelets and contracted panicles.

horealis, Roem. & Schult. (*H. odorata*, Wahl.). **VANILLA GRASS**. **HOLY GRASS**. **SENECA GRASS**. **SWEET-SCENTED GRASS**. Rather slender, smooth, 1-2 ft. high: lvs. short: panicle brownish, spreading, 2-4 in. long. June, July. Eu., N. Amer. B.B. 1:132.

G. T. HASTINGS.

HIGGINSLIA. See *Ioffmannia*.

HIMANTOGLÖSSUM. All included in *Orchis*.

HIPPEASTRUM (*knight* or *horse* and *star*, from some fancied resemblance in *H. equestre*, perhaps of the equitant lvs. and the star-shaped corolla-opening). *Amaryllidaceae*. Includes *Habranthus*. From 40 to 50 tropical American bulbous plants, now much hybridized. Closely allied genera are *Amaryllis*, *Crinum*, *Sprekelia*, *Brunsvigia*, *Zephyranthes*, *Lycoris*, *Sternbergia*, *Valloia*, which see. The fls. are large and showy, two to several being borne on a stout, hollow, leafless scape; perianth tube evident, often long, dilated in the throat; segments erect-spreading, nearly or quite equal; filaments (6) distinct, often with small scales between.

The Hippeastrums are usually known in gardens under the general name of *Amaryllis*; and their culture is given in full under that name. Many of them are noble garden plants, but the high price of the bulbs prevents them from becoming popular, although they may be grown easily from seeds. Most of the species were first described in the genus *Amaryllis*, but that genus differs in its solid scape and absence of scales between the filaments.

Very many of the names in trade catalogues are of horticultural forms; and many of them cannot be referred positively to any of the original species. For the *Belladonna Lily*, see *Amaryllis*; for *Atamasco Lily*, see *Zephyranthes*; for *Josephine Lily*, see *Brunsvigia*. For *Amaryllis aurea*, see *Lycoris*; for *A. caudata*, see *Zephyranthes*; for *A. formosissima*, see *Sprekelia*; for *A. gigantea*, see *Brunsvigia*; for *A. longifolia*, see *Crinum*; for *A. lutea*, see *Sternbergia*; for *A. Nerine*, see *Nerine*; for *A. orientalis*, see *Brunsvigia*; for *A. ornata*, see *Crinum*; for *A. speciosa* or *purpurea*, see *Valloia*. Latin-form names which do not appear in the following account are very likely to be horticultural forms.

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The genus divides itself into the narrow-leaved (lvs. linear) and broad-leaved sections. All the common garden sorts belong to the latter section. The species which are chiefly known in cult., or which have been parents of hybrid races, are contrasted below. In some species the flowers precede the leaves.

A. Perianth tube 4-5 in. long, very slender.

1. *solandriflorum*, Herb. Bulb ovoid, 3-4 in. in diameter, with a short neck; lvs. appearing with the fls., 1-2 ft. long, 1-2 in. wide, blunt; scape somewhat flattened, 2-3 ft. tall, bearing 2-4 declined greenish white fls.; perianth tube cylindrical, nearly as long as the obovate sometimes purple-ribbed segments; stamens not exerted. S. Amer. B. M. 2573; 3771. L. B. C. 12:1200. I. H. 35:58.—Apparently little known in gardens, but is the parent of hybrids.

AA. Perianth tube short (usually not more than 1 in. long).

B. Throat constricted or closed by a neck or collar
c. Stigma 3-parted.

2. *albicum*, Herb. LILY-OF-THE-PALACE. Bulb ovoid, 3-4 in. in diameter, with a short neck; lvs. 6-9, 1-2 ft. long, 2 in. broad, bright green, the end blunt or nearly so, appearing with the fls.; scape scarcely longer than the lvs., stout, terete, usually bearing 2 large red fls., of which the segments are green at the base; segments 5-6 in. long, the 2 upper inner ones much broader than the others, all of them obovate and somewhat pointed; corona in the throat green; stamens shorter than the perianth; filaments red. Brazil. B. M. 2311. B. R. 6:444. Gt. 45, p. 417.—One of the best, and common in the trade. The form known as var. *platypétala*, Lindl., B. R. 12:1038, with broader petals and more robust habit, is in the trade.

3. *äckermanni*, Hort., is a garden hybrid, with large crimson fls. The var. *pulcherrimum*, Hort., with crimson, green-striped fls., is best known.

4. *psittacinum*, Herb. Bulb 3-4 in. in diameter, with a long neck; lvs. with the fls., 6-8, lightly glaucous, becoming nearly or quite 2 ft. long; scape stout, 2-3 ft. tall, bearing a 2-4-fld. umbel; perianth segments 4-5 in. long, oblong and acute, undulate, the edge crimson, the main part green but crimson-striped; stamens much shorter than the perianth. S. Braz. B. R. 3:199. L. B. C. 13:1204.—Apparently little known in cult., but it has been a parent in hybridizations.

cc. Stigma capitate.

5. *pardinum*, Domb. Bulb globular, 2-3 in. in diameter, with a short neck; lvs. 5-7, appearing with the fls. but not fully developed until after the fls. are gone, becoming 2 ft. long and 2 in. broad, narrowed to the base; scape nearly terete, 1½ ft. tall, glaucous, usually bearing 2 spotted fls.; perianth segments 4-5 in. long, oblong but much narrowed at the base, acute, greenish yellow and much spotted with red, not striped, the lowest inner segment narrowest; stamens declined, shorter than the perianth. Peru. B. M. 5645.—A handsome species, with fls. 6-7 in. across, offered in the American trade, and also a parent in the modern spotted hybrids.

bb. Throat not constricted.

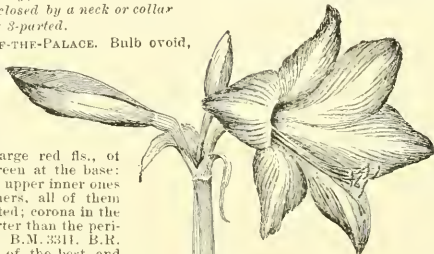
c. Stigma capitate or only obscurely lobed.

d. Tube of perianth ½-1 in. long.

6. *equestre*, Herb. BARBADOS LILY. Bulb globular, 2 in. in diameter, producing offsets freely, with brown scales and a short neck; lvs. 6-8, developing fully after the fls., 12-20 in. long and becoming about 2 in. wide, narrowed to the point; scape 1-2 ft., terete, glaucous; fls. 2-4, 4-5 in. across, the green tube 1 in. long, the segments obovate-pointed, bright red with green at the

base, the 3 inner ones narrower than the outer; stamens shorter than the perianth. Mexico to Chile and Brazil. B. M. 305.—An old garden species, one of the best for winter and spring blooming. There are several garden forms and hybrids, with larger and better fls. Var. *splendens*, Truff., R. H. 1895:578 (var. *Walteri*, Wittm., Gt. 44, 1418), is larger in all its parts, fls. red, and the pedicels are longer. Var. *fulgidum*, Hort. (not *H. fulgidum*, Herb.), has brilliant orange segments margined with white. Var. *ignescens*, Hort., is deep clear scarlet, with white throat and white bars on the segments. Var. *má-jor*, Hort., has very large, bright orange fls., with a green central star. B. R. 3:234. *H. Rözei*, Regel, *H. pyrrolithorum*, Lem., I. H. 11:420, and *H. sphacéum*, Sims, B. M. 2315, are regarded by Baker as forms of this species. There are double-fld. forms.

7. *reticulatum*, Herb. Bulb nearly globular, with a short neck; lvs. appearing with the fls., rather short and broad for the genus, being oblanceolate, 1 ft. long and 2



in. broad, thin and bright green; scape about 1 ft. tall, nearly terete, bearing 3-6 tessellated or checkered fls., 4-5 in. across; fls. bright mauve or purple-red, with cross lines and bars of crimson, the segments obovate and much narrowed below; stamens shorter than the perianth, declined. S. Brazil. B. M. 657. Var. *stratioliforme*, Baker, has still broader lvs., with a

5:552. G. C. 111, 4:477.—Handsome. Blooms normally in late summer. Offered in American catalogues.

8. *styletum*, Herb. (*Amaryllis Maracensis*, Ker (Gawl)). Bulb globular, 3 in. in diam., with a short neck and pale coverings; lvs. 4-6, mostly appearing with the fls., bright green, becoming nearly 2 in. wide; scape 1-2 ft., bearing 3-8 light red or flesh-colored fls., 4 in. across; perianth tube ½ in. long; segments oblong-acute, less than 1 in. wide, tawny pink or flesh-red; stamens somewhat exerted, the style much so (whence the specific name). Guiana and Braz. B. M. 2278. B. R. 9:719.—Apparently not much cult., but it has been a parent of hybrids.

DD. Tube of perianth very short (or scarcely any).

1069. *Hippeastrum vittatum*.
(× ¾)

9. *Reginae*, Herb. Bulb globular, 3 in. in diam.; lvs. developing after the fls., 2 ft. long and 1½-2 in. broad, green; scape 10-20 in., bearing 2-4 red declined fls.; perianth segments 4-5 in. long, obovate and acute, the lowest innermost one narrower, all bright red, a large whitish star in the throat; tube sometimes nearly or quite 1 in. long; stamens shorter than the perianth. Mex. to Peru and Braz. B. M. 453.—An old garden plant, still much cult. There are double-fld. forms: *Amaryllis Alberti*, Lem., I. H. 13:498, Baker considers to be one of these.

10. *Leopoldi*, Domb. Bulb globular, 2-3 in. in diam., with short neck; lvs. with the fls. or nearly so, often 2 ft. long; scape stout, 1½-2 ft., nearly terete, bearing about 2 large, very regular and parti-colored fls., measuring 6-7 in. across; perianth tube without any corona or constriction at the throat; segments obovate, 2 in. broad, the lower half dull crimson, the tips greenish white, the intermediate part bright red, with a forked white mark at the base of each, and a green-white throat; stamens declined, mostly exceeding the perianth, the filaments white; style exerted. Peru. G. C. 1870:733.—

Distinct, and one of the best. Apparently not in the Amer. trade, but it has been used in hybridizing.

11. *procerum*, Lem. (*Amaryllis Röyneri*, Hook. f.). Bulb ovoid, with a neck 10-12 in. long, on the apex of which—as on a trunk—the drooping, curling, buff-edged lvs. are borne (the lvs. 16-20 in. long); scape 12-18 in. high, 2-edged, green, bearing 2-3 horizontal pale lilac fls. 4-5 in. across; segments oblong-acute, acute, not 1 in. broad; throat without a star; stamens much shorter than the perianth; stigma capitate. Brazil. I.H. 11:408. F.S. 20:2077-8. B.M. 5883. Gn. 45:959.—One of the most distinct of the genus. In the Amer. trade. Sometimes called "Blue Amaryllis" and "Empress of Brazil." Plant out for late summer or fall bloom, in a warm, sunny place. Keep bulb dry until late spring.

cc. *Stigma markedly 3-parted.*

12. *ratilum*, Herb. Bulb nearly globular, 2-3 in. in diam., stoloniferous, with short neck; lvs. 6-8, elongating after flowering, bright green, 1 ft. long and an inch or more wide; scape as long as the lvs., somewhat compressed, glaucous, bearing 2-4 red fls.; perianth tube $\frac{3}{4}$ in. long, green, with a minute crown in the throat; segments oblong, acute, crimson and green keeled; stamens shorter than the perianth, the filaments red. Braz. B.R. 1:23. L.B.C. 15:1449.—In cultivation chiefly known in the var. *fulgidum*, Baker (*H. fulgidum*, Herb.), which is in all parts larger, deep crimson, the fl.-segments 3-5 in. long. B.R. 3:226. B.M. 1943, as *Amaryllis miniata*; 2475 as *H. subbarbatum*. Var. *crocatum*, Baker, is as large as var. *fulgidum*, except in its fls., which are smaller, with undulate segments, saffron-colored. B.R. 1:38. Var. *citrinum*, Baker, has bright yellow fls. Var. *scuminatum*, Roem. (A. and H. *puceroniata*). Fls. pink and segments acute. B.R. 7:534; 14:1188. L.B.C. 5:484. B.M. 2273.

13. *vittatum*, Herb. Fig. 1069. Bulb globular, 3 in. in diam.; lvs. 6-8, usually appearing after the fls., bright green, 2 ft. long; scape often 3 ft. high, bearing 3-6 horizontal or declined, striped white-edged fls. 4-5 in. across; tube about 1 in. long, with an obscure crown or crest at the throat; segments obovate-oblong and acute, $1\frac{1}{2}$ in. or less broad, the under color whitish but overlaid with red stripes, the keel white; stamens shorter than the limb. Peru; but once thought to be S. African. B.M. 129. G.C. III. 24:119.—The commonest species-type in Amer. gardens, now cult. in many forms. It seems to have entered freely into hybrids, and some of the forms now passing as *H. vittatum* are perhaps mongrels. The double red feathery stripes on each side of the more or less irregular-edged segments distinguish this species from its congeners.



1070. *Hippeastrum Johnsoni* (X $\frac{1}{4}$).

14. *H. Johnsoni*, Bury. Fig. 1070. Fls. deep dull red, each segment with a white stripe down the keel. A very profuse bloomer, and withstands much abuse. It is the most popular single Amaryllid in this country, and is particularly prized for window-gardens. It is the oldest hybrid, having been raised by one Johnson, an English watchmaker, who, in 1799, crossed *H. Regium* with *H. vittatum*.

The three following *Hippeastrums* are offered in Dutch-

American lists: *H. aduncum*, Herb. Belongs to the narrow-lvd. section of the genus; lvs. linear, glaucous; fls. 2-6, about 2 in. long, yellow or red, on slender pedicels, the segments oblong-linear and acute; stigma 3-parted. Chile. B.M. 125. B.R. 10:849. A form with pale yellow fls. is var. *pallidus*, Herb. L.B.C. 18:1760.—*H. pratense*, Baker. Also linear-lvd.; fls. 2-4, bright scarlet, the very short tube with small scales in the throat, the segments $2\frac{1}{2}$ in. long; stigma capitate. Chile. B.R. 28:35.—*H. roseum*, Baker. Lvs. narrow-linear, glaucous, 1 ft. long, with the fls.; scape 6 in. high, bearing 1 or 2 small bright red fls.; stigma 3-parted. Chile.

Latin-form trade names to be accounted for: *atrosanguineum*, *cardinalis*, *crocea*, *delicata*, *formosa* (hybrid), *Gravinea* (Craveana, Graviesiana, Gravensia), *Lindleyi*, *macrantha*, *refulgens*, *rubra* (hybrid), *rubra striata*, *Williamis*. L. H. B.

HIPPÓPHÆ (Greek, *horse-killing*; alluding to the berries, which are somewhat poisonous). *Eleagnaceæ*. This includes the Sea Buckthorn, a hardy European and mid-Asian shrub valued for its clusters of bright orange-red berries about the size of a pea, which persist all fall and winter. It also has the silvery or gray foliage which makes several members of this family useful in fine landscape effects. This family has only 2 other genera, *Elæagnus* and *Shepherdia* (including the Buffalo Berry). *Hippophææ* and *Elæagnus* have alternate lvs. and 4 stamens, but the former has unisexual and mostly dioecious fls., while the latter has hermaphrodite fls. *Shepherdia* has opposite lvs., 8 stamens and dioecious fls. *Hippophææ* has 2 species of shrubs or small trees; branches often spiny, covered with minute stellate hairs, as are all the young parts; fls. borne at the base of small lateral branches; staminate ones in catkins, sessile in the axils of 2 deciduous bracts; filaments none; pistillate fls. pedicelled, solitary in the axils of lvs.; perianth top-shaped, in 2 divisions; ovary 1-celled, 1-ovuled; style large, club-shaped.

In order to secure a good setting of berries, one or two staminate plants should be placed near every group of a dozen pistillate ones. When the shrubs are without berries the expert nurseryman can distinguish the two sexes by the more upright growth of the staminate and the more twiggy growth of the pistillate plants. The redder the berries the better for ornamental purposes. The berries are somewhat poisonous, but are eaten by birds. Though essentially a seashore plant, it is easily cult. inland in common garden soil, and thrives even in barren, sandy lands. It inhabits cool moving sands and the alluvium of torrents. When grown abroad to bold shifting sands it makes a straggling, stunted bush 2 ft. or more high. Under favorable conditions it may be grown into a tree 20 ft. high. The suckers may become so numerous as to be troublesome. The numerous spines which terminate the branches and the interlacing stems suggest its use for hedges. It is propagated by layers, suckers, root-cuttings and seeds.

rhamnoides, Lind. SEA BUCKTHORN. SWALLOW THORN. Lvs. appearing before the fls., grayish green above, silvery green below and scattered with reddish scales below; fls. yellowish, borne in clusters of 2-3 in May; fr. berry-like, orange-yellow, acid, maturing in Sept. G.M. 37:791. Gn. 49:1050 (with a fine colored plate and thorough appreciation by W. Golding), and 54, p. 396.

H. salicifolia, D. Don, has larger lvs., less densely coated with silvery scales. Nepal. Not cult. A. P. WYMAN.

HOBBLEBUSH. *Viburnum lantanoides*.

HOES. See *Tools*.

HOFFMANNIA (Georg Franz Hoffmann, 1760-1826, professor of botany at Göttingen). Including *Campylobotrys* and *Higginsia*. *Rubiaceæ*. About 15 tropical American herbs or shrubs, with opposite or verticillate lvs. and small white, yellow or red fls., cult. for the very showy foliage. Corolla tubular, with 4 (rarely 5) oblong or linear obtuse lobes; stamens 4; ring-like disk about the 2-3-lobed ovary; style filiform, the stigma 2-lobed. The Hoffmannias require warm temperature, although they may be planged in the open in the summer. Well grown specimens are also adapted to the decoration of window-gardens and living rooms. Propagated by cuttings. Hoffmannias are very showy foliage plants.

A. *Fl.-clusters on long stalks.*

discolor, Hems. (*Campylobotrys discolor*, Hook.). Fig. 1071. About 6 in high, but lopping over the side of the pot or pan and making a mat, slightly hairy, the branches purplish: lvs. short-petioled, oblong-ovate,



1071. *Hoffmannia discolor* ($\times \frac{1}{2}$).
A loose-growing sprig.

entire, satiny green above and rich light purple to green beneath: fls. small, red, in recurving racemes, on red peduncles. Mex. B.M. 4530. —Excellent little plant.

retulgens, Hems. Much like the former, but twice or more as large, the lvs. sessile and almost succulent, narrow-obovate, with many parallel veins running from the midrib to the margin, the under surface pale red or wine color and the upper surface dull green, with iridescent shades of purple and brown: fls. 1 in. across, pale red. Mex. B.M. 5346 as *Higginsia retulgens*. — A most beautiful plant.

AA. *Fl.-clusters crowded in the axils.*

Ghiesbreghtii, Hems. Half shrubby, 2-4 ft. tall, nearly glabrous: stem acutely 4-angled: lvs. usually 1 ft. or less long, oblong-lanceolate-acuminate, entire, the short winged petiole somewhat decurrent, very strongly veined, purple-red beneath and dark velvety green above: fls. yellow, with a red spot in the center. Mex. B.M. 5363 as *Higginsia Ghiesbreghtii*. I.H. 8:279, as a *Campylobotrys*. — A form with handsomely mottled lvs. is var. *variegata*, Hort. (I.H. 30:498).

regalis, Hems. Shrubby, strong-growing, glabrous, the branches obtusely 4-angled and somewhat fleshy: lvs. large, round-ovate and abruptly acuminate, entire, plicate with arched nerves, glabrous, purple-red beneath, and dark rich green above: fls. yellow, sessile. Mex. B.M. 5280, as a *Higginsia*.

Higginsia Rozii, Hort., is described as "a very beautiful new tropical plant, with dark bronzy leaves, streaked and marbled with white." *Saut.*

L. H. B.

HOHENBERGIA (personal name). *Bromeliacea*. Species commonly referred to *Echmea*, but the latest monographer (Mex. DC. Monogr. Phaner. 9) retains 17 species under this genus. The genus differs from *Echmea* in technical floral characters, the petals being ligulate, fls. always sessile and small, etc. **H. Legrelliana**, Baker, is by Mez referred to *Echmea* (*E. Lagrelliana*, Mez) and by Bentham & Hooker to *Portea*. It has also been referred to *Ortgiesia*. It is a strong Billbergia-like plant, with 7-12 strong, entire, brown-sealy lvs. and a simple dense spike of red fls. standing 4-7 ft. high: floral bracts serrate. Uruguay. For *H. ferruginea*, see *Echmea*. Warmhouse.

L. H. B.

HOLBELLIA (Frederick Louis Holbøll, once Supt. Bot. Gard., Copenhagen). *Berberidaceae*. This genus contains a fine shrubby climber, which is unfortunately inferior in hardiness to *Akebia quinata*, the latter being one of the best of all hardy vines. *Holbellia* resembles *Akebia* in having digitate lvs., edible, oblong, indurcent berries and an indefinite number of ovules. It differs in having 6 sepals and 6 minute petals, while *Akebia* has 3 sepals and no petals. Both genera have free stamens, while those of *Stantonia* are monadelphous. *Holbellia* has only 1 species. Generic characters are: fls. purple or greenish, monocious; sepals 6, petal-like; staminate fls. with rudimentary ovaries; pistillate fls. with 6 very small, sterile stamens.

Any one who was surprised with the "discovery" of the strange purple fls. of *Akebia* will be interested in the fls. of *Holbellia*. These are also purple or vary to greenish white, and the staminate fls., which appear later, are highly fragrant. The plant should be tried outdoors in the South where an evergreen quick-growing climber is desired, as it makes annual shoots 10 to 12 ft. long, and the foliage is distinct and beautiful. For the cool greenhouse it is too rampant and produces too few fls.

latifolia, Wallich. Leaflets commonly 3 or 5, but very variable in form and number. Himalayas. B.R. 32:49. R.H. 1890:348. Ga. 8, p. 548, and 14, p. 369. W. M.

HÖLCUS (Greek, to draw out; an old fable crediting this plant with the power of drawing thorns from the flesh). *Gramineae*. About 8 species of annual or perennial tufted grasses from Europe and Africa. The only species cult. is a forage grass of poor quality but capable of growing well in dry soil. Its nearest allies of garden value are *Avena* and *Desehampsia*, from which it differs as follows: spikelets falling off whole, and glumes with no or minute awns. *Avena* and *Desehampsia* have the floral glumes decidedly awned and the empty glumes remain on the plant when the florets fall.

lanatus, Linn. MEADOW SOFT GRASS. Perennial, 2-3 ft. high: lvs. downy; panicle greenish or tinged purple. Eu. A variegated form is cult. abroad for ornament.

G. T. HASTINGS.

HOLLY. Consult *Ilex*.

HOLLY, SEA. *Eryngium*.

HOLLYHOCK (*Althaea rosea* which see). Figs. 1072-4. The Hollyhock is an old garden favorite, full of sentiment and association with a distant past, and only the ravages of a dire disease have robbed it of the proud position it held among garden flowers during the middle of the present century. A plant of strong, vigorous growth, noble aspect, and of the most ornamental character, it must not be neglected or ignored, for we can ill dispense with its stately beauty. Before the ravages of disease there were in existence large collections of named varieties, and the Hollyhock was then one of



1072. The Hollyhock.



Hollyhocks, without which no hardy garden is complete

the most important of flowers. Within recent years, too, either from loss of virulence or through preventive measures, the disease having been somewhat controlled, collections of named varieties are again being formed, but, in the light of his own experience, the writer be-

Enchantress, yellow; Ochroleuca, light yellow; Queen, silver-rose; Venus, white; Psyche, lavender. Figs. 245 and 246, vol. 1, show good placing of Hollyhocks.

A. HERRINGTON.

HOLY GHOST PLANT. *Peristeria elata*.

HOMALANTHUS (application obscure). *Euphorbiaceæ*. This genus includes a small Australian tree or tall shrub cult. in S. Calif. for its copper-colored foliage. It is probably slightly cult. abroad under glass like *Euphorbia pulcherrima*. The genus contains 5-8 species of Malayan and Australasian trees or shrubs: lvs. alternate, stalked, wide, entire, feather-veined; racemes terminal; fls. apetalous; disk none; calyx of staminate fls. 2-parted; stamens 6-50; calyx of pistillate fls. 2-3-ld; ovary 2-celled.

The genus has no near allies of garden value, and the fls. are insignificant, being borne in racemes which consist mostly of staminate fls., with a few pistillate fls. at the base.

Leschenaultianus, A. Juss. (*H. papulifolius*, R. Grah. *Carriambium papulifolium*, Reinw.). Lvs. broadly ovate-triangular or rhomboidal, glaucous, 2-4 or even 6 in. long, with stalks of same length; racemes 1-4 in. long. India, Malaya, Australia. B.M. 2780.

HOMALOMENA (Greek, *equal filaments*). *Araceæ*. Also written *Homalonema*. This genus includes some tender foliage plants, variegated after the fashion of the well-known Dieffenbachias, and the rarer *Aglaonema* and *Schismatoglottis*. It is probable that the plants seldom produce flowers or fruit in cultivation. They are known to the trade as *Curmeria*, which is now regarded as a section of *Homalomena* in which the spathe has a distinct tube and the lvs. are either glabrous or pilose, while in the section *Euhomalomena* the spathe has an indistinct tube, and the lvs. are always glabrous.

The genus has about 15 species, natives of tropical Asia and America; robust herbs, with a thick rhizome; stem short or none; lvs. ovate- or triangular-cordate, or lanceolate, nerves reaching the margin, petiole mostly long and sheathing. Important generic characters are: stamens distinct; fr. included within the persistent spathe; ovules anatropous, adnate to the septa. For culture, see *Dieffenbachia*. Latest Monograph by Engler in DC. Mon. Phan. 2:332 (1879). The species described below belong to the subgenus *Curmeria*, with 3 other species, and all are American; the other 10 species are Asian.

Pitcher and Manda advertised in 1895 *Curmeria Leopoldii*, a rare and costly plant, of which the writer finds no further information.

A. *Lvs. irregularly blotched.*

Wallisii, Regel (*Curmeria Wallisii*, Mast.). Lvs. glabrous throughout, the base obtuse or acute, not notched; petiole 1½ in. long; blade 5 in. long, 2-2½ in. wide. Colombia. R. G. H. 7:108. B.M. 6571 (midrib outlined in light color). I.H. 25:303. R.H. 1878, p. 193. The blotches are pale yellowish green, becoming greenish gray. None of the pictures show a white-bordered leaf with golden blotches, as one dealer advertises.

AA. *Lvs. with midrib bordered with white.*

picturata, Regel (*Curmeria picturata*, Linden & André). Lvs. with petiole and midrib pilose; petiole 4 in. long; blade 10-12 in. long, 8 in. wide. Colombia. I.H. 20:121. - Blotched only near the midrib. W. M.

HOMERIA (application uncertain). *Iridaceæ*. This includes a half-hardy bulb, which can be set out in spring, and bears orange-colored fls. in summer. It is allied to *Sparaxis*, requires the same culture, and the bulbs, which are dormant from Aug. to Nov., are procurable from Dutch dealers. A genus of 6 species, all from the Cape of Good Hope. It belongs to the Moraea tribe, in which the fls. are stalked and more than one to a spathe, and the style branches placed opposite the stamens. It differs from *Iris* and *Morea* in having stylo branches furnished with terminal stigmas not overlapping the anthers. Nearer allies of garden value are *Tigridia*, *Herbertia* and *Ferraria*, from all of which



1073. Semi-double Hollyhock (× ¼).

lieves that one can get the best and surest results by raising plants from seed of a good strain. This may be sown at any time during the early months of the year. Sow in pots or pans and place in a warmhouse to assist germination. Pot the plants singly as they develop, and keep them growing freely but sturdily in a cool, airy temperature, removing them to the open air as summer advances. If well grown, the plants should be in 6-in. pots at this time. During the latter part of summer they may be planted out where they are to bloom. As Hollyhocks demand liberal treatment, their permanent spot should be well prepared by deep digging, at the same time working in a good quantity of rotted manure. Plant 3 ft. apart and firmly, and should the fall months be dry, give water frequently, as suffering from drought predisposes plants to attack of disease. The following spring the plants will grow vigorously, and the only attention needed is copious watering during dry spells. The flowers will appear from July onwards. The Hollyhock is a hardy perennial, and if it enjoys an immunity from disease, will spring up and flower each year. Should disease appear, however, root the plants out and destroy by fire and make the next plantation on a new site some distance removed. Thorough spraying with fungicides may be expected to check the disease in hand, if applications are made early and to the under sides of the lvs.; but if Bordeaux mixture is used, the plants look very untidy. Perhaps it is better to use ammoniacal carbonate of copper. A diseased leaf is shown in Fig. 880. If the stock keeps healthy and it is desired to increase specially fine varieties, this can be done easily by cuttings formed from offshoots. These should be taken off and dotted singly in small pots in sandy soil and kept close in a shaded coldframe.

A few fine named varieties obtainable in the trade at present are: Apollon, rose; Brennus, crimson; Ettie Beale, flesh pink; Mrs. Barron, rose-pink, and very beautiful; Diadem, rich yellow; Her Majesty, rose;



1074. Double Hollyhock (× ¼).

Homeria differs in the 2 petaloid stigmatose crests at the ends of the style branches. Homeria has 6 nearly equal perianth segments, which at the base are united into a cup. Monogr. by J. G. Baker in Handbook of the Iridaceae, 1892, and Flora Capensis 6:26 (1896-7). The following characters successively delimit *H. collina* from the other 5 species: perianth segments not blotched in the middle: fls. large: spathes $2\frac{1}{2}$ -3 in. long: lvs. not banded down the middle. W. E. Endicott writes that *H. collina* does well when treated like *Ixia*, as described by him in this work.

collina, Vent. (*Morica collina*, Thunb.). Corm tunicated, globose, $\frac{3}{4}$ -1 in. long; the only long leaf is linear, rigid, $1\frac{1}{2}$ -2 ft. long, overtopping the fls.; stem bearing 1-4 clusters of fls.; perianth segments $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long, typically bright red, as in B.M. 1033; G.C. III. 4: 163. Var. *aurantiaca* has a slenderer habit and yellow-clawed, bright red segments, which are narrower and more acute than the type. B.M. 1612. Var. *ochroleuca* has the habit of the type and pale yellow fls. B.M. 1103. It is probable that var. *aurantiaca* is the only form in which the species is cultivated.

HOMOCÉLTIS, a name in the Amer. trade, is a misspelling of *Homoioceitis*. P. J. Berckmans writes that seeds of *Homoioceitis Japonica* were distributed some 20 years ago by Gen. Wm. Browne, then a professor at the Georgia State University. These trees were injured in Georgia by the severe cold of February, 1899. Reasoner writes that it is a fine, deciduous tree, with the appearance of an elm or hackberry, and makes a dense top. It has not flowered in Florida.

Homoioceitis aspera, Blume, is *Aphananthe aspera* (which see), and this is the only *Homoioceitis* in Japan. Some, at least, of the stock known as *H. Japonica* (and sometimes called also *Celtis Davidiana*) is *Aphananthe aspera*. In *Aphananthe*, the secondary veins are straight and end the teeth of the lvs.; in *Celtis*, they are curved and form loops along the margin.

HONESTY. *Lunaria annua*.

HONEY LOCUST. *Gleditsia triacanthos*. Honey-suckle, *Lonicera*. Honeywort, *Cerinth*.

HOOKERA. A part of *Brodiaea*.

HOP. See *Humulus*.

HOP HORNBEAM. See *Ostrya*. Hop, Wild, *Bryonia dioica*.

HOPLOPHYTUM. Several Bromeliads have been described under this name, but the species are now referred to *Echmea*. *Halophytum* of one trade catalogue is apparently an error for *Hoplophyton*.

HORDEUM (Latin, *heavy*; because barley bread is heavy and firm). *Cyranineae*. This genus includes the Barley (*H. sativum*) and the Squirrel Tail Grass (*H. jubatum*), the latter a meadow weed obnoxious in the West, but sometimes cult. for ornament in the East and abroad. Its head of long spreading awns is ornamental, but the spikelets separate too readily to make the grass particularly desirable. Hordeums are erect, annual or perennial grasses, spikelets in 3's, sessile on opposite sides of the notched rachis, empty glumes narrow and long, forming an involucre around the spikelets. In these characters it resembles *Elymus* and *Asprella*, but it is separated from them by the fact that each spikelet is but 1-fl'd., while in the others the spikelets are 2-many fl'd. See *Barley*.

jubatum, Lindl. SQUIRREL-TAIL GRASS. WILD BARLEY. Erect, simple, usually smooth and glabrous, 10 in. to 2 ft. high: lvs. 1-5 in. long, only the central spikelet in each cluster perfect: awns of empty glumes 1-2½ in. long, spreading. In dry soil, northern U. S. and Canada. B.B. 1:229. R.H. 1890, p. 488 (poor). G. T. HASTINGS.

HOREHOUND. See *Marrubium*.

HORMINUM. See *Salvia*.

HORNBEAM. Consult *Carpinus*.

HORNED POPPY. *Glaucium*.

HORSE, in combination with other names of plants, usually signifies something large and coarse, not necessarily eaten by horses.

HORSE BALM. *Collinsonia*.

HORSE BEAN. See *Vicia Faba*.

HORSE CHESTNUT. See *Esculus*.

HORSE MINT. See *Monarda*.

HORSE-RADISH (Fig. 1075), the well-known condiment used so much with roast beef and oysters, is a member of the natural family Cruciferae, to which belong cabbage, turnip, wallflower, stock, charlock, mustard, and many other vegetables, flowers and weeds. It comes to us from Great Britain, where it is thought to have been naturalized from some more eastern European country. It is often found growing wild in moist locations, such as the margins of streams, in cool woods and damp meadows, and, in some places, notably in the state of New York, is troublesome as a weed. For botanical description, see *Cochlearia*.

The root is perennial, fleshy, whitish externally, pure white within, conical at the top, cylindrical, and, unlike the tap-roots of parsnips, is abruptly branched below. When bruised, it emits a volatile oil of strong, pungent odor and hot, biting taste. If eaten before this oil evaporates, it is highly stimulant, exciting the stomach when swallowed, and promoting the secretions, especially that of urine. Externally, it is rubefacient. Its chief use is as a condiment to promote appetite and invigorate digestion; but it is also occasionally employed in medicine." (U. S. Dispensatory.) As a table relish, the consumption of Horse-radish is increasing, and greater attention is being paid to its cultivation than formerly. Under the old methods, profitable returns were often obtained, but under the new, profits are generally highly satisfactory where enemies are not very troublesome. The season of fresh-grated Horse-radish runs almost parallel to that of oysters, with which the root is most frequently eaten in this country. Ungrated roots are, however, kept in cold storage for summer use, since roots dug at that season have an unpleasant taste.

Horse-radish will do well upon almost any soil except the lightest sand and the heaviest clay, but a deep loam of medium texture and moderate richness, well supplied with humus and moisture, will produce roots of the best quality and the largest size. In dry soils the roots will be small, woody and deficient in pungency; in wet, small, succulent, strong-tasting. Drainage is essential, and so is a fairly open subsoil. Hard subsoil induces excessive branching of the root. Applications of nitrogenous manures should be rather light, commercial fertilizers rich in potash being given the preference. Roefs recommends a mixture containing 10 per cent potash, 7 per cent phosphoric acid, 4 per cent nitrogen, 600 pounds drilled in per acre. A heavier application broadcast and deeply plowed under, it is believed, would give better results, since the shaft of the root is less likely to become unduly branched when the food is below instead of above and around it, especially when the sets are placed horizontally. A weeder should be used after the harrow periodically until the plants are an inch or so tall. Thorough preparation of the soil is essential.

Since Horse-radish rarely produces seeds, cuttings



1075. Good root of Horse-radish.

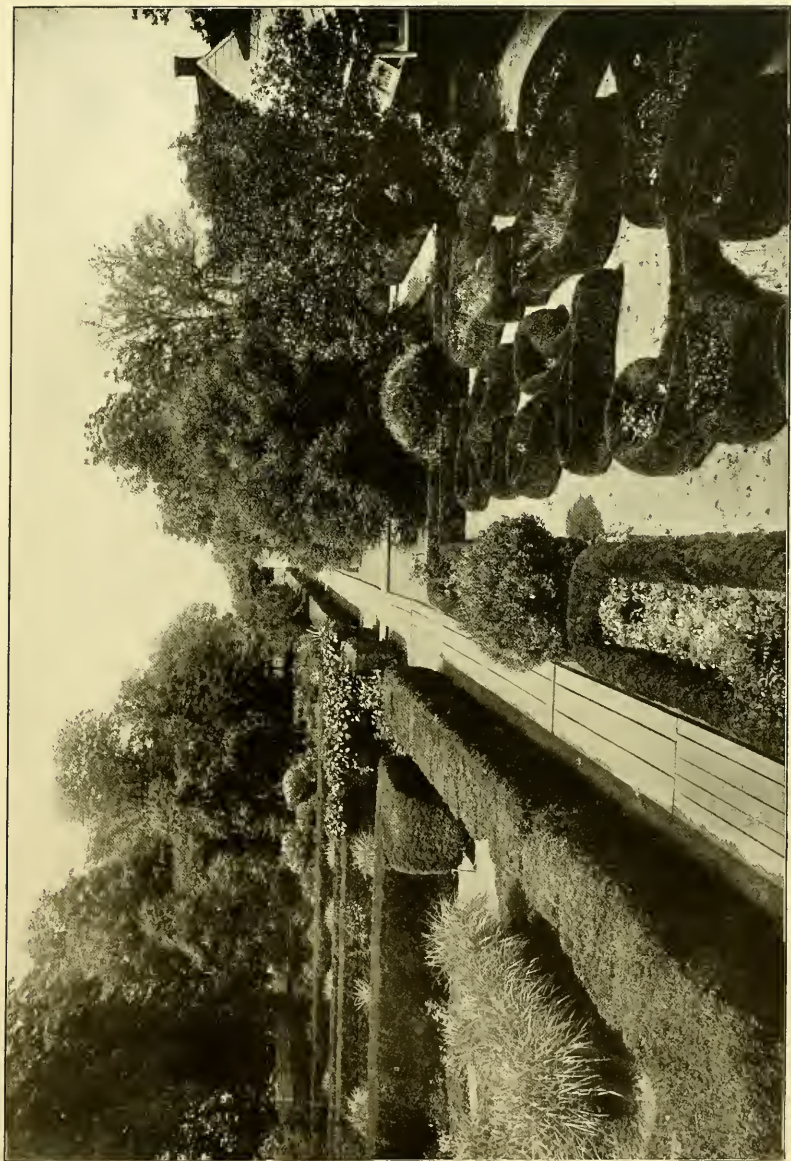


Plate XIV. Type of an old-time formal garden.—Washington's garden at Mt. Vernon, as it looks to-day

are made from the roots, not less than one-fourth of an inch thick and 4-5 in. long (Fig. 1076). To facilitate planting the large end of the upper end is cut off square and the lower oblique. If set small-end up no growth may result. In horizontal planting this special cutting is unnecessary. Root-crowns are sometimes used, but since these develop a large number of roots too small for profitable grating, they are employed only for increasing stock.

The land having been prepared, shallow furrows are laid off 30 in. apart and 2-5 in. deep, according to the method of planting. Sets are planted horizontally, vertically, and at all intervening angles, the large ends being made to point in one direction to facilitate cultivation and digging. The angle is a matter of choice, good returns being obtained in each. The usual distance between sets is about 12 in. Cultivation is given after every rain, or once in 10 days, until the lvs. shade the ground.

Double-cropping is common in Horse-radish growing, early cabbage, turnip beets and other quick-maturing plants being used. The sets are dibbled in 2-4 weeks after the first crop, vertically, 18 in. asunder, between the rows of cabbage, which are not less than 2 ft. apart. One management answers for both crops until the first is removed, when, after one cultivation, the Horse-radish usually takes full possession. Deep burying of the sets at the time the first crop is planted is also practiced, the object, as in the first case, being to prevent the appearance of the former until the latter is almost mature.

Horse-radish makes its best growth in the cool autumn, steadily improves after September, and, not being injured by frost if undug, is usually left until late before harvesting with plow or spade. Storage in pits is best, since the roots lose less of their crispness, pungency and good appearance than if stored in cellars. In trimming for storage, the lateral roots are saved and buried for next season's planting. Exposure to air, sun and frost robs the roots of their good qualities and injures their vitality.

The insect enemies of this plant are those that attack other members of the cabbage family, the harlequin bug being the most dreaded. Remedies are the same as for other pests of this group of plants. Only two diseases have been reported, and these are seldom troublesome.

In the neighborhood of cities, especially where oysters are cheap, this crop is generally profitable, the usual retail price being 10 cents per pint, freshly grated, but without vinegar. This quantity weighs a scant half-pound. The cost of growing per acre is about as follows: Cuttings (10,000 @ \$2), \$20; fertilizer (1,000 lbs.), \$17.50; cultivation (6 times), \$6; rent of land, \$5; plowing, wear of tools, etc., \$3.50; setting roots, at 30 cents per 1,000, \$3; total, \$55. A marketable crop varies from 3,000 to 6,000 pounds, which may sometimes be sold as high as 5 cents per lb. for first-class root, and 2½ cents for second grade. Usually, however, prices seldom rise above 4 cents and 2 cents for the two grades. Under good cultivation, the proportion of No. 1 to No. 2 root is about 1 to 1 by weight. Lower prices may rule in well supplied markets, and higher in poorly furnished, and when sold in small lots to retail graters, even 7 cents may be obtained.

M. G. KANS.

HORSE-RADISH TREE. *Moringa pterygosperma*.

HORSE SUGAR. *Symplocos tinctoria*.

HORSETAIL. *Equisetum*.

HORSEWEED. *Collinsonia*.

HORTICULTURE (*hortus* a garden, originally an inclosure; *cultura*, to care for or to cultivate). Horticulture is the growing of flowers, fruits and vegetables, and of plants for ornament and fancy. Incident to the growing of the plants are all the questions of plant-breeding, variation of plants under domestication, and the bearings and applications of many biological and physical sciences. Primarily it is an art, but it is intimately connected with science at every point. From agriculture it has no definite boundary. It is, in fact, a department of agriculture, as forestry is; for agriculture, in its largest meaning, is the business of raising products from the land. It is customary, however, to limit the word agriculture to the growing of grains, forage, bread-stuffs, textiles, and the like, and to the raising of animals. In this restricted application it is practically coordinate, in a classificatory sense, with forestry and Horticulture. Etymologically, agriculture is the tending of the fields (*agri*, field) or those parts which, in earlier times, lay beyond the fortified or protected inclosure, or at least more or less remote from the residence; Horticulture was concerned with the area within the inclosure. Equivalent to Horticulture in etymology is *gardening* (Anglo-Saxon *gyrdan*, to enclose, to which the verb *to gird* is allied). By custom, however, *garden* and *gardening* denote more restricted areas and operations than are implied in the term Horticulture. The word *paradise* is connected with the idea of an inclosure and a garden. Early gardening books of the Cyclopaedia type are sometimes known as *paradisus*. Parkinson's famous *Paradisus*, or account of "a garden of all sorts of pleasant flowers," was published in England in 1629.

The only demarcation between Horticulture and agriculture is the line of custom. Sweet potatoes are usually considered to be a horticultural crop in North America, particularly in the northern states, but round or Irish potatoes are usually classed as an agricultural crop. Nor is there a definite division between Horticulture and botany. The science of plants is botany; yet some of the most significant problems relating to plants—their response to the needs of man—are ordinarily resigned by the botanist to the horticulturist. Horticulture is a composite of botanical and agricultural subjects.

But Horticulture is more than all this. It is a means of expressing the art-sense. Plant forms and plant-colors are as expressive as the canvas work of the painter. In some respects they are more expressive, since they are things themselves, with individuality and life, not the suggestions of things. The painter's work excels in its power to suggest, and in its condensed portrayal of expression. But the essentials of a good landscape painting often can be presented in an artificially-made landscape. This effort to plant what the artist paints is modern. It is strictly not Horticulture, although Horticulture is contributory to the results, as paint-making is contributory to painting. Landscape making is fundamentally a fine art. In this work it is treated under *Landscape Gardening*.

Horticulture divides itself into four somewhat coordinate branches (Annals Hort. 1891, 125-130):

- Pomology, or the growing of fruits;
- Olericulture, or vegetable-gardening;
- Floriculture, or the raising of ornamental plants for their individual uses or for their products;
- Landscape Horticulture, or the growing of plants for their use in the landscape (or in landscape gardening).

In the world at large, floriculture is the most important as measured by the number of people who are interested, and by the number of species of plants which are grown (see *Floriculture*). In North America, pomology is the most important in respect to commercial supremacy. North America is the great fruit-growing country of the world (see *Pomology*). Relatively speaking, vegetable-gardening is undeveloped in the New World. Landscape Horticulture and landscape gardening will appeal to a constantly enlarging constituency with the growth of culture and of leisure and the deepening of the home life.

Strictly speaking, there are few horticulturists. The details are too many to allow any one person to cover



1076. Root cuttings of Horse-radish ($\times \frac{1}{2}$).

the entire range. It is only those who look for principles who survey the whole field. Practitioners must confine themselves to rather close bounds. Consider that no less than 25,000 species of plants are in cultivation, each having its own requirements. Consider the great number of species which are actually on sale in North America, as registered in this *Cyclopaedia*. The most important species vary immensely, the named and recorded forms often running into the thousands; and each of these forms has particular merits and often particular requirements. Consider that the requirements are likely to be different in any two places, and that the plants are profoundly modified by changes in conditions or in treatment. Consider the vagaries of markets, which are ruled by questions of fancy more than by questions of necessity. There is probably no art in which the separate details are so many as in Horticulture.

Of Horticulture there are two general types,—that which is associated immediately with the home life, and that which is undertaken primarily for the gaining of a livelihood. The former is amateur Horticulture. Those things are grown which appeal to the personal tastes: they are grown for oneself. The latter is commercial Horticulture. Those things are grown which the market demands: they are grown for others. In all countries, commercial Horticulture is a relatively late development. General agriculture is usually the primary means of earning a living from the soil. For the most part, Horticulture comes only with the demand for the luxuries and refinements of life: it does not deal with what we call the staples. It is not the purpose of this sketch to trace the general history of Horticulture. If one desires such outlines, he should consult the Bohn edition of Pliny's "Natural History;" London's "Encyclopaedia of Gardening;" G. W. Johnson's "History of English Gardening;" Amherst's "History of Gardening in England;" Sieveking's "Gardens, Ancient and Modern;" Jüger's "Gartenkunst und Gärten, sonst und jetzt;" Hüttig's "Geschichte des Gartenbaues;" the historical chapters of André's "L'Art des Jardins." For the histories of cultivated plants, see DeCandolle's "Origin of Cultivated Plants;" Hehn & Stalbyrass' "Wanderings of Plants and Animals from their first Home;" Pickering's "Chronological History of Plants."

In North America there was little commercial Horticulture before the opening of the nineteenth century. There were excellent home gardens more than a century ago, in which many exotic plants were growing; yet, in proportion to the whole population, these gardens were isolated. The status of any modern time is accurately reflected in its writings. It may be well, therefore, to bring in review the leading early horticultural writings of this country. Few studies have been made of our horticultural history. The best is the introductory sketch, by Robert Manning, in the "History of the Massachusetts Horticultural Society," 1880. For its field, Slade's "Evolution of Horticulture in New England," 1895, is interesting. In a still narrower field, Boardman's "Agricultural Bibliography of Maine" is critical and invaluable. The chapter on "American Horticulture," by Alfred Henderson, in Depew's "One Hundred Years of American Commerce," 1895, presents the commercial side of the subject. Another fragment of the history is presented in the writer's "Sketch of the Evolution of our Native Fruits," 1898. Histories from several points of view are presented in the "Florists' Exchange" for March 30, 1895; and the writer has incorporated parts of his own contribution to that history in the sketch which follows.

The earliest writings on American plants were by physicians and naturalists who desired to exploit the wonders of the newly discovered hemisphere. The earliest separate writing is probably that of Nicolo Monardes on the products of the New World, which was published in Seville in parts, from 1565 to 1571. The completed treatise was translated into Italian, Latin, English and French. Monardes is now remembered to us in the genus *Monarda*, one of the mint tribes. He wrote of the medicinal and poisonous plants of the West Indies, and gave pictures, some of them fantastical. His picture of tobacco is not greatly inaccurate, however; and it has the distinction of being probably the first picture extant of the plant, if not of any Ameri-

can plant. This picture is here reproduced (Fig. 1077) exact size, to show the style of illustration of three hundred years ago. Jacques Cornutus is generally supposed to have been the first writer on American plants. His work, "Canadensium Plantarum," appeared in 1635, and it also had pictures. One of the earliest writers on the general products and conditions of the northern country was John Josselyn, who, in 1672, published a book entitled "New England's Rarities discovered in Birds, Beasts, Fishes, Serpents, and Plants of that Country," and in 1674 a second volume, "An Account of Two Voyages to New England, made during the years 1638, 1663." The "Rarities" gives specific accounts of many plants, together with pictures of a few of them, as, for example, the pitcher plant. He mentions the plants which had become naturalized from Europe. There is also a list "Of such Garden Herbs (amongst us) as do thrive there, and of such as do not." This list, the earliest record of the kind, is here transcribed:

- Cabbage grows there exceeding well.
 - Lettice.
 - Sorrel.
 - Parsley.
 - Marygold.
 - French Mallows.
 - Chervil.
 - Burnet.
 - Winter Savory.
 - Summer Savory.
 - Time.
 - Sage.
 - Carrats.
 - Parsnips of a prodigious size.
 - Red Beetes.
 - Radishes.
 - Turnips.
 - Parslain.
 - Wheat.
 - Rye.
 - Barley, which commonly degenerates into Oats.
 - Oats.
 - Pease of all sorts, and the best in the World; I never heard of, nor did see in eight Years time, one Worm eaten Pea.
 - Garden Beans.
 - Naked Oats; there called Silpee, an excellent grain used instead of Oat Meal, they dry it in an Oven, or in a Pan upon the fire, then beat it small in a Morter.
 - Spear Mint.
 - Rew, will hardly grow.
 - Felherow prospereth exceedingly.
 - Southern Wood, is no Plant for this Country. Nor
 - Rosemary. Nor
 - Bayes.
 - White Satten groweth pretty well, so doth
 - Lavender Cotton. But
 - Lavender is not for the climate.
 - Penny Royal.
 - Smalledge.
 - Ground Ivy, or Ale Hoof.
 - Gilly Flowers will continue two Years.
 - Fennel must be taken up, and kept in a warm Cellar all Winter.
 - Housleek prospereth notably.
 - Holly bocks.
 - Enula Campana, in two Years time the Roots rot.
 - Coniferie, with white Flowers.
 - Coriander, and
 - Dill, and
 - Annis thrive exceedingly, but Annis Seed, as also the Seed of Fennel, seldom come to maturity; the Seed of Annis is commonly eaten with a fly.
 - Clary never lasts but one Summer, the Roots rot with the Frost.
 - Sparagus thrives exceedingly, so does
 - Garden Sorrel, and
 - Sweet Bryer, or Eglantine.
 - Bloodwort but sorrowly, but
 - Patience, and
 - English Roses, very pleasantly.
 - Celandine, by the West Country men called Kenning Wort, grows but slowly.
 - Muscata, as well as in England.
 - Dittander, or Pepper Wort, flourisheth notably, and so doth Tansie.
 - Musk Mellons are better than our English, and
 - Cumbers.
 - Pompions, there be of several kinds, some proper to the Country, they are dryer then our English Pompions, and better tasted; you may eat them green.
- Tuckerman comments as follows on the above lists: "The earliest, almost the only account that we have of the gardens of our fathers, after they had settled themselves in their *New England*, and had tamed its rugged

coasts to obedience to English husbandry. What with their garden beans, and Indian beans, and pease ('as good as ever I eat in England,' says Higginson in 1629); their beets, parsnips, turnips, and carrots ('our turnips, parsnips, and carrots are both bigger and sweeter than is ordinary to be found in England,' says the same reverend writer); their cabbages and asparaguses,—both thriving, we are told, exceedingly; their radishes for lettuce; their sorrel, parsley, chervil, and marigold, for pot-herbs; and their sage, thyme, savory of both kinds, clay, anise, fennel, coriander, spearmint, and pennyroyal, for sweet herbs,—not to mention the Indian pumpkins and melons and squanter-squashes, 'and other odde fruits of the country,'—the first-named of which had got to be so well approved among the settlers, when Josselyn wrote in 1672, that what he calls 'the ancient New-England standing dish' (we may call it so now!) was made of them; and, finally, their pleasant, familiar flowers, lavender-cotton and hollyhocks and satin ('we call this herbe, in Norfolk, sattin,' says Gerard; 'and, among our women, it is called honestie') and gillyflowers, which meant pinks as well, and dear English roses, and eglantine,—yes, possibly, hedges of eglantine,—surely the gardens of New England, fifty years after the settlement of the country, were as well stocked as they were a hundred and fifty years after. Nor were the first planters long behindhand in fruit. Even at his first visit, in 1639, our author was treated with 'half a score of very fair pippins,' from the Governor's Island in Boston Harbor; though there was then, he says, 'not one apple tree nor pear planted yet in no part of the country but upon that island.' But he has a much better account to give in 1671: 'The quinces, cherries, damsons, set the dames a work. Marmalad and preserved damsons is to be met with in every house. Our fruit trees prosper abundantly,—apple trees, pear trees, quince trees, cherry trees, plum trees, barberry trees. I have observed, with admiration, that the kernels sown, or the suckers planted, produce as fair and good fruit, without grafting, as the tree from whence they were taken. The country is replenished with fair and large orchards. It was affirmed by one Mr. Woolcut (a magistrate in Connecticut Colony), at the Captain's messe (of which I was), aboard the ship I came home in, that he made five hundred hogheads of syder out of his own orchard in one year.'—*Voyages*, p. 189-90. Our barberry bushes, now so familiar inhabitants of the hedgerows of eastern New England, should seem from this to have come, with the eglantines, from the gardens of the first settlers. Barberries 'are planted in most of our English gardens,' says Gerard." Relics of Josselyn's time still persist in old apple trees in New England (Fig. 1078). The foregoing lists and remarks show that the colonists early brought their familiar home plants to the new country; and there are many collateral evidences of the same character. There was long and arduous experimenting with plants and methods. Several things which were tried on a large scale failed so completely, either from ungenial conditions or for economic reasons, that they are now unknown to us as commercial crops; amongst these are indigo, silk and the wine grape. The histories of these things can be traced only as a refrain is cotemporary writing. Indian corn, tobacco and cotton early became the great staple crops.

The Indians cultivated corn, beans, pumpkins and other plants when America was discovered. They soon adopted some of the fruits which were introduced by the colonists. William Penn and others found peaches among the Indians. Orchards of peaches and apples were found in western New York by Sullivan's raid against the Six Nations in revolutionary times. Josselyn, Roger Williams, Wood and others speak of the corn and squashes of the Indians. The word squash is adopted from the Indian name, *squantersquash*, *askutasquash*, or *isquotersquash*. C. C. Jones, in his "History of Georgia," in describing the exploration of De Soto, says that before reaching the Indian town of Canasagua (whose location was in Gordon county, Georgia), DeSoto "was met by twenty men from the village, each bearing a basket of mulberries. This fruit was here abundant and well flavored. Plum and walnut trees were growing luxuriantly throughout the country, attaining a size and beauty, without planting or pruning,

which could not be surpassed in the irrigated and well-cultivated gardens of Spain." For critical notes on the plants cultivated by the American aborigines, see Gray and Trumbull, *Amer. Journ. of Science*, vol. 25 (April, May), vol. 26 (August).

"Fruit-growing among the Indians of Georgia and Alabama in the early history of these states," writes Berckmans, "is demonstrated by the large quantity of peaches which the Indian traders of the early colonial period found growing in the Creek, Cherokee and Choctaw villages. It is on record that Indians often made long trips to other tribes for exchanging various articles

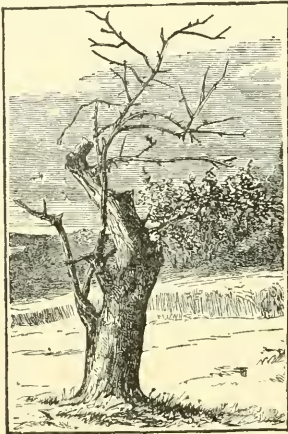


1077. Earliest picture of an American plant.
Mouardes, 1571.

of their making, and thus the seed from those peach trees was undoubtedly procured from the Florida Indians, who, in turn, procured these from the trees planted by the Spanish explorers. The peculiar type of 'Indian peaches,' found throughout the South and recognized by the downy and striped fruit and purple bark on the young growth, was introduced from Spain and gradually disseminated by the Indians. Apple-growing was quite extensively carried on by the Cherokee Indians in the mountain regions of Georgia, Alabama and North Carolina. The trees being all seedlings, as grafting was likely unknown to the Red Man, vestiges of old apple trees originally planted by these denizens of the South are still occasionally found in upper Georgia. Fifty years ago a large collection of apples was introduced into cultivation, and to-day many of the best southern winter apples owe their origin to the Indians, who procured the first seeds from traders."

One of the earliest glimpses of plant-growing in the New World is an account in the *Philosophical Transactions of the Royal Society*, early in the eighteenth century, by Chief Justice Paul Dudley, of Roxbury, near Boston. In the *Abridgement of the Transactions* are the

following notes, amongst others, under the date 1724: "The plants of England, as well those of the fields and orchards as of the garden, that have been brought over into New England, suit very well with the soil, and grow to perfection. The apples are as good as those of England, and look fairer, as well as the pears; but they have not all of the sorts. The peaches rather excel



1075. Relic of colonial days—apple tree at 250 years.

those of England, and there is no trouble or expence of walls for them; for the peach trees are all standards, and Mr. Dudley has had, in his own garden, 700 or 800 fine peaches of the rare-ripen, growing at a time on one tree. * * * The peach trees are large and fruitful, and commonly bear in 3 years from the stone. * * * The common cherries are not so good as the Kentish cherries of England; and they have no dukes, or heart-cherries, unless in two or three gardens." It was reported that people of "late years have run much upon orchards." The product of these orchards was chiefly cider. "Some of their apple trees will make 6, some have made 7 barrels of cider; but this is not common; and the apples will yield from 7 to 9 bushels for a barrel of cider; a good apple tree will measure from 6 to 10 feet in girt." Dudley mentions a bloomless apple, and "the tree was no graft." In common with other new countries, New England astonished persons with the luxuriant growth of the plants. "An onion, set out for seed, will rise to 4 feet 9 inches in height. A parsnip will reach to 8 feet; red orrice [orach] will mount 9 feet; white orrice 8. In the pastures he measured seed mullen 9 feet 2 inches in height, and one of the common thistles above 8 feet." Record is made of a pumpkin vine which grew unattended in a pasture. It made a single stem which "ran along over several fences, and spread over a large piece of ground far and wide." "From this single vine were gathered 260 pumpkins; one with another as large as a half peck; enough in the whole, to fill a large tumbrel, besides a considerable number of small and nrippe pumpkins." Indian corn was "the most prolific grain." Mr. Dudley did not accept the notion that the mixing of corn is due to the intermingling of the roots, but thought that it was brought about through the agency of the wind. He also noted that the hop and the running kidney bean twine in opposite directions on their support.

The colonial ornamental gardens were unlike our own in the relative poverty of plants, in the absence of the landscape arrangement, in the rarity of greenhouses, and the lack of smooth-shaven lawns (for the lawn mower

was not invented till this century). These gardens were of two general types: the unceremonious personal garden, without form but not void (Fig. 1073), in which things grew in delightful democracy; the conventional, box-bordered, geometrical garden, in which things grew in most respectful aristocracy. (Plate XIV.) There were many interesting and elaborate private gardens in the colonial days. One of the earliest and best was that of Governor Peter Stuyvesant, of New Amsterdam (New York, near Third Avenue), known as the "Bowwerie," where 40 or 50 negro slaves, and also white servants, were kept at work. "The road to the city had been put in good condition, and shade trees were planted on each side where it crossed the Governor's property." The Bowery of these degenerate days has lost the Eden-like features which distinguished its illustrious progenitor.

Excellent gardens were attached to the residences of wealthy persons by the middle of last century, and probably earlier, and they were said to have been encouraged by the example and precept of Washington. There are records of many large and meritorious collections of plants a century and more ago. William Hamilton's collection at Philadelphia was one of the best, and it contained a large collection of exotics. It flourished towards the close of last century, and was broken up in 1828. William Jackson began "a highly interesting collection of plants at his residence in Londongrove," Pennsylvania, in 1777. About 1800 Joshua and Samuel Pierce, East Marlborough, Pa., "began to adorn their premises by tasteful culture and planting," and by the establishment of an arboretum of evergreens. The most famous botanic garden which North America has ever had was John Bartram's, established at Philadelphia in 1728. It contained a great collection of native plants, and some of the trees are now amongst the most valued landmarks of the city. Bartram was a skillful farmer and gardener, and his sons, John and William, inherited his tastes and continued the garden. The elder Bartram was probably the first American to perform successful experiments in hybridization. Bartram's house (Fig. 1080), built by himself, is still one of the sights of the environs of Philadelphia, and the site of the garden, with many of the old trees standing, is now happily a public park. Bartram's cousin, Humphry Marshall, established a botanic garden at West Bradford, in Chester county, Pa., in 1773. John Bartram's name is preserved to us in the moss Bartramia, and Marshall's in the genus Marshallia,



1079. An old-time garden.

applied to small Composite of the eastern states. The Elgin botanic garden, near New York, was established in 1801 by David Hosack, a man of great learning and of the keenest sympathies with rural occupations. He

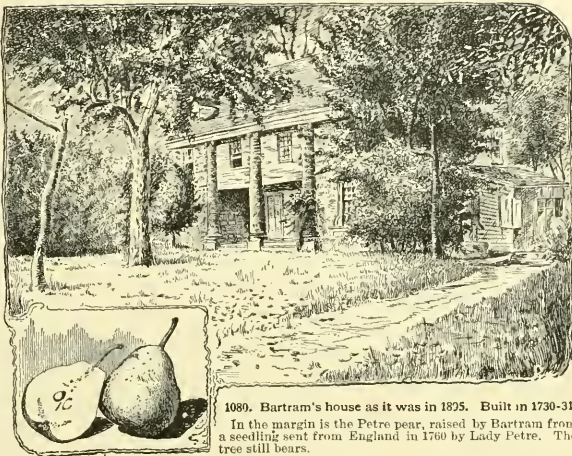
is now remembered in the interesting genus *Hosackia*, one of the Leguminosae. A botanic garden was established at Charleston, S. C., about 1804, and one in Maryland about the same time. The Botanic Garden at Cambridge, Mass., was begun in 1805, an institution which, together with the Professorship of Natural History at Cambridge, was founded largely through the efforts of the Massachusetts Society for Promoting Agriculture. The society subscribed \$500 for the purpose, and raised more by subscription.

EARLY GENERAL WRITINGS.—The progress of Horticulture may be traced in the books devoted to the subject. The earliest writings did not separate Horticulture from agriculture. The only work exclusively devoted to agricultural matters which appeared in America before the Revolution seems to have been the "Essays upon Field-Husbandry," begun in 1748 and completed in 1759, by Rev. Jared Eliot, of Killingworth, Conn., grandson of the famous

apostle Eliot. (See *Eliot*.) "There are sundry books on husbandry wrote in England," said Eliot, in his preface. "Having read all on that subject I could obtain; yet such is the difference of climate and Method of Management between them and us, arising from Causes that must make them always differ, so that those Books are not very Useful to us. Besides this, the Terms of Art made use of are so unknown to us, that a great deal they Write is quite unintelligible to the generality of New-England Readers."

Just at the close of the Revolution, J. Hector St. John's "Letters from an American Farmer" appeared, although "the troubles that convulsed the American colonies had not broken out when * * * some of the * * * letters were written." For a period of twenty-five years following the close of the war the condition of our agriculture, and of all American institutions, was minutely unfolded to the world through the writings of many travelers, English and French, who made inquisitive journeys into the new country. Strickland, an English traveler, wrote in 1801 that "land in America affords little pleasure or profit, and appears in a progress of continually affording less. * * * Land in New York, formerly producing 20 bushels to the acre, now produces only 10. * * * The little profit can be found in the present mode of agriculture of this country, and I apprehend it to be a fact that it affords a bare subsistence. * * * Decline has pervaded all the states." There is abundant evidence, including a painstaking inquiry made by Washington, to show that agriculture was at a low state at the close of the century. It was in striking contrast to its status a hundred years later, notwithstanding the lugubrious writings of the present time.

There was early development of the garden desire in the South as well as in the North. In South Carolina appeared the earliest American horticultural book of which we have any record. This book is no longer extant, and it is known to this generation chiefly or wholly from the following page in Ramsay's "History of South Carolina," 1809: "The planters of Carolina have derived so great profits from the cultivation of rice, indigo (see *Indigo*) and cotton that they have always too much neglected the culture of gardens. The high price of their staple commodities in every period has tempted them to sacrifice convenience to crops of a marketable quality. There are numbers whose neglected gardens neither afford flowers to regale the senses, nor the vegetables necessary to the comfort of their families, though they annually receive considerable sums in money for



1080. Bartram's house as it was in 1825. Built in 1730-31.

In the margin is the Petre pear, raised by Bartram from a seedling sent from England in 1760 by Lady Petre. The tree still bears.

their crops sent to market. To this there have been some illustrious exceptions of persons who cultivated gardens on a large scale, both for use and pleasure. The first that can be recollected is Mrs. Lamboll, who, before the middle of the eighteenth century, improved the southwest extremity of King street [Charleston], in a garden which was richly stored with flowers and other curiosities of nature, in addition to all the common vegetables for family use. She was followed by Mrs. Logan and Mrs. Hopton, who cultivated extensive gardens in Meeting, George and King streets, on lands now covered with houses. The former reduced the knowledge she had acquired by long experience and observation to a regular system, which was published after her death, with the title of 'The Gardener's Calendar;' and to this day regulates the practice of gardens in and near Charlestown." Ramsay records that Mrs. Martha Logan was the daughter of Robert Daniel, one of the last proprietary governors of South Carolina. "Mrs. Logan was a great florist, and uncommonly fond of a garden. She was seventy years old when she wrote her treatise on gardening, and died in 1779, aged 77 years."

The opening of the nineteenth century may be taken as a convenient starting point for a narrative of the evolution of American Horticulture. At that time Horticulture began to attain some prominence as distinct from general agriculture, and the establishment of peace after the long and depleting war with England had turned the attention of the best citizens afresh to the occupation of the soil. The example of Washington, in returning to the farm after a long and honorable public career, no doubt exerted great influence. His agricultural correspondence was large, and much of it was published at the opening of the century. His correspondence with Arthur Young and Sir John Sinclair will be found in volumes published in London in 1800 and 1801, in Alexandria in 1803, and in Washington in 1847. Details respecting the management of his plantations comprise vol. iv. of the *Memoirs of the Long Island Historical Society*, 1889.

It was not until 1790, however, that an indigenous and distinctly agricultural treatise other than Eliot's appeared in America. At that time, the Rev. Samuel Deane, vice-president of Bowdoin College, published his "New England Farmer, or Geographical Dictionary," a cyclopedic work of the state of American agriculture. This passed to a second edition in 1797, and to a third in 1822. (See *Deane*.) In 1799 J. B. Bordley published in Philadelphia "Essays and Notes on Husbandry." Other

early works need not be mentioned here. As early as 1785, Varlo's "New System of Husbandry" was printed in Philadelphia. It is in many ways a remarkable book, and it was written by a man who had had remarkable experiences. He was not an American, and the work first appeared in the old country; but Varlo had lived in this country, and was in sympathy with the American people. The book contained a "Farmer's and Kitchen Garden Calendar." In 1792 there appeared anonymously, from Burlington, New Jersey, the third edition of Arthur Young's "Rural Economy," which excellently displays that noted author's catholicity of view. He argues strongly for experiments and for the establishing of agricultural journals. This book first appeared in London, in 1770.

At the opening of the century, Sir Humphry Davy had not illumined the science of agricultural chemistry, and men were even disputing as to what the food of plants is. The "burn-baking" or "devonstiring" of the land—burning the sod and scattering the ashes over the field—was still recommended; and in 1799 James Anderson's "Essay on Quick-lime as a Cement and as a Manure," was given an American edition in Boston. It is easy to see from these facts that the fundamental conceptions of the science of agriculture were vague and crude a century ago. Near the close of the last century, Deane wrote that "the alarming effect of the present low state of husbandry is, that we are necessitated to import much of our food and clothing, while we are incapable of making proportionable remittances in the produce of the soil, or in anything else."

The earliest book on a horticultural subject known to have been published in North America, excepting Mrs. Logan's, was an American edition of Marshall's "Introduction to the Knowledge and Practice of Gardening," Boston, 1799. The first indigenous horticultural book appeared in 1804, "The American Gardener," by John Gardiner and David Hepburn. It was published at Washington. This book had an extensive sale. It was revised by "a citizen of Virginia," and republished in Georgetown, D. C., in 1838. A third edition appeared in 1826. (See *Hepburn*.) This book was followed in 1806 by Bernard McMahon's excellent and voluminous "American Gardener's Calendar," in Philadelphia. This work enjoyed much popularity, and the eleventh edition appeared as late as 1857. For fifty years it remained the best American work on general gardening. McMahon remembered in the *Mahonia* laboratories, was an important personage. He was largely responsible for the introduction into cultivation of the plants collected by Lewis and Clark. These early books were calendars, giving advice for the successive months. They were made on the plan then popular in England, a plan which has such noteworthy precedent as the excellent "Kalendrium Hortense" of John Evelyn, which first appeared in 1664, and went to nine regular editions. Other early books of this type were "An old gardener's 'Practical American Gardener,'" Baltimore, 1819 and 1822; Thorburn's "Gentleman's and Gardener's Calendar," New York, the third edition of which appeared in 1821; Robert Squibb's "Gardener's Calendar for the States of North-Carolina, South-Carolina, and Georgia," Charleston, 1827.

The first indigenous book written on the topical plan, treating subject by subject, was Cox's fruit book, 1817; the second appears to have been Cobbett's "American Gardener," published at New York in 1819, in London in 1821, and which passed through subsequent editions. This William Cobbett is the one who edited the federalist paper in Philadelphia known as "Peter Porcupine's Gazette," and whose attack upon Dr. Rush's treatment of yellow fever brought against him a judgment for damages, and which decided him to return to England in 1800, whence he had come, by way of France, in 1792. In London he again took up political writing, and in 1817 he retreated to America to escape political penalties, and resided upon a farm on Long Island until 1819. He kept a seed store in New York in 1818, and we find Grant Thorburn disputing with him in the "Evening Post" as to which sold the better rutabaga seed at one dollar a pound. Cobbett, it seems, claimed to have been the introducer of this vegetable, also known as the Russian turnip, into this country; but Thorburn retorts that "in the year 1796 a large field of these turnips was

raised by Wm. Prout on that piece of ground now occupied by the navy yard, at the city of Washington." He completed his life in England, becoming a voluminous author upon political and economical subjects. (See *Cobbett*.) It is interesting to note, in connection with this dispute about the turnips, that the kohlrabi was introduced about the same time, and Deane says of it in



1081. Two old-time flowers—Hollyhock and Crown Imperial.

1797, that "whether this plant, which has but newly found its way into our country, is hardy enough to bear the frost of our winters, I suppose is yet to be proved." It was recommended to be grown as a biennial, which accounts for Deane's fear that it might not pass the winters.

Fessenden's "New American Gardener," made upon the topical plan, appeared in Boston in 1828, and went to various editions; and from this time on, gardening books were frequent. Some of the leading early authors are Thomas Bridgeman, of New York; Robert Buist, of Philadelphia, and Joseph Breck, of Boston.

FLOWER-BOOKS AND FLORICULTURE.—The first American book devoted wholly to flowers was probably Roland Green's "Treatise on the Cultivation of Flowers," Boston, 1828. Edward Sayers published the "American Flower Garden Companion," in Boston, in 1838. From 1830 to 1860 there appeared many of those superficial and fashionable books, which deal with the language of flowers, and which assume that the proper way to popularize botany is by means of manufactured sentiment.

Green's book on flowers deserves a paragraph, since it enables us to determine what were the leading ornamental plants in that early day (1828). The full title of the book is "A Treatise on the Cultivation of Ornamental Flowers; Comprising Remarks on the Requisite Soil, Sowing, Transplanting, and General Management; with Directions for the General Treatment of Bulbous Flower Roots, Greenhouse Plants, etc." It comprises only 60 pages. The introductory pages give general directions; then follow two annotated lists, one of annuals and biennials and the other of greenhouse plants. These lists are interesting, also, for what they do not contain. All the plants which they mention are here set down:

ANNUAL AND BIENNIAL FLOWERS.

<i>Althæa frutex</i> ,	Catalpa,
Almond, Double-flowering,	Cherry, Double-flowering,
<i>Amaranthus sibiricus</i> ,	<i>Chrysanthemum Indicum</i> ,
<i>Amaranthus tricolor</i> ,	Clematis, Austrian (<i>C. integrifolia</i>),
Animated Oats,	Clethra,
Aster, China,	Columbine,
Auricula,	Convolvulus,
<i>Azalea nudiflora</i> ,	<i>Coreopsis Japonicus</i> ,
Box,	Cupid's Car, or Monk's Hood
Brier, Sweet,	(<i>Aconitum</i>),
Canterbury Bell,	Dahlia,
Carnation,	
<i>Cassia Marylandica</i> ,	

ANNUAL AND BIENNIAL FLOWERS—Continued.

Daisy,
Dwarf Basil,
Egg Plant,
Eupatorium, Blue,
Euphorbia Lathyris,
Fading Beauty, or Morning
Glide (*Scabiosa*),
Fir (*Pinus balsamea*),
Foxglove,
Fringe Tree,
Geranium (*Pelargonium*),
Garden Angelica,
Glycine, Cluster-flowering,
Golden Corocopsis,
Golden Everlasting (*Xeran-
themum*),
Hollyhock,
Honeysuckle,
Hyacinth,
Hydrangea,
Ice Plant,
Impatiens Balsamina,
Iris,
Lagerstromia Indica,
Laurel, Broad-leaved (*Kal-
mia*),
Laburnum,
Larkspur,
Lily,
Lily,
Lime Plant (*Podop yll u
pellatum*),
Linchpin (*Phlox*),
Mezereum (*Daphne Meze-
reum*),
Mountain Ash,
Musk Geranium,
Myrtle,
Narcissus,
Nasturtium,
Passion Flower,
Peony,
Pea, Sweet,
Peach, Double-flowering,
Pink,
Perennial Sunflower, double,
Polyanthus,
Pyrethrum Parthenium,
Poppy,
Purple Hyacinth Bean,
Roses,
Rose Acacia,
Rose colored Hibiscus,
Rudbeckia,
Scarlet Cavalia,
Searlet Lychnis (*L. Chalce-
donica*),
Siberian Crab,
Snow-ball Tree,
Snowberry,
Spice-wood (*Lawrus Benzoin*),
Spiderwort (*Tradescantia*),
Spiraea,
Syringa, or Mock Orange,
Strawberry Tree (*Euonymus*),
Sweet Bay (*Lawrus nobilis*),
Sweet William, or Poetic
Pink,
Tulip,
Venetian Sumac, or Fringe
Tree,
Violet, blue fragrant.

GREENHOUSE PLANTS.

Lilies of the valley,
Eranaculuses,
Anemones,
Single and Double Jonquils,
White Lilies,
Roses,
Tuberoses,
Persian Iris,
Mignonette,
Verbena trifoliata, or Sweet
Vervain,
Fuchsia coccinea,
Cobaea scandens,
Camellia Japonica, or Japa-
nese Rose,
Myrtles.

These lists are much less ample than those of M'Mahon, over twenty years earlier, but they may be supposed to include the popular and most easily grown things. They will be suggestive to those who wish to make "old-fashioned gardens." M'Mahon's list was evidently largely compiled from European sources. Green says that the first list (strangely called "annual and biennial flowers") contains "such plants, shrubs and trees as are of easy cultivation, generally hardy." The second list comprises "a few different sorts of greenhouse plants" which are commonly grown in rooms.

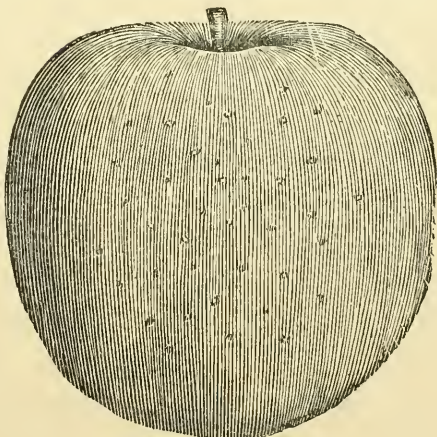
The first American book to be devoted to a special flower was Sayers' book on the dahlia, Boston, 1839, which appeared only a year later than Paxton's well-known book in England. Sayers' book also included the cactus. The next special flower book seems to have been Buist's "Rose Manual," Philadelphia, 1844, although a sentimental book on the "Queen of Flowers" had appeared in the same city in 1841. Buist's book went to at least four editions. It was followed by Prince's in 1846, and by S. B. Farson's "The Rose: Its History, Poetry, Culture and Classification," 1846. Parson's book went to a revised edition. Of later-date flower-books there are several of importance, but it is not the purpose of this history to trace more than the beginnings of American floricultural writings.

In 1838 appeared a book in French in New Orleans. This was Lielevre's "Nouveau Jardinier de la Louisiane." It was a small book of 200 pages, with a calendar and brief directions for the growing of vegetables, fruits and flowers. Singularly enough, a French book also appeared at the other extreme of the country. This was Provancher's "Le Verger-Canadien," published in Quebec in 1872.

The writings clearly portray the tendencies of the floricultural interests.—from the formal-flower ideals of the dahlia and camellia to the enormous development

of the cut-flower interest, and the growth within the last few years of the greater love of plants themselves. Palms and decorative plants are now almost necessities, where 50 years ago they would have been the luxury of luxuries. "There has been a radical change in the character of the flowers used for cut-flower purposes," wrote Alfred Henderson in 1895. "Fifty years ago, camellia flowers retailed freely for a dollar each, and during the holidays Philadelphia used to send thousands to New York florists, getting \$500 per 1,000; while roses went begging at one-tenth these figures. Now, the rose is queen, and the poor camellia finds none so poor to do her reverence. * * * I confidently believe that the time is not far distant when we shall compete seriously with the foreign grower in the production of new varieties of roses." William Scott, of Buffalo, makes the following comments on tendencies in floriculture: "About the year 1880, tulips and narcissuses began to be forced, and during the next 15 years immense quantities of these bulbs were imported annually from Holland. As the methods of forcing were perfected the market became overstocked, and, although large quantities are still forced for the winter and spring months, they are not now in the same favor as formerly, and the rose, carnation, violet, lily-of-the-valley and mignonette are still the favorites. Orchids are not yet the flower for the million, but there is a yearly increasing demand for them, and at present the showy orchids, such as the Cattleyas and Lælias, are far short of the demand. As their cultivation is more generally understood, we look for a very steady increase in the number grown, and are confident that the supply will not soon exceed the demand. Within the past 5 or 6 years a marked increase is noticeable in the use of plants to adorn the home, and the demand is for an expensive class of plants,—palms, dracenas, araucarias and ferns being among those mostly used. Now few homes with any pretension to luxury or even comfort are without a few fine plants scattered through the rooms, and many of our modern houses are provided with either a bay window or small conservatory for the accommodation of plants." See *Cut-Flowers and Floriculture*.

EARLY POMOLOGICAL WRITINGS.—It is in the pomological writings that North America has made the greatest contributions to horticultural literature. William For-



1082. Example of the earliest illustrations of American fruits.

Esopus Spitzenburg, figured by Coxe in 1817.

syth's excellent "Treatise on the Culture and Management of Fruit Trees" appeared in London in 1802, and it was widely read, "an impression of 1,500 copies (of the



1083. One of the old Downing test apple trees,

first edition), in 4to having been sold in a little more than eight months." An American edition, by William Cobbett, appeared in New York and Philadelphia in 1802, and in Albany in 1803, and an epitome of it by "an American farmer," was published in Philadelphia in 1803. The first American pomological book was William Coxe's "View of the Cultivation of Fruit Trees," published in Philadelphia in 1817, a work known to students of horticultural literature for the uniform completeness and accuracy of its descriptions. A feature of this excellent work are the many woodcuts of varieties of fruits. Although not answering the requirements of the present day, they were considered to be very good for the time and for a new country. One of them is here reproduced (Fig. 1082) to show the style of workmanship. Coxe had 100 woodcuts of apples, 63 of pears, 15 of peaches, 17 of plums, 3 of apricots, 2 of nectarines. This makes 200 engravings, which would be considered liberal illustration even at the present day.

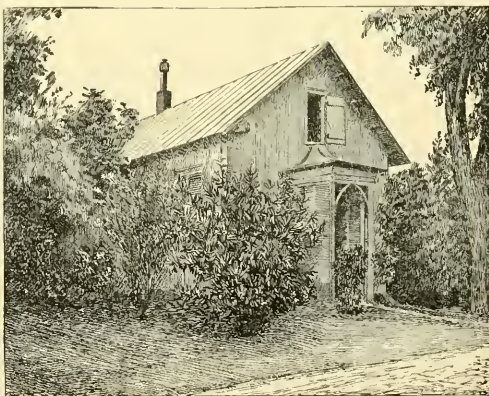
James Thacher's "American Orchardist" appeared in Boston in 1822, and the second edition at Plymouth in 1825. The first edition was also bound with William Cobbett's "Cottage Economy," and the double volume was issued in New York in 1824 as "American Orchardist and Cottage Economy." "The Pomological Manual," New York, 1831 (second edition 1832), is a compilation of descriptions of varieties, by William Robert Prince and William Prince, son and father respectively. William Kenrick's "New American Orchardist" was published in Boston in 1833. The eighth edition appeared in 1848. Like all early works, it devotes most of its space to varieties. Robert Manning, whose son of the same name is the secretary of the Massachusetts Horticultural Society, published his admirable "Book of Fruits," at Salem, in 1838, being aided by John M. Ives. Upon the death of Manning, Ives published a second edition in 1844 under the title of "The New England Fruit Book," and a third in 1847 as "The New England Book of Fruits." Downing's "Fruits and Fruit Trees of America" appeared in 1845 in two forms, duodecimo and octavo, although both issues were printed from the same type. One issue of the octavo form contained colored plates. Thomas' "Fruit Culturist," which is known in subsequent editions as "The American Fruit Culturist," appeared in 1846. Other pomological writings which appeared before 1850 are Sayers' "American Fruit Garden Companion," Boston, 1839; Hoff's "Orchardist's Companion," Philadelphia, 1841; Bridgeman's "Fruit Cultivator's Manual," New York, 1845; Floy's American edition of George Lindley's "Guide to the Orchard and Fruit

Garden," New York, 1846; Jaques' "Practical Treatise on the Management of Fruit Trees," Worcester, 1849; Goodrich's "Northern Fruit Culturist," Burlington, Vt., 1849; Cole's "American Fruit Book," and others. Barry's "Fruit Garden" appeared in 1851.

Of these pomological books, the first place should be given to those of Coxe, Kenrick, Manning, Downing, Thomas and Barry. The influence of Downing's "Fruits and Fruit Trees of America" probably has been greater than that of all others in extending a love of fruits and a critical attitude towards varieties. Begun by Andrew Jackson Downing—perhaps the fairest name in American horticultural literature—it was continued and revised by the elder brother, Charles, after the untimely death of the former (see *Downing*). Reminiscences of the Downings are shown in Figs. 1083-4. Most of these works were largely compilations. A notable exception was Manning's "Book of Fruits." In the introductory remarks to the volume is the following statement: "There is one circumstance to which we venture to call the attention of our readers—that while some recent works on pomology are compiled from earlier authors, or from information derived at second-hand, the writers themselves seldom having the means of observation in their power, we have in these pages described no specimen which we have not actually identified beyond a reasonable doubt of its genuineness." It was Manning who chiefly made known to Americans the pears of the Belgian, Van Mons. He was one of the most careful observers and conscientious writers amongst American pomologists.

The awakening pomology of the region west of the Alleghanies found expression in Elliott's "Fruit Book," 1854, whose author wrote from Cleveland, and which went to a new edition in 1859 as "The Western Fruit Book," with the preface dated at St. Louis; and Hooper's "Western Fruit Book," 1857, written at Cincinnati. Dr. John A. Warder was a guiding spirit of the opening West.

In America, no crop has been the subject of so much book writing as the grape. Counting the various editions, no doubt a hundred books have appeared, being the work of at least fifty authors. Since the American grape is a product of our own woods within a century, the progress in grape-growing has always been ahead of the books. Most of the books are founded largely on European advice, and therefore are not applicable to American conditions. In general pomology, the books seem to have had much influence upon fruit-growing; but in the grape the books and actual commercial grape-growing seem to have had little relation one to the



1084. The fruit house of Charles Downing.

other. Some of the later books have more nearly caught the right point of view.

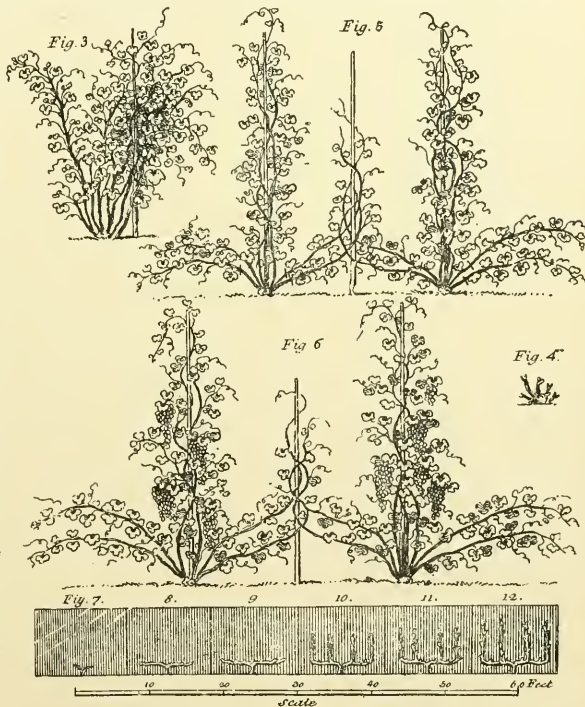
The earliest separate grape book was published in Washington in 1823, by the prophetic Adlum, "A Memoir on the Cultivation of the Vine in America." This went to a second edition in 1828 (see *Adlum* and Plate II). Before this time (1806), S. W. Johnson had devoted much space to the grape in his "Rural Economy," published at New Brunswick, N. J., and he published the first pictures of grape training (Fig. 1085). Adlum's book was followed in 1826 by the "American Vine Dresser's Guide," by the unprophetic Dufour. This work also gave pictures of grape training, one of which is reproduced in Fig. 1086. The larger part of the grape literature appeared before the close of the Civil War, although the larger part of the development of the subject has taken place since that time.

GENERAL REMARKS ON FRUIT-GROWING.—Horticulture, in its commercial aspects, was nothing more than an incidental feature of farm management at the opening of the century. In fact, it is only in the present generation that the field cultivation of horticultural crops has come to assume any general importance in the rural economy of the nation. And even now, horticultural operations which are projected as a fundamental conception of land occupation are confined to few parts of the country. It is still the original or first conception of the farmer's boy, when he proposes to occupy land of his own, that he raise grain and hay and stock, and add the fruits and other horticultural crops by piecemeal. It is only in particular parts of the country that the farmer starts out with Horticulture as a base, and with grain and stock and hay as accessories; and even in these places, the best horticulturists are still drawing their practices and the reasons for them from the operations of general mixed agriculture. There was practically only one general horticultural commodity, at least in the northern states, a hundred years ago, and that was the apple. Pears, peaches, cherries, quinces and some other fruits were common, but there was little thought of marketing them. Even the apple was generally an accidental crop. Little care was given the trees, and the varieties were few, and they were rarely selected with reference to particular uses, beyond their adaptability to cider and the home consumption.

Thacher, writing from Plymouth in 1821, says that "the most palpable neglect prevails in respect of proper pruning, cleaning, and manuring round the roots of trees, and of perpetuating choice fruits, by engrafting from it on other stocks. Old orchards are, in general, in a state of rapid decay; and it is not uncommon to see valuable and thrifty trees exposed to the depredations of cattle and sheep, and their foliage annoyed by caterpillars and other destructive insects. In fact, we know of no branch of agriculture so unaccountably and so culpably disregarded." Were it not for the date of Thacher's writing, we should mistake this picture for one drawn at the present day.

If one may judge from the frequent and particular references to cider in the old accounts, it does not seem too much to say that this sprightly commodity was held in greater estimation by our ancestors than by ourselves. In fact, the cider barrel seems to have been the

chief and proper end of the apple. Of his thirty chapters on fruit-growing, Coxe (1817) devotes nine to cider, or 42 pages out of 253. John Taylor's single epistle devoted to horticultural matters in the sixty and more letters of his "Arator" is upon "Orchards," but it is mostly a vehement plea for more cider. "Good cider," he says, "would be a national saving of wealth, by expelling foreign liquors; and of life, by expelling the use of ardent spirits." In Virginia, in Taylor's day, apples were "the only species of orchards, at a distance



1085. The earliest American picture of Grape training (1806).

from cities, capable of producing sufficient profit and comfort to become a considerable object to a farmer. Distilling from fruit is precarious, troublesome, trifling and out of his province. But the apple will furnish some food for hogs, a luxury for his family in winter, and a healthy liquor for himself and his laborers all the year. Independent of any surplus of cider he may spare, it is an object of solid profit and easy acquisition." As early as 1647, twenty butts of cider were made in Virginia by one person, Richard Bennet. Paul Dudley writes of a small town near Boston, containing about forty families, which made nearly 3,000 barrels of cider in the year 1721; and another New England town of 200 families, which supplied itself with "near ten Thousand Barrels." Bartram's Cider Mill, as it exists at the present day, is shown in Fig. 1087. It was not until well into the present century that people seem to have escaped the European notion that fruit is to be drunk.

There are evidences that there have been several marked alternations of fervor and neglect in the plant-

ing of apples since the first settlement of the country. Early in the last century there appears to have been a great abundance of the fruit; but in 1821 Thacher declared that "it is a remarkable fact that the first planters bequeathed to their posterity a greater number of orchards, in proportion to their population, than are now to be found in the old colony," and he attributes the decline in orcharding largely to the encroachment of the "poisonous liquor" of the later times. Under the inspiration of Thacher, Coxe, Kenrick, Prince, Manning, and the Downings, orchards were again planted, and we are just now in another period of decline in the East, following the decay of these plantations.

Apples were carried far into the frontiers by the Indians and probably also by the French missionaries, and the "Indian apple orchards" are still known in many localities even east of the Mississippi (see also, *Apples and Johnny*). At the opening of the century, the Early Harvest, Newtown Pippin, Swaar, Spitzenberg, Rhode Island Greening, Yellow Bellefleur, Roxbury Russet, and other familiar apples of European origin were widely disseminated and much esteemed. Apples had begun to be planted by settlers in Ohio before 1800. In 1817, Coxe could recommend a list of "one hundred kinds of the most estimable apples cultivated in our country;" and in 1825 William Prince offered 116 varieties for sale—at 37½ cents per tree—of which 17 were set aside—after the fashion of the time—as particularly adapted to the making of cider. Of these 116 varieties, 61 were considered to be of American origin. In 1872, Downing's list of apples which had been fruited and described in America, had swelled to 1856 varieties, of which 1099 were of known American origin. Of this great inventory, probably not over a third were actually in cultivation at any one time, and very many of them are now lost. Yet the apple is still our most important fruit, and 878 varieties were actually offered for sale by the nurserymen of North America in 1892.

There has been a most noticeable tendency towards the origination of varieties of apples in this country, and the consequent exclusion of varieties of European origin. As early as 1760, cions of American varieties were sent to England. Before the Revolution, apples were exported. The origination of indigenous varieties was of course, an accidental one, and was a necessary result of the universal method of growing apple trees directly from seeds, and top-grafting them in case they should turn out profitless. A critical study of American Horticulture will show that all species of plants which have been widely cultivated in this country have gradually run into indigenous varieties, and the whole body of our domesticated flora has undergone a progressive evolu-

tion and adaptation without our knowing it. By far the greater number of the apples of the older apple-growing regions of the country are indigenous varieties, and the same process is now operating in the Northwest, where the American seedlings of the Russian stock are proving to be more valuable than the original importations.



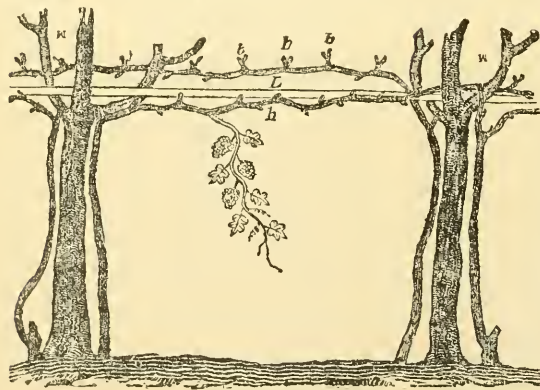
1087. Bartram's cider mill, a relic of the last century.

It is said that the apples were placed in the circular groove in the rock and crushed by means of a weight rolling over them. The juice ran out the gutter at the farther side and was caught in a rock-hewn cistern.

Pears were amongst the earliest fruits introduced into the New World, and the French, particularly, disseminated them far and wide along the waterways, as witnessed by the patriarchal trees of the Detroit river and portions of the Mississippi system. John Bartram's Petre pear (Fig. 1080) is one of the patriarchs of the last century, although the tree is not large. The first book devoted exclusively to the pear was Field's, published in 1859. The Japanese type of pears had been brought into the country from two and perhaps three separate introductions, early in the fifties, but they had not gained sufficient prominence to attract Field's attention. From this oriental stock has come a race of promising hybrids with the common pear, represented chiefly by the Kieffer, Le Conte and Garber.

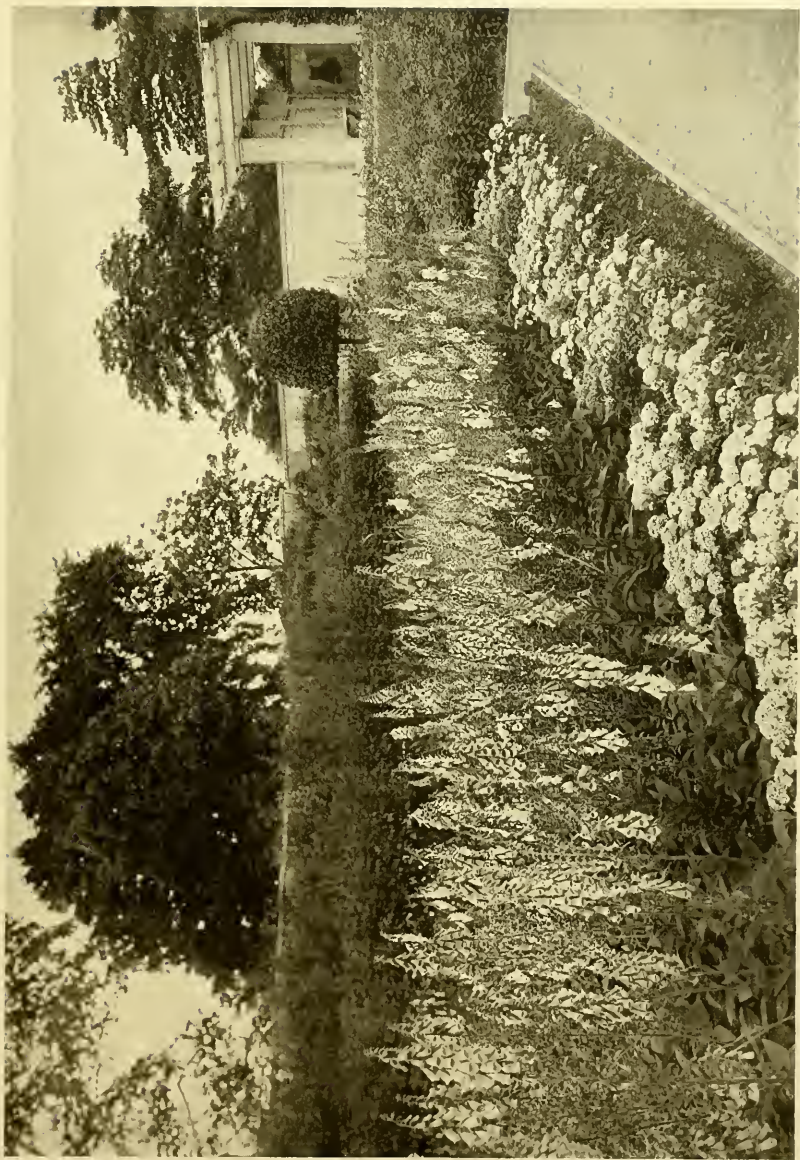
Peaches were early introduced into the New World by various colonists, and they thrived so well that they soon became spontaneous. Nuttall found them naturalized in the forests of Arkansas in 1819, and the species now grows with all the luxurious abandon of a native in waste and forest lands from Georgia and the Carolinas to the westward of the Mississippi. There is probably no country in the world in which peaches grow and bear so freely as in the United States. The old Spanish or Meacocon type is now the most popular race of peaches, giving rise to the Crawfords and their derivatives.

Of late years there has been a contraction of the original peach areas, and many good people have thought that the climate is growing uncongenial, but it is only the natural result of the civilization of the country and the change in methods of Horticulture. Peaches had never been an industry, but the orchards were planted here and there as very minor appendages to



1086. Dufour's picture of Grape training (1826).

Patterned after the South-European fashion of employing mulberry trees for supports,



A formal garden display. Foxglove and Sweet William

the general farming. For generations insect pests were not common. There were no good markets, and the fruit sold as low as 25 cents a bushel from the wagon box. In fact, it was grown more for the home supply than with an idea of shipping it to market. Under such conditions, it did not matter if half the crop was wormy, or if many trees failed and died each year. Such facts often passed almost unnoticed. The trees bore well, to be sure; but the crop was not measured in baskets and accounted for in dollars and cents, and under such conditions only the most productive trees left their impress upon the memory. The soils had not undergone such a long system of robbery then as now. When the old orchards wore out, there was no particular incentive to plant more, for there was little money in them. Often the young and energetic men had gone West, there to repeat the history perhaps, and the old people did not care to set orchards. And upon this contracting area, all the borers and other pests which had been bred in the many old orchards now concentrated their energies, until they have left scarcely enough trees in some localities upon which to perpetuate their kind. A new country or a new industry is generally free of serious attacks of those insects which follow the crop in older communities. But the foes come in unnoticed and for a time spread unmolested, when finally, perhaps almost suddenly, their number becomes so great that they threaten destruction, and the farmer looks on in amazement.

The orange is another tree which has thrived so well in the new country that the spontaneous thickets of Florida, known to be descendants of early Spanish introductions, are confidently believed by residents to be indigenous to the soil.

The progress of the plum in America nearly equals that of the grape in historic interest. The small, spontaneous plums, known as Damsons, the offspring of introductions from Europe, were early abundant in New England. Plum culture has never thrived far south of Mason and Dixon's line or west of Lake Michigan, except, of course, upon the Pacific coast and parts of the far southwestern country. There are climatic limitations which more or less restrict the area of plum growing, and the leaf-blight fungus, black-knot, and fruit-rot have added to the perplexities. In this great interior and southern area, various native plums, offshoots of several indigenous species, have now spread themselves, and they have already laid the foundation of a new type of plum culture. The first of these novel plums to receive a name was that which we now know as the Mimer, and the seed from which it sprang was planted by William Dodd, an officer under General Jackson, in Knox county, Tennessee, in 1814. The second of these native plums to come into prominence, and the one which really marks the popularization of the fruit, is the Wild Goose. Some time before 1850, a man shot a wild goose near Columbia, Tennessee, and where the carcass was thrown this plum, Adonis-like, sprang forth. It was introduced to the trade about 1850, by the late J. S. Downer, of Fairview, Kentucky. Over 200 named varieties of these native plums are now described, and some of them are widely disseminated and deservedly popular. In the South and on the plains, these natives are a prominent horticultural group. The complexity of the cultivator plum flora is now further increased by the introduction of the Japanese or Chinese type, which first came in by way of California in 1870. Finally, about 1880, the apricot plum, or *Prunus Simonii*, was introduced from China by way of France; and the American plum industry, with no less than ten specific types to draw upon, and which represent the entire circuit of the northern hemisphere,

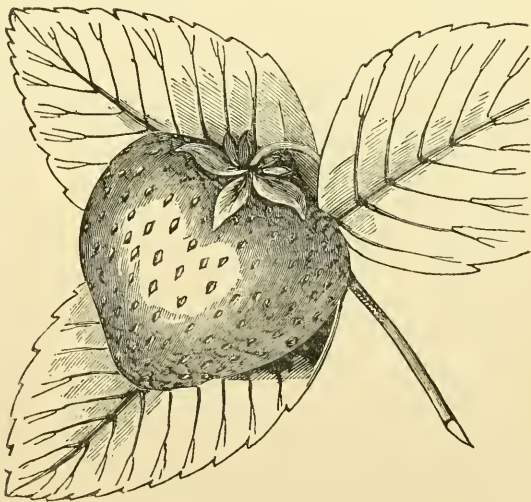
is now fairly launched upon an experimental career whose promise lies with the coming century.

The grape of America is of two unlike types,—the natives, which comprise all commercial outdoor varieties in the interior and eastern states; and the vinifera or Old World kinds, which are grown in California. The native types have been developed within the century. The oldest commercial variety is the Catawba, which dates from 1802. The cosmopolitan variety, the Concord, which first fruited in 1849. A full review of the history is made in "Evolution of our Native Fruits."

There was no commercial strawberry culture in America, worthy of the name, until the introduction of the Hovey (Fig. 1088) late in the thirties. This and the Boston Pine were seedlings of C. M. Hovey's, Cambridge, Massachusetts. They first fruited in 1836 and 1837, and from them have descended most of the garden strawberries of the present day. These were seedlings of the old Pine type of strawberry, which is a direct descendant of the wild strawberry of Chile. The Wilson, or Wilson's Albany, which originated with John Wilson, of Albany, New York, began to attract attention about 1856 or 1857, and it marked the beginning of the modern epoch in American strawberry growing. In the middle West, strawberry growing was given a great impulse by Longworth and Warder.

Raspberries were grown in the last century, but they were of the tender European species, of which the Antwerp were the common types. This type of raspberry is now almost wholly superseded by the offspring of our native red and black species, which first began to impress themselves upon cultivation about 1860.

The blackberry, an indigenous American fruit, first commended itself to cultivation with the introduction of the New Rochelle or Lawton, towards the close of the



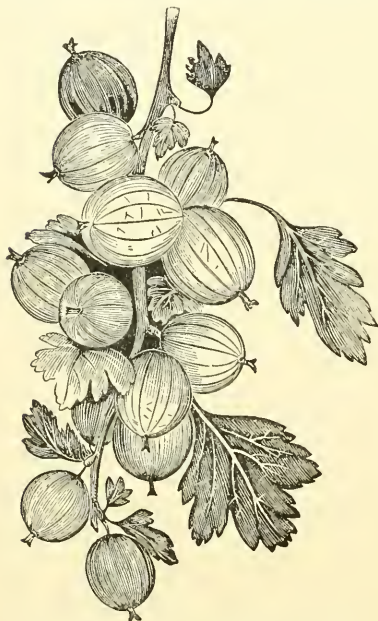
1088. The original picture of the Hovey Strawberry. Magazine of Horticulture, August, 1840. Original size.

fifties. The first named variety of blackberry of which we have any record was the Dorchester, which was exhibited before the Massachusetts Horticultural Society in 1841.

The dewberry, a peculiarly American fruit, first appeared in cultivation early in the seventies in southern Illinois under the name of the Bartel, which is a large form of the common wild dewberry of that region. It

was first brought to the attention of the public in 1875. The following year the Lucretia, the most popular of dewberries, was introduced into Ohio from West Virginia, where it had been found wild some years before by a Union soldier.

The history of the gooseberry in America recalls that of the grape. It is a characteristic fruit of England and the low countries, and it was early introduced into America. But, like the European grapes, the gooseberries were attacked by a fungous sickness which rendered



1089. The original picture of the Houghton Gooseberry. From the Horticulturist for September, 1868. Original size.

their cultivation precarious. An improved form of the native species must be introduced, and this was accomplished by Abel Houghton, of Massachusetts, who, from the seed of the wild berry, produced the variety which now bears his name. This variety began to attract some attention a little previous to 1850, although it was not planted freely until several years later (Fig. 1089). From seed of the Houghton sprang the Downing, still the most popular gooseberry in America, although Houghton is still much grown from Philadelphia south; and our gooseberry culture is, therefore, but two removes from nature. With the advent of the Bordeaux mixture and its related species, however, the English gooseberries are again coming to the fore. Hybrids of the English and American types, as in the Triumph or Columbia and the Chautauque, may be expected to become more popular for home use and special markets, but the Americans will probably remain in favor for general market purposes.

The cranberry, most unique of American horticultural products, was first cultivated, or rescued from mere wild bogs, about 1810. Its cultivation began to attract attention about 1840, although the difficulties connected with the growing of a new crop did not begin to clear away

until about 1850. Cape Cod was the first cranberry-growing region, which was soon followed by New Jersey, and later by Wisconsin and other regions. The varieties now known are over a hundred, and the annual product from tame bogs in the United States is nearly 800,000 bushels.

THE NURSERY AND SEED BUSINESS.—It is impossible to fix a date for the beginning of the nursery business in America. Trees were at first grown in small quantities as a mere adjunct to general farm operations. Governor John Endicott, of the Massachusetts Colony, was one of the best fruit growers of his time, and he grew many trees. In 1644, he wrote to John Winthrop as follows: "My children burnt mee at least 500 trees this Spring by setting the ground on fire neere them;" and in 1648 he traded 500 apple trees, 3 years old, for 250 acres of land. The first nursery in Maine is thought by Manning to have been that of Ephraim Goodale, at Orrington, established early in the present century. Other early nurserymen of Maine were the brothers Benjamin and Charles Vaughan, Englishmen, who settled at Hallowell in 1796. The first nursery in South Carolina was established by John Watson, formerly gardener to Henry Laurens, before the Revolution. In Massachusetts, there were several small nurserymen towards the close of last century, amongst others, John Kenrick, of Newtown, whose son William wrote the "New American Orchardist," published in 1833, and which passed through at least eight editions. The trees were generally top-grafted or budded, sometimes in the nursery and sometimes after removal to the orchard. Deane writes in 1797, that "the fruit trees should be allowed to grow to the height of 5 or 6 feet before they are budded or grafted." Stocks were sometimes grafted at the crown, and even root-grafting was known, although it is generally said that this operation originated with Thomas Andrew Knight, in 1811. It is probable, however, that the root-grafting of last century was only grafting at the surface of the ground, and that it had little similarity to the method now in vogue. One of the new trees a hundred years ago was the Lombardy poplar. John Kenrick had two acres devoted to it in 1797; and Deane writes, in 1797, that "the Lombardy poplar begins to be planted in this country. To what size they will arrive, and how durable they will be in this country, time will discover." He does not mention it in the first edition, 1790. The tree is said to have been introduced into America by William Hamilton, of Philadelphia, in 1784, although Mr. Meehan writes that he remembers trees fifty years ago that seemed to be a century old. Manning quotes a bill of sale of nursery stock in 1799, showing that the price of fruit trees was 33½ cents each. With relatively cheaper money and with much better trees, we now buy for one-third this price. Deane speaks of raising apple trees as follows: "The way to propagate them is by sowing the pomace from cydermills, digging, or hoeing it into the earth in autumn. The young plants will be up in the following spring; and the next autumn, they should be transplanted from the seed bed into the nursery, in rows from 2 to 3 feet apart and 1 foot in the rows, where the ground has been fitted to receive them." Nothing is said about grafting the trees in the nursery.

But the first independent nursery in the New World, in the sense in which we now understand the term, seems to have been that established by William Prince at Flushing, Long Island, and which was continued under four generations of the same family. The founder was William Prince. The second Prince was also William, the son, and author of the first professed American treatise upon Horticulture, 1828. The third generation was William Robert Prince. He was the author of "A Treatise on the Vine" (1830), "The Pomological Manual" (1831), and "Manual of Roses" (1846). In the first two he was aided by his father, the second William. This William Robert Prince is the one who first distinguished the types of the prairie strawberry into the two species, *Fragaria Illinoisensis* and *F. Iowaensis*. From a large catalogue of William Prince second, published in 1825—and which contains, amongst other things, lists of 116 kinds of apples, 108 of pears, 54 of cherries, 50 of plums, 16 of apricots, 74 of peaches and 255 of geraniums—the following account is taken of the founding of this interesting establish-

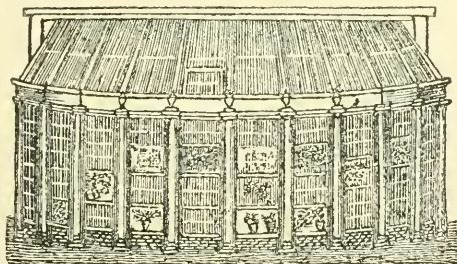
ment: "The Linnaean Garden was commenced about the middle of the last century, by William Prince, the father of the present proprietor, at a time when there were few or no establishments of the kind in this country. It originated from his rearing a few trees to ornament his own grounds; but finding, after the first efforts had been attended with success, that he could devote a portion of his lands more lucratively to their cultivation for sale than to other purposes, he commenced their culture more extensively, and shortly after published a catalogue, which, at that early period, contained several hundred species and varieties, and hence arose the first extensive fruit collection in America." The elder Prince died in 1802, "at an advanced age."

Among the nurseries which were prominent from 1820 to 1830 were Bloodgood's, Wilson's, Parmentier's, and Hogg's, near New York; Buel and Wilson's, at Albany; Sinclair and Moore's, at Baltimore. David Thomas, a man of great character, and possessed of scientific attainments, was the earliest horticulturist of central or western New York. His collection of fruits at Aurora, upon Cayuga Lake, was begun about 1830. His son, John J. Thomas, nurseryman and author of the "American Fruit Culturist," which first appeared in 1846, died at a ripe old age in 1895, and in his removal the country lost one of its most expert, systematic and conscientious pomologists. The nursery firm of Parsons & Co., on Long Island, was founded in 1838, and is continuing. It was instrumental in distributing great quantities of fruit and ornamental stock at a formative time in American Horticulture, and it was a pioneer in several commercial methods of propagation of the more difficult ornamental stock. It was the chief distributor of Japanese plants in the early days. Between 1840 and 1850 arose the beginnings of that marvelous network of nurseries, which, under the lead of Ellwanger & Barry, T. C. Maxwell & Brothers, W. & T. Smith, and others, has spread the name of western New York throughout North America. In 1857, Prosper J. Berckmans, who had then been a resident of the United States seven years, removed to Georgia, and laid the foundation of what is now the best known nursery in the South.

The first American seed house, David Landreth's, in Philadelphia was established in 1784. The second was John Mackejohn's, 1792; third, William Leeson, 1794; fourth, Bernard M'Mahon, 1800, all of Philadelphia. In 1802, Grant Thorburn's was established in New York. The first and last of these businesses still exist under the family names. M'Mahon did a large business in exporting seeds of native plants, and it was through his work that many American plants came into cultivation in Europe. His catalogue of seeds of American plants in 1804, for the export trade, contained about 1,000 species of trees, herbs and shrubs. He also announced at

ness and writing, had great influence on American Horticulture in its formative period. As we have seen, he distributed seeds of the Lewis and Clark expedition; but Landreth is said to have shared these seeds, and also those collected by Nuttall. Those were days of the enthusiastic exportation of the seeds of American plants.

The development of the seed trade is coincident with the development of the postal service. Burnet Landreth writes that "it was not until 1775 that the New York city post office was first established, the mail passing



1091. Greenhouse front.

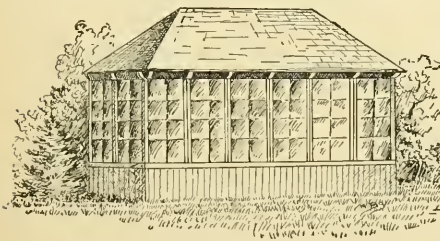
With glass lights and door of glass at the end, to be 7 feet high, 35 in length by 12 in breadth. Brick foundation 2 feet high, half a foot of which to be underground.—Robert Squibb, Gardener's Calendar, Charleston, S. C. 1827.

once every two weeks between New York and Boston. In 1775, a through mail was established by Postmaster Franklin between Boston and Savannah, the letters being carried by post riders, each man covering 25 miles. Previous to that date, sixty days would frequently pass without a mail from Virginia." Landreth estimates that there are now nearly two hundred seed firms in the United States publishing and distributing descriptive seed catalogues.

GREENHOUSES.—The first glasshouse in North America was probably that erected early in last century in Boston, by Andrew Faneuil, who died in 1737. This passed to his nephew, Peter Faneuil, who built Faneuil Hall. The greenhouse which is commonly considered to be the first one built in the country was erected in 1764 in New York, for James Beekman. A picture of this, from Tall's "Greenhouse Construction," is shown in Fig. 1090. Glasshouses were fully described in 1804 by Gardiner and Hepburn, and in 1806 by M'Mahon, but these authors do not state to what extent such structures existed in America. In Doctor Hosack's botanic garden, 1801, extensive glasshouses were erected. Compare Figs. 986, 987. Fig. 1091 shows one of the earliest American pictures of a greenhouse. It is copied, full size, from Squibb's "Gardener's Calendar," Charleston, S. C., 1827. Fig. 1092 shows the first greenhouse in Chicago, as illustrated in "American Florist." Note the small panes, and the sash construction. This was built in 1835 or 1836. With these pictures should be compared the modern greenhouses as shown in Fig. 1093; also in the pictures in the articles on *Greenhouse*.

These early houses were heated by flues or fermenting substances. The use of steam in closed circuits began in England about 1820. Hot-water circulation seems to have been a later invention, although it drove out steam heating, until the latter began to regain its supremacy in this country twenty or twenty-five years ago. The "New England Farmer" for June 1, 1831, contains a description of hot-water heating for hot-houses, a matter which was then considered to be a great novelty.

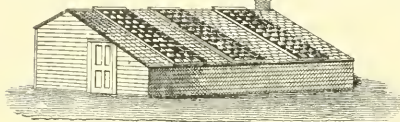
Most of the early houses had very little, if any, glass in the roof, and the sides were high. It was once a fashion to build living rooms over the house, so that the roof would not freeze. In the "modern" construction of the greenhouse of M'Mahon's day, 1806, he advised



1090. One of the earliest American greenhouses. 1764.

that time that he had "also for sale an extensive variety of Asiatic, South Sea Islands, African and European seeds of the most curious and rare kinds." "The prices shall be moderate, and due allowance will be made to those who buy to sell again." M'Mahon, through busi-

that "one-third of the front side of the roof, for the whole length of the house, be formed of glass-work," and in order that the tall, perpendicular sides of the house should have as "much glass as possible," he said that "the piers between the sashes are commonly made of good timber, from 6 to 8 or 10 inches thick, according



1092. First greenhouse in Chicago (1835 or 1836).

to their height." "The width of the windows for the glass sashes may be 5 or 6 feet; * * * the bottom sashes must reach within a foot or 18 inches of the floor of the house and their top reach within 8 or 10 inches of the ceiling. The panes in the roof should be 6 inches by 4, this size "being not only the strongest, but by much the cheapest, and they should lap over each other about half an inch." But the sides or "front lights must be made with large panes of glass." Many or most of the early plant-houses had removable tops, made of sash. On the change from the old to the new ideas, Alfred Henderson writes as follows: "The first published advocacy of the fixed-roof system was made by Mr. Peter B. Mead, in the 'New York Horticulturist,' in 1857. Before that, all greenhouse structures for commercial purposes were formed of portable sashes, and nearly all were constructed as 'lean-to's,' with high back walls, and none were connected. All were separate and detached, being placed at all angles, without plan or system. Then, too, the heating was nearly all done by horizontal smoke-flues, or manure fermenting, although there was a crude attempt at heating by hot water by some private individuals as early as 1833. The first use of heating by hot water on anything like a large scale, however, was in 1839, when Hitchings & Co., of this city, heated a large conservatory for Mr. William Niblo, of New York; and yet for nearly twenty years after this time heating by hot water was almost exclusively confined to greenhouses and graperies on private places, as few professional florists in those days could afford to indulge in such luxuries. All this is changed now. The use of steam, hot water under pressure, and the gravity system of hot-water heating are almost universally in operation, the hot-air flue having been relegated to the past. The best evidence of progress is in the fact that the florist has not waited for the tradesman, but has brought about these improvements himself."

Much attention was early given to the slope of the roof, in order that the greatest amount of sunlight might be obtained. Early in this century the curvilinear roof came into use, as the various angles which it presents to the sun were supposed to catch the maximum number of the incident rays. The sides of the house remained high, for the most part, until near the middle of this century. All this shows that the early glasshouse was modeled after the dwelling or other buildings, and that it had not developed into a structure in which plants were grown for commercial purposes.

The modern commercial forcing-house, with direct roof, low sides, and heated by steam or hot water in closed circuits, is mostly a development of the last thirty years. Its forerunner was the propagating-pit of the nurseryman. If anything is lost in sunlight by adopting a simple roof, the loss is more than compensated by the lighter framework and larger glass. In the forcing-house, all architectural ambition is sacrificed to the one desire to create a commercial garden in the frosty months.

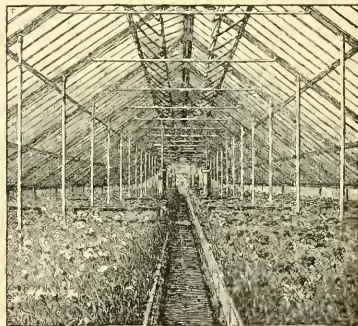
Lettuce, cucumbers, tomatoes, carnations, violets, and various other plants are now grown as crops under glass roofs, whilst a generation ago they were generally not forced at all for market or were grown mostly under frames. With the simplifying and cheapening of the

glasshouse, amateur flower and vegetable growing has acquired a new impetus, and the business of the retail florist has grown amazingly in the recent years.

Some idea of the increase of the demand for plants may be obtained from the sale of flower pots. A. H. Hews, of Cambridge, Massachusetts, whose ancestors began the manufacture of pots before 1765, reports that for a period of twenty-two years, from 1788 to 1810 the accounts of the sales of pots "cover about as many pages as we now often use in one day; and the amount in dollars and cents does not compare with single sales of the year 1894." He also compared the sales for 1869 and 1894 and "found the increase as ten to one; or, in round numbers, 700,000 flower pots in the former year and 7,000,000 in the latter; and if the same factory can in 1920, twenty-five years later, produce and sell 70,000,000, we shall verily be living in a land of flowers."

One of the earliest greenhouse builders was Frederic A. Lord, who built his first houses, according to Taft, in Buffalo in 1855, and who, in 1872, entered into partnership with W. A. Burnham, at Irvington, on the Hudson. In very recent years a new impetus has been given to glasshouse building and work by the establishment of the agricultural experiment stations and the extension of horticultural teaching in the colleges.

HORTICULTURE IN CALIFORNIA.—California Horticulture is in the main patterned after the South-European types, and to this extent it originated from Spanish-Mexican sources. The Horticulture of California's high mountain valleys approximates more closely to that of colder regions, while the Horticulture of the Pacific slope, north of California, becomes more and more different from the South-European types, but still has many characteristics of its own separating it sharply from that of the Atlantic slope. The first horticultural experiments in California were at the missions of the Peninsula (Baja or Lower California), where 22 missions were founded between 1697 and 1797. Here the Mission Fathers introduced the date palm; also oranges, lemons, limes, pineapples, bananas, olives, figs, pomegranates, peaches, quinces, plums, apples, pears and grapes. They shipped to Monterey and the northern missions large quantities of dried figs, grapes, dates and peaches. The Upper California missions received seeds, cions, etc., from those of Lower California, as well as from Mexico. The first of these missions was established in 1769 at San Diego by the Franciscans, under the leadership of Father Junipero Serra, whose name visitors to



1093. Interior of a modern commercial greenhouse—Carnations.

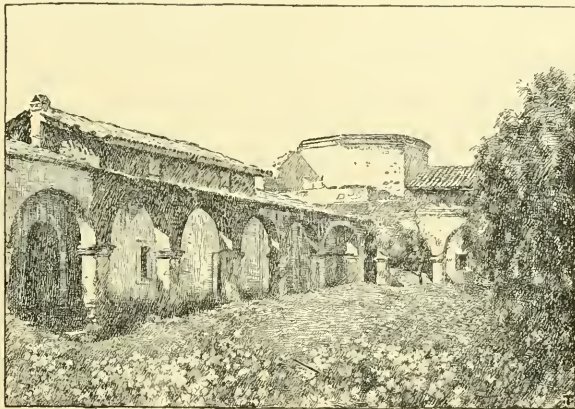
the California State Building at the World's Fair will recall in connection with the great date palm from the Mission Valley of San Diego. This palm was raised from seed which Junipero Serra planted about 1770. Twenty-one missions were founded by the Franciscans, the last one in 1823, and at all but one or two of them there were important collections of the fruits of south-

ern Europe—olives, figs, oranges, lemons, pomegranates, wine grapes, and also apples, pears and peaches. Early in this century the mission of San Gabriel had over 2,000 fruit trees, and others had more than a thousand. Fig. 1094 shows the yard of San Juan Capistrano Mission, as it existed in 1889. There are also some traces in California of the fruits of the few early Russian settlements. With the American occupation and the immigration from the East, came the eastern American types of fruits, and the state is now the seat of a wonderfully varied fruit culture, although the small fruits have not yet attained that prominence which they enjoy in older countries.

Details of the early California Horticulture are given for this occasion by Charles Howard Shinn. The first official horticultural reports from California appeared in the second part of the United States Patent Office Report for 1851. In this report, Mr. A. Williams, of San Francisco, presented statistics from the Horner Ranch, near the Mission San José, Alameda county, where 800 acres were planted in vegetables and the crop of 1851 sold for upwards of \$200,000. The crop of potatoes, onions, beets, turnips and tomatoes was 134,200 bushels. The same report noted an onion weighing 21 pounds, and at the Fair of 1853 the committee on vegetables reported a "white flat turnip" weighing 33 pounds, a squash that weighed 121 pounds, and a tomato weighing 5½ pounds. Thus early California began to boast of the mammoth productions of her soil. The first official report printed in California appeared in a document issued by the Secretary of State for 1852. The capital then employed in "fruits and orchards" was given at \$366,910. The market-garden interests were surprisingly large; among single items were "460,000 pumpkins, worth \$16,000;" upwards of 5,000,000 pounds of onions, "worth \$186,000;" 30,000 bushels of beans, "worth \$72,000;" Santa Barbara county reported "1,370 barrels of olives, worth \$27,500." Horticultural statistics are continued in the reports of the state Surveyor General. In December, 1855, the State Agricultural Society of California was organized, after a successful exhibition in San Francisco, where almonds, figs, olives, walnuts, and many other fruits, as well as vegetables and flowers, were shown. Fairs were held in 1854 and 1855, but were not officially reported. The state began to publish the proceedings of the agricultural society in 1858, when its membership was \$856, and annual reports have continued till the present time. The California Horticultural Society was organized April 5, 1881; in 1883, the State Board of Horticulture was established. Reports of these bodies and of the state fruit-growers' conventions have appeared annually or biennially since 1882. The State Viticultural Commission was organized in 1881, and its reports continued until 1894. Upwards of one hundred octavo volumes represent the official output of California since 1858 in lines of Horticulture, including, of course, the California Experiment Station reports.

Among the special California horticultural literature, are the following: "California Fruits," E. J. Wickson, first edition, 1889; second edition, 1891; third edition, 1900. So many changes and additions have occurred in this book that all three editions will be found very useful in libraries. "California Vegetables," E. J. Wickson, 1897. The only book on this subject that has yet appeared (1900). "Gardening in California," Wm. S. Lyon, Los Angeles, 1897. This is a small volume of 156

pages. "Olive Growing," Pohndorff, San Francisco, 1884. "Olive Culture," A. Flamant, San Francisco, 1887. "The Olive," Arthur T. Marvin, San Francisco, 1888. "The Raisin Industry," Gustav Eisen, San Francisco, 1890. "The Wine Press and Cellar," E. H. Rixford, San Francisco, 1883. "Grape Culture, a Handbook for California," T. Hart Hyatt, San Francisco, 1876. "Orange Culture in California," Thomas A. Garey, San Francisco, 1882. Contains appendix on grape culture, by L. J. Rose. "Orange Culture," W. A. Spalding, Los Angeles, Calif. "The California Farmer," established in January,



1094. One of the early California Missions, which were the early promoters of Horticulture on the western coast—San Juan Capistrano.

1854, and maintaining a spasmodic existence for a number of years, printed the first pomological and horticultural reports of committees, etc. "The Rural Press" was established in 1871, in San Francisco, and still continues. "The Rural Californian," of Los Angeles, still in existence, was established in 1877. "The California Fruit-Grower," commenced in 1888, and still survives (1900). "The California Florist," first issued in Santa Barbara, then in San Francisco, began in May, 1888, and stopped in April, 1889. "The California Cultivator," of Los Angeles, established in 1884, still published. "The Pacific Tree and Vine," of San José, established in 1882, still published.

California is now a horticultural wonderland; but its illimitable plantations are depressing to the man of small means and non-commercial ambitions, or to those who would grow for the discriminating personal market. Difficult climates develop the highest type of the amateur.

PERIODICALS.—Whilst the periodicals of any subject are supposed to chronicle all the fleeting events of the days and years, and to embalm them for future generations, it is the most difficult thing to remember and record the journals themselves. Many horticultural journals have lived and died in this country without having attracted the attention of a single library or collector of books. They germinated in the rich soil of expectation, bloomed in the dewy morning of enthusiasm, and collapsed when the sun rose. It is probably no exaggeration to say that 500 horticultural journals have been started in North America. There are about 40 in the flesh at the present moment. The "Massachusetts Agricultural Repository" was started in 1793, and this was the first agricultural journal in the country, but it was as late as 1821 that a horticultural department was added to it. The first journal to devote any important extent of its space to horticultural matters was the

"New England Farmer," which was established in Boston in 1822, and which was one of the chief instruments in the organization of the Massachusetts Horticultural Society. Its first editor was Thomas G. Fessenden, author of the "New American Gardener," a book which appeared in 1828, and passed through at least six editions. The "Horticultural Register and Gardener's Magazine," established in Boston in 1835, and edited by Fessenden and Joseph Breck, and "Hovey's Magazine," were probably the first distinct Horticultural periodicals. The former, although a magazine of more than ordinary merit, did not persist long. The latter was founded by C. M. Hovey and P. B. Hovey, Jr., and was called the "American Gardener's Magazine and Register of Useful Discoveries and Improvements in Horticultural and Rural Affairs," a journal which, in the third volume, became the "Magazine of Horticulture," and which enjoyed an uninterrupted existence until 1868, thus covering a third of a century of the most critical and interesting period in American Horticulture.

The next important journalistic venture was A. J. Downing's "Horticulturist," begun in 1846, and continued under many changes and vicissitudes for some thirty years, and still represented, in line of descent, by "American Gardening." It has been published in Albany, Rochester, Philadelphia and New York. The first seven volumes were edited by A. J. Downing; the eighth and ninth by Patrick Barry; the tenth by Barry and J. J. Smith; the eleventh to fourteenth by J. J. Smith; fifteenth and sixteenth, by Peter B. Mead; seventeenth and eighteenth, by Mead and G. E. Woodward. Later it was continued by Henry T. Williams, in New York, until the close of 1875, when the "Horticulturist" was united with the "Gardener's Monthly," of Philadelphia. This latter magazine started January 1, 1859, as a quarto, but became an octavo with its second volume. It continued until the close of 1887, when upon the death of its publisher, Charles Marot, it passed into the hands of the "American Garden," New York. It had a long and useful career under the editorial management of one of the most accomplished and conscientious of American horticulturists, Thomas Meehan, whom all the younger generation has learned to love. The "American Garden," itself was a continuation of the "Ladies' Floral Cabinet." In November, 1891, "American Garden" absorbed "Popular Gardening," which was established at Buffalo in October, 1885, and the combined journals became known as "American Gardening." With the issue of September, 1893, this journal again passed into new management, and the magazine type of American Horticulture ceased to exist. The "Philadelphia Florist" completed its first volume in 1852-3. The subsequent volumes (at least three) were known as the "Florist and Horticultural Journal." It was a very credible monthly magazine, with colored plates. An early journal in the new West was Hooper and Elliott's "Western Farmer and Gardener," Cincinnati, September, 1839-1845, with plates colored by hand.

The first pomological journal was probably Hoffs' "Orchardist's Companion," a quarterly, established in Philadelphia in 1841, and edited by Dr. Bincklé. It was a pretentious quarto, with colored plates, of which only one volume was issued. This was followed in 1845 by the "North American Pomologist" by Dr. Bincklé, an abler publication than the other. Other early horticultural periodicals were "Western Horticultural Review," Cincinnati, 1851 to 1853, edited by John A. Warder; "American Journal of Horticulture," later known as "Tilton's Journal of Horticulture," Boston, 1867 to 1871 (9 vols.), edited in its last three years by the younger Robert Manning; "Western Pomologist," Des Moines, Iowa, and Leavenworth, Kansas, 1870 to 1872, by Mark Miller, Dr. J. Stayman, and others. The first attempt to establish a weekly, after the pattern of the great English journals, was "Garden and Forest," which appeared in New York in 1888, under the management of Professor Charles S. Sargent, of Harvard University. Unfortunately, this fine journal came to an end with 1897. It stands as the highest type of American horticultural journalism. Probably the first journal devoted to any particular fruit or plant was Husmann's "Grape Cultivist," St. Louis, 1869 to 1871.

On the Pacific coast, the earliest distinct horticultural

periodical was the "California Cultivist," the first number of which appeared in January, 1859. This ran through four volumes, and it records the marvels of the first era of modern fruit-growing upon the Pacific slope. The "California Horticulturist" was established in 1871, and ran through 10 yearly volumes, when, in 1880, it was merged into the "Pacific Rural Press," which is still in active existence. The current periodical literature calls for no comment here, except to remark that pomology—the one distinctive feature of American Horticulture—has no journal devoted to its interests. America has never been favored with horticultural annuals to the extent to which England and other countries have. The first attempt of the kind seems to have been Woodward's "Record of Horticulture," edited by A. S. Fuller, which appeared in 1866 and 1867. The next venture was the "American Horticultural Annual," New York, for the years 1868, 1869 and 1870, under the general editorial care of Dr. George Thurler. The attempt was not made again until the present writer established "Annals of Horticulture," in 1889, and which was issued for five years, the last volume containing an account of the Horticulture of the Columbian Exposition.

HORTICULTURAL SOCIETIES.—The year 1785 saw the establishment of two agricultural societies, the Philadelphia Society for Promoting Agriculture, and the Agricultural Society of South Carolina. These were followed in 1792 by the organization of the Massachusetts Society for Promoting Agriculture. It was not until 1818, however, that the first horticultural organization came into existence, the New York Horticultural Society, now, unhappily, extinct. It expired about 1837. The second, organized in 1827, was the Pennsylvania Horticultural Society, which is still in vigorous existence. The third, according to Manning, was the Domestic Horticultural Society, organized at Geneva, New York, in 1828, and which was the forerunner of the Western New York Horticultural Society, the latter having continued for 40 years, and which now enjoys the most energetic and influential membership of any similar society in the Union. The next organization was the Albaeo Horticultural Society, established in 1829, but which expired long ago. In 1829, also, the Massachusetts Horticultural Society was organized, an association which, in the character of the men who have been members of it and in the service which it has rendered to the advancement of rural taste, stands without a rival in the country. The American Pomological Society was organized in 1850, through a union of the North American Pomological Convention and the American Congress of Fruit-Growers, both of which were established in 1848. The Congress of Fruit-Growers was a meeting held in New York on the 10th of October, 1848, at the call of the Massachusetts, Philadelphia, New Jersey and New Haven Horticultural Societies and the Board of Agriculture of the American Institute of the City of New York. The Pomological Convention held its first meeting on the 1st of September in Buffalo. The American Pomological Society is undoubtedly the strongest organization of pomologists in the world. A. J. Downing wrote in 1852, that "within the last ten years the taste for horticultural pursuits has astonishingly increased in the United States. There are, at the present moment, at least twelve societies in different parts of the Union devoted to the improvement of gardening, and to the dissemination of information on the subject." At the present time there are over 500 such societies, and the average attendance at the meetings cannot be less, in the aggregate, than 15,000. From a careful estimate which I made in 1891, I concluded that the aggregate attendance for that year at the national, state, provincial and district societies "probably exceeded 5,000." There are now at least ten national societies devoted to Horticulture or some branch of it. The most gratifying feature of this movement towards organization, however, is the establishment of great numbers of local societies, florists' clubs, and the like, which sustain the interest in horticultural pursuits and foster pride in the personal surroundings of the members. All this great body of societies is proof enough that there is a rapidly expanding and abiding love of Horticulture in America, and that it must increase with the increasing amelioration of the country.

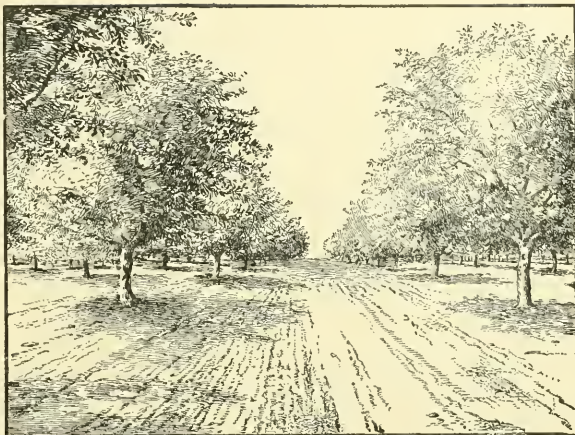
EXPERIMENT STATIONS AND COLLEGES.—Closely associated with the aims of the societies in the general extension of education, are the experiment stations and agricultural colleges. These institutions are the result of agitations in the agricultural societies. These agitations began over one hundred years ago. Most of the experiment stations are founded upon the Federal law known as the Hatch Act, which received the President's signature March 2, 1887. There are now 55 experiment stations in the United States. There are a dozen scientific bureaus and divisions connected with the Department of Agriculture at Washington, three of which directly concern the horticulturist: Divisions of Pomology, Vegetable Pathology and Entomology, and to these might be added the Division of Gardens and Grounds. The work of all these stations and of the agricultural bureaus and divisions is condensed and epitomized in the "Experiment Station Record," a monthly publication of the Department of Agriculture.

The writings and teachings of the horticulturists in the colleges and experiment stations will, in time, bring our horticultural activities into proper relationships and perspective. These men will arrive in time at judicial conclusions on the disputed points. It is only those persons who have some taste and leisure for study and reflection who can do this. Persons who are intensely absorbed in one commercial pursuit usually exalt that pursuit out of all proportion to its relative importance.

COMMERCIAL TRANSPORTATION.—The rise of the great commercial movement in horticultural products may be said to have taken place since the civil war. The first important invention to usher in this era, aside from improvements in transportation, was that of canning perishable commodities. The method originated with a Frenchman in 1795, but it first became an assured and recognized success in this country. The inauguration of the process dates from 1825, when President Monroe signed patents to Thomas Kensett and Ezra Daggett, to protect them in an improvement in the art of preserving. Kensett appears to have canned various products somewhat extensively as early as 1819. At the present time, the United States outstrips other countries in the variety and extent of its canned goods. Over 20,000 factories in North America now employ towards a million hands, directly or indirectly, during the canning season. For a sketch of the development of the canning industry, see an article by Edward S. Judge in "One Hundred Years of American Commerce."

Drying fruit for market by fire heat began to attain some prominence about 1860, but the advent of the Alden drier about 1870, and the Williams and others at about the same time, brought in the modern "evaporated" product, which is now an inseparable adjunct of the fruit trade. In the East, the most important region of evaporating establishments is western New York, particularly Wayne county, although California far exceeds other areas in the output of similar products.

The exportation of fruit has lately assumed large proportions. The first record known to the writer of the shipping of fruit across the ocean occurs in the correspondence of John Bartram, from which it appears that as early as 1773 apples were shipped to England in "great quantities." In 1821, 68,643 bushels of apples were exported. The modern apple export trade is generally said to have begun with the shipment of five



1095. A modern commercial apple orchard, in clean tillage.

barrels from Boston to Glasgow in 1845 under the auspices of one Buchanan, a Scotchman. The first heavy exportations were made about 1880. In the season of 1880-81 the total shipment of apples from North America to Europe was 1,328,806 barrels. The subsequent heavy years of the earlier period were as follows: 1888-89, 1,407,409 barrels; 1891-92, 1,450,336 barrels; 1892-93, 1,203,538 barrels; 1894-5, 1,438,155 barrels. California green fruits were first shipped to Europe in 1891, but the first public shipments were made the following year. Fresh grapes from the East were first shipped in 1892 from Chautauqua county, New York. Florida first shipped oranges to Europe in the fall of 1892, and California early in 1893. The cranberry was first put upon the European market in 1893. The first shipment of fresh peaches across the ocean from the East appears to have been made in 1893, when a consignment of Delaware peaches was made to Ambassador Bayard at London, but the attempt was only partially successful. The Canadians have recently made careful experiments with transatlantic shipments. The annual value of fruit exports from the United States (including cider, vinegar, canned and preserved fruits, nuts, and all green fruits) is about five million dollars' worth. The largest single item in this aggregate is fresh apples, comprising one and one-third million dollars' worth.

Unfortunately, there are no statistics of American Horticulture. Various horticultural inquiries were included in the schedules of the Eleventh Census (1890); only a few bulletins of summaries were published. The American Cranberry Society makes a yearly summary of the output, by means of correspondence amongst its members. The apple exporters have records of the transatlantic apple trade. The Treasury Department publishes summary statistics of imports and exports. But beyond this, there is little statistical measure of our horticultural wealth, except figures which are gathered now and then for special areas from transportation companies. The Twelfth Census is giving attention to the matter.

A summary history of the fruit trade was written by John W. Nix for Depew's "One Hundred Years of American Commerce," 1895. "One hundred years ago the fruit merchant, as such, did not exist in this country. Some of the larger importers occasionally received, among the other articles of an assorted Mediterranean cargo, a few half casks of dried prunes, currants, raisins, or grapes, but beyond these even the luxurious did not aspire. It was some years before even so sim-

ple a custom as selling native fruit brought to town in season by the neighboring farmer became at all general with the old New York grocers." The first bananas were imported into the United States in 1804, but "it was not until 1830 and later that the importation of foreign fruit was considered seriously." "In 1832 there arrived at New York by sailing ship the first cargo of oranges from Sicily. Lemons followed almost immediately, and the Mediterranean fruit trade became a recognized interest from that time." The fruits came to be sold largely by auction. About 1865 the wholesale commission business had "come to be a generally recognized feature of the fruit trade, many of the Italian growers * * * consigning their fruit directly to American firms." "About 1880, the third and last change in the methods governing the Italian fruit trade began with the establishment here of representatives of several of the large Italian houses." "Prior to the civil war and for several years afterward, the small fruits of New York, New Jersey, Long Island and Delaware were the only competitors of the foreign fruit. * * * Such was the condition of affairs in 1867, when the first consignment of green fruit from California was shipped by express to New York."

L. O. Thayer, editor of "Cold Storage," New York, estimates that there are in the United States (in 1900) 920 cold stores, excluding 300 used exclusively for meat. Of this 920 he says that 700 are fitted for the storing of fruits, produce, eggs, butter, etc. The capacity of these 700 is something like 35,000,000 cubic feet, or a yearly capacity of 980,000,000 pounds. Almost every cold store works to its fullest capacity nine months in the year. In Canada there are 40 cold stores, about 30 of them being fitted for butter, eggs and produce. Their capacity is about 200,000 cubic feet. Wm. A. Taylor estimates that in March, 1901, there were about 60,000 refrigerator cars in service in the United States, Canada and Mexico. Shippers estimate that 95 per cent of the California deciduous fresh fruits are handled in these cars.

CONCLUSION.—The one most significant thing in American Horticulture is the fact that it is American. Ideals, methods, varieties, implements, are unique. Even the species of plants which we cultivate are often peculiar to ourselves. This is particularly true in the fruits, for the native wild species have given us our grapes, raspberries, blackberries, dewberries, mulberries, cranberries, some gooseberries, many plums, some apples, and various minor fruits. In other esculents, it has given us the pumpkins and squashes, Indian corn, beans and Jerusalem artichokes. Our native flora has enriched the flower gardens of our own country and of the world. An inquiry made in 1891 showed that 2,416 species of the United States and Canada had been introduced to cultivation. In that year, 1,929 of these species were actually in the trade, and 1,500 had been introduced into England. Even when the species are of Old World origin, the varieties are American in most of those types which have been long cultivated here. Very few Old World apples and peaches are popular in North America, and the number in pears, plums and other fruits is constantly decreasing. The American carnation is already of a different type from the European. One of the strongly American features of our Horticulture is the great proportionate development of the cut-flower industry; but the last few years have seen a relative increase of pot-plant and decorative-plant demands. These divergencies are likely to increase rather than diminish. The tendencies which differentiate our Horticulture from that of the Old World will also differentiate the Horticulture of each geographical area of our own country, thereby giving each area the varieties and the methods which are best adapted to it.

The second most significant thing in our Horticulture is its strong commercial trend. This is particularly true of fruit-growing and cut-flower-growing, which have developed on a large-area basis (Figs. 1093, 1095). The first horticultural interest in this country was the amateur or home-garden type. That type is not dead, and it will not die so long as hearts burn for the out-of-doors and souls long for beauty and for the solace of nearness to nature. Amateur or personal Horticulture is increasing with great rapidity. It is a part of the ripening of the home life and the acquiring of

leisure. Personal gardening is intellectual enjoyment. The amateurs are the chief buyers of horticultural books. Yet, for all this, the prevailing note in American Horticulture is commercialism, and this note is the stronger the farther one goes from the Atlantic seaboard. Both types of Horticulture will increase. They are not incompatible, but complementary. Both are necessary to the greatest public weal. The commercial type will always be the aspiration of the comparatively few; it is coming more and more to be a profession. The personal or amateur type will be increasingly the hope of the many, for every person who has a home wants a garden.

Another important feature of our Horticulture is its living literature. Persons may care nothing for books; yet the literature of any subject is the measure of its ideals. Persons may say that the books are theoretical and beyond them; yet good books are always beyond, else they are not good. There is no use for literature if it does not inspire and point to better things. We measure the aspirations of any time by its writings. Whether the fact be recognized or not, the literature of our Horticulture is an underlying force which slowly dominates the thoughts and ideals of men. A book is a powerful teacher. It states its propositions, and is silent; and in the silence its lessons sink into the fiber of the mind. More than 600 books have enriched American Horticulture. Many of them have been poor, but even these may have challenged controversy and have done good. The early books were largely empirical and dogmatic. Downing, for example, in 1845, says that tillage makes better orrharbs, and he cites cases; but he does not give reasons. He does not mention nitrogen, potash, soil moisture, chemical activities. He does not even mention plant-food in connection with tillage. The horizon has widened since then. Men do not take up things actively until they know the reasons. The poor farmer, not knowing reasons for anything, has no inspiration and goes fishing. Thirty years ago, Colonel Waring was the apostle of deep-plowing; yet one should plow neither deep nor shallow until he knows why. Our literature has been singularly devoid of principles and analysis. The great writer is he who catches the significant movements and ideas of his time and portrays them to inspire his reader. Henderson first caught the rising commercial spirit of our vegetable gardening; his "Gardening for Profit" is the greatest American vegetable gardening book, even if somewhat out of date as a book of practice. The book of principles is now needed by the vegetable-gardener. American pomology has several strong names amongst its writers. Most of these writers have sacrificed fundamental things to varieties. The first sustained effort to write on fruit-growing from the point of view of underlying principles was by Charles R. Baker, who in 1866 published his "Practical and Scientific Fruit Culture." But the time was apparently not yet ready for a book of this kind, and much of the discussion lacked vital connection with the orchard. The book was too suggestive of the study and the compiler. Cox, Kenrick, Manning, Downing, Thomas, Warder, Barry, Fuller, are significant names in American pomological literature. In floriculture there have been many excellent treatises, but there is not a single great or comprehensive book. In recent years, the making of horticultural literature is passing more and more from the working horticulturist to the specially trained student and writer.

The great development of American Horticulture, as compared with European standards, has been in fruit-growing and its accessory manufactures, and cut-flowers. Its landscape planting is also a strong feature, and is increasing rapidly. Its cemetery planting is probably the best in the world. In America, also, the development of agricultural tools and appliances, and of spraying for insects and diseases, have reached their highest development. Other characteristic features of our Horticulture are its youth, and the vigor with which its scope is enlarging. L. H. B.

HOSACKIA (David Hosack, professor of botany and medicine in New York; author of *Hortus Elginensis*, 1811; died 1835). *Leguminosæ*. Herbaceous plants, of which 3 species were once advertised by collectors of north-



Plate XV. A modern landscape garden.—The spring garden of Mrs. J. L. Gardner, Brookline

west American plants. The genus contains about 30 species, all American and almost wholly confined to the Pacific slope. Herbs or rarely subshrubs: lvs. pinnate, with 2 to many lfts.; stipules minute and gland-like, rarely scarious or leafy; fls. yellow or reddish, in axillary umbels which are peduncled or not. The genus is closely related to *Lotus*, but the calyx teeth are shorter than the tube; keel obtuse; lvs. usually with numerous lfts., none of which are like stipules, while *Lotus* has calyx lobes usually longer than the tube, a rostrate keel and 5 or 4 lfts., of which 2 or 1 are stipule-like.

The 2 species first mentioned belong to a section in which the pods are shortly acute, linear, many-seeded, straight, glabrous; fls. and fr. not reflexed; peduncles long. The third species belongs to a section in which the pods are long-attenuate upwards, incurved, pubescent; peduncles short or none; fls. and fr. reflexed. Monogr. by Watson in Bot. Calif. 1:133.

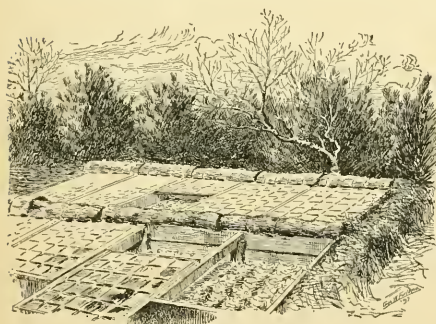
crassifolia, Benth. Stout, 2-3 ft. high, nearly glabrous; lfts. 9-15, thickish; stipules scarious, small; bract below the umbel; calyx teeth short; pod thick; fls. greenish yellow or purplish. B.R. 23:1977.

hicolor, Dougl. Glabrous; lfts. 5-9; stipules scarious, small; bract usually none or small; calyx teeth half as long as the tube; pod slender; fls. yellow, the wings often white. B.M. 2913.

decumbens, Benth. Silky or woolly, with appressed hairs; stems ascending, 1 ft. or more long; stems herbaceous; lfts. 5-7; umbels less dense; stipules gland-like; pods pubescent. W. M.

HOTBEDS. These are low glass structures that are generally heated by fermenting vegetable substances, such as stable manure, although fire heat is occasionally applied, steam, hot water and flues being used. Their usual place is some spot sloping to the south, where they are protected by buildings, evergreen screens or board fences, from the north and west winds (Fig. 1096). The frames are made either of plank or boards and may be portable, or built in place, the former being taken down and packed away except when needed. A tight board fence 6 feet high, as a wind-break, is desirable, as it will also serve as a support for the shutters, mats and sash when they are removed from the bed, and it will answer best for this purpose if it inclines a foot or so to the north.

When movable frames (Fig. 1097) are used they are generally constructed of 2-inch plank, the side pieces

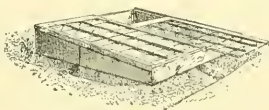


1096. Hotbed sheltered by a hedge.

The straw mats have been rolled off.

being from 9 to 12 feet and the ends 6 feet in length, to receive either three or four ordinary sash, which are 3 by 6 feet. The north side of the frame is made 15 inches wide, while the south side is but 9 or 10 inches, thus giving a slope to the south, which will permit the water to run off and favor the passage of the sun's rays through the glass. The end pieces are 6 feet in length,

but taper from 15 inches at one end to 9 or 10 at the other, so as to fit the side boards. The plank for portable Hotbed frames may be held in place by means of stakes, or iron rods or bolts may be fastened to the ends of the side pieces so that they can pass through the holes in the ends of the frame, which can then be fastened by keys or nuts. As supports for the sash and to hold the sides of the frame in place, cross-strips of



1097. Hotbed with movable frame.

board 3 inches wide are sunk into the upper edge every 3 feet, and another strip with a width equal to the thickness of the sash is fastened on edge to the center of its side. Frames of this size require a slightly deeper mass of heating material than would be necessary for larger frames, and when they are to be used during the winter, it is well to excavate to the depth of 2½ feet, and for a space 2 feet longer and wider than the frame, and after the hole has been filled with heating material, the material should be well tramped down. The frame is put in place and manure is then banked about it.

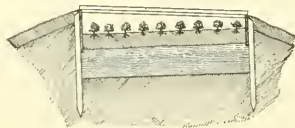
For permanent frames, rough 1-inch boards may be used, although 2-inch plank will be found far more durable. Stout stakes should be driven into the ground about 4 feet apart, where the north line of the bed is to be located. These should project above the surface from 12 to 15 inches, and should be boarded up from a point just below the level of the ground, so that the stakes will be on the north side of the frame. A second row of stakes should then be driven at a distance from the first row equal to the length of the sash, which is usually 6 feet, although other lengths are sometimes used. The south wall of the frame should then be boarded up so that it will be 5 or 6 inches lower than the north wall, after which the end should be closed and cross-pieces should be fitted, the same as for the portable sash. To prevent frost from working into the frame, soil should be taken from the inside and banked against the boards outside, so that it will reach two-thirds of the way to the top of the frame, and when the bed is ready for use, 3 or 4 inches of horse manure should be spread over this. The frame should be placed about 3 feet from the fence, and if other rows are needed, there should be alleys about 7 feet wide between them.

Hotbed Sash.—The size that has been found most satisfactory for Hotbed sashes is 3 by 6 feet, as when larger than this they are not readily handled by one man. While pine and other native lumber may be used; cypress is generally preferred, as it is much more durable and costs but little if any more than clear pine. The sides and upper ends of the sash are made from 3 by 1½-inch strips, grooved to receive the glass, while the lower end is about 1 by 5 inches. The center strips are 1 by 1½ inches. For glazing Hotbed sash, single strength 10 by 12 glass is commonly used, as three rows of this size will fill a sash 3 feet wide. While double-strength glass will be less easily broken, the increased weight is an objection to its use. The sash should receive two coats of paint, and after the glass, which may be either lapped or butted, has been set, it should be given a third coat.

Mats and Shutters.—For covering the frames on cold nights during the winter and early spring months, straw mats are often used, although those made of burlap are generally preferred. The burlap may be either single or doubled, or it may be stuffed with straw, excelsior or other materials. Quilted mats filled with combination wool are very warm and quite durable. During the winter, wooden shutters are also desirable to place over the mats, as they assist in holding the heat, and by keeping the mats dry, aid in preserving them.

Heating Material for Hotbeds.—To provide heat for the beds decomposing horse manure is generally used. While a large amount of straw is not desirable, the

presence of urine-soaked bedding with the manure to the extent of one-third its bulk is not objectionable, as it will lengthen the heating period of the manure. Unless straw is mixed with the manure, it will be well to add forest leaves to the amount of one-third to one-half the amount of the manure. The heating material should be forked over and placed in a pile 5 or 6 feet wide, 3 or 4



1098. Hotbed in cross-section.

feet high and of any desired length. If the manure and straw are dry, it will be well to moisten them with a fine spray. In case there is but a small amount of manure, it will be best to use warm water, though in all cases the soaking of the manure should be avoided. Within four or five days the giving off of steam will indicate that heating has commenced. The pile should then be forked over, working the outer portions into the center.

The amount of heating material that will be required for a Hotbed will vary with the crop, as well as with the location and season. For zero weather, there should be at least 18 inches of heating material after it has been well packed down, and 24 inches will be desirable in midwinter in the northern states, while 6 or 8 inches may answer where only a few degrees of frost are expected. For 18 inches of manure, the excavation should be made to a depth of 28 inches below the level of the south side of the frame, and 31 inches below that of the north side. After the manure has warmed through for the second time it should be placed in the excavation, spreading it evenly and packing it down with the fork, but leaving it for a few days before tramping it. Care should be taken to have the corners well filled, that an even settling may be secured. After the manure has again warmed up, it should be thoroughly tramped.

The bed is then ready for the soil, which should be quite rich and contain a large amount of sand and humus, a compost of decomposed pasture sods with one-third their bulk of rotten manure being excellent for the purpose. The thickness of the soil should vary from 5 to 7 inches, the greater depth being desirable for radishes and other root crops (Fig. 1098). When boxes of plants are to be placed in the beds the depth of soil need not be more than 3 inches. For a few days the bed will be quite warm, but when the temperature of the soil has dropped below 90° the seeds may be sown or the plants set out.

In severe weather the mats and shutters should be placed on the bed at night and should be removed in the morning. When the sun is shining, or if the bed is very hot, it should be ventilated by raising (Fig. 1099) or slipping down (Fig. 1097) the sash, the amount depending upon the season and the condition of the bed. By the middle of the afternoon the sash should be closed and the covering should be replaced before night. When used in the winter time, the Hotbed should be either sunk in the ground or well



1099. Ventilating the Hotbed.

banked up with soil or manure, so as to keep out the frost.

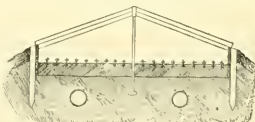
Pipe-heated Hotbeds.—Fire Hotbeds are generally from 10 to 12 feet wide, with a span roof. A Hotbed of this size would require two lines of 6-inch sewer pipe as flues (Fig. 1100), with furnaces in which wood can be burned at their lower ends. In order that a good draft

can be secured, it is advisable to have it upon a side-hill sloping to the south. When hot water is used for heating Hotbeds, a 2- or 2½-inch wrought-iron pipe is placed just beneath the ridge as a flow pipe, with one or two 2-inch pipes upon each of the side walls, the number varying with the season and the crops to be grown (Fig. 1101). Steam may be used in the same way, but the pipes should be one or two sizes smaller.

In the northern states the use of Hotbeds for growing crops during the winter months is not advisable, as better results can be secured in greenhouses, which will not be very much more expensive to build, and will be more durable besides much easier to handle, but in the spring Hotbeds are very useful for starting vegetable and bedding plants, as well as for growing lettuce, radishes and other vegetables. In the South fire Hotbeds answer very well for use in the winter for growing plants for the truck garden, as well as for forcing vegetables, but even there the simply constructed greenhouses are more satisfactory.

Coldframes differ from Hotbeds only in lacking artificial heat, as they depend entirely upon the sun. The surface of the soil should be from 6 to 12 inches below the glass, and a large amount of plant-food should be provided. Coldframes are often used for wintering half-hardy plants, and for starting and growing plants in the spring, after danger from severe frost is over.

Management of Hotbeds.—If the weather is mild during the latter part of February, the manure can be procured and prepared for use so that the Hotbed may be started about the first of March. If properly constructed



1100. Fire Hotbed.

they will provide heat for two months, and can then be used during May as a coldframe, thus making it possible to take off two crops in the spring. Although it is not often practiced, they may be used in the fall for growing a crop of lettuce or other vegetables, which can be matured before the first of December.

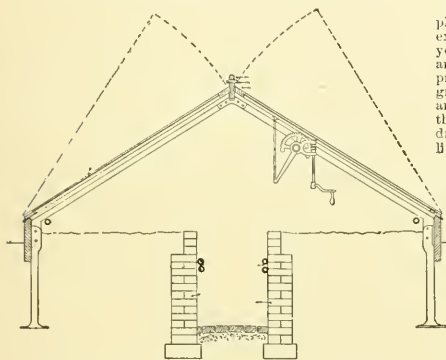
If a greenhouse is not available for starting the plants, seeds of lettuce, radishes, cabbages and other of the hardier plants may be sown in the Hotbed in the spring as soon as it is ready, in rows 4 or 5 inches apart. When the first true leaf appears, the radishes should be thinned and the other plants transplanted to about 2 inches. Later on, the lettuce plants should be placed about 8 inches apart each way. If the weather is so cold that the bed should not be kept open, the seeds may be sown and the first transplanting may be in flats or boxes, which can then be placed in the beds. Aside from proper ventilation, covering and watering, the beds should be occasionally weeded and the soil stirred. About the first of April, tomatoes, cucumbers and similar plants may be started. As soon as one crop is taken off another should be placed in the beds, and by deepening the soil they may be used during the early summer for growing cauliflower, tomatoes and cucumbers. L. R. TAFT.

HOTËIA. See *Astilbe*.

HOTTENTOT BREAD. *Testudinaria elephantipes*.

HOTTÏNIA (Peter Hotton, 1648-1709, professor at Leyden). *Primulacea*. FEATHERFOIL. A genus of two species of aquatic plants, the only aquatic members of the primrose family. They are suitable for small aquaria. The European species is procurable from dealers in aquatics; the American one can be gathered in shallow, stagnant ponds from Massachusetts to western New York and south to Florida and Louisiana. The European plant, *H. palustris*, Linn., is an herb with creeping rootstock, whorled, leafy branches entirely

submerged and alternate, pinnately dissected lvs., the divisions numerous and linear. From the center of the whorl of branches a single leafless flower-stem rises out of the water in summer, bearing a raceme with several whorls of 3-5 or 6 handsome, pale purple fls., ap-



1101. Hotbed (or forcing-house) heated by hot water.

parently with 5 petals, but actually with a short corolla tube below the lobes. The plants root in the mud or float, and the fls. are about three-fourths of an inch in diameter. Stamens 5, inserted on the tube of the corolla; capsule subglobose, with 5 lateral valves: seeds numerous.

The American plant, *H. inflata*, Ell., has spongy stems and clustered peduncles, which are partly above water, inflated, jointed, the lowest joint 2-4 in. long and sometimes 1 in. thick, the others 1-3 in. number and successively shorter; fls. small, in whorls of 2-10 at the joints. B.B. 2:586. Neither species is advertised. Like all aquarium plants, they are interesting, but they have no horticultural value otherwise. Both plants are called Featherfoil and Water-yarrow; the American also Water-feather and Water-yarrow.

HOULETIA (after Houlet, French gardener). *Orchidaceae*. About 8 species of epiphytic, pseudobulbous orchids from South America, allied to Stanhopea, and blooming in summer. Pseudobulbs conical, 1-leaved; lvs. lanceolate, plicate; sepals and petals usually nearly equal; labellum continuous with the clavate, arcuate column; pollinia 2, on a long candelike.

odoratissima, Linden. Sepals and petals reddish brown; labellum white, with two crimson appendages midway of its length. Colombia. G.C. II. 24:777. Var. *Antioquiensis*, André (*H. Antioquiensis*, Hort.), has labellum white, tinged yellow. I.H. 17:12.

Brocklehurstiana, Lindl. Fls. 5-8, about 3 in. across, brownish red, dotted with brown-purple; sepals oblong, obtuse, the lateral ones slightly united at base; petals narrower, obovate; labellum yellow, thickly dotted with brown-purple; from its lower half two linear appendages have their origin. Braz. B.M. 4072. P.M. 9:49. R.H. 1885:492.

picta, Linden & Reichb. f. Fls. 6-10; sepals oblong, brownish, unspotted above, tessellated with yellow below; petals similarly colored; labellum yellow, spotted or dotted with brown-purple or red-purple, the end hastate; apex recurved, pale yellow veined with crimson. Colombia. B.M. 6305.

Wallisii, Linden & Reichb. f. (*H. chrysantha*, Lind. & André). Fls. about 2 in. across; sepals and petals yellow, blotched inside with brown-purple; labellum yellow, dotted with crimson. Colombia. G.C. II. 18:437. I.H. 18:71.

OAKES AMES.

HOUND'S TONGUE. See *Cynoglossum*.

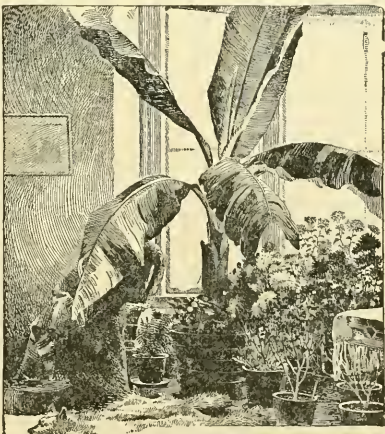
HOUSE LEEK. *Scempervivum tectorum*.

HOUSE PLANTS (Figs. 1102-1104) are those plants which can be grown in the ordinary rooms of dwelling houses. They may be hardy or tender; but only such as are suitable for this purpose will be considered here.

In the living rooms of the modern well-built house, plants must contend against difficulties which did not exist in the less carefully equipped dwellings of fifty years ago or earlier. The present methods of heating and lighting, by gas or kerosene lamps, not electricity, produce a dry atmosphere which is inimical to vegetable growth. In houses lighted by electricity, and heated by any system which introduces fresh air in abundance, this matter is not so troublesome. Too much heat and dry air are harder for plants to endure than insufficient light, but it is also lack of light which makes it so difficult to grow flowering plants in houses. Dust and insects do harm, but these difficulties can be overcome.

For the above reasons it is important to select House Plants which are adapted to resist a dry atmosphere, a high temperature and inadequate light. Such examples can be found among certain tropical plants with coriaceous leaves and small stomata, what the florists call foliage plants, e. g., rubber trees, palms, etc. These make the best foundation upon which any successful system of growing plants in houses can be built. Flowering plants can also be used, but they should be introduced from time to time, each in its proper season, when about to bloom or in bloom, and not considered a part of the permanent arrangement. After flowering they should be removed; their function is not unlike the use of cut-flowers, but they last longer and are not much more expensive, while they largely increase the attraction of the window-garden.

The best rooms for plants are those which get the most sun, and the best positions are those nearest the windows, where there is not only more light but more fresh air. A large palm, fern or rubber will grow in an entry or poorly lighted corner, but the best place is that which is best lighted. Plants do well in a kitchen, the moisture from the cooking helping them materially; it is by no means a bad hospital for unhealthy specimens.

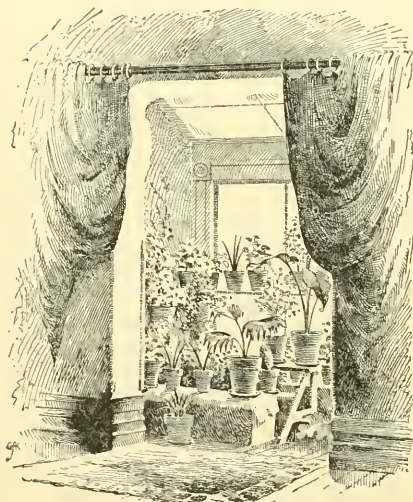


1102. Pot-plants in the window.

Sometimes a plant-room, not a conservatory, can be set aside for this purpose exclusively. If this is done in the basement, and it is possible to get good light, satisfactory results are obtained. The floor can be made of

concrete and water used without stint. In such a room plants can be grown and brought into the living rooms when in their best condition.

In rooms in which plants are kept, any device by which the atmospheric moisture can be increased is desirable: oilcloth on the floor, or a floor of porous tiles; a zinc tray, in which the pots can be set and surrounded with moss; saucers under the pots, the pots being raised slightly to prevent the roots of the plants standing in the water which runs through. By these aids not only can plenty of water be given to the roots, but there will also be some opportunity to sprinkle the leaves, while the evaporation of surplus water will dampen the air. The Japanese porcelain pots are not only ornamental but useful: the glaze prevents undue evaporation from the sides, and the legs hold the pot well above the water which may collect in the saucer; they are in every way excellent. Wooden tubs are serviceable for large plants or for any which are likely to be exposed to frost, either before or after bringing into the house. Plants should never be overpotted, but the larger the bulk of earth the easier it can be kept uniformly moist; from the wider surface, too, there is more evaporation. For these reasons it is sometimes a good plan to have window boxes in which several plants can be grown; or the boxes can be filled with moss in which the pots can be plunged. All pots, tubs or boxes for growing plants should have holes in the bottom through which water can pass freely.



1103. A window-garden.

Much trouble is likely to come from the use of unsuitable potting soil. Procure it from an experienced florist, or make it yourself of equal parts rotted sods, old leaf-mold, well-decayed cow manure and clean, sharp sand; discard tea leaves, chip dirt, and the decomposed remains of dead stumps. The soil should always be moist when used, not too wet and never dry; it should be made firm, not hard, and a good space left between the surface and rim. Large pots should be drained with potsherds and moss. The best time for potting is just before the plant begins to grow; the next best is just before growth ceases, thus giving the plant opportunity to establish itself in its new quarters before it stops growing. It is not always easy to do this properly at home, and large and valuable plants should be sent to a

florist. Plants growing in the open air should be lifted and potted two weeks or more before bringing into the house, not only before frost but before the nights are cool. Keep them at first in a cool, shady place, gradually accustom them to the sunlight, and carefully avoid all drafts. Do not give too much water at the root: some wilting is unavoidable, and cannot be prevented by heavy watering. Give one good application when they are first potted, and sprinkle the foliage and surroundings in the middle of the day. After they are established, keep them out of doors, on the piazza or porch, until there is danger of frost, but try to bring them into the house before the furnace fires are lighted.

A period of rest is natural to all plants. Amateurs often make mistakes in trying to force plants to grow all winter in the house after a vigorous growth in the open ground all summer. Such plants should be rested, kept cool at first and water withheld, but never to such an extent as to shrivel the wood. No rules can be given for watering, the most important detail of plant-growing. Water must be given as it is required, a knowledge to be gained from experience only. This may be once a day or once a week, twice a day or once in two days. The smaller the pot and the more vigorous the growth, the oftener it will be required. In hot weather and in dry rooms more water is needed than in cool rooms and on damp, cloudy days. It should always be given in sufficient quantity to pass through the hole in the bottom of the pot: here it can remain an hour or more, and part of it will soak up, back into the pot, but the surplus should be taken away with a sponge, unless the pot has legs or it is a plant like calla, English ivy or some ferns, which are uninjured by an over-supply. Water given to the foliage of House Plants in the form of spray is always helpful.

Insects, dust and sometimes fuguous pests are troublesome to House Plants, due largely to insufficient watering and lack of ventilation. The best remedy is frequent washings with warm water and a sponge for plants with large leaves. All plants can be easily cleaned at the kitchen sink or in the bath tub, or advantage can be taken of a mild day, and the work done in the yard with the hose. The forcible application of water will remove most insects, but if scale appears it must be taken off with a stiff brush. Whale-oil and tobacco soap are too rank for house use; fir-tree oil and Gishurst's compound are less obnoxious. They can be used when the plants are washed with sponge or brush. The florist's preventive against greenfly is impracticable: enough tobacco smoke to harm him would not be tolerated. The red spider can be driven off by spraying with an atomizer, if discovered in time. Some plants are not attacked by insects, but are injured by dust, e.g., the rubber-tree. Dusting when dry is better than nothing, but washing is best. If fungous diseases appear, the plants should be isolated, giving a chance to recover, or be thrown away.

Ventilation is an important factor in keeping House Plants in good condition. Open the windows on bright days: the fresh air is moist and therefore grateful, and will do no harm, even if the plants are near the glass, so long as the sun shines and discretion is exercised.

The night temperature need never exceed 50° F., and a drop of 5° or even 10° is not likely to do any harm. Precautions must be taken to exclude frost; the blinds must be shut and the curtains pulled down on cold nights. A layer of newspapers between the plants and the windows is a protection in extremely bad weather, or a large kerosene lamp can be allowed to burn all night near the plants.

A list of suitable foliage plants for the house; *Ficus elastica*, the rubber plant; *F. religiosa*, the peepul tree, and most of the other strong-growing evergreen species. *Livistona Sinensis*, *Corypha australis*, *Chameroops Fortunei* and *Rhapis Japonica*, all good fan-palms (the first is the best); *Pharnea reclinata*, *P. rupicola* and *P. Canariensis* are the best date-palms. *Neofortheria elegans*, *Howea Belmoreana*, *Kentia Forsteriana*, *Areca Baueri*, *A. rubra* and *Cocos Weddelliana* are all good palms, but require more care than the fan and date-palms. *Cycas revoluta*, the sago-palm, *Chenailigo recurvata*, *Aspidistra litoria*, *Pandanus utilis*, the screw pine, *F. Feitchii*, *Phormium tenax* (New Zealand flax), *Cyperus alternifolius*, *Peperus antiquorum*, Cordyline (Dracena), *Agave*

Americana (the century plant), *Pittosporum*, *Grevillea robusta*, English ivy, all do well in ordinary rooms. *Daphne odora*, *Laurestinus*, *Olea fragrans* and orange tree are both flowering and foliage plants, but require a cooler room than any of the preceding varieties.

Good flowering plants are *Asalea Indica* and *Canelilla Japonica*, both of which should be kept in a cool room when not in bloom. Calla and begonia both do well. *Chrysanthemum*, cyclamen, Chinese and English primroses, freesia, ixia, oxalis, fuchsia, mahernia, euphorbia, heliotrope, pelargonium and lily-of-the-valley can be brought into the rooms when in flower, and last a reasonable time in good condition. Hyacinths, tulips, narcissus and crocus, if potted in October, kept covered up out of doors until cold weather, stored in a cool cellar until the middle of January and then brought into warm rooms, will give flowers: a succession can be maintained by bringing them into warmth at intervals (see *Bulbs*). B. M. WATSON.

HOUSTONIA (Dr. Wm. Houston, of the early part of the eighteenth century). *Rubiacæ*. About 20 North American small herbs or subshrubs, with pretty white, blue or purple fls., some of the species occasionally cult. in wild gardens and rockeries. Parts of the fls. in 4's, the corolla gamopetalous and funnel-form or salverform; stamens and styles polymorphous; stigmas 2; capsule opening near the top; lvs. small, opposite. A moist, partly shaded place is to be recommended for most *Houstonias*, because their flowering season is thereby prolonged and the plants retain their foliage much longer than in a drier and sunny position. Collected plants are not difficult to establish. Prop. by division. The following perennial species are offered by American dealers.

A. *Stamens or stigmas conspicuously exerted.*

purpurea, Linn. Tufted, 3-12 in. high, bearing offsets, glabrous or pubescent; radical lvs. ovate or oblong, short-stalked; fls. in late spring or summer, the corolla funnel-form, light purple to white. Canada to Texas. — Var. **longifolia**, Gray, 3-6 in. high, thinner-lvd. and mostly glabrous; lvs. oblong-lanceolate to linear, $\frac{1}{2}$ -1½ in. long. — Var. **tenuifolia**, Gray, is slender and diffuse, 6-12 in. high, with almost biflorous branches and peduncles; stem-lvs. linear. This species and its forms grow well in dry, open places.

AA. *Stamens or stigmas little or not at all exerted.*

æerulea, Linn. BLUEETS. INNOCENCE. QUAKER LADY. Fig. 1105. Little tufted perennials, 3-6 in. high, the stems glabrous; radical lvs. spatulate to obovate, hairy, short-petioled, the stem-lvs. small; corolla salverform, the tube much exceeding the calyx lobes, varying from blue to white, with a yellow eye. B. M. 370. D. 233. — Charming little plant in grassy places in the northeastern states and southward in the Allegheny region. Excellent for rockwork and grassy borders. Early spring. In gardens, may be treated as annual or biennial.

serpyllifolia, Michx. Extensively creeping; radical lvs. orbicular to ovate-spatulate and abruptly petioled; corolla rather larger than that of *H. æerulea*, deep violet-blue (often white). Va., southward. Early spring. J. B. KELLER and L. H. B.

HOVENIA (after David Hoven, Senator of Amsterdam). *Rhamnaceæ*. Ornamental shrub or small tree, with deciduous alternate, long-petioled lvs. greenish inconspicuous fls. in axillary peduncled cymes, and with small globular frs. on reddish, fleshy and edible peduncles. It grows into a small, round-headed tree, with handsome somewhat shining foliage, and thrives best in sandy loam, but is not hardy north. Prop. by seeds, also by root-cuttings and cuttings of ripened wood under glass. One species in Himal., China and Japan. Without stipules; calyx lobes, petals and stamens 5, style 3-parted; fr. 3-celled and 3-seeded, indehiscent.



1104. An attractive corner of Pandanus, Begonia, and Wandering Jew.

dulcís, Thunb. (*H. inaequalis*, DC.). To 30 ft.: lvs. cordate-ovate or ovate, acuminate, serrate, almost glabrous, 4-6 in. long; cymes many-fl'd. S. Z. 73-74. B. M. 2360. A. G. 12:80.

ALFRED REHDER.

HOVEY, CHARLES MASON (Fig. 1106), horticultural journalist and nurseryman, was born in Cambridge, Mass., Oct. 26, 1810, and died there Sept. 2, 1887. He is best known as editor of the "Magazine of Horticulture," which had an uninterrupted existence from 1835 to 1868. It was founded as the "American Gardener's Magazine," by C. M. Hovey and his brother, Phineas Brown Hovey. In its third volume (1837) it changed its name, and continuously thereafter was known as the "Magazine of Horticulture," and was edited by Charles M. Hovey alone. It enjoyed the longest period of prosperity of any American horticultural journal. It is a record of the budding stage of New World horticulture. It was modelled after London's "Gardener's Magazine," although its spirit was essentially American. Essays, records of current events, reviews of books, descriptions of varieties, were prominent features. It had very few illustrations. Mr. Hovey was author of the "Fruits of America," issued in parts from 1852 to 1856, completing two volumes and making more than a beginning on a third. Its purpose was to give "richly colored figures and full descriptions of all the choicest varieties cultivated in the United States." The volumes contain more than 100 colored plates. Handsomely printed and bound, these volumes are a fine type of the amateur's art-book of varieties.

Mr. Hovey was also nurseryman and seed merchant. Until 1840, his grounds at Cambridge are said to have comprised only an acre, but at that time his premises were greatly enlarged. His epoch was a time of knowl-

edge of varieties. Straightway he began assiduously to collect varieties, until he exhibited pears, apples and camellias by the hundreds, and plums, grapes, chrysanthemums and many other things by the score. These things were shown before the Massachusetts Horticultural



1105. Blueberries—*Houstonia cerulea* ($\times \frac{1}{2}$).
(See *Houstonia*, p. 777.)

ural Society, which was the center of horticultural life of the country. He raised many seedlings. *Thuya Hoveyi* is still prized as a garden conifer. His greatest contribution to horticultural varieties was the Hovey strawberry, which first fruited in 1836, and which is generally regarded as the starting-point of American commercial strawberry-growing (see Fig. 1088). For many years this berry was the standard of market excellence. Mr. Hovey continued to grow it and cherish it until the end. The writer remembers with what enthusiasm he expatiated on its virtues but a very few years before his death. Mr. Hovey was long an active member, and for a time president, of the Massachusetts Horticultural Society. He was one of the active projectors of the building which gave the Society a new and more commodious home. The history of the society records that, when the project was in doubt, "the perseverance and determination of the president of the society and chairman of the building committee, Charles M. Hovey, triumphed over every hindrance, and carried the work on to success."

A portrait of Mr. Hovey will be found in the first volume of the "Fruits of America." Another occurs in "Gardeners' Monthly" for 1886 (frontispiece) and "American Garden," Nov., 1887; and a reduction of this appears in Fig. 1106.

L. H. B.

HOWEA (named for Lord Howe's Island, where these 2 species grow). Also written *Howea*, *Palmacea*. A genus of only 2 species, known to the trade as Kentias, and certainly ranking among the 6 most popular palms for house culture. They have the habit of *Kentia*, but their fls. differ widely. *Howea* belongs to a subtribe in which the fls. in each spadix are attached to the stem between the bases of opposite lvs., while *Kentia* belongs to another subtribe in which the fls. are attached at a lower point. Also *Howea* has symmetrical staminate fls. with round sepals, while in *Kentia* the staminate fls. are not symmetrical, the sepals being small and acute.

Howea's nearest cultivated ally is *Linosyris*, from which it is distinguished by the following characters: staminate fls. with very numerous stamens, the anthers erect and fastened at the base; pistillate fls. with no staminodes; ovule erect. *H. Belmoreana* is the more popular of the two species, and as a house plant may be readily told from *H. Forsteriana* by the more nearly erect position of its leaf segments; those of *H. Forsteriana* are more pendent. *Howeas* are erect, spineless palms, with stout rigid caudex; lvs. terminal, numerous, dense, equally pinnatisect; segments narrow, acuminate; spadices 2-3 ft. long, solitary or 3-5 from 1 spathe, thick, cylindrical, nodding or pendulous; peduncle long, compressed at the base; spathe solitary, as long as the spadix, cylindrical, 2-keeled toward the apex, longitudinally split; bracts bordering the channels; bractlets scaly; fls. sunk in the deep furrows of the spadix, the staminate nearly an inch long; fr. $\frac{1}{2}$ in. long, olive-shaped.

Belmoreana, Becc. (*Kentia Belmoreana*, F. Muell.). CURLEY PALM Fig. 1107. Described and distinguished above. B.M. 7018. R.H. 1897:256 and p. 257; G.C. III. 8:75. I.H. 21:491. A.G. 13:141; 16:345. Mn. 9:25. — Var. **variegata**, Hort. Adv. 1895 by Pitcher & Mandia.

Forsteriana, Becc. (*Kentia Forsteriana*, F. Muell.). FLAT OF THATCH LEAF PALM. G.C. III. 8:75 and 533. S.H. 2:53. A.G. 16:346. A.P. 4:365; 14:701.

JARED G. SMITH and W. M.

The two species of this genus are beyond a doubt the most popular and also the most satisfactory palms in the trade for decorative work in general, and in consequence of the great and growing demand, are grown by tens of thousands in the large nurseries. There does not seem to be any record of either of these species having borne fruit in cultivation in this country, and the trade, therefore, depends on imported seeds, which are gathered in immense quantities on Lord Howe's Island, usually shipped from thence to Sydney, N. S. W., and from the latter port to either London or New York. This long voyage is a severe test of the vitality of such seeds, and frequently results in faulty germination, the average of germination seldom exceeding 50 per cent, and is often much less. Two heavy shipments of *Howea* seeds are made each year, the first installment arriving in February or March, and the second in September or October. Many growers favor the autumn shipment of these seeds as giving the best results. The seeds should be sown at once on their arrival, the practice followed by large growers being that of broadcasting the seeds on a side-bench in a warm greenhouse on 2 to 3 inches of light soil, then covering them with 1 inch of the same compost, watering liberally and keeping up a bottom heat of about 80°. Under such treatment some of the seeds may germinate in two months, but others in the same lot may not start for eight or



1106. Charles M. Hovey.

nine months, from which it will be seen that the operation extends over a considerable period of time. The seedlings should be potted into small pots when the first leaf is expanded, kept moist and given a night temperature of 65°, the greenhouse in which they are

placed being moderately shaded. In three to four months the young plants should be ready for shifting into 3-inch pots if properly cared for; from this time forward they do not require a higher night temperature than 60°. The Howeas are not very particular in regard to soil, a rich, light loam answering very well for them, but a very stiff soil may be improved by the addition of one-fourth part of peat, and in all cases a reasonable proportion of fertilizers may be used to advantage. Scale insects are the most troublesome the grower has to contend with, and should be removed as rapidly as possible, else the foliage will be permanently disfigured. Of the two species referred to, *H. Belmoreana* is perhaps the greater favorite, being more compact in growth and extremely graceful in foliage, a plant of this species of a given age usually carrying a greater number of leaves than one of *H. Forsteriana* of the same age, and the leaves having more leaflets than those of the latter species. The seeds of the two species are very similar in appearance, though those of *H. Belmoreana* frequently average a larger size, and while those of the last named species require about three years to mature on the tree, the seeds of *H. Forsteriana* ripen in about twelve months. For house culture by amateurs, see *Palms*.

W. H. TAPLIN.

HÓYA (Thomas Hoy was once gardener to the Duke of Northumberland). *Asclepiadaceae*. More than 50 tropical Asian and Australian climbing or trailing evergreen shrubs, bearing thick, opposite lvs., and odd, often showy fls. in umbel-like clusters. Corolla rotate, 5-lobed, thick and more or less waxy in appearance; crown of 5 thick and depressed fleshy appendages; pollen-masses 10, short, fixed by their base in pairs to the 5 glands of the stigma; follicles acuminate, smooth; stems twining, or climbing by means of roots.

Howeas are summer-blooming plants, of comparatively easy culture. They need an intermediate or warm temperature. Let them rest or remain very slow in winter (50° in a dryish place), but start them into growth towards spring. In the summer they are sometimes plunged in the border, but better results are to be expected, as a rule, by keeping them in pots in the conservatory. In their growing and blooming season, give plenty of sun and air. They propagate by cuttings of the top growth in spring, and also by layering. The latter method is particularly adaptable to *H. carnosa* and other species which climb by means of roots. A. P. Meredith advises as follows: "For compost, use fibrous loam, lumpy (or coarse) in two parts, to one of leaf-mold, using charcoal pounded fine, brick dust, and lime rubble if procurable, instead of sand. They are often found doing well in loam and sand. When in growth use weak liquid manure."

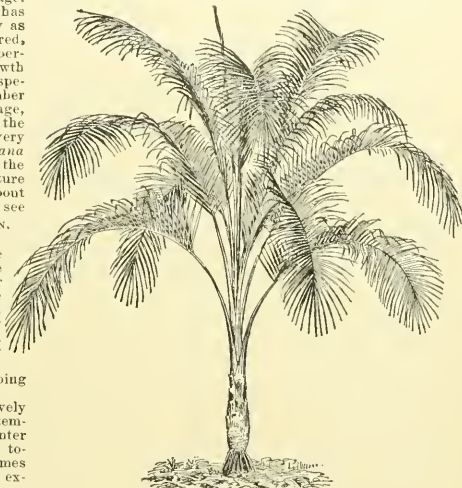
A. *Plant distinctly climbing.*

carnosa, R. Br. (*H. Molokai*, Teijsm.). **WAX PLANT**, twiner, and attaching itself to support by means of roots; ordinarily grown as a pot- or tub-plant, and reaching 5-8 ft. high, but growing twice and more this height when it has the opportunity; glabrous: lvs. succulent and shining, ovate-oblong, acute, short-stalked, entire: fls. white with pink center, fragrant, in axillary or interpetiolar umbels, the crown-segments very coriaceous, and spreading into a horizontal star. Trop. Asia and Austral. B.M. 788, as *Asclepias carnosa*. A.G. 18:34.—The common species, and often seen in window-gardens. After the bloom is over (in summer) keep the plant in a cool place in order that it may remain half-dormant. In late winter or spring, start it into growth. Do not cut off the spur which remains after the fls. pass, for this spur bears fls. again. The Wax Plant is easy to manage, and it improves with age. Often trained as a permanent cover for a glasshouse wall. In the South, it is nearly everblooming. There is a form (var. *variegata*) with handsome variegated lvs. L. 44.

globulosa, Hook. f. **Hairy**: lvs. elliptic-oblong or long-oblong, acuminate, rounded at the base, the midrib very stout, the petiole an inch or less long: fls. pale straw or cream color, the star-like crown-segments white, with pink at the base, borne in dense, globular umbels: follicles a foot or more long. Sikkim. F.M. 1880:406. G.C.

ll. 17:741.—A handsome species, requiring the general treatment given to *H. carnosa*.

imperialis, Lindl. **Lofty climber**, with puberulent stems and foliage: lvs. elliptic or linear-oblong, obtuse but with a short point: fls. immense (2-3 in. across), leathery, dull purple, somewhat pubescent near the white crown, the segments triangular-acute: umbels drooping on long peduncles: follicles 9 in. long. E. Indies.



1107. *Howea Belmoreana*.
One of the most popular of all palms.

B.M. 4397. F.S. 4:393-4.—A noble Hoya, requiring very rich soil and a rather high temperature. Although naturally a very tall climber, it can be made to flower in pots when 3 or 4 ft. high.

AA. *Plant trailing or nearly erect.*

bella, Hook. (*H. Faxtoni*, Hort.). **Slender, bushy**, 1-2 ft. high, pubescent: lvs. an inch long, ovate-acute, very short-stalked, somewhat recurved: fls. $\frac{3}{4}$ in. across, pure white, with very short and half-acute lobes, the crown-segments boat-shaped and violet: umbels few-fl. and short-stalked. India. B.M. 4402. F.S. 4:399. J.H. III. 35:5.—Handsome little species; scarcely climbing. L. H. B.

HUCKLEBERRY. See *Vaccinium*; also *Gaylussacia*.

HULSEA (Dr. G. W. Hulise, of La., who collected in Calif.). *Compositae*. This includes one of many woolly herbs offered by Californian collectors. It grows a few inches high and bears fls. with 20-30 yellow rays. Six species of herbs, perennial, biennial or annual, all Californian, glandular pubescent or woolly: lvs. pinnately lobed or toothed: fls. large, solitary, yellow or purple; involucrel bracts free, narrow; style branches obtuse; pappus of 4 hyaline, lacerated, chaffy scales. Monogr. by Gray in Bot. Calif. 1:365.

nana, Gray. Stems depressed, leafy at summit: lvs. pinnatifid or incised, petiole long-margined; peduncle 1-2 in. long; involucrel scales in 2 series: rays 20-30.

HUMATA (Latin, *of the earth*; referring to the creeping habit of the rhizomes). *Polygodiaceae*. A genus of ferns related to *Davallia* and sometimes included with

that genus, with small, thick, deltoid lvs., with the indusium tough, suborbicular or reniform, attached by a broad base and free at the apex and sides. Some 20 species are known, mostly from the East Indies. For culture, see *Davallia*.

Tyermanni, Moore (*Davallia Tyermanni*, Baker). BEAK'S FOOT FERN. Rootstock wide-creeping, densely covered with linear white scales; lvs. 4-6 in. long, deltoid, 3-4-pinnatifid; lower pinnule largest, the lowest pinnules cuneate-oblong or deltoid; sori at the base of the ultimate lobes less than a line broad. Central China. G.C. 1871:871.

L. M. UNDERWOOD.

HUMBLE PLANT. *Mimosa pudica*.

HUMEA (after Lady Hume). *Compositae*. This includes a half-hardy biennial Australian plant, growing 5 or 6 ft. high, cult. for the grass-like beauty of its large, loose, much-branched, drooping panicles. The genus has no near allies of garden value. It belongs to a group of 6 Australian genera which have no pappus. *Humea* has nothing of the typical beauty of the common garden composites, since it has no rays. Its fls. are exclusively tubular and hermaphrodite, 1-4 in a small head. Other important generic characters are the narrow involucre with scarious or petaloid, non-radiating bracts. Three, at any rate, of the 4 other species are shrubs, with fls. in dense corymbs and involucre bracts rigid or petal-like, while in *H. elegans* the bracts are thin and scarious.

Sow seed from July 1 to Sept. 1. Keep young plants during winter in very cool house in preference to frames, in northern latitudes, on account of losing so much foliage through damping. In spring, or when signs of growth are taking place, repot into larger pots, using a good, rich loam, which has had plenty of manure. They are gross feeders and growers, requiring plenty of water and good feeding. Good plants in 10-in. pots are very ornamental for conservatory or piazza work. The young plants need plenty of light and air, and should be kept nearly dry during the winter. In spring they should be started into growth gradually, and successively repotted until an 8-in. pot is needed. They should not be syringed except when growing rapidly in warm weather. In June the plants can be placed in a sub-tropical bed that is shielded from high winds, and staked. The foliage has a peculiar and agreeable scent.

elegans, Smith. Lower lvs. ovate-lanceolate or oblong, acuminate, stem clasping or decurrent, 6-10 in. long, wrinkled; fls. variously described as brownish red, pink, ruby-red and rose. *H. abida*, Hort., is presumably a whitish fld. form of this species, and should therefore be called var. *abida*. R.H. 1862, pp. 9-10 and 1895, p. 459.

A. P. MEREDITH and W. M.

HUMULUS (old Latin name), *Urticaceae*. HOP. Two or three twining vines, with long, opposite, palmately lobed or divided lvs. and dioecious fls. in axillary clusters. Staminate fls. with 5 erect stamens and 5-parted calyx, in little drooping, tassel-like racemes; pistillate fls. with an entire calyx or perianth closely investing the ovary, which bears 2 long stigmas, the fls. in pairs under large overlapping bracts, the whole making a cone-like catkin which, when becoming very large, is a "hop."

A. *Plant bearing hops*,—the pistillate catkin greatly enlarging in fruit.

Lupulus, Linn. COMMON HOP. Native to Europe and North America, and long cult. for the hops, which are used in the brewing of beer; it is a perennial herb; shoots often grow 25-30 ft. long in the season; rough-hairy; lvs. ovate or orbicular-ovate in general outline, deeply 3-lobed (sometimes 5-7-lobed), or the upper ones not lobed, margins strongly and uniformly dentate, petioles long; staminate fls. in panicles 2-6 in. long; hops (mature pistillate catkins) oblong or ovoid, loose and papery, straw-yellow, often 2 in. or more long, glandular and odoriferous.—Native along rivers and in thickets in the northern states, and southward in the Alleghanies and Rockies. Much cultivated for Hops, and extensively run wild from cultivated plants. The Hop

makes an excellent arbor or screen plant. Recent European literature mentions a var. *aureus*, with yellow foliage. The Hop grows readily from cuttings of the shoots, which spring from the crown; also by seeds, but the latter do not reproduce the partienar varieties or strains. As a field crop, the Hop is not a horticultural subject, and is not discussed here.

AA. *Plant not bearing hops*,—the pistillate catkin not greatly enlarging in fruit.

Japonicus, Sieb. & Zucc. Annual (or at least treated as such); foliage very like the last, but usually more deeply cut and not less than 5-lobed; catkins not glandular. Japan. G.C. II, 24:716.—Int. to general cult. in 1886, and now one of the most popular of all climbing herbs. It is a very quick grower, plants 10-20 ft. long coming from seed sown in early May. It is very easy of cultivation, and often seeds itself. Var. *variegatus*, Hort., is the most popular form. Gng. 1:241. A.F. 8:489. The foliage is variously streaked and splashed with white. Seeds of this variety will give a large percentage of variegated forms, and the plants usually show interesting variations. *H. Japonicus* is more popular as an ornamental vine than *H. Lupulus*, because it grows so quickly from seeds, and also because it has such interesting variegated forms; but *H. Lupulus* has a distinct charm in its great hanging Hops. L. II. B.

HUNNEMANNIA (John Hunneman, English friend of botany, d. 1839). *Papaveraceae*. This includes a fine yellow fld. herb closely allied to the California Poppy (*Eschscholzia*) and of the same garden value. It is treated as a hardy annual. The genus has but 1 species, a native of Mexico, and agrees with *Eschscholzia* in having much-cut foliage and spreading lobes of the stigma, but differs in having separate sepals instead of the peculiar hood-like calyx of *Eschscholzia*, which covers the young flower like a candle extinguisher. The only other genus in the Hunnemannia tribe is *Dendromecon*, a shrub with entire lvs., separate sepals and 2 erect, stigmatic lobes. For culture, see *Annals*.

lunariæfolia, Sweet. Lvs. ternately divided; peduncles solitary, terminal; fls. 2 in. or more across; petals 4; stamens numerous. B.M. 3061.—Sold as Giant Yellow Tulip Poppy.

W. M.

In our trial grounds during 1898, this was one of the showiest and most satisfactory plants in over 400 trials. The seed was sown early in May, and by the middle of July the plants were covered with their large yellow flowers, and they were never out of flower until hard frost. The plants have a bushy habit and beautiful, feathery, glaucous foliage. The flowers have wavy borders, and at times stand up like tulips.

W. F. DREER.

HUSK TOMATO. *Physalis*.

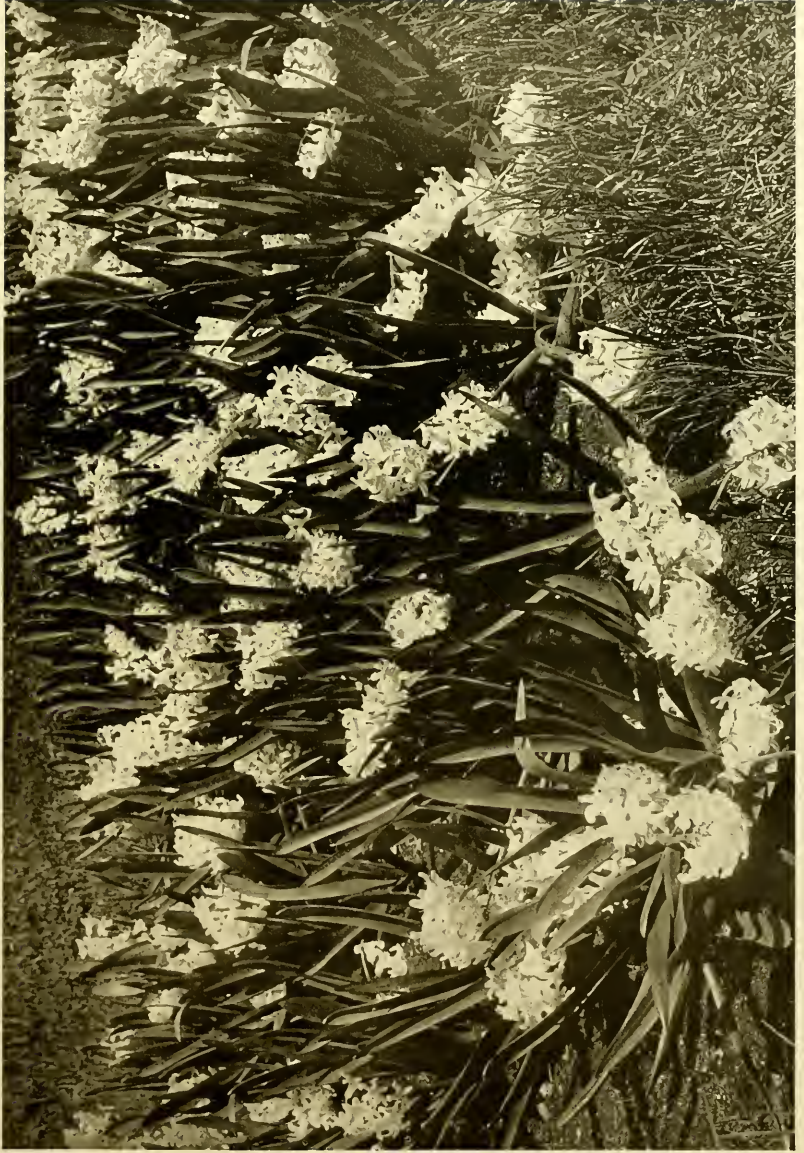
HYACINTH. See *Hyacinthus*, below.

HYACINTH BEAN. See *Dolichos*.

HYACINTH, GRAPE. See *Muscari*.

HYACINTH, WATER. See *Eichhornia*.

HYACINTHUS (name from Greek mythology). *Liliaceae*. Of *Hyacinthus* there are something over 30 species, the great part South African. Others inhabit the Mediterranean region, and from this source come the common garden *Hyacinthus*. From related genera, *Hyacinthus* is distinguished by the funnel-shaped or bell-shaped flower, the throat not constricted, the lobes shorter than or at most not much exceeding the tube, the 6 stamens attached to the tube or throat and the filaments thread-like or dilated at the base. Bulbous plants with only radical lvs., and fls. in a raceme or spike. The common *Hyacinthus* is *H. orientalis*, Linn. (Fig. 1108), with 4-8 thick green lvs. 8-12 in. long, $\frac{1}{2}$ - $1\frac{1}{2}$ in. wide; scape 8-18 in. tall, stout, bearing an elongated and dense raceme; perianth about 1 in. long, the tube usually ventricose or swollen, the lobes oblong-spatulate, 8-8 long as the tube, in many colors, often double in cult. B.M. 935. F.S. 23:2399-2400.—The *Hy-*



Hyacinth (*Hyacinthus orientalis*) in a lawn planting

cinth is extensively grown in Holland for export to this and other countries, and consequently is commonly known as the Dutch Hyacinth. The Roman Hyacinth (Figs. 1109-10) is var. *albubus*, Baker (*H. albubus*, Jordl. *H. Romānus*, Hort., not Linn.), is smaller and slenderer, lvs. narrower, very erect, fls. fewer, earlier, white or bluish, the tube cylindrical and scarcely ventricose, the segments narrower and usually proportionately shorter. Central France, and perhaps in the Mediterranean region. Much used for early bloom. The Hyacinth has been cultivated for some centuries, and it shared some of the early popularity of the tulip in the Netherlands. *H. orientalis* is wild in Syria, Asia Minor, Greece and Dalmatia. For a picture of a Hyacinth bulb, see Fig. 288, Vol. I.

Other species are sometimes seen in the gardens of the curious, particularly *H. amethystinus*, Linn., Spain, France (B.M. 2425. Gu. 47, p. 147), and *H. azureus*, Baker (B.M. 6822. G.C. III. 24:191, var. *gigantēus*), Mediterranean region. The former is slender and graceful, with light blue fls. in short racemes, standing nearly or quite $\frac{1}{2}$ ft. high: fls. small, nodding, bell-shaped, with short teeth-like segments. There is a white-fid. form. Good for rockeries. Hardy in the middle states. The latter species is by some considered to be a form of *H. ciliatus*, Cyrill. Looks like a Grape Hyacinth (or *Muscari*): 4-8 in. tall, with strongly canaliculate, glaucous lvs.: fls. blue, fragrant, in a dense spike 1 in. long, tubular, with small teeth. Distinguished from the genus *Muscari* by the perianth segments being flaring instead of incurved. Hardy in middle states. *H. fastigiatus*, Bertol. (*H. Ponzolzii*, Gay) is a Corsican species, which is hardy in southern New England. It is a delicate species, with very narrow lvs., scape 3-5 in. high and shorter than the lvs.: fls. few, in a loose cluster, $\frac{1}{2}$ - $\frac{3}{4}$ in. long and light blue (a white form), with oblong-lanceolate segments longer than the tube. B.M. 6663. *Hyacinthus Romanus*, of Linnaeus, is not the *H. Romanus* of horticulturists (which is the Roman Hyacinth, *H. orientalis*, var. *albubus*). Linnaeus' species is a blue-white, scilla-like plant (see B.M. 939). *H. candinicus* is now referred to Galtonia. For general cultural notes, see *Bulbs*.

L. H. B.

CULTURE OF THE HYACINTH.

—The perfection of the flower depends largely upon the strength of the roots, and as Hyacinths make all their root growth in the fall, the bulbs should be planted early,—say from the beginning to the middle of October. Any good garden soil suits, provided it is well drained. The ground should be carefully prepared by spading to a depth of 20 inches, so that the roots may pass straight through it to their full development of 12 or 16 inches. If the soil is naturally stiff it may be lightened by the addition of some sand, and if the beds have been occupied by other plants during the summer, some pure old cow manure, well worked in, is recommended. Horse manure should not be used.

The bulbs should be planted 6 inches deep (to the bottom of the bulb) and very uniformly, to insure simultaneous flowering. The ground having been prepared as above, perhaps the best way is to remove 3 or 4 inches of the soil, level the bed carefully with the rake and set the bulbs in it 5 or 6 inches apart each way, pressing them in firmly, and then covering them

evenly with the soil that had been taken out. When winter sets in, the beds should be covered with 2 inches of dry litter or coarse manure. As soon as the shoots appear above ground in the spring, 1 inch of this covering should be removed and the balance when danger from late frosts is past. Unnamed Hyacinths in separate colors can be bought cheaply, and when grown in masses of solid color or in design beds, they make a very rich display.

Forcing in Pots.—For this purpose large, solid bulbs should be selected, and potted singly in 5-inch pots in a rich compost of loam, leaf-mold and some sharp sand. A few pieces of broken pot being placed in the bottom for drainage, the pots should be filled lightly, and the bulbs pressed into the loose soil till only the apex remains above the surface. The pots are then buried to a depth of 8 or 10 inches in the open ground for seven or eight weeks, till the roots are developed fully and the sprout is about $1\frac{1}{2}$ in. above the bulb. When taken inside they should be kept in subdued light, at a temperature of about 50°, until the sprout has assumed a vigorous green color. Florists who force large numbers for winter decorations, set them under the greenhouse benches for about two weeks, and then force them in a temperature of 70°. A greater heat than this attenuates the growth and weakens the color. Syringing with water twice a day is recommended, and as the flower-spike develops weak manure water is helpful. The slower Hyacinths are forced the fluer and more lasting will be the bloom. Bulbs wanted in flower for Christmas should be potted in September, and for a succession later, at intervals as desired. Single Hyacinths are handsomer and force better than the double, although a few of the latter may be recommended. The following are among the best adapted for forcing and most largely grown by American florists:

SINGLE BLUE:

Baron van Thuyll. China-blue.
Charles Dickens. Dark porcelain.
Czar Peter. Light blue.
King of the Bines. Dark blue.
Leonidas. Clear blue.
Queen of the Bines. Light blue.
Regulus. Porcelain-blue.

DOUBLE BLUE:

Charles Dickens. Dark blue.
Van Speyk. Lilac-blue.

SINGLE WHITE:

Alba superbissima. Pure white.
Baroness van Thuyll. Pure white.
Grandeur à Merveille. Blush-white.
La Grandesse. Pure white.
L'Innocence. Pure white.
Madame Vanderhoop. Pure white.
Mont Blanc. Pure white.
Paix de l'Europe. Pure white.

DOUBLE WHITE:

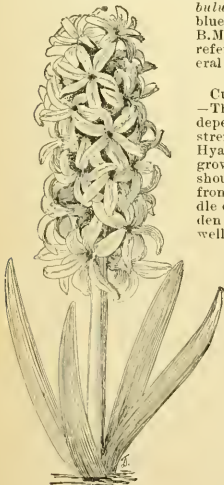
La Tour d'Auvergne. Pure white.
Prince of Waterloo. Pure white.

SINGLE RED:

Charles Dickens. Pink.
Gertrude. Bright pink.
Gigantea. Bright rose.
Moreno. Waxy pink.
Norma. Delicate waxy pink.
Robert Steiger. Crimson.
Sultan Favorite. Salmon.



1109. Roman Hyacinth.



1108. Common or Dutch Hyacinth.

sure simultaneous flowering. The ground having been prepared as above, perhaps the best way is to remove 3 or 4 inches of the soil, level the bed carefully with the rake and set the bulbs in it 5 or 6 inches apart each way, pressing them in firmly, and then covering them



1110. Roman Hyacinth.

- DOUBLE RED:**
 Bonquet Tendre. Crimson.
 Noble par Merite. Deep rose.
- SINGLE LILAC:**
 Haydu. Lilac-mauve.
- SINGLE YELLOW:**
 Ida. Pure yellow.
 King of the Waves. Deep yellow.
- DOUBLE YELLOW:**
 Goethe. Bright yellow.

Miniature Hyacinths, or "Dutch Romans," are small-sized bulbs of the ordinary Dutch Hyacinths. They are excellent for growing in groups in bowls, pans or flats, planted close together and treated just like the large Hyacinths when grown in pots.

Culture in Glasses.—Some of the single Hyacinths may be grown very satisfactorily in water. Special glasses for the purpose can be bought from the seedsmen. They should be filled with pure water and the bulb so placed that its base barely touches the water. They are stored in a dark, cold closet or cellar till the roots are developed, and then brought in to the light. An airy, sunny situation and a temperature of about 60° regularly maintained will insure the best results. The glasses should be kept filled by adding water occasionally as required. The following varieties are especially suited for glasses:

Charles Dickens. Pink.	Charles Dickens. Blue.
Lord Macaulay. Deep rose.	Baron van Thuyll. Deep blue.
Mina. Pure white.	Mr. Plimsoil. Fine bluish.
L'Innocence. Pure white.	Obelisque. Yellow.
Von Schiller. Dark red.	Moreno. Deep rose.
Grand Lilas. Light blue.	Sir. Wm. Mansfield. Mauve.

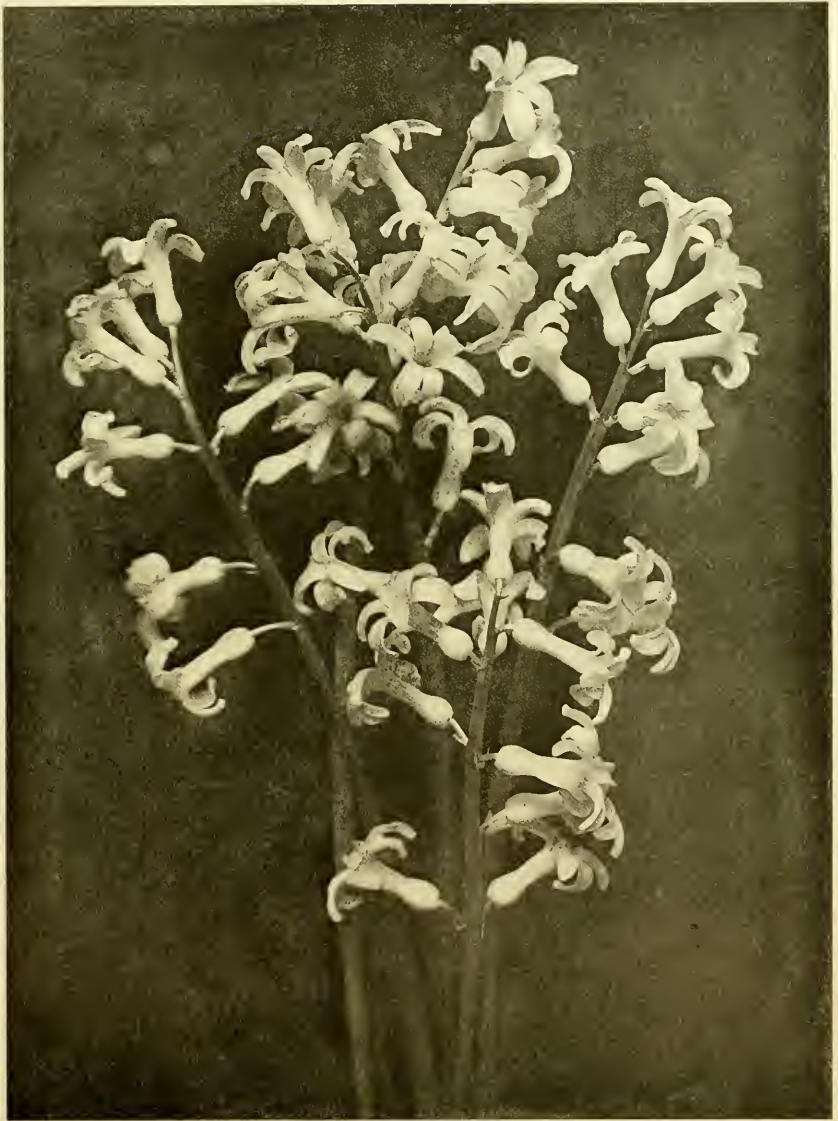
Roman Hyacinths.—Instead of one large truss from each bulb, the Roman Hyacinth produces three or four smaller but more graceful flower-spikes. The bulbs arrive in America in August, and by successive pottings they may be had in flower from November till May. They require the same forcing treatment as the larger Hyacinths, but three or four bulbs may be planted in a pot. The florists use wooden flats instead of pots, setting the bulbs close together, 40 or 50 in a flat. By reason of its beauty and exquisite fragrance, its earliness and easy culture, the white Roman Hyacinth is the most popular of our winter-blooming plants. Several millions of these bulbs are grown annually by the florists in our large cities for winter cut-flowers.

The Propagation of Hyacinths.—With the exception of the Roman Hyacinths (which come from the south of France), the world's supply of Hyacinth bulbs is produced in Holland. The soil and climate of that country seem to be peculiarly suitable for bulb-growing, which has been one of the leading industries there for 200 years. The bulbs intended for next year's market are planted in October in carefully prepared, richly manured land, and protected over winter by a thick covering of reed or litter. The flowers are cut when in full bloom in the spring. By July the bulbs are fully ripened, and

are taken out of the ground by hand, dried, cleaned and assorted into three grades of quality, according to size. Early in August they are ready for shipping. Overgrown or unshapely bulbs are reserved for propagating. As soon as these are taken out of the ground, three deep cross cuts are made with a sharp knife in the bottom of each bulb. They are then set out, bottom upwards, and covered with loose soil for two or three weeks, during which time the cuts open out and the wounds are healed. They are then taken up and kept spread out on tables in storehouses till October, when they are planted out. When lifted next June nothing of the parent bulb remains but dry skins, on the edges of which from 20 to 30 offsets are fastened. These bulbs are picked off by hand and planted out in the fall, just like large bulbs. This process of planting in fall and taking up in summer for a two months' rest is repeated for four or five years, till the bulbs have attained to marketable size. Another method of propagating is to hollow out the bottom of the bulb smoothly to a point in the center. More offsets are obtained in this way, but they are smaller and take a year or two longer to reach maturity.

New varieties are obtained from seed, but such a degree of perfection in form and color has already been obtained that it is seldom a seedling is produced that proves superior to existing varieties of the same color. Some new varieties are obtained by encouraging any tendency to change of color or form which may be shown by the standard sorts. In this way the single blue Charles Dickens has been changed to single red and to double blue, and again, very recently, to double red, till we have four varieties named Charles Dickens. Last year's catalogue of a reliable Dutch grower contains 340 named Hyacinths. J. M. THORBURN & Co.

HYBRIDS are the products of crossing between species. Of late, the word Hybrid has been used by some writers to comprise all crosses, whether between species or varieties. The justification of this usage is the fact that there are no hard and fast lines between varieties and species, and therefore that hybridism in the old sense is incapable of exact delimitation. The opponents to this usage, however, contend that so long as it is customary to speak of species and varieties as different classificatory categories, it is equally allowable and useful to speak of Hybrids as between species and of cross-breeds as between varieties; moreover, historical custom favors this usage. Common-language terms rarely if ever express absolute or ideal truth: they grow up by custom. Whenever new ideas and discoveries render them inexact, it may be quite as well to invent new terms as to give new and technical meanings to old terms, which are thoroughly established in literature. The word Hybrid has always been a specific term, and it were a pity now to make it a generic one, particularly since there is a well established generic term. The generic word, both substantive and verb, is *cross*. Specific kinds of crosses are Hybrids, between species; cross-breeds, between plants of the same species; half-hybrid, between a species and a variety of another species; bigener, between plants of different



Roman Hyacinth (*Hyacinthus orientalis* var. *albulus*)

genera. There are technical terms to designate the various kinds and degrees of crossing.

It was formerly held that inability to make fertile Hybrids is proof that the forms are distinct species; and contrariwise, that plants which make fertile crosses are of one species. Hybridization has also been made a test of genera. These notions are now given up, for crossing and classification belong to two unlike categories of facts. Species and genera are not entities in themselves, but are mere artificial groups made by men for their convenience when writing and speaking of living things. Crossing is a biological phenomenon.

Hybrids are unusual facts in nature; that is, they are rare compared with the whole number of plants. On the other hand, cross-breeds are usual. Most flowers are so constructed as to favor cross-pollination. Cross-breeding is one of the prime means of inducing slight variations and of invigorating a type. Upon the variations which arise from crossing and other means, natural selection operates in the production of new forms. But it is significant that these new forms usually come about slowly and gradually. It is the desire of the cultivator to produce new forms quickly and of pronounced distinctness. He therefore employs crossing of between unlike types, or species, hoping thereby to secure wider departures. In nature, the cross-breed is the beginning of a process of breeding; it starts off the variation. Man is often tempted to look upon the Hybrid as the end. If the products of a given cross are not to his liking, he throws them away and tries again. The most expert plant-breeders, however, now hybridize to get a "break," and thenceforth depend chiefly on selection to realize their clear-cut ideals, particularly in seed-propagated plants.

To man Hybrids are of no value unless they can be propagated. By seeds they usually vary immensely; it is difficult to "fix" them so that they will come true. By cuttings or layers or division, however, the character of the parent may be propagated with practical certainty: the original plant is divided, and the parts are put on the market. Nearly all commercial Hybrids are of plants which are thus propagated by asexual parts: Kieffer pear, Hybrid grapes, Wilson blackberry, Wild Goose plum, cannas, roses, begonias, anthuriums, fuchsias, pelargoniums, rhododendrons. Since the Hybrid is variable when propagated by seeds, continued selection, or plant-breeding, must be employed to fix and establish a desirable type.

It is thus seen that hybridization rarely gives rise to dominant horticultural seed-races, but rather to an individual plant which may be disseminated by some divisional means of propagation. The seeds of Hybrids—as of the modern cannas—may give rise to good varieties, and they may not; but these new varieties are, in their turn, usually propagated by means of asexual parts if they are to be kept true.

Practically there is no certainty in hybridization. Rarely can a man picture to himself an ideal variety, and then by means of hybridization produce it. He hybridizes plants which possess some of the characteristics of the desired or ideal variety, and then takes his chances. True plant-breeding sets an ideal, and then reaches it by working along certain definite lines. It seeks first to secure a variation in the desired direction; this may be secured by means of crossing, change of soil, modification of food supply, and other changed conditions. It seeks, then, to preserve or augment the form by means of definite selection.

We are not yet able to formulate positive laws of hybridization. Every Hybrid is a law unto itself. By the study of many examples of hybridization, one is able to construct an average of probabilities as to what will or what will not occur in a given case; but the given case may contradict all the probabilities without apparent cause. Hybridization is an empirical subject.

One can not tell what species will or will not hybridize except by trying. Hundreds of species have been tried, and for them the knowledge is more or less exact. Plants hybridize most freely which are the subjects of much care and coddling: the orchids are the best examples. In these groups, Hybrids are chiefly fanciers' plants, valuable often only because they are Hybrids or are rare and curious. One cannot tell beforehand

whether the products of any hybridization will be exact intermediates, or in what way or degree they will carry over or blend the parental characters. As a rule, the more closely akin the species, the more perfect will be the blending or amalgamation of the two. See *Pollination*.

The literature of hybridization is extensive but scattered. The standard text is Focke's "Die Pflanzen-Mischlinge," 1881. The possibilities of hybridization as a factor in plant-breeding are presented in many aspects in the "Hybrid Conference Report" of the Royal Horticultural Society, London, 1900. There are special books devoted to orchid Hybrids (see *Orchids*). In North America there has been little fundamental writing on the subject. See an excellent paper by Swingle and Webber, Year-Book of the U. S. Dept. Agric, 1897; papers in American Gardening, 1899, pp. 397, 413, 431; Bailey's "Plant-Breeding," 1895.

L. H. B.

HYDRANGEA (Greek, *hydor*, water, and *aggeion*, vessel; alluding to the cup-shaped fruit). *Saxifragaceae*. Very ornamental deciduous shrubs, with opposite, simple, rarely lobed, petioled lvs. and small, white, bluish or pinkish fls. in corymbs or panicles, bearing usually marginal sterile fls., with enlarged showy sepals, or in some varieties all the fls. are sterile and enlarged: fr. a small, insignificant capsule. *H. paniculata* is the hardiest of all, but *H. arborescens*, *H. radiata* and *H. Bretschneideri* are also almost hardy North, while *H. quercifolia* and *petiolaris* require at least a very sheltered position and *H. hortensis*, *velutina*, *incolocata* and *virens* are still more tender, and can hardly be grown outdoors North except when well protected and sheltered. They grow best in a rich, porous and somewhat moist soil and thrive well in partly shaded positions, but flower more freely in full sun if they only have sufficient moisture. All Hydrangeas are well adapted for borders of shrubberies, and *H. paniculata* and *hortensis*, especially the varieties with sterile fls., are very showy as single specimens on the lawn. In warmer climates they are sometimes used for ornamental hedges (see G.C. III. 24:337 and 456); but it is not hardy in the North. These and also most of the other species should be pruned in fall or early spring, and the branches of the previous year cut back to 1-3 pairs of buds, according to the growth of the branches and the desired size of the panicles; if only slightly pruned the panicles will be many but small. Sometimes they are cut back every year almost to the ground and produce then enormous panicles, which, however, usually need artificial support and lack the gracefulness of less severely pruned plants. *H. paniculata*, var. *grandiflora* can be grown in a small standard tree; for this purpose vigorous young plants should be selected and planted in rich soil, and cut down to the base. The strongest shoot of each plant will attain by fall the height of 4-6 ft., if freely manured and watered during the summer; in autumn, all the weaker branches are cut off, and in colder climates the plants should be lifted and stored in a frost-proof pit or cellar, since the wood is not usually sufficiently ripened to withstand severe frost. In the following year the top of the stem is allowed to branch. The weaker basal shoots may be pegged down to make new plants. Strong-growing varieties of *H. hortensis* may be treated in the same way if standard plants are desired.

H. hortensis, which cannot withstand much more than 10° of frost, is in the North much grown as a pot-plant, especially the more showy varieties with large heads of sterile fls., and is extensively used for outdoor decoration during the summer. Late in fall, when the lvs. have fallen after frost, the plants are moved to a frost-proof cellar and kept rather dry until spring, when they are re-potted in new soil and the growth of last year cut back to 1 or 2 pairs of buds. As a suitable soil may be recommended a mixture of loam, leaf-mold and sand, with ground bone, dried cow manure or some other kind of manure added. During the summer a liberal supply of water should be given, also occasionally applications of liquid manure, until the fls. have developed. They may also be planted in the open ground during the summer, lifted late in fall with a large ball of earth, stored over winter in a coldframe or pit and planted out

again in spring; this will not injure in any way the profusion of fls. In certain kinds of soil the pink Hortensias show a tendency to turn blue, and perhaps this can be caused by adding iron filings or alum to the soil. *H. hortensis* is also a valuable plant for forcing, and is much grown for Easter, especially the var. *Otaksa*, on account of its dwarfer habit. Handsome pot-plants can be grown in one year from cuttings. In February or March cuttings are inserted in the propagating house with slight bottom heat, and planted in small pots as soon as they are rooted. During the summer they may be easily grown in pots and plunged outdoors in coal ashes or in any kind of porous soil, transplanted several times and freely watered and occasionally manured; or they may be planted out in rich soil, exposed to the full sun, where water should be liberally given and now and then an application of liquid manure. Last of September they should be repotted in 8-inch pots, kept shady some days until established, and afterwards exposed to the sun.



1111. Summer cutting of *Hydrangea paniculata*.

After the first frosts they may be brought into a cool greenhouse, if intended to have them in flower for Easter, they should be transferred not later than the fore part of January into a warmer house, with a temperature gradually rising from 50° to 60°; the plants should be freely watered, and about once a week an application of liquid manure given until the plants are developed. The fls. should be almost fully developed some time before they are desired, that they may be hardened off in a cooler house, since overforced plants are likely to collapse if exposed to sudden changes of temperature. After flowering, the plants are pruned and repeated or planted out and treated as above described for cuttings, or they may be thrown away and another set of plants raised from cuttings.

H. petiolaris is a handsome climbing plant for covering walls and trunks of trees, and grows well in the shade, but fls. freely only in the full sun.

The Hydrangeas are readily prop. by cuttings of half-ripened or nearly ripe wood under glass in summer (Fig. 1111); also by hardwood cuttings, layers, suckers or division of older plants. *H. quercifolia* is best propagated by suckers or by layers of growing wood put down in summer. Rarely increased by seeds, which are very small, and should be sown in fall in pans or boxes and only slightly covered with soil.

About 25 species in N. and S. America, Himal. and E. Asia. Lvs. without stipules; fls. perfect in terminal panicles or corymbs, often with sterile marginal fls.; calyx lobes and petals 4-5; stamens usually 10; styles 2-5, short; capsule 2-5-celled, dehiscent at the base of the styles, with many minute seeds.

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A. Erect or spreading shrubs; stamens 10; petals expanding.

B. Inflorescence pyramidal.

1. *paniculata*, Sieb. Shrub or small tree, to 30 ft., with dense globose head: lvs. elliptic or ovate, acuminate, serrate, sparingly pubescent above, more densely on the veins beneath, 2-5 in.; panicle 6-12 in. long; fls. whitish, the sterile ones changing later to purplish; styles 3; capsule with the calyx about at the middle. Aug.-Sept. Japan. S.Z. 61.—The following varieties are cult.: Var. *horibunda*, Regel. Panicles large, with more and larger sterile fls. Gt. 16:530. Var. *grandiflora*, Sieb. (var. *hortensis*, Maxim.). Fig. 1112. Almost all fls. sterile; panicles very large and showy. F.S. 16:1665-66. Ga. 10:37 and 54, p. 376. R.H. 1873:50. Mn. 8:119. A.G. 18:313. Gng. 3:357 and 5:3. F.E. 8:214. S.H. 1:174. Var. *præcox*, Rehd. Almost like the type, but flowering about 6 weeks earlier, in the middle of July. G.F. 10:363. The late flowering typical form is sometimes called var. *tardiva*, Hort. *H. paniculata*, var. *grandiflora* is the common Hydrangea of lawns. It is seen to best effect when planted close in front of heavy shrubbery. Cut back rather heavily in early spring.

2. *quercifolia*, Bartr. Shrub, with spreading branches to 6 ft.; young branches densely ferruginously tomentose; lvs. long-petioled, roundish or broadly ovate, pinnately lobed with serrate lobes, glabrous above at length, whitish tomentose beneath, 4-8 in. long; panicle 4-7 in. long; fls. pinkish white, the sterile ones turning purple. June. Ky. to Alab. and Fla. B.M. 975. Gng. 2:305. Hardy at Philadelphia.

BB. Inflorescence corymbose, flat or globular.

c. Cyme without involucre at the base.

D. Styles usually 2; capsule with the calyx at the apex.

3. *arborescens*, Linn. (*H. verticillata*, Hort.). Erect shrub, 4-10 ft.; lvs. long-petioled, ovate, acute or acuminate, rounded or cordate at the base, serrate, green and glabrous on both sides or somewhat densely or glaucous beneath, 3-6 in. long; cymes 2-5 in. broad, with none or few sterile fls. June, July. N. J. to Iowa, south to Fla. and Mo. B.M. 13:437.—Var. *cordata*, Torr. & Gr., has the lvs. broadly ovate and cordate.—Var. *sterilis*, Torr. & Gr. Almost all fls. sterile, known also as Hills of Snow.

4. *radiata*, Walt. (*H. nivea*, Michx.). Similar to the former, but lvs. densely whitish tomentose beneath and cymes always with sterile fls. June, July. N. C. to Mo., south to Ga. B.B. 2:185.—Var. *canescens*, Dipp. (*H. canescens*, Hort. *H. cinerea*, Small). Lvs. grayish tomentose beneath, sometimes pubescent above. Tenn. to Ga.—Hardly about Philadelphia.

DD. Styles usually 3; capsule with the calyx near the middle.

5. *vestita*, Wall. (*H. heteromalla*, Don. *H. pubescens*, Deene.). Shrub, to 10 ft.; petiole deeply grooved and margined, red; lvs. ovate, acuminate, densely setosely dentate, almost glabrous above, densely whitish-tomentose beneath, 4-8 in. long; cyme 5-8 in. broad, with bracts; sepals of sterile fls. elliptic or obovate, acute or mucronulate; capsule with the calyx above the middle. June, July. Himal. F.S. 4:378-79. G.C. II. 22:617.

6. *Bretschneideri*, Dipp. (*H. vestita*, var. *pubescens*, Maxim. *H. Pekinensis*, Hort.). Shrub, to 8 ft.; petioles not margined; lvs. ovate or elliptic-ovate to oblong-ovate, acute or acuminate, serrate with short callous teeth, more or less pubescent beneath, 3-5 in. long; cymes similar to the former but smaller and denser, sepals roundish, obtuse; capsule with the calyx near the middle. July. N. China, Szechuen. G.F. 3:17 and 6:396.—Var. *glabrescens*, Rehd. (*H. serrata*, Koehne, not DC.). Lvs. smaller, elliptic, more coarsely serrate and only sparingly pubescent.

7. *hortensis*, Smith (*H. hortensio*, DC. *H. opuloides*, C. Koch. *H. Japonica*, Sieb.). Shrub, to 8 ft., almost glabrous; lvs. ovate or ovate-elliptic, acuminate or acute, coarsely serrate, 5-8 in. long; fls. in large cymes without bracts, white, bluish or pink, few or all of

them sterile. — The greenhouse Hydrangea. June, July, but blooming in winter under glass. A large number of varieties have been introduced from Japan and China, where this species has been extensively cultivated for many centuries, and where it is native. The following are some of the best known. They may be divided into 3 groups:

(1) *Japonica* group: *cymes flat, with sterile and fertile flowers.*

Var. *acuminata*, A. Gray (*H. acuminata*, Sieb. & Zucc. *H. Bœrgeri*, Sieb. & Zucc.). Lvs. ovate-lanceolate, acuminate, sparingly appressed-pubescent: sterile fls. with elliptic entire sepals, usually blue. S.Z. 56-57. Var. *Azisai*, Maxim. (*H. Azisai*, Sieb.). Lvs. elliptic-ovate, glabrous: sterile fls. with obovate sepals, long-pedicelled, overtopping the fertile ones. S.Z. 51. Var. *Belzoni*, Maxim. (*H. Belzoni*, Sieb. & Zucc. *H. Japonica*, var. *coriacea*, Hook. *H. Japonica*, var. *coriacea*, Regel.). Of dwarfier and stouter habit: lvs. ovate or obovate, short-acuminate, glabrous, somewhat thick; sterile fls. whitish, pinkish or bluish, with rhombic, usually entire sepals. S.Z. 45, B.M. 4233. Here belongs also var. *Impératrice Eugénie* with pink fls. R.H. 1868:471. Var. *Japonica*, Maxim. (*H. Japonica*, Sieb.). Lvs. ovate to elliptic, acuminate, glabrous: sepals broadly ovate, toothed, pink. S.Z. 53. B.R. 30:61. R.H. 1874:90 (as *H. acuminata*). Var. *macrosepala*, Rgl. Differs from the former only by its larger sepals. Gt. 15:520. Var. *Mariesi*, Hort., seems also not much different, but has somewhat broader lvs., and the pink sterile fls. are very large, 3-3½ in. across. Gn. 54:1196. G.C. III. 23, suppl. 5-28. Var. *rosalba*, Van Houtte (*H. Lindleyi*, Hort.). Lvs. ovate or elliptic-ovate, acuminate, sparingly hairy: sepals dentate, ovate or broadly ovate, white and pink or white changing to pink. S.S. 16:1649-50. R.H. 1866:430. Gn. 46:990. Var. *serrata*, Rehd. (*H. serrata*, DC. *H. Thunbergi*, Sieb. & Zucc. *H. cymosa*, Hort.). Lvs. elliptic or ovate, narrowed at both ends, serrate, sparingly appressed-hairy, 1½-3 in. long; cymes small, 3-4 in. broad: fls. pinkish or bluish; sepals roundish, obtuse or emarginate. S.Z. 58. G.C. 1870:1699.

(2) *Hortensia* group: *cymes globose, with almost all fls. sterile.*

Var. *nigra*, Arb. Kew. (*H. Mandshurica*, Koehne. *H. opuloides*, var. *cyanoelata*, Dipp. *H. nigra*, Carr. *H. ramulosa coccinea* and *ram. picta*, Hort.). Branches dark purple or violet, often almost black: lvs. ovate-elliptic, acute: cymes large, with purple peduncles: sepals pink or bluish, obovate. A.F. 5:360. Var. *Hortensia*, Maxim. Lvs. large, elliptic, glabrous: sepals broadly ovate, entire, usually pink. This is the form which first came into cultivation outside of Japan and China, and is said to have been introduced from China to England in 1790, by Joseph Banks. B.M. 438. G.C. III. 24:45. Gn. 45, p. 12; 50, pp. 123, 256, 367; 52:281. Var. *Otaksa*, Maxim. (*H. Otaksa*, Sieb. & Zucc.). Fig. 1113. Dwarfier, but of vigorous growth: lvs. obovate, short-

acuminate, rather thick, glabrous: sepals obovate, entire, pink or blue. S.Z. 52. F.S. 17:1732-33. Gn. 50:1079. R.H. 1868:450. Mn. 5, p. 105. A.G. 11:415. A.F. 10:1015. F.E. 9:52 and 401. Gng. 5:161. Var. *plena*, Rgl. Similar



1113. *Hydrangea hortensis*, var. *Otaksa*.

to var. *Hortensia*, but sepals toothed. Var. *Thomas Hogg*, Hort. Lvs. elliptic or ovate, rather small: heads large, pure white. This variety is somewhat dwarfier than the common *Hydrangea* and is, besides *Otaksa*, the best as a pot-plant. It is also to be recommended for outdoor cultivation, as it is one of the hardiest.

(3) *Stellata* group: *fls. with many narrow sepals.*

Var. *stellata*, Maxim. (*H. stellata*, Sieb. & Zucc.). Lvs. ovate or ovate-oblong, sparingly pubescent: cymes with larger sterile and smaller fertile fls., both with many narrow-elliptic sepals. S.Z. 59. Var. *fimbriata*, Dipp. Cymes rather dense, with almost all the fls. sterile: sepals fimbriate, white, pink toward the base. G.C. III. 23, suppl. 5:28. Var. *prolifera*, Hort. (*H. stellata*, var. *prolifera*, Rgl.). The fertile fls. bearing 1 or few smaller ones in the center. Var. *rubro-plena*, Dipp. Cymes rather dense, with almost all fls. sterile, changing from pink or pale lilac to dark red.

There are also some varieties with variegated lvs., as var. *variegata*, Regel, a form of var. *Belzoni*, with the lvs. edged white (F.S. 7:696); var. *tricolor*, Hort., with the lvs. variegated with white and edged yellow; var. *roseo-marginata*, Hort., with the lvs. spotted white and edged pink.

cc. *Cyme enclosed before expanding by 6-8 large, deciduous bracts.*

8. *involuta*, Sieb. Low shrub, to 5 ft.: lvs. oblong, acuminate, densely and sharply serrate, appressed, pubescent on both sides, rough to the touch, 4-8 in. long; bracts at the base of the cyme large, orbicular; smaller bracts none: fertile fls. blue or pinkish, sterile ones whitish: capsule with the calyx at the apex; styles usually 2. Aug. Jap. S.Z. 63. J.H. III. 32:705. *H. Sapphire*, introduced 1890 by Lovett, seems to belong here. Var. *hortensis*, Maxim. Fls. double, usually pink and often proliferous. S.Z. 64. F.S. 3:187.

AA. *Climbing by aerial rootlets: stamens 15; petals cap-like, cohering, falling off as a whole.*

9. *petiolaris*, Sieb. & Zucc. (*H. scandens*, Maxim., not DC. *H. volubilis*, Hort.). Clim-



1112. *Hydrangea paniculata*, var. *grandiflora*.

ing to 80 ft. in Japan: lvs. long-petioled, broadly ovate-cordate to elliptic, acute or acuminate, crenately serrate, almost glabrous, 2-4 in. long; cymes rather loose, -8 to 10 in. across, with rather few sterile fls.; styles usually 2; capsule with the calyx at the apex. July. Japan, Saccharin. B. M. 6788. S. Z. 54, 59, 2, 92. M. D. G. 1897:236-37. S. H. 2:191-93.—A very variable species, figured and described by Sieb. & Zucc. under three different names. In gardens it is often met with under the name of *Schizophragma hydrangeoides*, another Japanese climber of similar habit, which, however, is easily distinguished by its sinuately dentate lvs. and its sterile fls. having only one large cordate sepal.

H. altissima, Wall. Allied to *H. petiolaris*, but less high climbing, often only a spreading shrub, to 15 ft.: lvs. ovate-lanceolate; stamens 10. Himal.—*H. aspera*, Don. Shrub, to 20 ft., similar to *H. vestita*: lvs. oblong-lanceolate, densely pubescent beneath; sepals usually toothed: fr. with the calyx at the apex. Himal. Tender.—*H. hirta*, Sieb. & Zucc. Shrub, to 4 ft.: lvs. broad-elliptic, coarsely incised-serrate; cymes without sterile fls. Jap. S. Z. 62. Not very decorative.—*H. robusta*, Hook. f. & Thoms. (H. cyanota, Nutt.). Spreading shrub, to 15 ft., with large ovate lvs., pubescent on both sides; sterile fls. with toothed sepals; capsule with the calyx at the apex. Himal. B. M. 5038. Handsome in bloom, but tender.—*H. arvensis*, Sieb. Slender shrub, to 6 ft.: lvs. elliptic or lanceolate, coarsely serrate, 1-2½ in.; cymes rather few-fl'd., sterile fls. with 3 or 4 large, unequal sepals, white. Jap. S. Z. 60. A desirable shrub, with graceful, and delicate fls. and with the lvs. often handsomely variegated along the veins, but tender.

ALFRED REIDER.

HYDRASTIS (name of doubtful meaning). *Ranunculaceae*. Two species of hardy herbaceous perennials, one from Japan and one from N. Amer. Stem erect, pubescent; lvs. palmately 5-7-lobed, serrate; fls. greenish white, small, solitary; sepals 3, petal-like, falling early; petals none; stamens many; carpels 2-ovuled, in fruit becoming aggregated berries. Requires moist situations in good, rich loam and leaf-mold. Prop. by division of the root, and by seed.

Canadensis, Linn. ORANGE ROOT. GOLDEN-SEAL. Stem 4-10 in. long, from a thick, yellow rootstock; basal lvs. 5-8 in. broad; stem lvs. 2, lower one petioled, upper sessile and near the small flower; fr. in ovoid head, the 8-12 fleshy carpels tipped with a short, curved beak. April. Eastern U. S., in rich woods. B. M. 3019 (in flower); 3232 (in fruit).—Used in gardens for the showy leaves and beautiful red fruit; root used in medicine.

K. C. DAVIS.

HYDRIASTELE (Greek, *water* and *column*); the tall trunks growing near springs). *Palmaceae*. A genus of one species, a tropical Australian palm advertised by perhaps only one American dealer as *Kentia Wendlandiana*. It is told, however, from the *Kentias* in foliage by the leaf-segments split at the apex instead of acuminate and not split. More fundamentally, it differs in having the ovule on the side of the cell instead of at the bottom, as in *Kentia*. In this respect it agrees with the group of genera mentioned under *Hedysepe*, but it differs from that group in having the fls. borne in 4 ranks instead of spirally. *Hydriastele* is a spineless palm with erect winged caudex; lvs. terminal, pinnatisect; segments alternate, linear, split at the apex; midveins covered below with caducous scales; margins thin; rachis laterally compressed, dorsally convex; face of the petiole concave; sheath rather short; spadices with short, wide peduncles, branched from the base, the branches obtusely quadrate, long, slender, pendulous; spathes 2, complete, compressed, deciduous, the lower one ancipital; bracts and bractlets connate; fruit small, ellipsoidal, smooth or ribbed. For culture, see *Palms*.

Wendlandiana, H. Wendl. & Drude (*Kentia Wendlandiana*, F. Muell.). A tall palm. Leaves many feet long; segments numerous, unequal, the longest 1½ ft., the upper ones confluent at the base, all denticulate at the apex. Queensland.

JARED G. SMITH.

This distinct and excellent palm has hitherto been rare, but now that the seeds are being produced in tropical nurseries it is fast becoming popular. The seeds are round, fairly hard, and resemble those of *Archontophoenix Alexandra*. The characteristic lvs. are pinnatisect, the segments being irregular and somewhat jagged at the apex, after the fashion of a Fish Tail palm or

Caryota. It stands the temperature of an ordinary living room better than many other palms. For rapid growth it needs more heat than *Howea Belmoreana* and *Forsyteriana*. In the greenhouse a temperature of 60 to 70° is most congenial. A lower temperature will not hurt it, but gives a slower and more compact growth. It loves plenty of moisture, and frequent syringing is beneficial. For potting soil, it likes rich loam, with plenty of sharp sand and good drainage. The seeds and seedlings should be treated more like the commercial *Areca*, i. e., *Chrysalidocarpus lutescens*. It forms a single stem when only 3 ft. high, and grows to a height of 20 ft. or more in cult. It is at its best when 10 to 15 ft. high. When well established and pot-bound it loves high feeding, as does *Chrysalidocarpus lutescens*. This palm has a bright future commercially.

H. A. SIEBRECHT.

HYDRÓCHARIS (Greek, *graceful water plant*) *Hydrocharidaceae*. FROBIT. A genus of one species, an aquatic plant, grown in a few aquaria. It is found in ditches and ponds in Europe and temperate Asia. **H. Morsus-ranae**, Linn., has floating stems resembling runners, and tufts of radical leaves, and submerged roots. Lvs. stalked, roundish, with a heart-shaped base, rather thick, about 2 in. across; peduncles of the staminate plant bearing 2 fls. on long pedicels, which spring from a spathe of 2 thin bracts; petals 3, white, stamens 3-12; spathe of the pistillate fls. sessile among the lvs.; styles 6, with 2-cleft stigmas. For American Frobit, see *Limnobiolum*.

Hydrocharis dies in the fall, but winter buds (see similar buds of *Elodea*, Fig. 759) break off and sink when the old plants die. In spring, or in the greenhouse or aquarium under genial conditions, they start early into growth, the scales bursting and a young leaf developing and then the whole rises to the surface. It is a very interesting plant. Its fine, silky roots are beautiful and attractive in the aquarium, as well as the soft, tender leaves and delicate flowers.

WM. TRICKER.

HYDRÓCLEYS. See *Limncharis*.

HYDROCÓTYLE (Greek, *water* and *beaker*); the plants thrive in moist places, and the roundish lvs. have a cup-like depression in the middle). *Umbelliferae*. This includes a plant which, according to J. N. Rose, is considerably used at Washington, D. C., for carpet bedding under the name of *H. stibthorpioides*, but, like many other bedding plants its name seems not to appear in



1114. *Hydrocotyle rotundifolia* (× 1/2).

the leading retail catalogues, American or foreign. Fig. 1114 is the only accessible picture of the plant, except that in Hooker's *Exotic Flora* as *H. utidula*. The plant has shining lvs. ½-1 in. across, and is perhaps the perennial. It is prostrate, with widely scattered species, mostly inhabiting swamps, and has no near allies of garden value. The species vary widely in habit and otherwise.

Important generic characters are fr. strongly compressed; calyx teeth minute or obsolete; petals concave, valvate or imbricate; umbels simple. For culture, see *Belding*.

rotundifolia, Roxb. (*H. sibthorpioides*, Lem. *Sibthorpia Europaea*, Hort., not Linn.). Fig. 1114. Lvs. orbicular, cordate, subtentire or 7-9-lobed to the middle or lower, doubly crenate; umbel 6-8-fld.; fr. 2-ribbed. Trop. Asia and Afr. Numerous synonyms are accumulated for it by the variable length of the petiole. W. M.

HYDROPHYLLUM (Greek, *water-leaf*; application obscure). *Hydrophyllaceae*. About 7 species of American hardy herbaceous plants, mostly North American, and perennial, with pinnate or palmately cut foliage and cymose clusters of numerous small white, lilac, light blue, purplish or violet fls. borne in early summer. These plants grow a foot or two high, and are desirable for shady situations where other plants do not succeed. They are obtainable from dealers in native plants and collectors. Floral parts in 5's; ovary 2-celled; styles 2. Important generic characters are: calyx appendaged or not; corolla bell-shaped, the tube within bearing a linear, longitudinal appendage opposite each lobe, with infolded edges, forming a nectariferous groove.

A. *Calyx appendaged with a reflexed lobe at each sinus.*

appendiculatum, Michx. Biennial (all the others perennial), hirsute with long spreading hairs: root-lvs. pinnately 5-7-parted; stem-lvs. palmately 5-7-angled-lobed; fls. violet or purple. B.B. 3:44.

AA. *Calyx not prominently appendaged (often minutely appendaged in H. Canadense).*

B. *Lvs. palmately cut.*

Canadense, Linn. Fls. mostly greenish white; sometimes purplish. B.R. 3:242. B.B. 3:44.

BB. *Lvs. pinnately cut.*

C. *Peduncle shorter than the petioles.*

capitatum, Dougl. Tufted, about 9 in. high; lvs. softly hirsute or pubescent. This and the next are the only 2 far western species.

CC. *Peduncle longer than the petioles.*

D. *Divisions of the leaf 7-15.*

occidentale, Gray. Pubescent, hirsute or sparingly hispid; fls. violet-purple, varying to white; 1 ft. or more.

DD. *Divisions of the leaf 3-5.*

Virginicum, Linn. Glabrous or nearly so; fls. white or violet-purple. B.B. 3:43.

HYDROTËNIA (Greek, *water and hand*; referring to a triangular glandular bar which secretes nectar). *Iridaceae*. Four species of tender bulbs from Mexico and Peru, more curious than beautiful, allied to *Tigridia*, which see for culture. The following is procurable from Dutch bulb growers.

Van-Houttei, Baker. Stem 2-3 ft. long, bearing 2-3 fls.; lvs. lanceolate, plaited, the lower 1 ft. long; spathe inflexed, 2 in. long; perianth campanulate; outer segments oblong, over 1 in. long, greenish outside, inside dark brown, much veined, yellowish at tip; inner segments suborbicular, half as long, pale lilac, somewhat veined. F.S. 21:2174, as *Tigridia Houttei*.

HYMENËA (application obscure). *Leguminosae*. This includes a tree cult. in S. Calif. for its economic interest. According to Von Mueller, the timber is hard, extremely heavy, close-grained, used for select wheel-work, tree-nails, beams, planks, and in various machinery. A fragrant, amber-like resin, known as West Indian copal, exudes from the stem. A tree of colossal size and remarkable longevity, found in the West Indies, Trop. Amer. and subtropical S. Amer. A genus of 8 species of tropical American trees; fls. 2, leathery, said to close at night; fls. white, in short, densely corymbose panicles; sepals 4; petals 5, sessile; stamens 10; stigma small; pod short, indehiscent, woody.

Courbaril, Linn. Lfs. unequal-sided, obliquely oblong-lanceolate; fls. pedicellate; pod few-seeded, filled with an edible mealy pulp with a honey-like taste.

HYMENOCALLIS (*beautiful membrane*, alluding to the webbed filaments). Including *Isuene*, *Amaryllidaceae*. SPIDER LILY. SEA DAFFODIL. Bulbous plants of about 30 species of the warm parts of the New World (one in Africa), cult. for the fragrant white (in 1 species yellow) umbellate fls. Perianth with a cylindrical tube, equal linear or lanceolate segments; stamens 6, the filaments free above but webbed and united into a cup below, the anthers narrow and versatile; ovary 3-loculed, with 2 ovules in each, bearing a long, slender style and capitate stigma; scape solid and compressed, arising from a tunicated bulb; lvs. oblong or strap-shaped. The genus is represented in the Old World by *Paneratium*, which differs chiefly in having many ovules in each locule. For an account of the species, see Baker, *Amaryllidaceae*, pp. 120-129 (1888).

Some of the species of *Hymenocallis* are winter bloomers: these should be treated essentially like *Crimms*, being rested or kept slow in the summer. They require a warm temperature. Of such are *H. macrostephana*, *H. speciosa*, *H. Caribaea*. Other species require an intermediate or conservatory temperature, and bloom in spring or summer, resting in winter. Of such are *H. calathina*, *H. Harrisiana*, *H. Macleana*, *H. lacera*, *H. littoralis*. Some of these latter or intermediate-horse species are hardy in the southern states, there blooming in spring, as *H. lacera*, *H. Galvestonensis*, and others. The species of *Hymenocallis* require no special treatment (see *Bulbs*), except that the same bulbs may be flowered year after year if they receive good care. Use turfy or peaty soil that will not become "sour" or soggy. Prop. by offsets from the bulbs.

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A. *Filaments long and slender beyond the small cup.*

B. *Lvs. distinctly petioled.*

1. **tubiflora**, Salisb. Bulb ovoid, about 4 in. in diam., short-necked; leaf-blade about a foot long and one-third to one-half as broad at the middle, the petiole 6-12 in. long; scape 1 ft. tall; fls. many in the umbel and sessile, the valves or bracts broad and cuspidate; tube of perianth greenish, 6-8 in. long, the linear white reflexing segments 4 in. long; cup 1 in. long, not toothed, less than half or a third the length of the free part of the filament. Northeastern S. Amer. B.R. 4:265, as *Paneratium Guaianense*, Ker.

2. **undulata**, Herb. Bulb ovoid, 3-4 in. in diam.; lvs. with an oblong blade 1 ft. long and half as wide, cross-veined; scape 2 ft. long, compressed; fls. about 10, sessile, the tube 6-7 in. long, and the segments 3-4 in. long and linear, white, with tinged red cup an inch long. Venezuela.

3. **speciosa**, Salisb. Bulb globular, 3-4 in. in diam.; lvs. 20 or less, large (often 2 ft. long), oblanceolate-oblong and acute, narrowed into a channeled petiole; scape mostly shorter than the foliage, glaucous; fls. 10-15, on very short pedicels, the bracts or spathe-valves 3-4 in. long; tube of perianth greenish, 3-4 in. long, the segments often twice longer (entire fl. often 9 in. long); cup about 1½ in. long, toothed, the free parts of the filaments little longer than the cup. W. Indies. B.M. 1453. Gn. 47, p. 294. F. 1883, p. 71.—One of the best. The bulb improves with age if care is taken in growing and repotting. The lvs. are evergreen and handsome. Fls. very fragrant, retaining their scent even when dried. Blooms in winter. This and *H. macrostephana* are the most showy species.

B. *Lvs. not petioled, strap-shaped.*

C. *Perianth tube mostly above 3 in. long.*

4. **littoralis**, Salisb. Bulb 3-4 in. in diam.; lvs. about 12, 2-3 ft. long, 1½ in. broad, acute; scape 2-edged, 2 ft. or less tall; fls. 4-8 in a sessile umbel, the tube 6-7 in. long and green-tinged, the segments linear and recurved, 4 in. long, joined to the base of the cup; the cup funnel-shaped, broader and longer, toothed, the free part of the

filaments about 2-3 in. long; style about equaling the stamens. Tropics. Gn. 53, p. 57.—Long known in cult., but less than other species.

5. *Senegambica*, Kunth & Bouché. Lvs. somewhat curved, acute, 2 ft. long, 2 in. broad at the widest place; scape about as long as the lvs.: fls. 6-8 in a sessile umbel, the tube 5-6 in. long, segments very narrow and 4 in. long; cup funnel-shaped, 1 in. long and somewhat broader, the free parts of the filaments 2 in. long. W. Africa.

6. *Harrisiana*, Herb. Bulb globular, small (less than 2 in. in diam.): lvs. only 3-6, a foot long and 2 in. broad, much narrowed below; scape less than 1 ft. tall, slender, glaucous: fls. 2-3 in a sessile umbel, the tube slender and 3-4 in. long, the segments linear and 3 in. or less long; cup funnel-shaped, $\frac{3}{4}$ in. long, plicate, small-toothed, the free filaments $\frac{1}{2}$ in. long and often exceeding the style. Mex. B.M. 6562.—Flowers in early summer. Hardy South.

cc. *Perianth tube mostly under 3 in. long.*

7. *Caribaea*, Herb. (*Pancratium Caribaeum*, Linn. *P. declinatum*, Jacq.). Bulb globular, 3-4 in. in diam.: lvs. thin, 12 or more, not 2-ranked, shining, 2-3 ft. long, 2-3 in. broad at the widest place; scape sharp-angled, nearly or quite as long as the lvs.: umbel sessile, 6-12-fl.: tube 2-3 in. long, the segments linear and somewhat exceeding it; cup 1 in. long, toothed, the free part of the filaments $\frac{1}{2}$ -2 in. long. W. Indies. B.M. 826. L. B.C. 6:558.

8. *Galvestonensis*, Baker. Scape 1-2 ft. long, rather shorter than the linear lvs.: umbel sessile, 4-6; perianth tube 2-3 in. long (sometimes shorter), mostly a little shorter than the linear segments; cup $\frac{1}{4}$ in. or less long, funnel-shaped, the edge erect, the free part of the filaments little more than $\frac{1}{2}$ in. long. Texas.—Lately introduced to cultivation with the statement that it may be planted out in gardens all over the North like a peony and prove hardy. Spring or early summer.

9. *Icebera*, Salisb. (*H. rotata*, Herb. *Pancratium rotatum*, Ker). Bulb ovoid, 2 in. or less in diam., with a long neck and producing stolonous or runners: lvs. 6-8, linear, $\frac{1}{2}$ ft. or less long, flat above but concave toward the base; scape 2-6 in. long, glaucous, about as long as the lvs.: umbel sessile, with 2-6 fls.: tube green, 3-4 in. long, exceeded by the linear, often recurved lobes; cup saucer-shaped or rotate, irregularly toothed, the free part of the filaments $\frac{1}{2}$ in. long. N. Car. to Fla. B.M. 827. L. B.C. 1:19.—Variable, particularly in the dimensions of the fl. Spring or early summer.



1115. *Hymenocallis macrostaphana* (X 1.5).

10. *macrostaphana*, Baker. Fig. 1115. Closely allied to *H. speciosa*, and conjectured by Baker to be a hybrid of that species and *H. calathina*. Bulb with a long neck: lvs. 8-9, oblanceolate and bright green, 2-5 ft. long; fls. 6-10, large and striking because of the great cup (whence the specific name), which is 2 in. across and as much long, wavy-toothed; tube greenish, 3 in. long; segments

linear-lanceolate, a little longer than the tube. B.M. 6436. Gn. 18:211.—Blooms in Feb. and Mar. One of the best of the Spider Lilies, perhaps the best for warm-house culture.

AA. *Filaments short and incurved (usually less than 1 in. long) beyond the large cup. (Ismene.)*

11. *Macleania*, Nichols. (*Ismene Macleania*, Herb.). Bulb ovoid, 2 in. in diam.: lvs. a foot or more long and nearly 2 in. broad, narrowing towards the base; scape 2-edged, about the length of the lvs.: fls. 2-8, with a straight tube 2 in. or less long, and linear, erect or somewhat spreading segments as long as the tube; cup corolla-like, $\frac{1}{2}$ in. long and green-striped, fringed, the free filaments $\frac{1}{2}$ in. long, strongly inflexed and angled or knee'd at the cup. Peru. B.M. 3675.—One of the plants known to the Peruvians as Amanacas, the subject of festivals. This and the next are intermediate-house species, flowering in spring and summer.

12. *calathina*, Nichols. (*Ismene calathina*, Herb. *Pancratium calathinum*, Ker). Bulb long-necked: lvs. 6-8, somewhat 2-ranked, strap-shaped, 2 ft. or less long; scape 2-edged, $\frac{1}{2}$ to 2 ft. tall, bearing 2-5 fls. in a sessile umbel; tube green, 3-4 in. long, much enlarging above; segments as long as the tube, $\frac{1}{2}$ in. wide, lanceolate; cup corolla-like and green-striped, usually larger than in the last, with rounded fringed lobes; filaments free for $\frac{3}{8}$ in., incurved but not angled. Peru, Bolivia. B.M. 2685.

The following names may be expected in the trade: *H. adnata*, Herb.—*H. litoralis*.—*H. Amanacas*, Nichols., is one of the *Ismene* group, and the only species with yellow fls. B.M. 1224. B.R. 7:600. Gn. 48, p. 168.—*H. amana*, Herb.—*H. ovata* (below).—*H. Andreana*, Nichols. An *Ismene*; fl. only 1, the cup nearly or quite as long as the segments. R.H. 1884, p. 129, 368.—*H. crassifolia*, Herb. (*H. occidentalis*, Britton & Brown). Ga. to Mo.; lvs. linear, evergreen, thick; fls. with tube 3-5 in. long and linear segments nearly as long; cup much narrowed below.—*H. fragrans*, Salisb.—*H. ovata* (below).—*H. Moritziana*, Kunth. Evergreen, with lvs. like *Eucharis*: fls. white, fragrant, with greenish tubes, very slender and twice as long as the segments, the cup very short and toothed. Venezuela. G.C. III. 27:89.—*H. ovata*, Roem. Lvs. broad and petioled; fls. 6-10, the tube about 2 in. long, the linear segments little longer; cup 1 in. long. W. Indies. B.R. 1:43. B.M. 1467. L. H. B.

HYMENODIUM. See *Aerostichum*.

HYMENOLEPIS. See *Aerostichum*.

HYMENOPHYLLUM (Greek, *membrane-leaved*). *Hymenophylloideae*. A large genus of filmy ferns allied to *Trichomanes*, but having a more or less deeply 2-lipped or 2-valved involucre. Some 80 species are found in the tropics of both hemispheres. One species appears in wells in England.

Hymenophyllum demissum is a difficult plant to grow. It needs a Wardian case in a coolhouse, and occasional sprinkling overhead. The members of this genus are propagated slowly by division.

A. *Lvs. glabrous; rachis slightly winged above.*

polyanthos, Swz. Lvs. 2-8 in. long, 1-3 in. wide, tri-pinnatifid; sori 2-12 to a pinna; involucre small. Tropics of both hemispheres.

demissum, Swz. Lvs. 4-12 in. long, 3-4 in. wide, 3-4-pinnatifid; sori very numerous, 20-30 to a pinna; involucre with ovate entire valves. E. Indies to New Guinea.

AA. *Lvs. pubescent or ciliate.*

ciliatum, Swz. Fig. 1116. Stalks ciliated and winged above; lvs. 2-6 in. long, 1-2 in. wide, tri-pinnatifid, the segments ciliated; involucre roundish, the valves divided half way down and ciliated. Tropics of both hemispheres.

aeruginosum, Carm. Fig. 1117. Stalks tomentose; lvs. 2-3 in. long, 1 in. or less wide, tri-pinnatifid, the pinnae often imbricate, the surface and margins densely pubescent; involucre small, with valves divided nearly to the base, densely ciliate. Tristan d'Acunha.

L. M. UNDERWOOD and ROBERT SHORE.

HYMENOSPORUM (Greek, referring to the 2-winged seeds which distinguish it from *Pittosporum*). *Pittosporaceae*. This includes an ornamental shrub, cult. only

in S. Calif. It has corymbs of tubular yellow fls. each 1 in. or more across. The genus has only one species, an evergreen Australian shrub, with the habit of Pittosporum and resembling that genus in having thick, leathery capsules and an indefinite number of seeds, but in Pittosporum the seeds are thicker, not so much flattened and not winged.

flavum, F. Muell. Lvs. usually alternate, sometimes opposite or subverticillate, becoming nearly 9 in. long, obovate, leathery, entire; corolla with 5 obovate lobes, silky outside, marked with red at the throat; stamens 5. B.M. 1799.

HYMENOXYS Californica is
Actinolepis coronaria



1116. *Hymenophyllum ciliatum*.
($\times \frac{1}{2}$.)

1117. *Hymenophyllum*
aeruginosum. Nat. size.

HYOPHÔRBE (Greek, *food for swine*; referring to the fruits, probably). *Palmææ*. Three species of pinnate palms from Mauritius, 2 of which are cult. under glass North and outdoors South. Much of their distinctive beauty is in the color of the petiole and rachis, which in *H. Verschaffeltii* is yellow, while in *H. amaricanalis* the petiole is maroon and the rachis orange. The first species also has its leaves handsomely veined with white.

These two species are highly ornamental palms, and are frequently found in trade collections. They would probably be grown in greater quantities were it not for the fact that they are not very rapid growers while in a young state. They are naturally heat-loving plants, and flourish under similar treatment to that recommended for the palm commercially known as *Areca lutescens*, namely, a good loamy soil well enriched with stable manure and with a moderate addition of bone dust, firm potting, an abundance of water, and a night temperature of 65°, while in common with palms in general when grown under glass, it is found necessary to shade from full sunshine during the period between March 1 and November 1.

Of the two species, *H. Verschaffeltii* is much the better, and is one that should be found in all collections, its stout and usually triangular stem and well furnished foliage giving it a distinction that readily attracts attention. Seeds of *Hyophorbe* should be sown in a light compost, pure peat giving good results for this purpose, the seed pots being placed in a bottom heat of 80° and kept moist. The seedlings are delicate in their earlier stages, and should be kept in a warm place until thor-

oughly established; they also require careful watering, the roots of these small plants being quite tender.

Hyophorbe is allied to *Chamaedorea* and *Roscheria*, which are cultivated. *Hyophorbe* is spinose and the leaf segments are acuminate, while *Roscheria* has spines and segments 2-cut at the apex. In *Hyophorbe* the fls. are monoëcious in the same spadix and disposed in small, elongated beaps; in *Chamaedorea* the fls. are dioëcious or monoëcious in different spadices and spirally disposed. *Hyophorbe* contains stout, spineless palms with ringed caudices, cylindrical, or swollen below the middle or interruptedly swollen: lvs. terminal, equally pinnatisect, the subopposite segments linear-lanceolate, acuminate, plicate-nerved, with the thickened margins recurved at the base; petiole subcylindrical, the upper surface slightly furrowed, 3-sided at the base; sheath large, swollen, entire: spadices with short peduncles, twice-branched, the branches slender, spreading; spathe numerous, imbricated in 2 rows: fls. pale green or yellow; fr. small, pear-shaped or olive-shaped, straight or curved, gibbous or gibbous at the base, orange or blue.

amaricanalis, Mart. (*Areca speciosa*, Hort.). Palm 60 ft. high, with a bottle-shaped caudex, 15-24 in. in diam. near the base, slightly diminishing upwards to the base of the leaf-sheaths and there abruptly constricted: petiole 12-18 in. long, somewhat trigonous, grooved on the face; segments in 40-60 pairs, 18 in. long, 2 in. broad, with the central and 1 lateral vein on each side prominent above, the veins clothed below with rather rigid, lanceolate, appressed scales. L.H. 13:462. —Mauritius.

Verschaffeltii, H. Wendl. (*Areca Verschaffeltii*, Hort.). Caudex 25-30 ft. high, 6-12 in. in diam. at the base, bulging after a few feet, reaching 12-24 in. in diam. in the middle, thence contracting upward: petiole 3 in. long, subterete, slightly grooved on the upper surface, with a yellow band extending from the upper part of the leaf-sheath along the face of the petiole to the base of the blade; segments in 30-50 pairs, 20-30 in. long, 1 in. wide, only the central vein prominent, clothed on the under surface toward the base with short, linear scales. Mauritius. L.H. 13:462. G.C. 1870:418.

H. Connersonioides, *Indica* and *lutescens* are *Chrysalidocarpus lutescens*, though *H. Indica* is given as a good species by Index Kewensis. JARED G. SMITH and W. H. TAPLIN.

HYOSCÝAMUS (Greek, *hog's bean*). *Solanæææ*. **HENBANE** is a coarse, clammy, ill-smelling, annual or biennial wayside weed which is cultivated for medicinal purposes. An extract is commonly sold in drug stores. About 15 species of herbs, biennial or perennial, pilose or glabrous; lvs. wavy-margined, coarsely toothed, or pinnatifid, rarely entire: corolla pallid, or lurid and netted-veined, funnel-shaped, with 5 unequal lobes: capsule circumscissile above the middle. The nearest ally of garden vicia is *Datura*. Henbane grows wild in Eu., W. Asia and Himalayas and is naturalized in Amer. It is found in sandy and waste places. Seeds can be obtained by the pound or less. For medicinal purposes, only the leaves of the second year's growth should be used.

niger, Linn. Annual or biennial, 1-2½ ft. high: lvs. 3-7 in. long, the upper ones stem-clasping, irregularly lobed or pinnatifid: fls. greenish yellow, with purple veins. June-Sept. B.B. 3:138.

HYPERICUM (old Greek name of obscure meaning used by Dioscorides). *Hypericæææ*. **ST. JOHN'S-WORT**. A genus of about 200 species, consisting of herbs, under-shrubs and shrubs, and scattered over the whole world, but particularly abundant in S. Europe, W. Asia and N. Amer.; few species of any value in the garden. The leaves are opposite, oblong or lanceolate, exstipular, sessile or subsessile, entire, subevergreen or deciduous, dotted with pellucid or opaque glands, rich in volatile oil. Flowers polypetalous, terminal, solitary or disposed in single or compound cymes, appearing July-Oct., but particularly in early August; sepals 4-5, more or less united at the base and unequal, petals commonly yellow, 4-5, oblique or contorted, hypogynous, alternate with the calyx; stamens numerous, free or connate, in

3-5 clusters, sometimes with interposed hypogynous glands; ovary free, 1-celled, with a central placenta or incompletely or completely 3-5-celled, sometimes longitudinally furrowed; fr. a berry or capsule, with numerous seeds borne upon the placenta or introflexed margins of the carpels; styles 3-5, free or united, persistent.

The Hypericums grow 6 in. to 5 ft. high, of erect to prostrate habit, most of them tender or of uncertain hardiness, requiring some winter protection. Many kinds from the southern United States and southern Europe, otherwise good, are unreliable from lack of hardiness. Several N. American species not yet in cultivation are ornamental and hardy. The few useful species furnish a brilliant color, blooming when most shrubs do not. All are of simple culture, succeeding in almost any garden soil, but generally preferring a light, warm land; hence useful in sandy soils, flowering later and longer if partly shaded. They are prop. by seeds, suckers, cuttings and strong pieces of creeping-rooted kinds. The twigs are terete, 2-angled or 4-angled. The smaller species are useful as rock-plants, the larger as border plants, in the front of shrubberies or in unmixed masses. Their common name, St. John's-Wort, comes from the fact that the common people of some European nations used to gather the flowers of *H. perforatum* to decorate their dwellings on St. John's Day. The Hypericums are mostly short-lived, and need renewal every 6-7 years.

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A. Flowers yellow.

B. Styles 5.

c. Plant herbaceous.

1. **Aseyron**, Linn. (*H. pyramidalatum*, Dryand.). Upright perennial, 2-6 ft. high, with tetragonal stems; lvs. clasping, ovate-oblong or ovate-lanceolate, acuminate from the base, 2-5 in. long; cymes terminal, 3-12-fl., appearing in July; lvs. 1-2 in. in diam.; sepals small, ovate-lanceolate; petals thin, narrowly obovate or oblanceolate, curiously shaped and twisted, persistent until withered; stamens in 5 clusters; styles somewhat spreading; stigma capitate; capsule ovoid, $\frac{3}{4}$ in. long. — A somewhat coarse and ungainly plant living on river banks, native to both North America and N. Asia. B.B. 2:429. — Toward fall apt to be unsightly through the lower lvs. dying and remaining.

cc. Plant shrubby or suffruticose.

D. Stems terete.

2. **Hookerianum**, Wight & Arn. (*H. oblongifolium*, Hook., not Choisy; *H. triflorum*, Blome). A suffruticose species, 2½ ft. high, thin growing; lvs. among the largest of the genus, 1-4 in. long, evergreen, ovate or oblong, sessile, dark blue-green above, pale and glaucous below, minutely pellucid punctate; corymbs several-fl., of large golden yellow fls. in profusion, 2-3 in. in diam.; sepals large, obovate; petals very large, firm, sub-rotund; stamens in 5 clusters; styles recurved, longer than the stamens; ovary broad-ovate, longitudinally furrowed. — Considered to be one of the best species because of its large fls. and hardiness, August. From the higher altitudes of the Himalayas. B.M. 4949. Gn. 54, p. 490. — Easily prop. by cuttings.

3. **patulum**, Thunb. (*H. Uralium*, Don. *H. Nepalense*, Hort.). An evergreen spreading under-shrub, 1½-2 ft. high, with many smooth, purplish arching branches; lvs. ovate-lanceolate, acute, with 6-8 dots; fls. many, solitary or in cymes, large, 2 in. in diam. of good substance; sepals suborbicular; styles recurved; capsule ovate, more or less longitudinally furrowed. Japan, China and the Himalayas. Not very hardy, but one of the

best where it succeeds. Gn. 54, p. 491. B.M. 2375, 5693. R.H. 1875:171. — Not so showy as some American species, but graceful and delicate, and one of the best for rock-gardens. Earliest to bloom.

4. **Moseriænum**, André. GOLD FLOWER. Hybrid raised by Moser, of France, from *H. patulum* and *H. calycinum*, generally resembling the latter but lacking its coarseness, and surpassing both parents in good qualities. A glabrous subshrub 2 ft. high, erect, with the tips of the branches pendulous; lvs. similar to those of *H. calycinum*, ovate-obtusely-mucronulate, opaque, 2 in. long, dark green above, pale below; inflorescence with 1-3 fls. per stalk, which are golden yellow, 2 in. in diam., blooming for some time; calyx of foliaceous oblong sepals; corolla of broad rounded petals, their color heightened by the many tufted yellow stamens with reddish anthers; capsule top-shaped. July, Aug. R.H. 1889, p. 464. Gn. 54:1201. R.B. 16:97. G.C. III. 10:333. — Not hardy in N. England, but successful farther south. Not good individually, but good in masses, better adapted to the herbaceous border than the shrubbery. May be used as a pot-plant. Var. **tricolor**. Variegated form of white and green edged with red. Habit like *H. patulum*, but more horizontal, the lvs. smaller and narrower; fls. one-fourth the size of those of *H. Moseriænum* but similar. Less hardy.

DD. Stems angled.

5. **calycinum**, Linn. ROSE OF SHARON. AARON'S BEARD. A subshrub, 1 ft. or less high, with many procumbent or ascending stems occurring in thick tufts; lvs. ovate, evergreen, leathery, dark green, glaucous below, 2-4 in. long, filled with pellucid dots; fls. large, solitary, or 2-3 together, 3 in. in diameter; sepals large, obovate, spreading; stamens long and showy, in 5 clusters, with red anthers; styles shorter than the stamens, divergent; capsule ovate, 4 in. long. July-Sept. B.M. 146. — A rapidly spreading plant, creeping by woody root-stalks completely covering the soil. Used as a ground cover abroad. Not very hardy in New England, the annual killing-back preventing its covering wide stretches, but not destroying its bloom each year, nor its usefulness in the herbaceous border, or in the margin of a shrubbery. May be protected, and its dark, persistent foliage preserved. Thrives in sun and moderate shade. From Greece and Asia Minor. Prop. by root and ripe wood cuttings.

6. **Kalmianum**, Linn. A shrub, 2-3 ft. high, with rather contorted stems; lvs. oblong-linear, or oblanceolate, 1-2½ in. long, bluish, more or less glaucous below, crowded; fls. small, $\frac{3}{8}$ -1 in. in diameter, in 3-several-flowered cymes; sepals foliaceous oblong; stamens distinct; styles united below to form a beak; capsule ovoid, longitudinally furrowed. G.F. 3:113. Mn. 6:141. — A rare species, confined to the rocks and sands of Niagara and the northern lakes, enduring considerable dryness. Easily adapted to the garden, succeeding in the shade. Not so showy in fl. as some other species, but good because of its bright, narrow lvs. and hardiness.

7. **lobocarpum**, Gattinger. Upright, hardy shrub, 1½ ft. high, in the South 5-7 ft.; lvs. oblong-linear or linear-lanceolate, obtuse or barely acute, 1½-2 in. long; fls. profuse, small, in many-flowered naked cymes; sepals linear-lanceolate; stamens numerous; styles connivent; capsule oblong, 5-angled, furrowed. Last of August. Tenn., where it frequents marshes. G.F. 10:453. — Straggling plant of inferior quality.

BB. Styles 3.

c. Fruit a berry; lvs. ovate.

8. **Androsænum**, Linn. (*Androsænum officinale*, All.). SWEET AMBER. COMMON TUTSAN. A dense under-shrub with erect, quadrangular stems; lvs. ovate, 4 in. long, subcordate, minutely dotted, dark green, whitish below; fls. solitary or in cymes of 3-9, large, light yellow; sepals ovate; stamens in 5 clusters, longer than the corolla; ovary subglobular or oval, incompletely 3-celled; styles divergent, persistent; fr. berry-like, blackish violet, the size of a pea. June-Sept. Lives in shady wet places, W. Europe. — Not yet proved hardy at the North. Fls. not particularly attractive, but good in fruit and foliage. All parts very aromatic.

cc. *Fr. a capsule, 1-3-celled.*

d. *Plant low, 6-15 in. high.*

9. *adpressum*, Barton. (*H. fastigiatum*, Ell.). Practically a herbaceous perennial, erect from a creeping or decumbent base, growing in dense masses; lvs. oblong or lanceolate, 1-2 in. long, acute, thin; cymes few-several-flowered. July, August. Moist places, Nantucket, Mass., south. B.B. 2:431. Spreads rapidly by underground stolons, suggesting occasional use as a ground cover. Not very hardy in New England.

10. *Buckleii*, M. A. Curtis. Later written Buckleii. Dense shrub, with slender, 4-angled stems, forming neat, rounded tufts: lvs. bluish, broadly ovate oblong, $\frac{1}{2}$ - $2\frac{1}{2}$ in. long, rounded at the apex, gradually narrowed at the base, pale below, becoming scarlet in autumn; fls. solitary or in cymes of 3, 1 in. diam.; sepals ovate; petals striated and strap-shaped; styles connate; capsule oblong-ovoid, large. June, July. Found only in the highest mountains of the Carolinas and Ga. G.F. 4:581. —Adapted to rockeries and margins of small shrubberies.

11. *elegans*, Steph. A low perennial, 1-1 $\frac{1}{2}$ ft. high, with erect, winged stem filled with black dots; lvs. ovate-lanceolate, rather clasping, bright green; fls. racemose, 1 in. in diam., appearing in late summer and autumn; sepals ovate, much shorter than the petals, the stamens somewhat longer: capsule ovoid, with 3 apices. —A scarcely hardy plant from Siberia.

12. *Japonicum*, Thunb. Decumbent, with ovate or oval 3-nerved clasping lvs. $\frac{1}{2}$ in. or less long, the stems 4-angled, 2-15 in. tall; fls. $\frac{1}{2}$ in. across, yellow, with petals equaling the linear-lanceolate sepals and bracts; styles one-third the length of the ovary. Japan to India. —Perennial; but Hooker (Flora of India) says it is annual. Blooms in spring. Not hardy North.

DD. *Plant higher, 2-4 ft.*

E. *Leaves linear.*

13. *densiflorum*, Pursh (*H. prolificum*, var. *densiflorum*, A. Gray). A shrub, closely related to *H. prolificum*, but rarer; stems erect, stout, densely leafy, 4-6 ft. high; lvs. variable, broader and oblong like those of *H. prolificum*, or narrower and linear-lanceolate like those of *H. galioides*, 1-2 in. long, mucronulate; fls. $\frac{1}{2}$ in. in diameter, in broad, dense, many-fl. cymes; sepals narrow, not foliaceous; stamens distinct; styles connate; capsule completely 3-celled, short and slender, longitudinally furrowed. July-Sept. Pine barrens, N. J., and south. Mu. 4:97. G.F. 3:527. —R.H. 1899, p. 517, 518. Not well known, but appears to be hardy.

14. *galioides*, Lam. (*H. arillare*, Lam., not Michx.). Practically suffruticose, but sometimes occurs as a round, compact shrub; stems erect, 3 ft. high, slender; lvs. linear, mucronulate, dark green, crowded, 1-3 in. long; fls. in dense, many-fl. cymes $\frac{1}{4}$ - $\frac{1}{2}$ in. wide; sepals linear, foliaceous, equal, shorter than the narrow petals; stamens distinct; styles at first connate, becoming free; capsule conical, completely 3-celled, acute, longitudinally furrowed. July-Sept. Natural to low, wet grounds, Delaware to Fla., but grows freely in rich garden soil. G.F. 10:433. G.C. 11. 24:301. —Seems to be perfectly hardy. Easily raised from seeds. Not well known.

15. *sphaerocarpum*, Michx. Erect perennial, 1-2 $\frac{1}{2}$ ft. high, 4-sided; lvs. linear or linear-oblong, obtuse, 1-2 in. long; cymes of many small fls. $\frac{1}{2}$ in. in diameter, nearly leafless; sepals ovate, mucronate; petals 3 times longer; stamens numerous, distinct; styles united below; capsule globose, $\frac{1}{4}$ in. long. July. Frequents rocky banks of rivers, Ohio and Ky.; satisfactory in light, sandy soil. —Spreads rapidly by stoloniferous roots, covering the soil and preventing washing. Not very ornamental. Half-hardy North.

EE. *Lvs. broadly lanceolate or ovate; sepals ovate.*

F. *Stamens and styles longer than the petals; styles divergent.*

16. *hiricum*, Linn. Glabrous subshrub of round, compact habit, 2-3 ft. high, the branches winged toward the tips; lvs. ovate-lanceolate, acute, glandular, 1-2 in. long, deep green; fls. 1 $\frac{1}{2}$ in. wide, solitary or 3-clustered; sepals deciduous, one-third to one-fourth the length of

the lance-oblong petals, which are of a deeper yellow than in the other species; stamens very long; styles spreading, longer than the stamens; capsule ovoid, pointed. July-Aug. —Species characterized by the strong, goat-like odor of the lvs. (hence the name). Of easy cultivation, but requiring a dry position and winter protection. Mediterranean region. Var. *minus*, Wats. Dwarfier, with smaller lvs. and fls.; as pretty and free-blooming as the type, and, in the rock-garden, preferable.

17. *elatum*, Dryand. Strong, tufted undershrub, recalling *H. androsæmum*, 3-4 ft. high, 1 of quite hardy, sometimes credited to the United States, but really from the Canaries; lvs. oval, 1 $\frac{1}{2}$ -3 in. long, dark green, whitish below, acute; fls. numerous, 1 in. in diameter, in 3-7-flowered cymes; sepals ovate-oblong; stamens distinct; styles prolonged, distinct; capsule oblong, small. July.

18. *horibundum*, Dryand. A subshrub, with round, glabrous stems; lvs. lanceolate-elliptic, light green, without dots, numerous, 1-1 $\frac{1}{2}$ in. long; fls. in few- to many-flowered panicles, 1 $\frac{1}{2}$ -2 in. in diameter, with dilated peduncles; sepals somewhat acute; stamens numerous, shorter than the petals, and stamens persistent; ovary oval; styles long, divergent, with capitate stigmas. —From the Canary and Madeira Islands. Not hardy North, but in cultivation in S. California. Grows very rapidly to the height of about 12 ft. Generally prop. from seeds, which are produced freely.

19. *multiflorum*, Hort., not HBK. A supposed hybrid between *H. androsæmum* and *H. elatum*, assuming an intermediate form, but more closely resembling *H. elatum*. It also resembles *H. hircinum*, but is more shrubby and taller. Lvs. ovate-oblong, acute, somewhat clasping, 1-2 in. long; fls. in profusion, several in a cyme, 1 in. wide, lasting two weeks; sepals small, ovate reflexed; styles spreading; capsule oblong. July. —Not very hardy.



1118. *Hypericum aureum* ($\times \frac{1}{2}$).

FF. *Stamens and styles shorter than the petals; styles connate.*

20. *aureum*, Bartram. Fig. 1118. Showy shrub 3 ft. high, more woody than most species, of stiff, dense habit, top often globular like a miniature tree, the branches 2-edged, with thin, exfoliating red bark; lvs.

oblong, mucronate, bluish, pale below, leathery; fls. solitary in the native state, in cymes of several in cultivation, 1½-2 in. in diam., bright yellow, lightened by the golden filaments at the center; bracts leaf-like, lasting two weeks; sepals leaf-like, ovate, shorter than the thick, broad petals, which persist until withered; stamens distinct, very numerous; styles connate; capsule ovate acuminate, red. July-Aug. Affects rocky situations when wild, generally shady, where moisture is longest retained, from Ga. and Tenn., but perfectly hardy in Mass. G.F. 2:185.—Prop. by seeds and cuttings, young plants from seed blooming the second year.

21. *nudiflorum*, Michx. (*H. cistifolium*, Coulter, not Lam.). Shovy subshrub, 1-2 ft. high, with quadrangular winged branches; lvs. ovate-lanceolate or oblong, subsuccinate or obtuse, 2-3 in. long, thin, veiny, pale above and below, with minute reddish dots; cymes leafless, loosely flowered, of many small fls.; sepals linear to oblong; styles united; capsule ovate-conical, ¼ in. long. N. C. and S.—Ornamental and of easy cultivation.

22. *prolificum*, Linn. (*H. foliosum*, Jacq. *Myridandra prolifica*, Spach). A stout, dense shrub, 3 ft. high, with terete branches and exfoliating light brown bark, the twigs 2-angled; lvs. oblong or oblanceolate obtuse, 1-3 in. long, glossy, dark green, pellucid, punctate; fls. in profusion, 1½ in. wide, in several to many-flowered cymes; sepals lance-ovate; stamens numerous, distinct; styles united at the base; capsules large, oblong, ½ in. long. July-Sept. Found in sandy or rocky soil, New Jersey to Iowa and Georgia; one of the most commonly cultivated. G.F. 3:526—A strong, hardy shrub. Grows rapidly in ordinary garden soil, flowering regularly and profusely. Varies greatly in size.

BBB. Styles united throughout.

23. *Chinense*, Linn. (*H. monogynum*, Willd. *H. salicifolium*, Sieb. & Zucc.). Shrubby, half evergreen; lvs. narrow, elliptic and obtuse, 1-2 in. long; fls. large, yellow, with long stamens resembling "fine golden wire." Mar.-Sept. Orient. G.C. III. 1:705.—Said to be known only as a garden plant. Tender. Grown under glass in parts of the Old World.

AA. Flowers pink.

24. *Virginicum*, Linn. (*Elodia campanulata*, Pursh. *Elodia Virginica*, Nutt.). MARSH ST. JOHN'S-WORT. Smooth perennial, 1-1½ ft. high, nearly simple; lvs. numerous, oblong or oval, cordate, clasping, rounded, 1-2½ in. long; fls. ½ in. in diam., pink- or flesh-colored, in small, close cymes; sepals equal; petals oblong; stamens at least 9 in 3 sets; styles distinct; capsule oblong. July, Aug. In swamps, Labrador to Louisiana. B.B. 2:436.—Useful plant for an artificial bog, and thrives well also in any fine, loamy soil in the shade or sun.

H. Egyptianum, Linn. Dwarf shrub, with very small yellow lvs. and minute, solitary fls. in profusion. Not hardy. Mediterranean region. G.C. II. 14:593.—*H. Balearicum*, Linn. Curious evergreen species, with small oblong lvs. ½ in. long, warty beneath and on the twigs; fls. few, large, solitary. Not very hardy. Mediterranean region.—*H. Coris*, Linn. Procmulent shrub, with linear lvs. in whorls, flowering May-Sept. Not hardy. Central and S. Europe.—*H. dolabriforme*, Vent. Procmulent perennial, with ascending stems 6-20 in. high, with small narrow lvs. and fls. 1 in. wide. Not very hardy. Ky. and S.—*H. Elodes*, Huds. Procmulent perennial, with round-ovate, tomentose lvs. and few flowered, pale yellow panicles. Suitable to boggy places. Europe.—*H. caputritolium*, Willd. Neat evergreen subshrub in patches, 6-12 in. high, with fine lvs. and fls. Not hardy.—*H. fasciculatum*, Lam. Tall shrub, 3-6 ft., erect, with numerous small linear lvs. and small fls. and frequenting marshy places South. Not tested North.—*H. inodorum*, Mill. Dense arching or pendulous shrub, 1½ ft. high, with oblong lvs. and few fls.—*H. nummularium*, Linn. Perennial, from the Pyrenees, with ascending stem and orbicular lvs.—*H. Olympicum*, Linn. Evergreen shrub, with lanceolate lvs. and fls. 1-2 in. wide, with narrow petals. (In. 30:590.—*H. ovatum*, Torr. & Gray. Southern shrub, 1-4 ft. high; lvs. small, pointed, numerous; fls. small, in many-flowered cymes; stems erect, slender. Half hardy North. G.F. 5:305.—*H. orientale*, Linn. Half-hardy, erect perennial, 6-12 in. high, with linear lvs. Asia.—*H. perforatum*, Linn. The common perennial species of the Belts naturalized from Europe, with elliptical oblong or linear-oblong lvs. and numerous fls. in leafy, open cymes.—*H. pulchrum*, Linn. Central European species, with cordate connate lvs. Not hardy.—*H. ramosissimum*, Hort. Dense, upright and slightly pendulous shrub, 1½-2 ft. high, with large elliptical lvs. and fls. in clusters. Hardy.

A. PHELPS WYMAN.

HYPHÆNE (Greek, to *entwine*; referring to the fibers of the fruit). *Paludæce*. About 11 species of fan-leaved palms from tropical Africa and Madagascar. The Borassus tribe of palms consists of *Borassus*, *Lodoicea*, *Latania* and *Hypphæna*. In the first two the staminate fls. in the pits of the spadix are numerous; in the last two they are solitary. In the first and fourth there are few stamens; in the second and third the stamens are numerous. *Hypphæna* consists of unarmed palms of moderate or tall stature; caudex robust, cylindrical, ventricose or pear-shaped, simple or forkingly branched; lvs. terminal, orbicular, palmate-labelliform, plicately-multifid; segments palmate, acute or 2-fid, margins induplicate with fibers interposed; rachis short; petiole strongly biconvex or a trilete flatter above, margins minutely spiny; ligule short, rotund; sheath short, open.

Hypphæna crinita does not look at all like *Latania*. It has long, thick seed-leaves, and has withstood the cold at Oviedo, Fla., better than any other palm. It is extremely slow of growth, and cannot be desirable as a house plant. It is probably cult. more in northern conservatories than in the South.

crinita, Gært. (*H. Natalensis*, Kunze). Young fronds 1 to 1½ ft. long, lanceolate, bi- or trifid at the apex, bright green, clothed on both sides with a white



1119. Star-grass, *Hypoxis erecta* (× ½).

blom which soon vanishes, plicate, scabrous on the margins and nerves above; petiole sheathed for 1 or 2 in., deeply channeled above, rough on the margins; fruits obovate, $2\frac{1}{2}$ in. long, smooth. S. Africa. Cult. outdoors in S. Fla.

JARED G. SMITH and E. N. REASONER.

HYPOCRITE PLANT. *Euphorbia heterophylla*.

HYPOLÉPIS (Greek, *a scale underneath*). *Polypodiaceæ*. A genus of ferns with marginal sori, placed in the sinuses of the leaf, covered with the membranous leaf margin. Tropical ferns of both hemispheres rarely cultivated. Ten or more species are known.

repens, Presl. Stalks straw-colored, more or less prickly; lvs. 3-4 ft. long, quadripinnatifid; lower pinnæ 1-2 ft. long, 6-12 in. wide, ovate acuminate; sori 2-6 to a segment. West Indies to Brazil.

Hypolepis repens is a rather coarse fern, of easy culture, with the general appearance of a *Cyathea*. Like all strong-growing ferns, it requires a large percentage of loam. It likes shade and moisture at all times, and is readily propagated by spores, which it produces in great quantity. It often sows itself, and requires a stove or intermediate temperature.

H. Californica. See *Cheilanthes Californica*.

L. M. UNDERWOOD.

HYPÓXIS (old Greek name, of no application to these plants). *Anagryllidaceæ*. STAR-GRASS. About 50 species of little herbs of temperate and tropical regions, with linear leaves, hard rootstalks or corns, perianth adnate to the ovary, and anthers not versatile. They are scarcely known in cultivation, although the common species of the northern states, *H. erecta*, Linn. (*H. hirsuta*, Coville), Fig. 1119, is offered by dealers in native plants. The lvs. are radical, hairy, grass-like; fls. 1-6, small, star-like, bright yellow, on scapes 4-10 in. tall. Give a half-shady place in the rockery or border. Prop. by division. Blooms in spring. Not showy, but interesting. D. 143. G.W.F. 39. *H. stellata*, Linn. f., from S. Africa, is a pretty greenhouse bulb, blooming in Dec.; lvs. 4-12, glabrous, a foot or less long; peduncles sometimes forked, 1-4, bearing fls. white inside, and the outer segments green-striped on the back.

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

HÝSSOPUS (ancient name; but precisely what plant was the sacred Hyssop of the Jews is uncertain). *Labiatæ*. HYSSOP. Hyssop is a familiar plant, cultivated for medicine and also for ornament in hardy borders. It is considered a genus of only one species, the numerous synonyms being referred mostly to *H. officinalis* or to the genus *Lophanthus*, 2 species of which are cult. Hyssopus has entire lvs.; *Lophanthus* has serrate lvs. Important generic characters of Hyssopus are the 15-nerved calyx and divergent stamens: upper lip of corolla 2-lobed; lower 3-lobed; stamens 4, didynamous, 2 of which are exerted.

officinalis, Linn. Fig. 1120. Stems herbaceous from a woody base, slender, branched or not; lvs. linear to

oblong, sessile or nearly so, acute at both ends or the lower ones obtuse at the apex, $1\frac{1}{2}$ -2 in. long. B.M. 2299. B.E. 3:110. Var. *alba*, with white fls., is cult.

Hyssop is a hardy perennial shrub, growing 18 in. tall, which has been naturalized in the United States from southern Europe or Siberia. Lvs. narrow and entire; fls., which appear from June to September, blue, sometimes white or pink, borne in whorled spikes, which are more or less interrupted. The whole plant has a strong odor and pungent, bitter taste. The green parts are used in connection with wormwood and other plants in the manufacture of absinthe, occasionally as a pot herb, and as a flavoring for cold salad plants. The powdered, dried flowers are similarly employed in soups. The flower spikes are cut just as the blossoms begin to open, and are dried for use in domestic medicine as a stimulant and expectorant in the treatment of asthma, coughs and other pulmonary troubles. Hyssop is not now so highly esteemed as formerly by the medical profession.

This plant is readily propagated by seed, cuttings and plant division. The seed, generally employed in cold climates, is sown in early spring, either in drills 15 to 18 inches apart where the plants are to remain, or broadcast in nursery beds for transplanting, 12 inches asunder in June or July. Propagation by cuttings and by division may be done in the autumn, but better in the spring, when the plants first start to grow. Greenwood cuttings may be started in the shade in the early summer. They need to be well watered. The soil should be a light, mellow, calcareous or sandy loam, with a warm aspect. Culture and harvesting are the same as for sage, mint and other herbs. The beds should be renewed every three or four years.

M. G. KAINS.



1120. Hyssop—*Hyssopus officinalis* ($\times \frac{1}{2}$).

I

IANKÆA. A misprint for *Jancrea*. See *Ramondia*.

IBÆRIS (from *Iberia*, the ancient name of Spain, where the genus is abundant). *Cruciferae*. A genus of about 30 species, native to southern Europe, western Asia and northern Africa, all low-growing annuals, biennials and subshrubs. Comparatively few species are cult. The annuals are the common Candytuft of gardens. The biennials are not cultivated. The subshrubs are flat, dwarf, compact, commonly evergreen plants, with dark green lvs., completely covered with broad, flat or elongated clusters of irregular cruciferous fls. in spring.

The annuals are showy branching plants, 6-18 in. high, much grown in masses in beds or for edging. Florists grow them also, especially the white varieties, for cut-flowers. They are of easy cultivation, and succeed in any rich garden soil, in a place exposed to light and air. They are propagated by seeds, which may be sown at any season, in the house or open ground, but particularly in the fall when the climate permits, or as early as possible in spring, in rows 6-8 in. apart where the plants are to grow, the plants being thinned later to 4 in. apart in the row. The finest display is attained from autumn-sown plants, which flower from May to July. If seed is sown in autumn, the plants should be slightly protected from the sun during winter. Seeds sown early in the spring bloom from July to September. Continuous bloom may be obtained by sowing every two weeks. Good results are attained by sowing under glass and transplanting into open ground when the soil is warm. The name Candytuft was given because the fls. appear in tufts and because the first introduced species, *I. umbellata*, was brought from Candia.

The subshrubby species are adapted to the front of shrubberies, where they connect taller plants with the surrounding lawn. They may appear in separate clumps, in broad masses, or may mingle with other genera in the herbaceous border. They are suited to rockeries, and hang well over walls and ledges. They are to be treated much like herbaceous perennials. They are plants of refinement, and are pleasing when close to the observer. They are useful and popular for cut-flowers, are easily forced into bloom in winter, and are adapted to pot and pan culture. They are easily propagated. The perennial *Iberis* succeed best when let alone. Once planted and not disturbed, they soon form a dense foliage. They are the best spreading, dwarf plants with white flowers.

Iberis is a genus of glabrous or minutely downy plants, with terete stems and pungent, watery juice; lvs. alternate, without stipules, linear or obovate, entire or pinnatifid, often fleshy; fls. perfect, in terminal corymbs or racemes; sepals 4, inferior, deciduous; petals 4, hypogynous, white or purple, obovate, with short claws, very unequal, opposite each other in pairs, their spreading limbs forming an irregular cross, the two outer petals much larger and about equal in size; pods or siliques roundish or ovate at the base, flattened at right angles to the narrow partition, notched at the top, in which stands the permanent style, the 2 valves boat-shaped, the keel or midrib expanding into a wing, the cells 1-seeded. The characters of *Iberis* as distinguished from other *Cruciferae* are taken almost wholly from the pods and seeds, the fls. being similar to most *cruciferae* except that they are irregular.

A. PHELPS WYMAN.

The common white-fl. annual Candytuft is *I. omara*. The common annual kinds with colored fls. are *I. umbellata*. The common perennial kind is *I. sempervirens*. The clusters of some kinds remain rather flat-topped when they run to seed, while the clusters of other kinds lengthen after flowering. This is expressed in technical language under A and AA in the key which follows:

- A. *Inflorescence raremose in fruit.*
 B. *Annuals; stems not woody at the base.*
 c. *Lobes of the pod erect.*
 d. *Lvs. toothed,* 1. *amara*
 dd. *Lvs. pectinate (i.e., divisions deeper, narrower, and farther apart)* 2. *pectinata*
 cc. *Lobes of the pod spreading.*
 d. *Lvs. merely toothed* 3. *odorata*
 dd. *Lvs. deeply cut (pinnatifid)* 4. *pinnata*
 BB. *Perennials; stems woody at the base.*
 c. *While in flower raremose* 5. *sempervirens*
 cc. *While in flower corymbose.*
 d. *Margin of lvs. entire.*
 E. *Form of lvs. linear.*
 F. *Apex of lvs. subacute* 6. *saxatilis*
 FF. *Apex of lvs. obtuse* 6. *saxatilis, var. corifolia*
 EE. *Form of lvs. oblong, narrow at base* 7. *Garrexiana*
 dd. *Margin of lvs. toothed toward apex* 8. *Gibraltarica*
 AA. *Inflorescence corymbose in fruit.*
 B. *Annuals; stems not woody at the base* 9. *umbellata*
 BB. *Perennials; stems woody at the base.*
 c. *Lvs. crenate* 10. *Tenoreana*
 cc. *Lvs. entire or subdentate.*
 d. *Radicule descending; seed not margined; septum simple* 11. *Pruiti*
 dd. *Radicule horizontal; seed somewhat margined; septum nearly double* 12. *semperflorens*

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1. *amara*, Linn. COMMON ANNUAL C. BITTER C. CLOWN'S MUSTARD. Lvs. lanceolate, toothed toward apex; fls. white. Common in En. S.B.F.G. II, 359. The best form is var. *coronaria*, Voss (*I. coronaria*, Hort., not D. Don). ROCKET C. This has larger and fuller clusters and larger fls. The taller varieties, Empress, Spiral White and Giant Snowflake, grow 18 in. high, with solid pyramidal trusses 5-8 in. long. Dwarf forms are Tom Thumb and Little Prince. All are good bedders, and Empress is fine for cutting. Seed may be sown at any time, but the best results with Empress are secured by sowing under glass and transplanting to the open, where plants will bloom in May and June.

2. *pectinata*, Boiss. (*I. affinis*, Hort., not Jord.). Fls. white. Spain. Advertised only as *I. affinis*.

Likely to be confused with *I. odorata*, but the petals are 4 times as long as the calyx and the pods have short hairs, while in *I. odorata* the petals are $1\frac{1}{2}$ times as long as the calyx and the pods glabrous.

3. *odorata*, Linn. SWEET-SCENTED or FRAGRANT CANDYTUFT. Lvs. linear: fls. white. Crete. S.B.F.G. 50. Frequently confused with *I. pinnata*. Better and more fragrant in poor soil.

4. *pinnata*, Linn. Not advertised in America, but often sold as *I. odorata*. Fls. white: inflorescence only slightly elongated in fruit. Spain, S. France, Italy.

5. *sempervirens*, Linn. EVERGREEN C. Lvs. oblong, obtuse, narrowed at base, glabrous; fls. white. Crete. (Fig. 2:145 (fine habit sketch), F.R. 1:75 (poor).) Var. *plena*, a double form, is cult., but is less desirable. Var. *rosea* and var. *foliis variegatis* are sold abroad. Var. *superba* or Perfection is said to be one of the best forms.—This is the commonest, hardest and most permanent of the perennial kinds. When the rarer and tenderer kinds are winter-killed *I. sempervirens* is likely to spread out and surround the labels of other kinds. This probably explains why some of the most



1121. *Iberis Gibraltarica* ($\times \frac{1}{2}$).

reliable dealers have sold this plant under other names, particularly *I. Gibraltarica*.

6. *saxatilis*, Linn. Lvs. glabrous or ciliate: fls. white. S. Eu.

Var. *corifolia*, Sims (*I. corifolia*, Sweet). Lvs. glabrous: fls. white. B.M. 1642, though this picture was doubtfully referred by Baker to *I. Garreziiana*.

7. *Garreziiana*, All., not Scop. Lvs. glabrous: fls. white. Piedmont, Pyrenees. Referred by Index Kewensis to *I. sempervirens*. Intermediate between *I. sempervirens* and *I. saxatilis*, having the habit of the latter.

8. *Gibraltarica*, Linn. Fig. 1121. Lvs. wedge-shaped, obtuse, subulate: outer fls. pink, inner ones white. Gibraltar. B.M. 124. Gn. 10:38. R.H. 1870:330. Gn. 24, p. 549, same as R.H. 1855, p. 446.—This is considered by some as the most striking and showy of the perennial kinds. It grows higher and more erect, with larger clusters and larger fls., but is less hardy than the others. This is much sought after, and the stock in the nurseries is often not true to name. Var. *hybrida* is advertised.

9. *umbellata*, Linn. Lvs. lanceolate, acuminate, lower ones serrate, upper ones entire: fls. in the wild typically purplish, rarely white: pods acutely 2-lobed. Italy, Crete, Spain. B.M. 106.—This is the common annual Candytuft with colored fls., the colors being more numerous and better fixed than in any other species. American trade names are vars. *carmines*, *carnea*, *Illegna* and *Dunnetti* (*I. Dunnetti*, Hort.), the last being dark purple. Vars. *rosea*, *purpurea* and *alba* are advertised abroad, also vars. *nana*, *pumila* and *hybrida*. Tall and dwarf forms of all the colors are procurable.

10. *Tenoreana*, DC. Lower lvs. obovate, narrowed at base: upper lvs. oblong-linear: fls. purplish or whitish: pods notched at apex. Naples. B.M. 2783. L.B.C. 18:1721. According to Baker (G.C. 1868:711), this is the only perennial kind that is decidedly hairy. DeCandolle says the lvs. are puberulous.

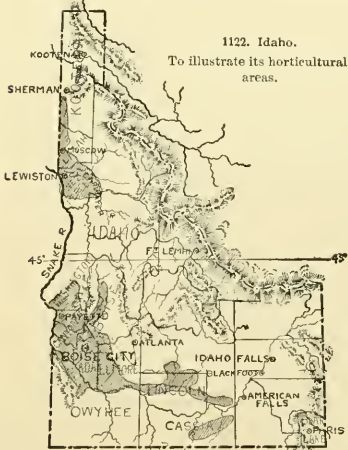
11. *Pratii*, Tineo. Lvs. glabrous, obovate-spatulate, entire or subdentate: fls. white: pods merely notched at apex. Sicily. Not advertised here, but cult. abroad.

12. *semperflorens*, Linn. Lvs. wedge-shaped or spatulate, obtuse, entire, glabrous: pods scarcely notched at apex. Sicily and perhaps Persia. The characters in the key under *D* and *DD* distinguish this from all the other species of *Iberis*. Once advertised by Pitcher & Maida, together with var. *plena*, a double variety. Var. *foliis variegatis* said to be cult. abroad.

I. caricaria, once advertised by Saal, is presumably a typographical error.—*I. cordifolia* is a frequent error for *I. corifolia*.—*I. corraefolia*, Hort., is a common trade name abroad, which is usually spelled *I. corraefolia* in American catalogues. There is no genus *Corra*, and *Correa* is an Australian plant of the Rutaceae. Specimens should therefore be compared with *I. saxatilis*, var. *corifolia*. Mottet's description, however, would place this plant directly after *Garreziiana* in the key, being distinguished from *Garreziiana* by the flowers becoming purplish instead of always remaining white. Mottet says that *I. corraefolia*, Hort., is a hybrid, with spatulate, entire, obtuse lvs. This question could be quickly settled if seedmen would keep dried specimens of their plants.—*I. Iberica*, of John Saal's catalogue, 1893, is not in Index Kewensis.—*I. Utacina* of careless trade catalogues is presumably a *Ilacifid.* variety of *I. umbellata*.—*I. nana hybrida*, Hort., is not *I. nana*, All., a distinct botanical species, but a trade name of mixed dwarf varieties of some common annual kind, presumably *I. umbellata*. W. M.

ICE PLANT is *Mesembryanthemum crystallinum*.

IDAHO, HORTICULTURE IN. Fig. 1122. The state of Idaho lies entirely west of the Rocky Mountain range, whose summit line forms the northeastern boundary. All drainage and waterways of the state finally reach the Columbia river by many directions and extensions of numerous rivers and creeks, excepting for a small area in the extreme southeastern portion of the state, which drains to the Great Salt Lake, in Utah. Generally the state is very mountainous, but a considerable area of the southern portion constitutes the high table-lands lying on both sides of the Snake river. Most of the state lies above an altitude of 2,000 feet. At and near Lewiston, in the valleys of the Snake and Clearwater rivers, the altitude drops suddenly to 647 feet and upwards. The numerous mountain chains and peaks which cover this vast Rocky Mountain slope, direct the streams



in endless ways to their outlets into the large rivers. Thus it can be understood that climatic influences are extremely variable. Altitude does not altogether determine the character of the climate in the valleys. The prevailing currents of air in a given locality are often influenced and directed by the direction of the mountain ranges and the proximity of snow-clad peaks. Greater

extremes of temperature prevail in the southern portion of the state than in the northern. The summers are hotter in the south than in the north, and the rigors of winter are more severely experienced.

Irrigation for the successful cultivation of crops is necessary over most of the southern portion of the state, below the 45th parallel of latitude. North of this there is generally an abundance of rainfall, the atmosphere is humid, and the soil is retentive of moisture. The native soils of Idaho are mostly of volcanic origin, interspersed with clay and sandy loam, and altogether quite fertile. Excepting in the narrow mountain valleys, and in the deep canyons of the Snake river, altitude largely determines the character of horticultural pursuits. According to the United States Weather Bureau records, some of the altitudes are these: Lewiston, 647 feet; Kootenai, 1,750; Payette, 2,150; Fort Sherman, 2,196; Moscow, 2,571; Boise, 2,880; American Falls, 4,341; Blackfoot, 4,503; Fort Lemhi, 4,700; Idaho Falls, 4,732; Paris, 5,946; Atlanta, 7,900. The known altitudes are named at points which are considered most advantageous for estimating variations for the whole state. Much of the south-central portion of Idaho contains vast lava beds, and hundreds of square miles are thus occupied. Among them, however, lie fertile irrigated areas. The wild sage brush covering these extensive tablelands grows most luxuriantly, often attaining to a height of six feet and over. Along the streams and bottomlands of southern Idaho are growths of willows and poplars, and in the mountain gulches a black haw and dwarf maple skirt the water courses. Very little shrubby growths in the mountains. In the mountain regions above an elevation of 4,500 feet, pine, spruce and fir abound. That portion of the state north of the 45th parallel contains fine forests of pine, fir, tamarack and cedar. The mountains, hills and valleys are also well covered with small deciduous trees and shrubbery, which for ages have contributed towards the establishment of a soil rich in organic matter. The list of species of deciduous plants found native in this part of the state is so extensive that it would seem out of place to name them in this article. There are no wild fruits of economic importance growing in the state.

Horticultural operations are conducted within narrow limits above an altitude of 4,500 feet. Up to 3,500 feet elevation, fruit-raising has shown great promise. The best adapted sections for raising apples lie within the counties of Latah, Nez Perce, Washington, Canyon, Ada, and more limited in portions of Elmore, Boise, Cassia, Owyhee, Lincoln and Kootenai. Apples can also be produced in other counties to a very limited extent. Even in Bear Lake county, at an elevation of 6,000 feet, some varieties are being raised successfully.

The horticultural inspectors of the various horticultural districts last year made a careful computation of the fruit acreage in their respective territories, and reported as follows: Ada county, 5,581 acres; Bannock, 100; Bear Lake, 100; Bingham, 1,100; Blaine, 350; Boise, 141; Canyon, 5,330; Cassia, 507; Custer, 185; Elmore, 875; Fremont, 1,000; Idaho, 200; Kootenai, 1,500; Latah, 5,900; Lemhi, 200; Lincoln, 840; Nez Perce, 2,000; Oneida, 1,000; Owyhee, 216; Shoshone, 1,200; Washington, 2,450. These figures show for the whole state a total of 30,805 acres planted to fruit. The figures include orchards, vineyards, and small fruit plantings, and are considered very reliable. Considerably the largest acreage is apples; then follow prunes, peaches, pears, cherries, nectarines and quinces in the order named. Small-fruit growing covers an important portion of the acreage given.

All kinds of forest trees suitable to northern climatic conditions can be grown with excellent success within the state.

F. A. HUNTLEY.

IDÉZIA (Yobran's Ides, Dutch traveler in China). *Berberis*. A genus whose only species is a Japanese tree, hardy as far north as Philadelphia. It is a large, rapid-growing, deciduous tree, with large lvs. borne on reddish stalks and loose clusters of fragrant, greenish yellow fls. which are inconspicuous except for their prominent anthers, and numerous orange-colored berries about the size of a small cherry. Fls. dioecious, the parts in 5's (or 3-6); sepals tomentose, imbricated, de-

ciduous; petals 0; stamens indefinite, inserted on a small disk with villous filaments; ovary of pistillate fls. globose; berries with an indefinite number of seeds. Prop. by green wood and root cuttings.

polycarpa, Maxim. Height 40 to 50 ft.: lvs. drooping, 5-10 in. long, sometimes 8 in. broad, usually cordate-acuminate, sometimes oblong or orbicular, deep green, margin distantly serrate, glaucous beneath, petiole 4-6 in. long; panicles shorter than the lvs., pendulous; staminate fls. $\frac{3}{8}$ in. across. Var. **crispa** has curled foliage. B. M. 6794. R. H. 1872, pp. 174, 175; 1878, p. 254; 1888, pp. 463-465. F. 1874, p. 64, 65.

JOSEPH MEEHAN and W. M.

ILEX (the ancient Latin name of *Quercus Ilex*). Including *Prinos* and *Othera*. *Hicniee* (or *Aquifoliaceae*). HOLLY. Ornamental evergreen or deciduous shrubs, with alternate, simple, sometimes spiny lvs., small, inconspicuous, whitish fls. in axillary clusters or solitary, and black, red or sometimes yellow berries, remaining on the branches often until the following spring. Of the evergreen species, only *I. glabra* and *I. rugosa* are quite hardy North, and also *I. opaca* and *I. crenata* in somewhat sheltered positions. *I. Aquifolium* and *I. cornuta* are more tender but stand many degrees of frost if sheltered, while most of the others can only be grown South. Of the deciduous species, *I. decidua*, *I. monticola*, *I. laevigata* and *verticillata* are hardy North; also *I. Sieboldi* and some other Japanese species are hardy or nearly so. The Hollies, especially those with scarlet or red berries, are highly ornamental, and the berried branches of *I. opaca* and *I. Aquifolium* are in great demand for Christmas decoration. Also *I. laevigata* and *verticillata*, the prettiest in fruit of the deciduous kinds, are sometimes sold for this purpose. The deciduous species are mostly shrubs, while many of the evergreen species grow into small or medium-sized trees, and *I. opaca* is the tallest of the broad-leaved evergreens which are hardy North; the evergreens *I. crenata*, *glabra*, *rugosa*, always remain shrubby. *Ilex opaca* fills the old, deserted and very dry and sunny, barren fields of the South, and thrives on extremely poor soil, and has good color, too. This trait is worth noting. *I. Aquifolium* is a favorite evergreen in English gardens, and numerous varieties are there in cultivation; it stands severe pruning well, and can be clipped and trained into almost every shape; it also makes fine hedges, but its slow growth is a disadvantage. As the chief value of the deciduous species is in the ornamental fruits and the Hollies are dioecious, care should be taken to select in planting a few staminate ones, but mostly pistillate plants, and to give the latter the most prominent place. The light, close-grained and tough wood of some of the arborescent species is much valued for turnery-work, engraving and cabinet-making. The lvs. of some tropical species, as *I. Paraguariensis* and *I. concocarpa*, yield a kind of tea known as Yerba de Maté, or Paragany Tea, which is much used in S. America. The Hollies grow best in rich, well-drained soil, and the evergreen ones in partly shaded situations, but *I. laevigata*, *verticillata* and also *Sieboldi* prefer moist places, and grow even in swamps. Most of the species grow slowly, and are not easily transplanted when older. The best time for moving the evergreen species is the early fall, when the young wood has almost ripened, or in the spring just before the plants start into new growth. The leaves should be stripped on *I. opaca* and *I. Aquifolium*, when transplanted, particularly if at all exposed—or at least nearly all. This is absolutely necessary to insure success. Wild Hollies may be handled this way with success, particularly if cut back as well. Prop. by seeds, which do not germinate until the second year, and are therefore stratified and treated like those of the slow-growing hawthorns. The young seedlings should be transplanted after the second year. The evergreen species may be increased by cuttings of ripened wood under glass, especially the shrubby ones; they are also sometimes grafted or budded on seedlings of *I. Aquifolium* or *opaca*. About 175 species in N. and S. America, tropical and temperate Asia and few in Africa, Australia and Europe. Lvs. petioled, with small, caducous stipules; fls. dioecious, usually in rather few-fl. axillary cymes; calyx lobes, petals and stamens usually 4, sometimes

more; style very short: fr. a berry-like drupe, with usually 4 long 1-seeded stones.

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A. Foliage evergreen.

B. Lvs. with coarse, spiny teeth, rarely mostly entire.

C. Fls. in axillary clusters on branches of previous year.

1. *Aquifolium*, Linn. EUROPEAN HOLLY. Fig. 1123. Tree, to 40 ft., with short, spreading branches, forming an oblong or pyramidal head, in cultivation often shrubby, glabrous: lvs. short-petioled, usually ovate or oblong-ovate, waved and with strong, spiny teeth, shining, $1\frac{1}{2}$ -3 in. long: fr. scarlet, globose, shining. May, June. Southern and middle Eu., western Asia, China, Gng. 4:83. A very variable species. A full account of the numerous varieties cult. in England is given by T. Moore in G.C. II. 2, p. 433; 519, 687, 751, 812; 4, p. 687, 741; 5, p. 43, 365, 437, 624; 6, p. 232, 389, 619, where 133 varieties are described and many of them figured. Some of the most important and most distinct are described below. *Osmanthus Aquifolium*, Sieb. & Zucc., an oleacean shrub, which may readily be known by its opposite leaves, is occasionally supplied by dealers as a variety of *Ilex Aquifolium*.

(a.) Foliage green.

(b.) Lvs. spiny-toothed.

(c.) Size of lvs. large, about 2-4 in. long.

2. Var. *Alteclarensis*, Hort. Lvs. oval, large, thin and rather plain, with numerous teeth. 3. Var. *ferox*, Loud. (*I. echinata*, Mill.). Lvs. of medium size, with strong teeth and numerous small spines on the upper convex surface. A very distinct variety, known as Hedgehog Holly. N. 2:175. 4. Var. *latifolia*, Loud. Lvs. oval to $3\frac{1}{2}$ in. long, with rather few, divaricate teeth. G.C. II. 2:433. 5. Var. *platyphyllos*, Hort. Lvs. broadly ovate, to $3\frac{1}{2}$ in. long, with divaricate spines, thick, deep green. 6. Var. *princeps*, Moore. Lvs. broadly ovate, to $4\frac{1}{2}$ in. long, with strong, regular spines, dark green, with prominent veins below. G.C. II. 13:45.

(cc.) Size of lvs. small, 1-2 in. long.

7. Var. *Handsworthensis*, Hort. Lvs. ovate-lanceolate, with numerous, moderately divaricate spines, projected toward the apex, glossy green. G.C. II. 2:519. 8. Var. *hastata*, Hort. Lvs. ovate-lanceolate, halbert-shaped: spines large, usually only 2-4 on each side at the base, the upper half usually entire. G.C. II. 2:687. 9. Var. *microphylla*, Hort. Lvs. ovate-lanceolate, about 1 in. long, shining green, with small, equal plane spines. G.C. II. 2:751. A very small-leaved form, but var. *hastata* is still smaller, and has the smallest lvs. of all. 10. Var. *myrtifolia*, Hort. Lvs. ovate-lanceolate, 1-1 $\frac{1}{2}$ in. long, moderately spiny, rarely entire. G.C. II. 2:687. 11. Var. *serratifolia*, Loud. Lvs. ovate-lanceolate, stiff, with numerous small spiny teeth. G.C. II. 2:687.

(bb.) Lvs. all or most of them without spines.

12. Var. *heterophylla*, Loud. Lvs. oval or elliptic-ovate, about $2\frac{1}{2}$ in. long, sometimes twisted near the apex, entire or with few spiny teeth. G.C. II. 2:519.

13. Var. *laurifolia*, Loud. Lvs. ovate to elliptic-lanceolate, 2-3 in. long, usually quite entire. 14. Var. *marginata*, Loud. Lvs. broadly ovate, sometimes twisted near the apex, with thickened entire margin. G.C. II. 2:813. 15. Var. *Scotica*, Hort. Lvs. oval-obovate, blunt and rounded at the apex, rarely pointed, $1\frac{1}{2}$ -2 in. long, with thickened, wavy entire margin. G.C. II. 2:813. 16. Var. *tortuosa*, Hort. (var. *crispa*, Hort.). Lvs. oval and spirally twisted, with revolute margin, entire or with few spines, about 2 in. long: of dense habit. G.C. II. 2:813.

(aa.) Foliage variegated.

(b.) Lvs. spiny-toothed.

17. Var. *albo-marginata*, Loud. (var. *argenteo-marginata*, Hort.). Lvs. broadly ovate, to $2\frac{1}{2}$ in. long, with numerous irregular spines, dark green, the disk mottled with grayish green, with rather narrow silvery margin. 18. Var. *albo-picta*, Loud. (var. *argenteo-medio-picta*, Hort.). Lvs. ovate, with divaricate spines, dark green, with a whitish center and a narrow, irregular, silvery margin. G.C. II. 4:687. 19. Var. *aureo-maculata*, Hort.



1123. *Ilex aquifolium*.

($\times \frac{1}{2}$)



1124. *Ilex opaca*.

($\times \frac{1}{2}$)

Lvs. oblong-ovate, $2\frac{1}{2}$ in. long, with distant triangular, somewhat divaricate spines, with a large creamy white blotch in the center, outer part of the margin dark green, inner part mottled pale gray. 20. Var. *aureo-regina*, Hort. (var. *aurea marginata* and var. *latifolia marginata*, Hort.). Lvs. broadly ovate, to 3 in. long, with strongly divaricate spines, mottled with gray and green, with a broad, continuous golden yellow margin. G.C. II. 5:44. 21. Var. *aureo-picta latifolia*, Hort. Lvs. ovate or broadly ovate, 2 in. or more long, with a large, branching, deep yellow blotch in the middle, and with an irregular, deep glossy green margin. G.C. II. 5:624. 22. Var. *ferox argentea*, Lond. Like var. *ferox*, but the margin and the surface spines creamy white. G.C. II. 5:44. 23. Var. *ferox aurea*, Loud., is like the former, but with yellow spines and margin.

(bb.) Lvs. spineless or mostly so.

24. Var. *heterophylla aureo-picta*, Hort. Lvs. ovate, flat, sometimes with few spines, about $2\frac{1}{2}$ in. long, marked in the middle with a broad feathery blotch of bright yellow. G.C. II. 6:389. 25. Var. *Scotica aurea*, Hort. Lvs. obovate, blunt, slightly wavy, about $1\frac{1}{2}$ in. long, dark, mottled green, with a broad golden margin: of dwarf habit. 26. Var. *Wateriana*, Hort. Lvs. oblong or ovate, with a few spines, or entire and plain and obtuse, about 2 in. long, mottled with gray and yellowish green and edged with a broad, irregular golden band. G.C. II. 6:233.

There are also some other vars., as, 27, var. *fructu luteo*, with yellow, and 28, var. *fructu aurantiaco*, with orange berries; 29, var. *pendula*, with pendulous branches and 30, var. *pyramidalis*, with ascending branches, forming a narrow, oblong head.

31. *cornuta*, Lindl. Shrubby, with short spreading branches, glabrous: lvs. oblong, with 3 strong spines at the dilated apex, and with 1-2 strong spines on each side of the truncate base, but rounded and spineless at the base on older plants, dark glossy green above, 2-4 in. long: fr. scarlet, clustered, short-petioled. June, July. N. China. P.F.G. I, p. 43. G.C. 1850:311. F.S. 7, p. 216; 9:895. B.M. 5059.

cc. Fls. in 1-fer-tild. axillary, peduncled cymes, on this year's growth.

32. *opaca*, Ait. (*I. quercifolia*, Meerb.). AMERICAN HOLLY. Fig. 1124. Tree, with spreading short branches.

sometimes to 50 ft., forming a narrow, pyramidal head, glabrous: lvs. oval or elliptic-lanceolate, with large remote spiny teeth, rarely entire, dull green above, yellowish green beneath, 2-4 in. long; fr. dull scarlet, usually solitary, globose, June, Mass. to Fla., west to Mo. and Tex. Em. 385. S. S. 1:45. Gng. 4:277.—Hardier than *I. Aquifolium*, but less handsome.

BB. *Lvs. serrate, crenate or entire.*

c. *Fr. red; nutlet ribbed on the back. Tender.*

33. *Cassine*, Linn. (*I. Dahoon*, Walt.). DAHOON. Shrub or small tree, to 30 ft.: lvs. obovate to oblong-linear, acute or obtuse and mucronulate, entire or sharply serrate above the middle, usually pubescent beneath when young, 2-3 in. long; fr. globose, small, dull red, rarely yellow, on this year's growth. April, May, N. C. to Fla., west to La. S. S. 1:46. 34. Var. *angustifolia*, Ait. Lvs. linear-oblong to linear, 2-3 in. long. 35. Var. *myrtifolia*, Chapm. Lvs. linear-oblong, 1-2 in. long; fr. usually solitary. S. S. 1:45.

36. *latifolia*, Thunb. Tree, sometimes to 60 ft., glabrous: lvs. oval to oblong lanceolate or obovate-oblong, serrate, glossy green above, 3-7 in. long; fr. large, in almost sessile clusters, June, Japan. B.M. 5597. P.F.G. 3, p. 13.—One of the most beautiful Hollies.

37. *vomitória*, Ait. (*I. Cassine*, Walt., not Linn.). CASSENA. YAUPON. Shrub, rarely tree to 25 ft., with spreading branches: lvs. oval or oblong, obtuse, crenate, glabrous, $\frac{1}{2}$ -1, rarely to 2 in. long; fls. clustered on branches of the previous year; fr. scarlet, globose, small. April. Va. to Fla., west to Ark. and Tex. S.S. 1:48.



1125 *Ilex verticillata*.
($\times \frac{1}{2}$)

cc. *Fr. black; nutlets smooth; pistillate fls. usually solitary, on this year's growth.*

38. *crenata*, Thunb. (*I. Fortunei*, Hort.). Much-branched shrub, rarely small tree to 20 ft.: lvs. oval, obovate or oblong-lanceolate, crenately serrate, glabrous, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long; fls. 4-merous, May, June, Japan. Gng. 6:165.

39. *glabra*, Gray (*Prinos glaber*, Linn.). INKBERY. WINTERBERRY. Much-branched upright shrub, to 8 ft.: lvs. obovate to oblanceolate, obtuse, with few obtuse teeth toward the apex, glabrous, 1-2 in. long; fls. 5-8-merous, June, Mass. to Fla., west to Miss. L.B.C. 5:450.

AA. *Foliage deciduous; fr. red. (Prinos.)*

B. *Frs. mostly and lvs. partly fasciated on short spurs; nutlets ribbed on the back.*

40. *decidua*, Walt. (*Prinos decidua*, DC.). Shrub or small tree, to 30 ft., with light gray spreading branches: lvs. cuneate-oblong or obovate, usually obtuse, crenately serrate, dark green, and with impressed veins above, pale and pubescent beneath, $1\frac{1}{2}$ -3 in. long; fr. globose, orange or orange-scarlet, $\frac{1}{2}$ in. across. May, Va. to Fla., west to Texas. S. S. 1:49.

41. *monticola*, Gray (*Prinos dabbis*, Don). Tree, to 40 ft., with slender branches, forming a narrow pyramidal head or spreading shrub: lvs. oval or oval-lanceolate, acute or acuminate, sharply serrate, pubescent only along the veins beneath, 2-6 in. long; fr. red, globular-ovoid, $\frac{1}{2}$ in. across. May, N. Y. to S. C., west to Ala. S.S. 1:50. G.C. II. 14:689 (as *I. decidua*). 42. Var. *mollis*, Britton (*I. mollis*, Gray). Lvs. broadly ovate, soft-pubescent when young, glabrous above at length.

BB. *Frs. and lvs. not fasciated; frs. axillary; nutlets smooth.*

43. *laevigata*, Gray (*Prinos laevigatus*, Pursh). WINTERBERRY. Low shrub, of upright habit: lvs. lanceolate, acute, finely or crenately serrate, rather thick, glabrous or nearly so, $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, turning clear yellow in fall; fls. 6-8-merous; fr. depressed-globose, bright orange-red, over $\frac{1}{2}$ in. across. May, June, Maine to Pa. and Va. G.F. 4:221.

44. *verticillata*, Gray (*Prinos verticillatus*, Linn.). BLACK ALDER. WINTERBERRY. Fig. 1125. Shrub, with spreading branches: lvs. obovate to oblanceolate or lanceolate, acuminate or acute, serrate or doubly serrate, usually pubescent beneath, $1\frac{1}{2}$ -3 in. long, turning black after frost; fls. 5-6-merous; fr. bright red, rarely yellow, about $\frac{1}{2}$ in. across. June, July, Canada to Fla., west to Wis. and Mo. Em. 388.—Very variable in shape and texture of lvs. One of the best hardy shrubs, with ornamental frs., which remain on the branches until midwinter, and are not eaten by birds.

45. *serrata*, Thunb. Slender shrub, to 15 ft., similar to the former but smaller in every part: lvs. elliptic or ovate, acute or acuminate, finely serrate, pubescent or glabrous beneath, 1-2 in. long; fls. 4-5-merous; fr. bright red, small, one-sixth to one-fifth in. across. June, Japan. There are two forms of this species: both have been introduced from Japan as *I. Sieboldi*, the first by Prof. Sargent, the second by Thomas Hogg. 46. Var. *argutidens*, Rehder (*I. argutidens*, Miq.). Lvs. glabrous beneath, short-petioled, teeth more remote and less fine; fls. usually 4-merous. 47. Var. *Sieboldi*, Rehder (*I. Sieboldi*, Miq.). Lvs. somewhat larger, longer-petioled, more finely serrate, pubescent beneath; fls. usually 5-merous.

I. ambigua, Chapm. Deciduous large shrub, allied to *I. monticola*, lvs. usually almost glabrous, remotely serrate, 1-2 in. long, N. C. to Fla., west to Ark. and Tex.—*I. Amelanchier*, M. A. Curtis. Deciduous shrub, to 6 ft.: lvs. oblong, subacute, serrate, pubescent, $1\frac{1}{2}$ -3 in. long; fr. dull red, large. Va. to La. G.F. 2:41. Hardy.—*I. Californica*, Branderage. Evergreen large shrub, to 12 ft., glabrous: lvs. elliptic to oblong-elliptic, obtuse, remotely and crenately serrate, 2-5 in. long; fr. black, small. Calif. G.F. 7:415 (by error named *I. triflora*).—*I. Canariensis*, Poir. Evergreen tree, to 20 ft., glabrous: lvs. ovate to ovate-oblong, obtuse, entire, 2-4 in. long; fr. usually solitary, on this year's growth. Canar.—*I. canavaria*, Reiss. Evergreen shrub, to 6 ft.: lvs. oblong-lanceolate, acuminate, serrate, glabrous, 2-5 in. long; fls. in short, dense spikes; fr. ovoid-conic, Brazil. B.M. 7310.—*I. coriacea*, Chapm. (*I. lucida*, Torr. & Gr.). Allied to *I. glabra*, but taller; lvs. broader and longer, to 3 in., acute or acuminate. N. C. to Fla., west to La.—*I. dipyrrena*, Walt. Evergreen tree, to 6 ft.: lvs. elliptic to lanceolate, remotely spiny-serrate, sometimes entire, glabrous, 2-4 in. long; fr. scarlet, globose, clustered. Himal.—*I. dabbia*, B.S.P.—*I. monticola*,—*I. Gongónha*, Mart.—*Villaresia mucronata*,—*I. insignis*, Hook. f. Evergreen small tree: lvs. elliptic-lanceolate, 6-8 in. long, spiny-toothed, often almost entire in older plants; fr. large, globose. Himal. G.C. II. 14:297.—*I. integrata*, Thunb. Evergreen large shrub or tree, to 40 ft.: lvs. obtuse,

obtuse pointed, entire, 2-3 in. long; fr. large, rather long-peduncled, red. Japan.—*I. longipes*, Chapm. Deciduous shrub, allied to *I. decidua*: lvs. elliptic-lanceolate, crenately serrate, almost glabrous; fr. globose, slender-pedicelled. N. C. to Ga., west to La. G. F. 3:345.—*I. microcarpa*, Lindl.—rotunda, Thunb.—*I. Paraguariensis*, St. Hil. (*I. Paraguariensis*, Anth.). MATÉ, PARAGUAY TEA. Shrub, to 15 ft.: lvs. obovate, obtuse, obtusely serrate, 2-5 in. long, glabrous; fr. small, peduncled, Brazil.—*I. Perado*, Ait. (*I. platyphyllos*, Webb. & Berth.). Evergreen pyramidal tree, to 20 ft., glabrous: lvs. broadly ovate or obovate to oblong, entire, serrate on young plants, 2-5 in. long; fr. large, red, clustered, short-pedicelled, on last year's growth; Cumar. L.B.C. 6:549. B.M. 4079.—*I. rotunda*, Thunb. (*I. microcarpa*, Lindl.). Evergreen shrub or tree, to 40 ft.: lvs. oblong or elliptic, acute, pointed, quite entire; fr. small, red, in pedicelled clusters. Japan. P. P. 41, p. 43. G. C. 1860:31. F. S. 7, p. 26.—*I. rugosa*, F. Schmidt. Evergreen low spreading shrub, sometimes prostrate, glabrous: lvs. oblong-lanceolate to lanceolate, remotely crenate-serrate, rugose above, $\frac{3}{4}$ -2 in. long; fr. usually solitary, scarlet. Japan, Saechalin.—*I. triflora*, Brandegee. Evergreen tree, to 40 ft., with spreading pubescent branches: lvs. elliptic-lanceolate, remotely serrate or almost entire, pubescent, 2-3 $\frac{1}{2}$ in. long; fls. 5-merous. Calif. G. F. 7:416 (by error named *I. Californica*).

ALFRED REHDER.

ILICICIUM (Latin *forallurement*; probably in reference to the agreeable odor). *Magnoliaceae*. A half dozen species in Japan, China, India and eastern N. America. Small trees or shrubs, glabrous, with thick, short-petioled entire evergreen lvs.: fls. small, solitary or in 3's in the axils of lvs. or bud-scales, nodding or inclined, yellow or purplish; sepals 3-6; petals many, imbricated in 3 or more rows or series; stamens 10-many, with thick filaments; carpels usually many, forming a ring of almost woody pods. The Illicium are aromatic plants with perfect fls.

One of the Illicium furnishes the Star or Chinese Anise, which is the small star-shaped cluster of fruits. The odor and flavor strongly resemble Anise. It is much used in oriental countries in cookery, and is exported to some extent and is said to be used in flavoring certain French wines. This product comes from China. It has been supposed to be the product of *I. anisatum* of Linnæus, but that plant is a Japanese tree and it contains a poison. In the American trade are the names *I. anisatum* and *I. religiosum*. It now transpires that these names belong to the same plant, and that the Star Anise is produced by another species. This other species, or the true Star Anise, was first accurately described and figured (as *I. verum*, Hook. f.) in B.M. 7005 (1888), where the confusion of two or three centuries is elucidated. There is probably only one East Asian Illicium in the trade in N. Amer., as follows:

anisatum, Linn., not Gært. (*I. religiosum*, Sieb. & Zucc.). Small tree: lvs. alternate, elliptic, short-petioled, somewhat acuminate: fls. mostly solitary, sessile or nearly so, yellowish, not fragrant, with many very narrow petals, and 20-30 stamens. Japan. B.M. 3965.—Grown far S. There is a form with variegated lvs.

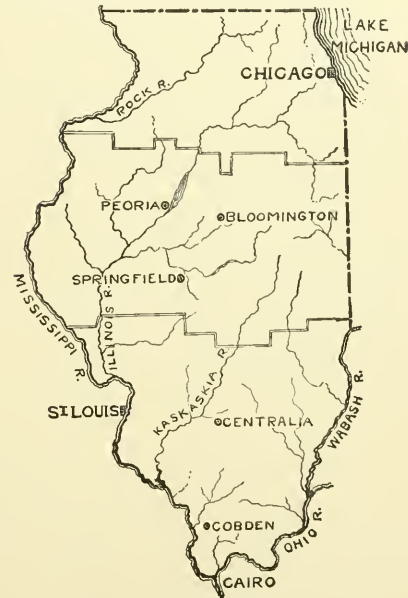
Two native Illiciums growing in the Gulf country are: *I. Floridaicum*, Ellis. Shrub, 6-10 ft.: lvs. oblong-lanceolate, 4 in. or more long; petals 20-30, very narrow, dark crimson. B.M. 439. Ga. 36, p. 151. J.H. III. 30:265.—*I. parviflorum*, Michx. Lvs. elliptic or lanceolate, mostly under 4 in. long; petals very small ($\frac{1}{4}$ in. long), 6-11, yellowish. L. H. B.

ILLINOIS, HORTICULTURE IN. Fig. 1126. The state of Illinois, lying in the heart of the Mississippi valley, the most fertile portion of the United States, and with its eastern boundary over 700 miles from the Atlantic coast, has a range north and south of a little over 350 miles, extending from 37° to 42° 30' north latitude, and a breadth east and west of about 200 miles at its widest point. In spite of its great length, the difference in mean annual temperature between the extreme northern and southern parts of the state is only 10° F., although the rainfall in the southern part is one-half greater than in the northern.

Soil conditions alone considered, Illinois stands, agriculturally, at the very forefront. Third among the states of the Union (1890) in population, and first in railroad mileage, it is also first in total bulk of agricultural and horticultural products. There are no considerable tracts of worthless land in the state; and the statistics collected by the State Board of Agriculture show every one of the 102 counties of the state to be fruit producing.

The statistics of the census of 1890 showed Illinois at that time to be easily third in rank among the horticultural states.

The horticultural interests of Illinois have been well looked after and carefully placed on a permanent basis by the legislature. In 1874 an act was passed by that body establishing the Illinois State Horticultural Society (which was organized in 1855) as a public corporation



1126. Illinois.

Showing three horticultural divisions, following county lines.

of the state. The State Horticultural Society is divided into three subdivisions, the Northern, Central and Southern Illinois Horticultural Societies, each taking in about one-third of the state (see map). The State Horticultural Society has been liberally supported by the legislature since its foundation, and is in a flourishing condition.

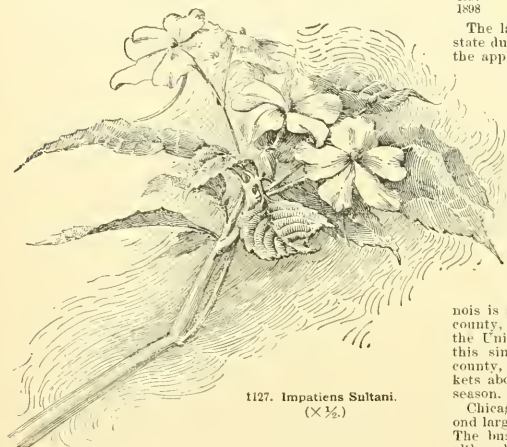
The most distinctive fruit section of Illinois is the southern third. This area contains something over 150,000 acres devoted to the growing of apples alone. Other deciduous fruits, notably peaches and pears, and small fruits, especially strawberries, are also grown in large quantities in this part of Illinois. During the season of 1898 over 800 car-loads of strawberries alone were shipped to outside markets from the fruit districts of southern Illinois. Increased shipping facilities and the coming into bearing of orchards already some time planted are rapidly bringing southern Illinois into competition with Michigan in the production of peaches.

The southern fruit district, as indicated on the map, lies between 37° and 39° 30' north latitude, the former being the latitude of Norfolk, Va., and the latter that of Baltimore, Md. The climate of this district is best indicated by the fact that the isotherm 55° F. passes through the northern part of the district, the same temperature line also passing through the peach and sweet potato districts of Delaware and southern New Jersey. The 50° isotherm passes through Illinois about on the dividing line between the northern and central fruit dis-

tries, thus showing the mean annual temperature of the northern district,—which is second to the southern in small-fruit production, and in 1898 produced more grapes than both the other districts put together,—to be practically the same as that of the great grape and small fruit sections of central New York. While speaking of temperature it should also be noted that the mean annual temperature of the famous Santa Clara valley and the Santa Cruz mountain wine grape district of California is 55° F., or about that of Madison and Bond counties, Illinois.

In 1898 the total annual precipitation at Galena, in the extreme northwest corner of the state, was 30 inches; in Henderson county and from thence along a line a little north of east clear across the state, 40 inches; in a circle taking in Adams, Pike, Fulton, Tazewell, Menard and Morgan counties, and along a line entering the state in Monroe county, bending north almost as far as Springfield, and thence southeast to Lawrence county, 50 inches; and in the 12 or 14 extreme southern counties of the state, 60 inches. The mean annual rainfall for 10 years up to and including 1898 at the Illinois Agricultural Experiment Station at Urbana, Champaign county, was nearly 33½ inches.

PRODUCTS.—An idea of the extent of the horticultural interests of Illinois can be best gained by reference to the following tables, which give the approximate production of the various horticultural crops raised in the state for five years, down to and including 1898:



1127. *Impatiens Sultani*.
(× ½).

ORCHARD FRUITS—Annual Crop in Bushels.

Year.	APPLES.				Total.
	Nor. Div.	Cent. Div.	Son. Div.	Total.	
1894	305,057	1,704,338	533,403	2,542,798	
1895	365,908	2,287,731	4,737,027	7,390,666	
1896	361,754	1,890,464	2,494,441	4,656,659	
1897	520,775	2,871,040	5,161,672	8,556,487	
1898	136,154	227,050	670,280	1,033,484	

Year.	PEACHES.				Total.
	Nor. Div.	Cent. Div.	Son. Div.	Total.	
1894	869	13,247	46,582	63,698	
1895	6,063	23,173	169,576	198,812	
1896	8,135	20,704	141,174	170,013	
1897	2,387	11,075	230,816	244,278	
1898	8,912	10,750	193,730	213,392	

Year.	PEARS.				Total.
	Nor. Div.	Cent. Div.	Son. Div.	Total.	
1894	313	1,845	3,007	5,165	
1895	275	1,828	14,194	15,997	
1896	434	1,251	12,191	13,876	
1897	192	1,060	13,773	15,025	
1898	223	885	10,177	11,285	

Year.	GRAPES—Annual Crop in Pounds.				Total.
	Nor. Div.	Cent. Div.	Son. Div.	Total.	
1894	603,638	658,908	467,813	1,731,089	
1895	198,888	459,916	410,839	1,069,643	
1896	218,151	467,877	263,980	960,018	
1897	449,803	573,505	279,807	1,303,115	
1898	715,502	435,544	201,807	1,352,943	

STRAWBERRIES—Annual Value of Crop.

1894	\$14,309	\$4,037	\$25,019	\$43,365
1895	5,506	1,065	3,458	10,999
1896	7,407	3,305	14,710	26,122
1897	14,362	3,864	24,374	42,600
1898	17,840	3,929	24,080	45,849

WATERMELONS—Annual Value of Crop.

1894	\$24,021	\$38,963	\$2,128	\$55,112
1895	20,231	18,116	11,710	50,057
1896	23,215	16,217	8,435	47,121
1897	21,997	16,451	8,276	46,224
1898	20,773	16,103	8,261	45,137

OTHER FRUITS AND BERRIES—Annual Value of Crop.

1894	\$28,190	\$36,930	\$42,364	\$107,484
1895	17,332	30,915	114,560	163,807
1896	18,196	22,586	80,733	121,515
1897	21,175	25,775	110,249	157,199
1898	25,807	26,452	84,186	136,445

SWEET POTATOES—Annual Crop in Bushels.

1894	7,901	85,321	235,704	328,926
1895	18,409	80,231	200,220	298,860
1896	25,408	67,147	210,790	303,345
1897	10,903	49,596	132,703	193,202
1898	12,633	67,327	280,156	360,116

The large falling off in the apple production of the state during the season of 1898 was due to a scourge of the apple-scab fungus, which attacked and devastated the apple orchards in all parts of the state. Pear-growing in southern Illinois has been more or less kept back by the prevalence of pear blight, which has destroyed many trees before coming into bearing. No comment on the other tables is necessary, as they tell their own story.

The nursery industry has been largely developed in Illinois. There are 447 commercial nurseries in the state, 203 in the northern division, 143 in the central, and 101 in the southern. The other branches of horticultural industry are also well developed in the state. Gardening for the Chicago market forms a large and important business in itself; while the growing of vegetables for shipment in certain sections of southern Illinois is assuming large proportions. Cobden, in Union county, is the largest shipping point for tomatoes in the United States, sending out some 300 car-loads of this single fruit during the season of 1898. Union county, exclusive of Cobden, shipped to outside markets about 400 car-loads of tomatoes during the same season.

Chicago was, according to the census of 1890, the second largest market in the United States for cut-flowers. The business has grown considerably since that time, although exact figures are not obtainable. The only notable examples of landscape horticulture or landscape gardening in the state are found in the Chicago city park system, which is the largest and in some respects the finest in the entire country.

With her situation, natural advantages, vast resources and present attainments along these lines, Illinois seems destined to take even higher rank horticulturally in the not far distant future than she has in the past; and with her increasing production and immense and growing railway facilities, to prove a formidable rival to the older fruit-producing regions of the Union.

The tables giving crop reports are compiled from figures given in the annual statistical reports of the Illinois State Board of Agriculture. Other figures (except where noted as being from census reports) are from the Report of the Illinois State Farmers' Institute for 1898. The climatic and meteorological information is based on reports of the United States Weather Bureau and records of the Illinois Agricultural Experiment Station.

J. C. BLAIR.

IMANTOPHYLLUM. Included under *Clivia*.

IMMORTELES. Consult *Everlasting Flowers*.

IMPATIENS (from the Latin; having reference to the pods, which, when ripe, on slight pressure burst open, scattering the seed). *Geraniaceae*. (By some referred to *Balsaminaceae*.) Tender, succulent herbs, with very fleshy stems and simple leaves usually alternate and the upper ones often in whorls; peduncles axillary with 1-6 or more fls. of various colors: sepals 3 (seldom 5), the posterior one taking on a spur-like shape; petals 5 or 3, in which case 2 are grown together; fr. a pod, which, when ripe, bursts when pinched, scattering the seeds. About 220 species, mainly from tropical India and Africa. About 20 have found their way into cultivation for the most part as greenhouse plants, *I. Balsamina* being the species best known as an outdoor annual. See *Balsam*. Propagation by cuttings and seed.

A. *Peduncles with single fls.*

Hawkeri, W. Bull. A bushy, soft-wooded plant with well branched stems of a dull red color; lvs. opposite or in whorls of 3, ovate, acuminate, serrate, dark green; peduncles axillary, long and slender; fls. rounded in outline, about 3 in. in diam., deep carmine, with a white eye. South Sea Islands. Int. about 1886. G.C. II. 25:761. I.H. 34:2.—A greenhouse plant, needing an intermediate temperature. Plants from early spring cuttings bloom all summer and into autumn.

platypétala, Lindl. (*I. pulcherrima*, Dalzell. *I. latifolia*, Hort.). Stems strong, succulent, branched and usually reddish purple; lvs. whorled, lanceolate or oval, serrate, hairy beneath; peduncles axillary, shorter than



1128. *Impatiens aurea* (× 1/2).
One of the native jewel-weeds.

the lvs.: fls. large, rose-colored; spur sickle-shaped, rather thin and petals transversely obcordate. Summer. Java. R.H. 1847:221. B.R. 32:68.—Needs a moderate to warm temp., and may be used as a house-plant or in

protected and warm situations outdoors. Prop. by cuttings, and during growth should be treated like *Gloxinias*. Var. *Lucie* or *Lucy* belongs here.

AA. *Peduncles with 1-2 fls.*

Sultáni, Hook. Fig. 1127 From 12-24 in. high, with stout stem and branches, rather succulent and green:



1129. *Impatiens Roylei* (× 1/2).

lvs. elliptical or lanceolate and narrowed into a petiole about 1 in. long; lower lvs. alternate, upper ones almost whorled; peduncles axillary, of a rich rose-red in the original form. Hybrids and sports have given shades from pink to almost purple, and a white variety also exists. Spur is very long and thin. Zanzibar. B.M. 6643. Gn. 23, p. 331. V. 7:325, 326. S.H. 2:280. I.H. 30:488; 42, p. 140. R.H. 1884:12.—Increased by seeds; also by cuttings, which root readily. With *I. Hookeriana*, the best in cult. A greenhouse plant; it also does well as a house plant, blooming almost continuously.

AAA. *Peduncles with 2-4 fls.: plant 2-4 ft.*

áurea, Muhl. (*I. pallida*, Nutt.). PALE TOUCH-MENOT. JEWEL-WEED. Fig. 1128. With *I. biflora* the representatives of the family in the indigenous flora of the U. S. Larger than *I. biflora*; otherwise similar to it, with pale yellow fls. sparingly dotted with brownish red; spur short, notched, and less than one-third the length of the posterior sepal. Moist, shady places. July-Sept. Quebec to Ore., Kans. and Ga. B.B. 2:404.—Procureable from dealers in native plants.

biflora, Walt. (*I. fulva*, Nutt.). SPOTTED TOUCH-MENOT. JEWEL-WEED. With *I. áurea* representing the genus in the U. S. An annual with orange-colored fls., mottled with reddish brown; spur strongly inflexed, about half as long as posterior sepal. Moist, shady places. July-October. Nova Scotia to Alaska, Ore., Mo. and Fla. B.B. 2:403. D. 155.—Has been offered by dealers in native plants.

Balsamina, Lindl. (*Balsamina hortensis*, DC.). GARDEN BALSAM. See Vol. I, p. 126.

AAAA. *Peduncles with 3-6 or more fls.*

Hookeriana, Arn. (*I. biglandulosa*, Moon. *I. Sultáni áiba*, Hort.). A very succulent much-branched plant, growing to a height of 3 ft.: lvs. long-petioled, ovate-lanceolate, toothed; peduncles axillary in the upper lvs.: fls. large, white, spotted with purple on the large lower petals; spur bent horn-shaped, and longer than the fls. Blooms in fall. Ceylon. B.M. 4704.—It is a perennial, requires a moderate temp., and does not bloom until well developed. Prop. by cuttings. One of the best species in cult.

Róylei, Walp. (*I. glandulifera*, Royle). Fig. 1129. A rather coarse garden annual, with strong stem, succulent and much-branched; lower lvs. opposite; upper lvs. usually in 3's and whorled, all ovate or ovate-lanceolate, naked, 4 in. long, sharply serrate; basal serrations and the petiole glandular; peduncles axillary, with 3 or more fls. and very numerous toward top of plant; fls. large, dark purple; spur very short. Aug., Sept. India. B.M. 4020. B.R. 26:22.—Grown from seed, needing but little care, and useful in groups.

G. N. LAUMAN.

IMPHEE. See *Sorghum*.

INCARVILLEA (after Incarville, the French Jesuit missionary to China). *Bigoniaceae*. About 10 species of herbaceous perennials from central Asia, one of which, *I. Delavayi*, has achieved extraordinary notice since 1893. It is a hardy plant with handsome pinnate foliage, each leaf being 1 ft. long, with as many as 15-20 dentate segments; scape 1-2 ft. high, bearing 2-12 large trumpet-shaped, rosy purple fls., each 2-3 in. long and as much wide. These fls. are probably equal in decorative value to many of the *Bigonias* cherished in our greenhouses. In size and beauty they rank with those of *Catalpa*, *Bigonia* and *Tecoma*, of the same family. This species is certainly the finest hardy herbaceous perennial in the *Bigonia* family. The tube is yellow inside and out, and the 2 upper lobes are smaller than the 3 lower ones. The genus is closely allied to *Amphicome*, and the flowers of both have the same general appearance, but in *Incarvillea* the calyx lobes are awl-shaped, while in *Amphicome* the calyx is truncate or shortly dentate. Also the seeds of *Incarvillea* have an entire hyaline wing, while in *Amphicome* the seeds have a wing that is cut into long thin, strips or hairs. The two genera form a small but remarkable group, characterized by their capsules opening by the ventral suture only. William Watson declares that *Incarvilleas* are not annuals, as stated in the botanies.

The general experience seems to be that these plants need rather more winter protection than most hardy herbaceous perennials. A light, sandy loam, well enriched and deeply worked, suits them well, and they like a sheltered position in a rather warm, sunny place. Prop. by division or seed.

A. *Segments toothed from base to apex.*

Delavayi, Bur. & Franch. Fig. 1130. Lvs. few, radical; fls. 4-5 in. long, not quite opposite; stamens included. B.M. 7462. Gn. 54:1198. R.H. 1893:544. J.H. 111. 30:149. Gt. 43:1398. Mn. 3, p. 26. G.C. 111. 26:659. G.M. 38:306.



1130. *Incarvillea Delavayi*.

AA. *Segments parted or dissected.*

variabilis, Batalin. Subshrub; lvs. 2- or 3-pinnate; segments parted or dissected, their lobes entire or slightly lobed; fls. as many as 10, pale rose. Gt. 47, p. 222.—Int. 1898 by Haage and Schmidt, who say that it makes a strong-growing, bushy plant covered with fls. each 1 in. or more across, from May to Oct.; also that seedlings bloom the first year.

AAA. *Segments often entire or nearly so.*

B. *Form of segments lanceolate or narrow-ov.*

Ölgez, Regel (*I. Köopmannii*, W. Lauche). Subshrub, 2-3 ft. high; lvs. 2-4 in. long; segments linear-oblong

or lanceolate, narrower than in *I. Delavayi*, especially at the base, entire or with a few distant teeth towards the tip; fls. pale pink, veiny; tube $\frac{1}{2}$ in. long; limb about 1 in. across, the 5 lobes nearly equal. B.M. 6593 (throat not yellow). G. C. 111. 19:89. Gn. 28, p. 653.—The hardiest species.

BB. *Form of segments ovate or broader.*

grandiflora, Bur. & Franch. Differs from *I. Delavayi* in its shorter lvs., more rounded fls., short scapes bearing only 1 or 2 fls., as large as those of *I. Delavayi*, but with narrower calyx lobes and longer corolla lobes, the color deep rose-red. Dried specimens show about a dozen scapes on a plant. China. (In. 56:1230.—Int. about 1898. Imperfectly known, and may be a form of *I. compacta*. *I. grandiflora*, Poir.=*Tecoma grandiflora*. *I. grandiflora*, Spreng.=*Eschynaakhus grandiflora*.)

J. B. KELLER and W. M.

INDIANA, HORTICULTURE IN. Fig. 1131. Indiana is essentially a fruit-growing state. There is no part of its soil that cannot be made suitable for the production of fruit of some kind. There are portions, however, that are better adapted to the growing of wheat and corn or grazing on account of the prairie character of the soil, or the climatic conditions, which render the cultivation of orchard fruits a precarious business. By referring to the accompanying map, it will be seen that the mean annual isotherms for the year 1898, and the same will hold approximately for a series of years, are decidedly irregular in the northern part of the state, while in the southern half they run more uniformly across the state. This is caused very largely by the ameliorating influence of Lake Michigan, which is felt very perceptibly along the northern counties which are protected from the severe northwest winds; but it is not felt in any appreciable degree as we go down the western side of the state. And so it often happens that the temperature falls lower 75 miles south of Lake Michigan than it does in the counties bordering on Michigan. This difference is often great enough to render peach growing in this section, as a commercial business, out of the question. From the northeastern portion of the state south to the Ohio river, and covering all that territory not already mentioned, the climate is not so severe, and fine crops of peaches are often produced. The dotted line shown on the map, starting near Michigan City and running in an irregular line, taking in most of the famous Kankakee marshes, thence in a southerly and westerly direction, finally striking the west line of the state a little north of Terra Haute, is intended to indicate, approximately, that portion of the state that is better adapted to the growing of general farm crops than fruit. This is not wholly due to climatic causes, but in a large degree to adverse soil conditions. A large part of this region is flat prairie land; much of it was once covered with marshes, but with modern drainage facilities nearly all of this naturally fertile land has been improved until it has become one of the best farming sections in the state. Only occasional spots, however, are high enough for orchard purposes; but small-fruits and vegetables grow with the greatest luxuriance, and large quantities of these are shipped to the Chicago market. A region in the Kankakee valley, including Starke and adjoining counties, is famous for its sugar beet productions. The soil here is of a sandy nature, eminently adapted to the culture of this vegetable; specimens have been analyzed which yielded 22 per cent of sugar, with a purity coefficient of 90 to 95. While there are not many large commercial orchards found in the northern and northeastern portions of the state, the soil and climate are admirably adapted to the growing of all kinds of orchard fruits, with the exception of peaches, which are grown only to a limited extent. Here we find a sandy or clay loam, with clay subsoil, which was originally covered with oak, maple, hickory, walnut and all kinds of hard woods found in this climate. The surface is more or less rolling, with numerous small lakes dotting the landscape, thus insuring both soil and atmospheric drainage. In the shallow waters of some of these lakes and marshes the cranberry finds congenial surroundings, and in the sandy districts of Pulaski, Fulton, Kosciusko and surrounding counties, the huckleberry grows to perfection.

In eastern Indiana the plum and the cherry are grown more largely than the peach, while the central part of the state excels in pears. Small-fruits are abundant everywhere.



Southern Indiana has a mean annual temperature 8° to 10° warmer than that of the northern end. With other favorable conditions in the way of soil, protection from severe winds and perfect atmospheric drainage, owing to the fact that the country for the most part is hilly, the peach and other tender fruits are successfully grown. Here, on the banks of the Ohio river, was, until recently, one of the largest peach orchards in the middle West; and even now orchards of from 40,000 to 50,000 trees may be seen on the "knobs" in Clark and Washington counties. Here, too, is the home of the "Big Red Apple" (Ben Davis) and the Kieffer pear. The largest Kieffer pear orchard may be seen near the town of Salem, in Washington county. This orchard consists of 12,000 trees. The soil in southern Indiana is for the most part decidedly different from that found farther north. In a report of the United States Geological Survey made some years ago, mention is made of the "white clay lands," which cover a large portion of southern Indiana, Ohio and Illinois, where most of the finest fruit is grown. In Indiana the northern boundary of this peculiar formation, according to the description, begins near Terre Haute on the west, and passes more or less irregularly across the state, passing into Ohio near Brookville, Franklin county. Thus the greater portion of the state south of this line is made up of this white clay deposit. In many places this clay becomes almost a brick-red, but the characteristics are, in general, the same, whatever the color. An apple orchard consisting of such varieties as Ben Davis, Rome Beauty, Winesap, Rall's Genet and Grimes' Golden, planted on these clays, is certain to reward the owner who gives it intelligent attention.

Here is also the home of the papaw, *Asimina triloba*, and the native persimmon, *Diospyros virginiana*. Excellent varieties of the latter are cultivated to some

extent for the large markets, but the industry is as yet in its infancy. Both of these wild fruits offer a wide field for investigation. This section also includes the famous melon districts, where both musk- and water-melons are grown to perfection. Hundreds of acres are grown annually and the products shipped to the larger cities of the North and West.

JAMES TROOP.

INDIAN BEAN. *Catalpa*. **I. Cherry.** *Rhamnus Caroliniana*. **I. Corn.** *Zea Mays*. See **Corn**. **I. Cress.** *Tropaeolum*. **I. Cucumber-Root.** *Medeola Virginia*. **I. Currant.** *Symphoricarpos vulgaris*. **I. Fig.** *Opuntia vulgaris*. **I. Hemp.** *Apocynum cannabinum*. **I. Mallow.** *Abutilon*. **I. Physic.** *Gillenia*. **I. Pipe.** *Monstropa*. **I. Rice.** *Zizania aquatica*. **I. Shot.** *Canna*.

INDIAN TERRITORY, HORTICULTURAL POSSIBILITIES OF. Fig. 1132. The horticulture of the Indian Territory is in a very primitive state. The land is owned in common. The individual has the right to live on and occupy a certain piece of land for an indefinite length of time. The shipping facilities are poor. The local markets are very limited. The country is thinly populated. There is an abundance of wild fruit. The people are not sufficiently educated in agricultural industries to be successful in fruit culture.

There are soils of all kinds in the Territory. Most of the soil, however, is a sandy loam with a clay subsoil. Most of the land drained by the Arkansas and Canadian rivers is sandy. That drained by the Neosho and Verdigris is a black clay and limestone land with heavy clay subsoil. All the grades between these can be found on the borders of these river watersheds. In the extreme southern part some of the land is very low and wet.

Most of the country is rolling, and in extreme north-eastern and south central part the hills almost reach the dignity of mountains. The Boston mountains (a spur of the Ozarks) run along the northeast border. The Washtau hills extend through the southern part from east to west. The Flint hills enter the northwest part of the Territory, and are enclosed by the Arkansas and Verdigris rivers. From this it will be seen that but little of the country is flat or low and swampy, and the best of exposures for fruit land may be had in all parts of the country. There are no lakes or large bodies of water in the Territory.

The flora is about the same as that of Arkansas, although more limited in the western part. Few collections have been made, and only the plants of commercial importance are well known. The forest belts of Arkansas and Missouri extend for some distance into



1132. Indian Territory.

the Territory. Most of the timber is only second grade, composed of oaks, pine and walnut.

Graden crops, where grown and cultivated, do well. Potatoes are grown to some extent for market in the Cherokee Nation, and give good returns. The early potatoes do best, but are very hard to keep over sum-

mer. Late potatoes yield well, but require more care in cultivation. Onions, beets, carrots, tomatoes and cabbage all produce good crops, but are not grown in commercial quantities. All of these vegetables promise to be money-makers in case of settlement of the country. Melons are grown here and shipped to neighboring markets with fair profits.

There are apple orchards in the Territory that have been in bearing for 15 years, and are still in fair condition. These orchards are usually near the Indian agencies or Mission schools, and are cared for by white people. When Oklahoma was first opened for settlement there were several wagon loads of apples taken to Guthrie and Oklahoma city, from the Creek Nation. These apples were of as good quality and as fine in appearance as apples shipped from Missouri and Kansas, and sold for a higher price. There are still a few apples taken each year from the Creek and Chickasaw Nations to the border towns of Oklahoma and sold for a good price. The fruit is the same quality as that grown in southern Missouri and northern Arkansas.

Few peach orchards have been planted, and these are mostly of seedling trees. The light open winters frequently cause the crop to be diminished or destroyed by the late spring frosts.

Plums seem to be perfectly at home here, and are almost a sure crop every year.

Grapes and berries are usually very free from disease, and bear heavily. The fruit is large, well developed and of a fine quality.

The soil and climate of Indian Territory are both very favorable to the production of fruit, and with permanent white settlement horticulture has a bright future within the borders of the Territory. O. M. MORRIS.

INDIAN TOBACCO. *Lobelia inflata*. I. Turnip. *Artemisia triphylla*. I. Wheat. *Fagopyrum Tartaricum*.

INDIGO. See *Indigofera*. False Indigo. See *Baptisia* and *Amorpha*.

INDIGÓFERA (*Indigo-bearing*). *Leguminosae*. Indigo. Perhaps 250 herbs or shrubs in many parts of the world. Lvs. odd-pinnate (rarely digitate); fls. usually small, in axillary racemes or spikes, in color ranging from purple to rose and white; standard mostly roundish, often persisting for some time; keel with a spur on either side; pod various, usually with thin partitions between the seeds. Several species are native to the United States.

Indigo is mostly the product of *I. tinctoria*, of Asia, but it is also made from the West Indian species, *I. Anil*. Other species, even of other genera, also yield indigo. These species were early introduced into the southern states for indigo-making, and the product was once manufactured to a considerable extent. The plant was introduced into South Carolina in 1742 from the West Indies. When it was found that commercial indigo could be made, the British Government offered a bounty. In 1775, the production was more than one million pounds of indigo. The war for independence checked the industry, and thereafter the rising importance of the cotton crop, amongst other things, drove it to the wall. But as late as the middle of the present century, indigo continued to be made in remote places. Plants still persist in some places as escapes from cultivation. *Indigofera tinctoria* is perennial, but is grown from seeds, which give from two to four cuttings of herbage the first year. The indigo is not contained in the plant, but the dye is a product of manufacture from a glucoside indican which is contained in the herbage, and which is obtained as an extract. Indigo seed is offered by seedsmen.

In North America, several species of *Indigofera* are occasionally grown as ornamental subjects. In the North, they are mostly green-house subjects. Propagated by seeds or cuttings, chiefly the latter.

AA. *Raceme as long as or longer than the leaf.*

decolorata, Lindl. Weak-growing or even half-climbing shrub, the branches slender and red-tinged; leaflets in 6-8 pairs, broad-lanceolate, usually drooping, sharp-pointed; racemes long, with showy rose-pink fls. about

1 in. long; standard oblong, nearly or quite obtuse, with a heart-like mark near the base; wings linear-lanceolate or spatulate, ciliate. China. B.R. 32:22. B.M. 5063. G.M. 31:591. P.M. 16:290.—Regarded as a greenhouse plant and cult. in the open far South. Var. *alba* is said (G.F. 7, pp. 266, 376, fig. 61) to be a hardy herbaceous or half-shrubby plant at the Arnold Arboretum.

macrostachys, Vent. Shrubby, the stems terete and appressed-pubescent; leaflets 8-10 pairs, oval-oblong, obtuse but mucronate, pubescent; racemes longer than the lvs., many-fld.; fls. rose. China.

Caroliniana, Walt. Tall and branching; leaflets 5-8 pairs, oblong or obovate; fls. small, many, yellowish brown and with short-acute calyx teeth; legume oblong, 2-seeded, less than $\frac{1}{2}$ in. long. Perennial, in the pine barrens from N. Carolina south.

AA. *Raceme mostly shorter than the leaf.*

australis, Willd. (*I. angulata*, Lindl. *I. sylvatica*, Sieb.). A very variable species, known by its glabrous aspect, short or nearly obsolete teeth of the calyx and the pod glabrous when young. Erect shrub; lfts. 9-17, varying from oblong to almost orbicular, $\frac{3}{4}$ in. or less long, obtuse or retuse; fls. red and mostly showy; the racemes sometimes as long as the lvs.; standard truncate at the base, with a very short claw; pod nearly or quite straight, terete. Austral. B.R. 5:386. L.B.C. 2:149. B.M. 3000.—Extreme South.

tinctoria, Linn. INDIGO. Fig. 1133. Shrub, 4-6 ft., with silvery branches; lfts. 7-15, thin, rather large, obovate-oblong, pubescent beneath; fls. small, reddish yellow.



1133. *Indigofera Anil*.

Nearly natural size. The single pod is *I. tinctoria* ($\times \frac{1}{2}$).

low, in short racemes; pod nearly straight, somewhat knotty, 8-12-seeded. S. Asia.—Long cult. and widely distributed. Runs wild South. Indigo was known to the Egyptians.

Anil, Linn. WEST INDIAN INDIGO. Fig. 1133. Much like the last, but fls. smaller, and pods curved and not knotty. W. Indies, but now runs wild in the southern states. B.M. 6566. L. H.B.

INGA (a West Indian name). *Leguminosae*. This contains some tropical trees and shrubs, with acacia-like foliage and clusters of showy red stamens. Under this name 3 species are cult. in S. Calif., but 2 of them be-

long to Calliandra. Another allied genus is *Pithecolobium*. *Inga* has pinnate foliage; the other two genera have bipinnate foliage. In *Inga* the pod is scarcely or slowly dehiscent; in *Calliandra* the valves dehisce classically from the apex to the base of the pod and are revolute; in *Pithecolobium* the valves are often twisted, but never rolled back and elastic.

A. *Leaflets hairy beneath.*

affinis, DC. (consult *I. dulcis* in the supplementary list). Lvs. simply pinnate; lfts. in 4 pairs, ovate, acuminate, pubescent above, somewhat shining and villous below, one side smaller than the other, 3 in. long, 1½ in. wide; petioles, branches, peduncles and fls. velvety tomentose, a gland between each pair of lvs.; spikes solitary or in pairs; corollas villous. Trop. Amer.—This is probably the plant cult. in S. Fla. and S. Calif. as *I. dulcis*.

AA. *Leaflets not hairy.*

Feuillei, DC. Lvs. simply pinnate; lfts. in 3-4 pairs, oval-oblong, acute at both ends, glabrous; pods 1-2 ft. long, linear, flat, glabrous, white inside. Peru.—Int. 1900 by Franceschi. The sweet, edible pulp of the pods is much prized by the Peruvians, who call it Paey.

I. anomala, Kunth. Properly *Calliandra grandiflora*, Benth. Carambol. lvs. bipinnate; pinnae 15-17 pairs; lfts. more than 20-paired, linear, obtuse; petioles not glandular; branches, peduncles and fls. puberulous; fls. ros. dry; pod linear, acute, narrowed at the base, glabrous, thickened at the margin. Trop. Amer.—*I. dulcis*. The older plant of this name is Willdenow's, which comes from the Philippines, and is described under *Pithecolobium*. *I. dulcis*, of Martius, comes from Brazil, and is *I. affinis* described above. Franceschi's plant of *I. dulcis* makes a bushy tree, which he says comes from Central America, and has pods containing a white pulp rich in sugar. This plant, he says, grows only in frostless districts, while *Inga anomala* and *pulcherrima* will grow where the lemon thrives.—*pulcherrima*, Cerv. Properly *Calliandra Tweedii*, Benth. Lvs. bipinnate; pinnae 3-5-paired; lfts. as many as 25-paired, paler and slightly hairy beneath; stipules ovate-sarceous, brown hairy; peduncle being a head of about 20 fls. Mex. B.M.4188. P.M. 11:147.

W. M.

INKBERRY. *Ilex glabra*.

INSECTICIDES. Substances used to kill insects, as commonly understood; but, as defined in dictionaries, "one who or that which kills, or the act of killing an insect," constitutes an Insecticide. Hence there are many natural Insecticides, such as winds, rains, sudden changes of temperature, forest and prairie fires, insectivorous plants, some bacteria and fungi, several of the higher animals (including man), and many of the invertebrates (including spiders and a host of parasitic and predaceous insects). Oftentimes these Insecticides of nature materially aid man in his warfare against injurious insects, but usually it is necessary to resort to a spray or some other artificial Insecticide.

Insecticides may be classed into those which are eaten with the food and kill by poisoning; powders, washes and gases which kill by suffocation; and certain oils and soaps which kill when they come in contact with the body, and may also suffocate by closing the breathing holes. The poisons are effective against only the biting or chewing insects, and the sucking insects must be hit with a powder, an oil or soap; or both kinds of feeders may be suffocated with the gaseous Insecticides.

Arsenic is the chief ingredient in most poisonous Insecticides. Its solubility in water, causing it to burn the foliage severely, prevents its being used alone. But by boiling one pound of it with two pounds of lime or four pounds of sal-soda in two gallons of water for half an hour, a very cheap, effective and reliable Insecticide results; use about 1½ quarts to 40 gallons of Bordeaux mixture or water.

Paris green is still the standard poisonous Insecticide, but its cost and adulteration have recently brought several substitutes, such as paracrene and green arsenoid, on the market. London purple is too soluble and variable to give uniform results; hence it is not as much used as formerly. These arsenicals are used at the rate of 1 pound in from 100 to 300 gallons of water or Bordeaux mixture on fruit trees, the most dilute on the peach. Arsenate of lead is now largely

used against such insects as the gypsy moth and the elm leaf-beetle; large quantities of it can be used on the foliage without injury, and it adheres better than Paris green, but is sometimes more expensive. Hellebore, the standard currant worm remedy, is especially valuable to use after fruits are more than half grown, when there would be danger from the use of the arsenical poisons.

Tobacco in its various forms is one of the best Insecticides for sucking insects; it is particularly useful in greenhouses. Pyrethrum powder is the standard Insecticide for house-flies, and is often effectively used against other insects.

Kerosene is one of the most active and effective of Insecticides. It can rarely be used with safety undiluted, but as an emulsion with soap, it has been the standard remedy for sucking insects for many years. The formula is: half a pound of soap, 1 gallon hot water, and 2 gallons of kerosene; pour the kerosene into the hot soap solution and agitate violently for a few minutes. Recently, however, manufacturers have devised spray pumps which combine kerosene and water into a good, effective emulsion. These kerosene pumps can be regulated to use certain percentages of kerosene, but they are often unreliable and have not taken the place of the kerosene soap emulsion. Whale-oil soap is now extensively and successfully used in killing scale insects and plant-lice. It and the lime-sulfur spray are the most effective sprays now in use against the famous San José scale, the pear psylla, and other sucking insects. Crude petroleum has been successfully used in combatting cattle lice and the horn-fly, and is an effective but sometimes unsafe substance to apply on dormant trees for the San José and other scales. In California, a resin wash and a lime, salt and sulfur wash are intensively used and found very effective against scale insects; in the East the lime-sulfur wash is also effective.

Two gases are extensively used in killing insects. The fumes of carbon bisulfide are certain death to insects infesting stored grains, seeds or clothing. Place the infested material in a tight box; pour the liquid, at the rate of 1 pound to each 100 bushels, or 1 pound to each 1,000 cubic feet, into shallow dishes placed on top of the materials, and quickly close the box, leaving it for a day or so. The fumes are explosive; hence keep all lights away. This liquid has also been successfully used in treating melon and cucumber vines, under covers for plant-lice. The other gaseous Insecticide is hydrocyanic acid gas, the uses of which are discussed below under *Scale Insects*, page 812.

The arsenical poisons seem to be equally effective when applied in combination with the fungicide Bordeaux mixture, and most fruit-growers now spray with such a combination. Sometimes one of the Insecticides for killing sucking insects has been successfully mixed with the Bordeaux, but it is doubtful if they are as effective when thus applied. The poisons do not readily mix with the soaps or oils, and, as a rule, one cannot effectively hit sucking insects, biting insects, or the fungous diseases with a single application of some combination mixture.

M. V. SLINGERLAND.

INSECTS. The animals which constitute the Insect world play an important part in most horticultural operations. The busy bee is an indispensable aid in the production of many fruits, but the equally busy jaws of canker-worms or other Insects oftentimes seriously interfere with man's plans for profitable crops. Horticulturists should become more intimately acquainted with their little friends and foes in the Insect world. Not only from the economic standpoint is this knowledge necessary in the business of growing plants, but the striking peculiarities of form, coloring, structure, habits, and the wonderful transformations of Insects afford one of the most interesting fields in nature. The life-stories of many Insects, if told in detail, would rival in variety and interest many a famous fairy tale. The science that treats of Insects, or entomology, has now reached the stage where its devotees are no longer looked upon as "crazy bug-hunters" in most communities. A recent directory of the entomologists, or those interested in the study of Insect life, of the United States and Canada contains the names of over 1,200 persons.

What They Are.—An Insect is an animal which, in the adult stage, has its body divided into three distinct regions: the head, the thorax and the abdomen (Fig. 1134). The head bears one pair of antennae, and there are always three pairs of legs and usually either one or two pairs of wings attached to the thorax. By these characteristics one can usually readily distinguish an adult Insect from any other animal. Among the near relatives of Insects in the animal world are the cray-fish, sow-bugs and crabs, but these are mostly aquatic animals, breathing by true gills; they have two pairs of antennae, and at least five pairs of legs.

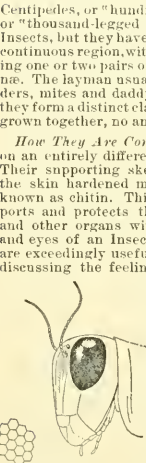
Centipedes, or "hundred-legged worms," and millipedes, or "thousand-legged worms," are also nearly related to Insects, but they have the thorax and abdomen forming a continuous region, with from 6 to 200 segments, each bearing one or two pairs of legs; they have one pair of antennae. The layman usually classes such animals as the spiders, mites and daddy-long-legs among the Insects, but they form a distinct class, as they have the head and thorax grown together, no antennae, and have four pairs of legs.

How They Are Constructed.—Insects are constructed on an entirely different plan from the higher animals. Their supporting skeleton is outside, it being simply the skin hardened more or less by a horny substance, known as chitin. This firm outer wall, or skeleton, supports and protects the muscles, blood-vessels, nerves, and other organs within. The mouth-parts, antennae and eyes of an Insect are attached to its head, and all are exceedingly useful organs, as will be shown later in discussing the feeling and the other sensations of an Insect. An Insect's wings and legs are always borne by the thorax. The wings are primarily organs of flight, but are used as musical organs by some of the grasshoppers and crickets. Female canker-worm moths, bed-bugs, and some other Insects have practically no wings, and the house-flies, mosquitoes, male bark lice, and similar Insects have but one pair of wings. Insects use their legs primarily for walking, running or climbing; some have their front legs modified for catching other Insects for food; others have hind legs fitted for jumping, while the honey-bee has little "pockets" on its hind legs for carrying pollen to feed its young.

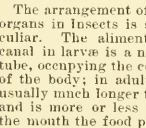
The arrangement of the internal organs in Insects is somewhat peculiar. The alimentary or food-canal in larvæ is a nearly straight tube, occupying the central portion of the body; in adult Insects it is usually much longer than the body and is more or less folded; from the mouth the food passes through a pharynx, an esophagus, sometimes a crop and a gizzard, a stomach, and a small and large intestine. The nervous system of an Insect is similar to that in the higher animals, but it extends along the venter instead of the back. There is a little brain in the upper part of the head, and two nerve cords extend from this around the food canal to another ganglion or nerve center in the lower part of the head; two nerve cords then extend longitudinally along

the venter and connect a series of nerve centers or ganglia, typically one for each segment of the body. From each of these ganglia or little brains nerves arise, which supply the adjacent organs and ramify throughout the body. In Insects, all parts of the body cavity that are not occupied by the internal organs are filled with a rich, colorless or slightly greenish blood. There is no system of tubes, like our arteries and veins, in which the blood is confined and through which it flows. There is a so-called "heart" above the food-canal, along the middle line of the back; it is a tube consisting of several chambers communicating with each other and with the body cavity by valvular openings. The blood is forced through this heart into the head, where it escapes into the body cavity. It then flows to all parts of the body, even out into the appendages, in regular streams which have definite directions, but which are not confined in tubes. They, like the ocean currents, are definite streams with liquid shores. Insects do not breathe through the mouth, as many suppose, but

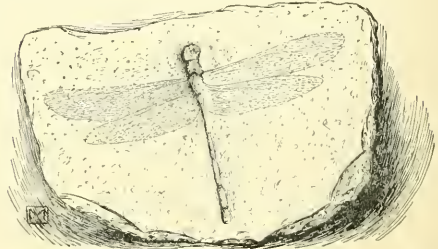
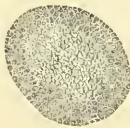
1134. A beetle.
Showing the different parts.



1135.
Head of grasshopper.
Showing the great eye.
A detail of a part of the surface of the compound eye is also shown.



1137. The four stages in an insect's life—egg, larva, pupa, imago.—The codling-moth. Egg much enlarged; others $\times 1\frac{1}{2}$.



1136. Fossil dragonfly, *Petahia longialata* ($\times 15$).

through a series of holes along the sides of the body. These openings, or spiracles, lead into a system of air tubes, called tracheæ. These tracheæ branch and finally ramify all through the Insect. Insects have no lungs, but the tracheæ sometimes connect with air-sacs or bladders in the body, which help to buoy up the Insect when flying. Thus the relation between the circulation of the blood and respiration is not nearly so intimate in Insects as in man. In Insects the air is carried to all the tissues of the body in the tracheæ and the blood simply bathes these tissues. Just how the blood is purified and how the waste matter is disposed of in Insects are not yet clearly understood. Aquatic Insects breathe by either carrying down bubbles of air from the surface entangled under their wings, or they may be provided with organs known as tracheal gills; these are usually plate-like expansions of the body that are abundantly supplied with tracheæ, in which the air is brought practically in contact with the air in water, and may thus be purified. More than 4,000 different muscles have been found in a single caterpillar. Notwithstanding their delicate appearance, these muscles are really very strong and their rapidity of action is wonderful; in certain gnats the

muscles move or vibrate the wings 15,000 times per second. *Their Sensations.*—Insects can see, feel, hear, taste and smell, and they may also possess other senses, as a sense of direction. Many Insects have two kinds of eyes. On each side of the head the large compound eye is easily recognized (Fig. 1135); each compound eye is composed

of many small eyes, from 50 in some ants to many thousands in a butterfly or dragon-fly. Between these compound eyes, from one to four simple eyes are to be found



1138. Nymphs of the four-lined leaf-bug and adult of the tarnished plant-bug.

The smallest one is the nymph recently hatched. The next is the nymph after the first moult. The imago is shown at the right. Hair lines at the right of nymphs, and small figure near imago indicate the natural size.

in many adult Insects. Caterpillars and other larvae possess only simple eyes. It is thought that each facet of the compound eye sees a part of an object; thus the whole eye would form a mosaic picture on the Insect's brain. The simple eyes doubtless see as our eyes do, and seem to be best adapted for use in dark places and for near vision. Insects do not see the form of objects distinctly, but their eyes are doubtless superior to ours in distinguishing the smallest movements of an object. It is now supposed that no Insects can distinctly see objects at a greater distance than 6 feet. It must be a sixth sense, a sense of direction, which enables the bee to find its way for a mile or more back to its home. Insects are doubtless able to distinguish the color of objects, and some Insects seem to prefer certain colors. Blue is said to be the favorite color of the honey-bee, and violet that of ants; ants are also apparently sensitive to the ultra-violet rays of light, which man cannot perceive. It is generally supposed that the shape and high colors of flowers attract Insects; but recent experiments seem to show that Insects are guided to flowers by the sense of smell rather than by sight.

The hard outer skin of an Insect has no nerves distributed in it, hence it is not sensitive; but it is pierced with holes, in which grow hairs that are in connection with nerves at their base. It is by means of these sensory hairs that Insects feel, and are sensitive to touch on most parts of the body.

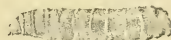
Doubtless Insects are not deaf, for we know that many of them make sounds, and it must naturally follow that they have ears to hear, for there is every reason to suppose that they make these sounds as love-songs to attract the sexes, as a means of communication, or possibly to express their emotions. Some think that



1140. Tent-caterpillar.



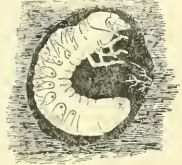
1139. Larva of a sphinx moth.



1141. A maggot.

Larva of a dipterous insect.

bees and ants hear sounds too shrill for our ears. Insects have no true voice, but produce various noises mechanically, either by rapid movements of their wings, which causes the humming of bees and flies, or by friction between roughened surfaces on the body or its appendages, thus producing the rasping sounds or shrill cries of some crickets and grasshoppers. The house-fly hums on F, thus vibrating its wings 335 times in a second, while the wing tone of the honey-bee is A. Usually the males are the musicians of the Insect world, but it is the female of the familiar mosquito which does the singing, and the "biting" also. The male mosquito doubtless hears the song of his mate by means of his antennae, as the song causes the antennal hairs to vibrate rapidly. Organs which are structurally ear-like have been found in various parts of the body of Insects.



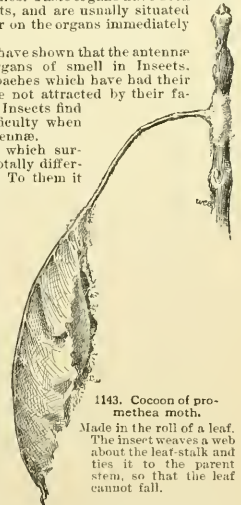
1142. A grub.
Larva of a beetle.

The common brown grasshoppers of the fields have a large ear on each side of the first segment of the abdomen; one can easily distinguish with the naked eye the membrane or tympanum stretched over a cavity. Many of the long-horned green grasshoppers, katydids and crickets have two similar ears on the tibia of each front leg. Some think that mosquitoes have the faculty of the perception of the direction of sound more highly developed than in any other class of animals.

Insects undoubtedly possess the sense of taste. When morphine or strychnine was mixed with honey, ants perceived the fraud the moment they began to feed. The substitution of alum for sugar was soon detected by wasps. Bees and wasps seem to have a more delicate gustatory sense than flies. Taste organs have been found in many Insects, and are usually situated either in the mouth or on the organs immediately surrounding it.

Many experiments have shown that the antennae are the principal organs of smell in Insects. Blow-flies and cockroaches which have had their antennae removed are not attracted by their favorite food, and male Insects find their mates with difficulty when deprived of their antennae.

The familiar world which surrounds us may be a totally different place to Insects. To them it may be full of music which we cannot hear, of color which we cannot see, of sensations which we cannot perceive. Do Insects think or reason? Why not? Their actions are said to be the result of inherited habit or instinct. But some of them have been seen to do things which require the exercise of instinctive powers so acute and so closely akin to reason that one can hardly escape the conclusion that some Insects are endowed with reasoning powers.



1143. Cocoon of pro-methea moth.

Made in the roll of a leaf. The insect weaves a web about the leaf-stalk and ties it to the parent stem, so that the leaf cannot fall.

Their Number, Size and Age.—Experts guess that there are from 2,000,000 to 10,000,000 different kinds of Insects in the world. Only about 400,000 of these have yet been described and named by man. Between 30,000 and 40,000 are now known in North America. Four-fifths of all the kinds of animals are Insects; some single families of Insects are said to contain more species than one can see stars in a clear sky at night; and

there are as many butterflies as birds in North America. The larger part of the land animals are Insects, and it is asserted that the larger proportion of the animal matter existing on the lands of the globe is probably locked up in the forms of Insects.

Insects vary in size from little beetles, of which it would take 100, placed end to end, to measure an inch, up to tropical species 6 or 8 inches in length, or of equal bulk to a mouse.

Insects have a very long, but, as yet, very imperfect pedigree extending through the geological ages to Silurian times. Fossil remains of many different kinds of Insects have been found in the rocks (Fig. 1136); even such delicate Insects as plant-lice left their impress on the rocks ages ago.

In the carboniferous or coal age, the Insect world was evidently quite different from that of to-day, for fossils of veritable Insect mammoths have been found; dragon-flies with a wing-expanse of from 2 to 3 feet then existed. Insect fossils found in the Tertiary rocks indicate that there were more kinds of Insects then than now.



1145. End of cocoon of Cecropia moth.

Inside view, showing where the moth gets out.

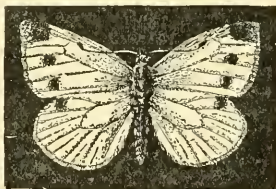
Their Growth and Transformations. Fig. 1137.—Insects begin life as an egg; in some cases the egg stage is passed within the body of the mother, which then gives birth to living young. The eggs of Insects exhibit a wonderful variety of forms, sizes, colors and characteristic markings. A single scale Insect may lay thousands of eggs, while some plant-lice produce only one. Remarkable instinct is often shown by the mother Insect in placing her eggs where her young will find proper food.

From their birth the young of some of the lowest or most generalized Insects closely resemble their parents, and they undergo no striking change during their life; hence are said to have no metamorphosis.

In the case of grasshoppers, stink-bugs, dragon-flies, and many other Insects, the young at birth resemble their parents, but have no wings. As they grow, wings gradually develop and often changes in markings occur, until the adult stage is reached. The growth, however, is gradual, and no striking or complete change occurs, and these Insects are said to undergo an incomplete metamorphosis. The young Insects in all stages are called *nymphs* (Fig. 1138); thus Insects with an incom-



1146. Pupa of tomato worm.



1147. The cabbage butterfly.

plete metamorphosis pass through three different forms during their life: an *egg*, the young or *nymph* stage, and the *adult*.

From the eggs of butterflies, moths, flies, beetles,



1144. Lengthwise section of the promethæa cocoon.

Showing at the apex the valve-like opening through which the moth escaped.

bees and some other Insects, there hatches a worm-like creature, much unlike the parent Insect. It is called a *larva* (Fig. 1139); the larvæ of butterflies and moths are often called *caterpillars* (Fig. 1140); *maggots* are the larvæ of flies (Fig. 1141); and the term *grub* is applied to the larvæ of beetles and bees (Fig. 1142). When these larvæ get their full growth, some of them go into the ground, where they form an earthen cell, while others proceed to spin around themselves a silken home or *cocoon* (Figs. 1143, 1144, 1145). In these retreats the larvæ change to a quiescent or lifeless-appearing creature which has little resemblance to either the larva or the parent Insect. It is called a *pupa* (Fig. 1146). The pupæ of butterflies are often called *chrysalids*.

Flies change to pupæ in the hardened skin of the maggot. Some pupæ, like those of mosquitoes, are very active. Wonderful changes take place within the skin of the pupa. Scarcely all the larval tissues break down and the Insect is practically made over, from a crawling larva to a beautiful, flying adult Insect. When the adult is fully formed, it breaks its pupal shroud and emerges to spend a comparatively brief existence as a winged creature. Such Insects are said to undergo a complete metamorphosis, and pass through four strikingly different stages during their life: the egg, the worm-like larva, the quiescent pupa, and the adult Insect. Such remarkable changes or transformations make the story of an Insect's life one of intense interest to one who reads it from nature's book. Various kinds of adult Insects, or imagoes, are shown in Figs. 1147-1152.



1148. Imago of a tent-caterpillar.

No two kinds of Insects have the same life-story to tell. Some pass their whole life on a single host; some partake of only a certain kind of food, while others thrive on many kinds of plants; some are cannibals at times, and others, like the parasites, are boarders within their host, while many prey openly on their brethren in the Insect world. Usually the life of the adult Insect is brief, but ants have been kept for thirteen years, and the periodical cicada has to spend seventeen years as a nymph underground before it is fitted to become a denizen of the air. The winter months may be passed in any of the different stages of the Insect's life. Two very closely allied Insects may have very different life habits.

How They Grow.—Many people believe that the small house-flies grow to be the large ones. While most Insects feed after they become adults, they get little or none of their growth during their adult life. Insects grow mostly while they are larvæ, or nymphs. The maggots from which the little house-flies develop doubtless do not have as luxurious or favorable feeding grounds as do those of the larger flies. In 30 days some leaf-feeding caterpillars will increase in size 10,000 times; and a certain flesh-feeding maggot will in 24 hours consume two hundred times its own weight, which would be paralleled in the human race if a one-day-old baby ate 1,500 pounds the first day of its existence! The skin of Insects is so hard and inelastic that it cannot stretch to accommodate such rapid growth. But nature obviates this difficulty by teaching these creatures how to grow a new suit of clothes or a new skin underneath the old one, and then to shed or moult the lat-



1149. A beetle.

The adult of a borer larva.

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1150. One of the weevil beetles. With a long and strong proboscis.

ter. The old skin is shed in its entirety, even from all the appendages, and sometimes remains in such a natural position where the Insect left it as to easily deceive one into thinking that he is looking at the In-

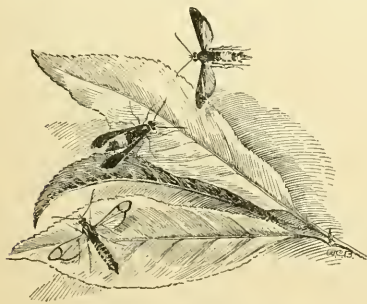


1151. Ground beetle.
One of the commonest predaceous insects.

sect rather than at its cast-off clothes. Some Insects are so neat and economical that they devour their old suits or skins soon after moulting them. Larvæ, or nymphs, may moult from two, or three to ten or more times; the larvæ do not often change strikingly in appearance, but the nymphs gradually acquire the characters and structures of the adult.

How They Eat.—To the horticulturist, the mouth-parts of an Insect are its most important organs or appendages. The mouth-parts are built on two very different plans. Grasshoppers, beetles, caterpillars and grubs have two pairs of horny jaws, working from side to side, with which they bite or chew off pieces of their food, that then pass into the food-canal for digestion (Fig. 1153). The scale Insects (Fig. 1154), plant-lice, true bugs (Fig. 1155), mosquitoes and others have these jaws drawn out into thread-like organs, which are worked along a groove in a stiff beak or extended under lip. Such Insects can eat only liquid food, which they suck with their beak-like mouth-parts. The Insect places its beak on the surface of the plant, forces the thread-like jaws into the tissues, and then begins a sucking operation, which draws the juices of the plant up along the jaws and the groove in the beak into the food-canal of the Insect.

Thus a sucking Insect could not partake of particles of poison sprayed on the surface of a plant. Its mouth-



1152. Moths of the peach-tree borer.
The lowest one is male.

parts are not built for such feeding, and as it is impracticable to poison the juice of the plant, one is forced to fight such Insects with a deadly gas, or each individual Insect must be actually *hit* with some insecticide. A knowledge of these fundamental facts about the eating habits of Insects would have saved much time and money that have been wasted in trying to check the ravages of sucking Insects with Paris green and similar poisons.

Some Insects, like the bees and wasps, have mouth-parts fitted both for sucking or lapping and for biting.

BENEFICIAL INSECTS.—The horticulturist has many staunch and true friends among the Insects. The honey-bee, the many wild bees, and other Insects, as they visit the blossoms to get food for themselves, for their young, and honey for man, leave an insurance policy in the shape of tiny grains of pollen, which often insures a crop of fruit that otherwise might be extremely uncertain. The honey-bee is often accused of biting into ripe fruits, especially grapes. They have not yet been proved guilty, and careful, exhaustive experiments have shown that they will not do it under the most favorable circumstances. Wasps and other strong-jawed Insects are responsible for most of this injury, the bees simply sipping the juice from the wound.

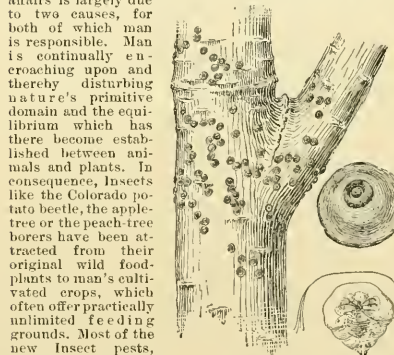
Most of the pretty little beetles known to every child as "lady-bugs" eat nothing but injurious Insects; many other beetles are also predaceous. Man is also often deeply indebted to many of the two-winged Insects or true flies whose larvæ live as parasites inside the body of Insect pests or feed upon them predaceously. Were it not for the ravenous larvæ of the "lady-bugs" and of the syrphus flies, plant-lice of all kinds would soon get beyond control. While man must recognize these little friends as valuable aids in his warfare against the



1153. Mouth-parts of a biting insect.

hordes of Insect pests, it will rarely be safe to wait for the pests to be controlled by their enemies. Fig. 1156 shows a tomato worm bearing the cocoons of a parasite. Fig. 1151 shows one of the predaceous beetles destroying a cutworm.

INJURIOUS INSECTS.—There are now about a thousand different kinds of Insects that may be classed as injurious in the United States and Canada. Over 600 kinds were exhibited at the Columbian Exposition in 1893. All of these may not be injurious every year, as most Insect pests have periods of subsidence, when certain factors, possibly their enemies or perhaps climate conditions, hold them in check. The outlook for American horticulturists, so far as injurious Insects are concerned, is not encouraging. Nowhere else in the world are Insects being fought as intelligently, successfully and scientifically as in America, yet we never have exterminated, and it is very doubtful if we ever will, a single Insect pest. This means that American horticulturists will never have any fewer kinds of Insects to fight. On the contrary, there are many more Insect pests now than in our grandfather's early days, and new pests are appearing every year. This alarming state of



1154. San José Scale.
Showing the mature winter scale; also the insect itself, with its thread-like feeding organs.

the new Insect pests, however, are now coming to America from foreign shores. American horticult-

tourists are continually importing plants from the ends of the earth, and oftentimes the plants are accompanied by one or more of their Insect pests. Some comparatively recent introductions of this kind are the sinuate pear-borer, the pear midge, the gypsy moth, the brown-tail



1155. Hemipteran insect.

Known to entomologists as a true bug.

moth, the horn-fly and the elm leaf-beetle; such standard pests as the Hessian fly, the cabbage butterfly, the currant-worm, the codling-moth (Fig. 1137) came in many years ago. Of the 73 Insects which rank as first-class pests, each of them almost annually causing a loss of hundreds of thousands of dollars, over one half have been introduced from foreign countries, mostly from Europe. It is a significant fact that usually these imported Insects become much more serious pests here than in their native home; this is doubtless largely due to the absence of their native enemies, to more favorable climatic conditions here, and to a less intense system of agriculture in this country. Most of our worst Insect pests of the fruits, of the garden crops, of the granary, of the household, of the greenhouse, and practically all of our most dangerous scale Insects, are of foreign origin. Man will continue to encroach on and disturb nature's primitive domain, and commercial operations will never cease, nor is there much hope of ever effectually quarantining our shores against these little foes; hence there seems to be no practicable way to stop this increase of the Insect enemies of the horticulturist. The one who is the best fitted by nature, and who best fits himself with a knowledge of these pests and how to fight them, will usually be the one to survive and reap the reward of profitable crops. No part of a plant, from its roots to the fruit it produces, escapes the tiny jaws or the sucking beaks of Insects.

Root-feeding Insects.—Many of the small fruits and vegetables are often seriously injured by Insects feeding on the roots. The grape-vine fidia (the grub of a small beetle) and the grape phylloxera plant-louse live on grape roots. Strawberries often succumb to the attacks of the grubs of several small beetles known as strawberry-root worms, and to the large white grubs of the May beetles. The roots of cabbages, radishes and



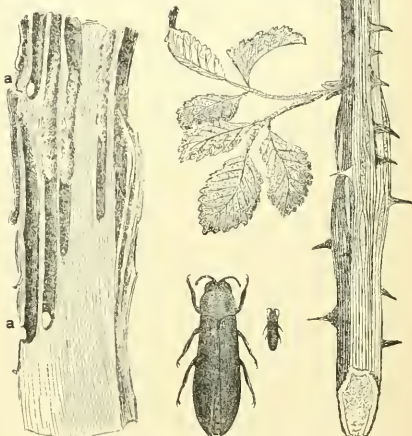
1156. Tomato worm attacked by parasitic insects.

other cruciferous plants are often devoured by hordes of hungry maggots.

These underground root-feeding Insects are difficult pests to control, like any other unseen foe. Sometimes they can be successfully reached by injecting a little carbon bisulfide into the soil around the base of the

plant. The cabbage maggots can be largely prevented by the use of tarred paper pads placed around the plants, or by pouring a carbolic acid emulsion at the base of the infested plants. The strawberry root-feeders are best controlled by frequent cultivation and a short rotation of crops.

Borers.—These are the larvæ of several different kinds of Insects, which burrow into and feed upon the inner bark, the solid wood, or the interior pith of the larger roots, trunks, branches, and stems or stalks of many horticultural plants. Nearly every kind of fruit trees is attacked by its special kind of borer, as are also many of the smaller trees and bush-fruits and garden crops. Borers are often the most destructive of Insect pests. The two apple-tree borers, the round-headed (Fig. 1157) and the flat-headed species, and the peach-tree borer (Fig. 1152) doubtless cause the death of as many apple and peach trees in America as all other enemies combined. The recently imported sinuate pear-borer seriously threatens the pear industry in infested localities. The fruit-bark bee-



1157. Burrows of an apple-tree borer.

The holes at a show where the imago or beetle emerged.

1158. A beetle borer and its work.

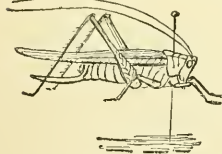
The larva bores in the young wood of raspberry and blackberry canes, causing the swellings seen in the picture.

bles, or "shot-hole" borers, usually attack only unthrifty or sickly fruit trees, and a tree once infested by them is usually doomed. Two borers, one the grub of a beetle and the other the caterpillar of a moth, sometimes tunnel down the stems of currants and gooseberries. Raspberries and blackberries (Fig. 1158) also suffer from two or three kinds of borers, one working in the root, one in the stem, and a maggot bores down and kills the new shoots. A caterpillar closely allied to the peach-tree borer lives in squash vines, often ruining the crop. The potato-stalk weevil sometimes does much damage in potato fields.

Sometimes one can prevent borers from getting into a fruit tree with a paper bandage closely wrapped around the part liable to be attacked, or by the application of some "wash." Most of the washes recommended will prove ineffectual or dangerous to use. Gas tar has given good results, but some report injury to peach trees from its use; hence one should first experiment with it on a few trees. No way has been found to keep borers out of the small fruits or garden crops; usually if infested canes, stems or plants are cut out and burned early in the fall or whenever noticed, most of the borers will be killed. When borers once get into fruit trees, the "dig

ging-out" process is usually the only resort, although some report that they readily kill the predator by simply injecting a little carbon bisulfide into the entrance of his burrow and quickly closing it with putty.

Bud and Leaf-feeding Insects.—The buds and leaves of horticultural crops often swarm with legions of biting and sucking insects. A mere enumeration of the different kinds of these pests would weary the reader. Some insects, like the rose chaffer, work on several different kinds of plants, while many others attack only one or two kinds. In apple orchards, the opening buds are seized upon by the hungry bud-moth and case-bearing caterpillars, by the newly-hatched canker-worms, and by tent-caterpillars, whose tents or "signboards" are familiar objects in many orchards. These pests continue their destructive work on the leaves. The pear slug often needs to be checked in its work of skeletonizing the leaves of the pear and cherry. The pear psylla, one of the jumping plant-lice, is a very serious menace to pear-growing in many localities; the fruit is either dwarfed or drops from badly infested trees, and sometimes so many little pumps sucking out its life finally cause the death of the tree. The little blue grape-vine flea-beetle often literally nips the prospective crop of fruit in the bud, or the rose-chaffer may swarm over the vines and eat the foliage or blossoms. Currant and gooseberry growers realize that eternal vigilance against the familiar green currant worms is the price of a crop of fruit.



1159. Grasshopper. Mounted.

The asparagus beetles would soon appropriate every asparagus shoot that appears in many localities. It is a continual struggle against insect pests to get a paying crop of almost any vegetable. The several kinds of cabbage caterpillars would soon riddle the leaves. The hungry striped cucumber beetles can hardly wait for the melon, squash, or cucumber vines to come up. Two sucking insects, the harlequin cabbage bug and the squash stink-bug, are equally as destructive as their biting relatives.

The bud- and leaf-feeding insects are usually readily controlled by spraying some poison on their food, or by hitting them with some oil or soap spray. As the female moths of canker-worms are wingless, a wire trap or sticky bandage placed around the trunk of the tree in the late fall and early spring, to capture the moths as they crawl up the tree to lay their eggs, will greatly help to check these serious pests. The collection and burning of the conspicuous egg-rings of the tent-caterpillars at any time between August and the following April, will greatly reduce the vast numbers of tents or signboards of shiftlessness in apple orchards. Hand-picking or collecting is the most successful method of controlling the rose-chaffer, harlequin cabbage bug, and the squash stink-bug in many cases. Prompt action, guided by a knowledge of the insect's habits and life-history, and an intelligent use of materials and apparatus, are essentials in any successful effort to control these bud- and leaf-feeding pests of the horticulturist.

Fruit-eating Insects.—"Wormy" apples, pears, quinces, plums, peaches, cherries, apricots, grapes, currants and nuts are often the rule rather than the exception. The codling-moth or apple-worm often ruins from one-third to one-half of the crop each year in many localities; it also infests pears seriously. The apple maggot tunnels its way through and through the flesh of a large percentage of the apples in the northern sections of the country. Most of the wormy plums, peaches, cherries and apricots are the work of the grub of that worst insect enemy of the stone fruits—the plum curculio; the plum gonger, a similar insect, whose grub works in the pit of plums, is equally destructive to this fruit in some states. "Knotty" quinces are largely the work of the adults of the quince curculio, while its grub often ruins the fruit with its disgusting worm-hole. There is also a grape curculio, that, with the aid of the

caterpillar of a little moth, works havoc in grapes. Currants and gooseberries are often wormy from the work of two or three different kinds of maggots and caterpillars. A new pest has now included the delicious cherry in its menu; it is a fruit-fly, closely allied to the apple maggot; infested cherries may show no external signs of the presence of the maggot reveling in the



1160. A crane fly. Mounted

juices within. Various small beetles, known as weevils, are responsible for most wormy nuts.

Most of the fruit-eating insects are out of the reach of the ordinary insecticides. The codling-moth is a noted exception, however, for the peculiar habit that the little caterpillar has of usually entering the blossom end of the fruit and feeding therein for a few days, gives the man with a poison spray a very vulnerable point of attack. It is only necessary to spray a bit of poison into the open calyx cup within a few days after the petals fall, and let nature soon close the calices and keep the poison therein until the newly-hatched caterpillar includes it in its first menu. Often 75 per cent of the apples that would otherwise be ruined by the worms are saved by an application of Paris green at this critical time. The fact that the apple maggot never leaves the fruit until after it is picked or has fallen from the tree, gives one a chance materially to reduce its numbers by frequently gathering the windfalls and feeding them to stock or burying them deeply. As the plum curculio, in the adult stage, feeds on the leaves and fruits, a poison spray, applied soon after blossoming time, is apparently sometimes effective against it, particularly on cherries. Many extensive growers of the stone-fruits, however, are satisfied that this pest can be best circumvented by jarring the curculios onto sheets and killing them; the quince curculio is also best fought by the jarring method. Hand-picking of the infested fruits must be practiced when grapes, currants or gooseberries are attacked by fruit-eating insects.



Plant-Lice.—Scarcely a plant escapes the little suction pump or beak of some kind of a plant-louse or aphid. About 250 different kinds of plant-lice have been identified in the United States, and nearly every kind of fruit, flower, farm or garden crop has its special plant-louse enemy, which is often a serious factor in the production of a crop. These little creatures are so small, so variable, so hard to perceive, present so many different forms in the same species, and have such varied and interesting life-stories to tell, that what we now know about them is but a mere beginning as compared to what is yet to be learned. It would take a large volume to include the interesting stories which might be told of the lives and of the relations with ants of some of the commonest of these plant-lice. No other group of insects presents so many curious, varied, interesting, and wonderful problems of life as do the aphids.

In the aggregate, the damage done by plant-lice is very great. At times hundreds of acres of peas have been ruined by an aphid. Nursery stock often suffers severely, but bearing fruit trees are not often seriously injured by them. About 40 different kinds of aphides live in greenhouses, where a perpetual warfare has to be waged against them. In 4 years we have reared nearly 100 generations of a common aphid in greenhouses,

and there were no indications of any egg-stage or of male forms during this time, so that they may thus breed indefinitely in houses, their young being born alive and no males appearing.

The standard remedies for plant-lice are whale-oil soap, kerosene emulsion, kerosene water, and tobacco in various ways (as a decoction, rose as a dust, or the Roselaf or similar extracts), and these are successfully used to kill the aphides in all situations.

Scale Insects.—Since the recent advent of the San José scale into the eastern United States, scale insects of all kinds have attracted world-wide attention. They are all small insects, and derive their name from the fact that their tender bodies are protected by hard, scale-like coverings secreted by the insects. Thus protected, they are difficult insects to kill, and as they are easily transported on a nursery stock, buds or cions, and also multiply rapidly, the scale insects are justly to be considered as among the most dangerous and destructive of injurious insects. A single female San José scale may rear a brood of from 100 to 600 young, and there may be four or five generations a year; and more than 2,000 eggs have been laid by a single Lecanium scale.

The scale insects, the dreaded San José species included, can be successfully controlled by judicious, intelligent and timely work with sprays of whale-oil soap, lime-sulfur, crude petroleum, or hydrocyanic acid gas, which should be used in the case of nursery stock.

Since 1889 fumigation with hydrocyanic acid gas has been extensively practiced in the citrus orchards of California, and now Florida and South African fruit-growers are also using it in their orchards. Large gas-tight tents or boxes are placed over the trees and the gas then generated within. Much nursery stock is now treated with the gas in tight boxes or houses; this is required by law in Maryland and the province of Ontario, and it should be practiced in other regions. Recently greenhouses, railway coaches, rooms in private houses, and whole flouring mills have been effectively fumigated with this gas. It is generated with water, a good grade of commercial sulfuric acid, and potassium cyanide 98 to 99 per cent pure. The acid is poured into the water in an earthen jar or crock and the cyanide then dropped in. In fumigating trees, rooms or flouring mills, 1 ounce of the cyanide, $1\frac{1}{2}$ fluidounces of sulfuric acid, and 2 $\frac{1}{2}$ ounces of water are used for every 125 cubic feet of

space; for nursery stock use the same amounts for each 100 cubic feet of space; in greenhouses the gas is used about one-half as strong, or even less for some kinds of plants. Nursery stock, trees and plants in greenhouses are usually subjected to the gas for from 30 to 60 minutes; mills are usually kept closed 12 to 24 hours. As potassium cyanide and hydrocyanic acid gas are among the most deadly poisons, fumigation should be under the direct supervision of competent persons.

Insects are preserved in collections by securing them in tight cases by means of a pin inserted through the thorax, or through the right wing if the subject is a beetle. Moths and butterflies are pinned in position on a spreading-board until thoroughly dried. See Figs. 1159-1163. Every horticulturist should make a collection of injurious insects.

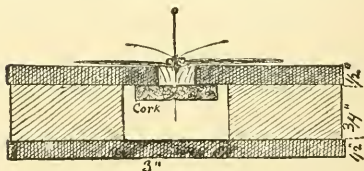
Insect Literature for Horticulturists.—Horticulturists should keep in close touch with the experiment stations and state entomologists of their own and of other states, and also with the Department of Agriculture at Washington; for it is from these sources that the best and latest advice regarding injurious insects is now being disseminated free, either by personal correspondence or by means of bulletins. Among the books, one or more of which may well find a place in a horticulturist's library are the following: Wood's "Insects and Insecticides," Semper's "Injurious Insects and the Use of Insecticides," Lodenian's "The Spraying of Plants," Saunders' "Fruit Insects," and Smith's "Economic Entomology." M. V. SLINGERLAND.

INULA (ancient name). *Compositæ*. This genus includes some hardy herbaceous plants of the easiest culture and of rather coarse habit, with heads of yellow or orange, each 2-4 in. across, borne in summer. There is such a great abundance of autumn-flowering yellow composites in the hardy border that only those inulas that bloom in early summer are particularly desirable. Elecampane, *I. Helenium*, is probably also cultivated for medicine. A preparation of the mulluginous roots is common in drug stores. Inula flowers have as many as 40 linear rays. The plants like a sunny position in any garden soil, and are prop. by division or seed.

Inula is a genus of about 56 species, found in Europe, Asia and Africa; herbs, usually perennial, glandular, hairy; lvs. radical or alternate, entire or serrate; heads large, medium or small, solitary, corymbose, panicle or crowded at the crown; rays yellow, rarely white.

A. *Stems panicle or corymbose.*

Helenium, Linn. ELECAMPAINE. Fig. 1164. Tall, thick-stemmed; lvs. inequally dentate-serrate; root-lvs. elliptic-oblong, narrowed into a petiole; stem-lvs. half-clasping, cordate-oblong; outer involueral parts leafy, ovate. Wet, sandy and mountainous regions. Eur., N. Asia. Naturalized in Amer. D. 163.—For medicinal purposes, 2-year-old roots should be dug in August. If older they are likely to be stringy and woody.



1163. A cross-section of spreading board in front of the cleat "d," as in Fig. 1162.

AA. *Stems 1-fl'd., or with at most 2 or 3 heads.*

B. Outer involueral parts linear and numerous.
grandiflora, Willd. Height 2-3 ft.; lvs. elliptic-oblong, serrulate, all sessile; upper ones subcordate; lower ones 2-4 in. long; glands numerous; heads 3 $\frac{1}{2}$ -4 in. across. Himalayas, Caucasus. G. F. 6:406.—Cult. but not advertised. Earliest blooming Inula in cult. Bears orange-yellow fls. 5 in. across in June, and has hold but not coarse habit.

giandulosa, Willd. Height 2-3 ft.: lower lvs. oblong-stipulate, long-attenuate at the base, the uppermost oblong with a subcordate-decurrent base, all entire or very obsolete-denticulate; glands remote. Canensis. B. R. 4:334. B. M. 1907. (In. 22, p. 234; 25, p. 101; 49:1047 and p. 7. J. H. III. 35:153. R. H. 1881, p. 419.



1164. Elecampane, *Inula Helenium*.

G. M. 33:541 and 38:477.—Keller says it has deep golden yellow, fringed, half-drooping rays. Rays are commonly said to be entire, but B. M. 1907 shows 2 minute teeth, and in B. R. 4:334 the fringes are more than a quarter of an inch long. This is said to be the only cult. species that does not seed freely. The Garden pictures an orange variety.

Hookeri, C. B. Clarke. Height 1-2 ft.: lvs. 3-4 in. long, sessile or narrowed into very short petioles, oblong-lanceolate, acute at the base, minutely toothed, glandular; heads $2\frac{1}{2}$ - $3\frac{1}{2}$ in. across; rays "pale yellow," according to Hooker. Himalayas. B. M. 6411 (rays pure yellow).—Fls. orange-yellow, according to J. W. Manning. J. B. Keller says it flowers in Aug. and Sept., and has bright yellow fringed rays. However, in B. M. 6411 the rays have only 3 minute teeth.

FB. *Outer involucrel parts lanceolate and leafy.*

hirta, Linn. Lvs. netted-veined, lanceolate or ovate-oblong, the lowest narrowed at the base, the others rounded at the base and half-clasping. En., N. Asia.—Keller says it grows 15-18 in. high and fls. July-Aug.

ensifolia, Linn. Lvs. with numerous somewhat parallel nerves, narrowly linear-lanceolate, involucrel parts appressed, not spreading. En., N. Asia. G. M. 41:559.—Keller says it grows 6-8 in. high and fls. July-Aug. Rockery plant; blooms first year from seed if sown early.

W. M.

IOCHRÔMA (Greek, *two-colored*). *Solanaceae*. This genus includes 2 handsome flowering shrubs cult. outdoors in S. Calif. and under glass in Europe. They are tall-growing, and bear clusters of as many as 20 tubular, drooping fls., each 1- $1\frac{1}{2}$ in. long and less than $\frac{1}{2}$ in.

across at the mouth, which seems to have 10 short lobes, but 5 of these are shorter, and are really appendages in the sinuses between the 5 typical lobes. *Ioichroma* is a genus of about 18 American species, mostly tropical and South American; trees or shrubs; lvs. entire, usually large; fls. violet, blue, white, yellowish or scarlet; berries globose or ovoid, pulpy.

A. *Fls. indigo-blue.*

lancoelata, Miers. Shrub, 4-5 ft. high (taller in Calif.), the young branches herbaceous and downy, with stellate hairs; lvs. alternate, oval or elliptic-lanceolate, acute, entire, tapering below into a long petiole; umbels supra-axillary and terminal. Equador. B. M. 4338 and F. S. 4:309 (as *Chornesthes lanceolata*).

AA. *Fls. scarlet or orange-scarlet.*

fuchsoides, Miers. Lvs. often clustered, obovate, very obtuse, tapering at the base into a short petiole. Peru. B. M. 4149 (as *Lycium fuchsoides*).

IONIDIUM. For *I. concolor*, see *Solea*.

IONOPSISIDIUM (Greek, *violet-like*). *Cruiferae*. *I. acule* is a pretty, tufted little plant, growing 2 or 3 inches high and bearing numerous small 4-petaled, lilac fls. from spring to fall. It is a half-hardy perennial from Spain and N. Africa, but is treated as an annual. It is desirable for edgings in moist, shady places, and for rockeries. In rich garden soil the plants make numerous runners. The fls. are about $\frac{1}{2}$ in. across, 1 on each stalk. They open white and turn lilac. The plant has been advertised as the Diamond Flower by seedsmen. This plant is referred by Index Kewensis to *Cochlearia*, a genus whose limits are very uncertain.

acule, Reichb. (*Cochlearia aculeis*, Desf.). Lvs. ovate-rotund, heart-shaped at the base; petioles proportionately very long; pods subrotund, notched. B. R. 32:51.

W. M.

IONOPSIS (Greek, *violet-like*). *Orchidaceae*. A small genus of epiphytic orchids, numbering about 10 species, many of which can probably be reduced to varieties of a few species. Most of the species are insignificant, only one or two being cultivated. The fine specimen of *I. paniculata* figured in the Botanical Magazine has a panicle 10 in. long, $8\frac{1}{2}$ in. wide, with 5 branches, and about 80 fls., each three-quarters of an inch across and chiefly white, with violet markings near the center and a dash of yellow. In its native country it is said to remain in attractive condition from Sept. to May. The fls. are produced so freely and over so long a period that it is sometimes necessary to destroy the flower spikes, which are out of all proportion to the number of lvs. The plants succeed in the warmhouse under the same treatment as *Burlingtonias* or the more delicate *Oncidiums*.

Ionopsis consists of tropical herbs without pseudobulbs, having very short stems, with few, narrow, sheathing, coriaceous lvs.; sepals subequal, erect, spreading, the dorsal one free, the lateral ones united into a short spur behind; petals like the dorsal sepals; labellum united to the base of the column, middle lobe large, expanded, 2-3 times as long as the sepals, 2-lobed; column short; pollinia 2; fls. small, in simple racemes or much-branched panicles.

paniculata, Lindl. Lvs. thick and channelled, linear lanceolate, keeled, 2-3 in a cluster and about 6 in. long; panicle much branched and spreading, loaded with innumerable fls. of a delicate texture; sepals and petals very short, sharp-pointed, the petals wider; labellum very large, pubescent at base, with a 2-lobed rounded limb, which in some is almost entirely white, while in others it has a spot of purple or yellow on the disk. Winter. Brazil. B. M. 5541. F. S. 22:2333 A. F. 6:631.—Very variable.

utriculorotides, Lindl. Lvs. and general habit as in the last; sepals and petals bluntnish; spur short; labellum almost twice as long as the petals; lobes subquadrate-rounded, white, streaked with red veins. Jamaica.

II. HASSELEBERG.

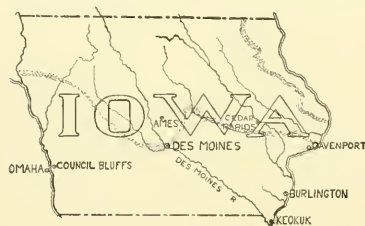
The best means of culture for the successful growing of these beautiful though delicate orchids is in shallow

pans, with plenty of small broken coal cinders for drainage, covered with the fine particles of fern root and chopped sphagnum gathered from the upland meadows. Plenty of heat and moisture during the growing season are essential. Rest them in winter at a temperature of 50° to 55° F.

WILLIAM MATHEWS.

IOWA, HORTICULTURE IN. Fig. 1165. Iowa is nearly a rectangle, about 200 miles north and south between the parallels 40° 36' and 43° 30', and 300 miles east and west, bordered on the east by the Mississippi and on the west by the Missouri and the Big Sioux rivers. Its extreme elevations are 44 feet in the southeast corner, and 1,694 at the highest point near the northwest corner, the average elevation being about 800 feet above the sea. The surface is a gentle, undulating, grassy plain, well drained by numerous streams discharging into the rivers on its borders. All these streams are bordered more or less broadly with belts of native timber, often many miles in width along the larger ones. The divide between the streams falling eastwardly and those falling westwardly is a line running from a little east of the northwest corner southwardly to about the middle of the state at the Missouri line, draining three-fourths of the state into the Mississippi and one-fourth westwardly. The entire surface, except a short and narrow belt along the Mississippi at the northeast corner, is found deeply covered with glacial drift, the depth varying from a few feet to 200 feet or more. In about half the state this drift is overlaid more or less deeply with the peculiar deposit called loess, this being mainly in the south, extending farther north on the west, as shown by the map.

There are no regions the size of Iowa which contain fewer acres unfit for agriculture. Agriculture is as profitable in northern Iowa as in the southern part. Horticulture,



To show horticultural regions.

however, has had a greater development in the southern and southwestern counties, the region of the fruit-bearing loess. It is not attempted to draw a hard and fast line below which fruit-growing is easy and above which it is difficult, but only to indicate, in a general way, that in the north and increasing with the distance, greater care must be used in selecting situations and varieties in culture and in protection.

If safe conclusions may be drawn from the native fruits and nuts found in Iowa, the state has great horticultural adaptability. The native nuts, the walnuts, black and white, the hickories and hazelnuts, are abundant and of high quality, and the pecan is found along the Mississippi. The fruits, especially the currants, raspberries, apples and plums, will compare favorably with the natives found in Europe, and the plums greatly excel. It cannot be doubted that they will soon be developed into varieties fit to satisfy the most exacting tastes. Many hybrids have been secured between the native and the cultivated apples descended from Europe, and this line of work, hitherto neglected, is believed to promise a race of apples entirely adapted to the inter-continental climatic conditions of the region.

The apples of Europe, and their descendants, originating along the eastern seaboard, have not been found entirely successful over the region of broader prairies, but have succeeded best in the southern half of the

state, and especially on or near the timbered lands. Here, commercial orcharding has had its greatest development. This industry is so young that statistics have not been systematically gathered, but in the most favored localities apple crops to the value of \$100 a year per acre are not uncommon. Fruit, to the value of more than \$350,000, has been reported as the product of a single county in one year, this being mainly of winter apples, the surplus finding markets in the Northwest, in the East, and in foreign countries.

In isolated localities, commercial apple-growing has been fully as successful in the north, but has necessarily been confined to a few sorts, chiefly two, the Oldenburg and the Wealthy. It has always been found that the long-keeping sorts of highest quality have been fastidious in choice of location in the south, and still more so northward, where early maturing sorts are more successful.

Pear-growing is everywhere difficult. Much time and money have been spent with eastern and foreign varieties without satisfaction. This fruit is profitably grown in a few localities only, and under management of exceptional skill. A race of prairie-born seedlings must, apparently, be grown to insure success.

With plums, the reverse is true. A generation of men tried to acclimatize the plums of Europe, and lately the effort has been extended to the Japanese, but without satisfaction; in fact, no others succeed in competition with the natives of the soil. These, and especially the Americana types, are so well adapted, so profusely productive of such handsome and good fruit, that even as they came from the hand of nature, they have taken substantial possession of the nurseries and orchards of the state. Such flattering successes have followed the first attempts to grow them for market, that the industry is fast assuming large proportions. New and improved varieties of larger size and finer quality are offered every year, and a bright future for that fruit is assured.

Of cherries, only the sour sorts succeed, and little effort has been made to breed sweet varieties better adapted to prairie conditions. Commercial cherry-growing is successful in the southern half of the state, and is rapidly increasing.

Peaches have been grown in limited quantities in the southeast since the first settlement of the state. By seedling selection, the limit of success is gradually extending northward and now reaches to the middle of the state, but only for home use, as yet.

The quince and the apricot cannot be said to succeed in Iowa. The former is liable to root-kill.

The grape flourishes and ripens in profusion, especially in the south, whence it is shipped in large quantities.

The currant, the gooseberry, the raspberry, the blackberry and the strawberry flourish in every part of the state, requiring more favorable situations and greater care in the north. In some localities the native gooseberry has been cultivated in preference to the best eastern varieties, while European sorts have very limited success. The greatest difficulty the fruit-grower of Iowa has had, and still has to contend against, is that he has been compelled to choose between varieties all of which had originated far from his place of fruitage, and usually under conditions of soil and climate so different that the chances have been strongly against success here. It is only of late that those who have insisted that prairie regions should breed and select for themselves races of fruit from seeds planted and grown under their own peculiar conditions, have found a patient hearing. With intelligent effort along this line, the future is full of promise that the horticulture of Iowa may be brought to the high level now held by its agriculture.

An account of the introduction of the Russian fruits into Iowa and other parts of the North, will be found under *Pomology*.

C. L. WATROUS.

IPECAC. The root of *Cephaelis Ipecacuanha* (now referred to *Psychotria*), a Brazilian plant not cultivated in N. America. For wild or American Ipecac, see *Gillenia stipulacea*.

IPOMŒA (according to Linn. from *ips*, bindweed, and *homoios*, like, because of its resemblance to Convolvulus; but *ips* is a worm). Including *Batatas*, *Calony-*

tion, *Mina*, *Pharbitis* and *Quamoclit*. *Convolvulaceae*. MORNING-GLORY. BLOSSOMER. Over 500 species of annual or perennial herbs, most by twining, rarely trees (C. P. 7:364) or shrubs, widely distributed in tropical and temperate regions. They are remarkable for easy culture, quick growth and beautiful flowers; hence the genus includes several of our most popular plants for covering verandas and screening unsightly objects.

The generic characters of *Ipomoea* are not clearly defined. The list of synonyms given above is a record of unsuccessful attempts to find constant characters by which this large and variable genus may be separated into smaller and more definite groups. It is distinguished from *Convolvulus*, its nearest ally, by having but 1 capitate or 2-3 globose stigmas, while *Convolvulus* has 2 linear or ovate stigmas. Stem mostly slender, twining or climbing, sometimes prostrate, diffuse or erect; leaves alternate, entire, lobed or parted, often varying greatly on the same plant; flowers usually showy, borne singly or in cymes on axillary peduncles; corolla funnel-form, salverform or bell-shaped (in one species bag-shaped), the limb sometimes entire, but usually 5-angled or 5-lobed, red, purple, blue, white or yellow, in various shades and mixtures; calyx without the bracts at the base, which appear in some species of *Convolvulus*, but the outer sepals are commonly larger. The flowers of most species open in early morning and last but a few hours under bright sunlight, hence the popular name. A few open only at night-fall.

The Japanese Morning-Glories, also called "Imperial" and "Emperor" Morning-Glories, were introduced to the American trade from Japan in 1895. They are probably selected strains of *I. hederacea*, although some botanists consider them to be of hybrid origin, possibly *I. hederacea* × *rubro-carulea*. Maximowicz referred them to *I. hederacea*, and this appears to be the more reasonable disposition. The culture of the "asagea" in Japan amounted to a popular craze about 1830, the equivalent of \$14 to \$18 sometimes being paid for a single seed of the rare sorts. With political disturbances came a decline of interest, but more recently the popular fancy for Morning-Glories has again revived. The Japanese gardeners grow their plants almost entirely in pots, and by constant attention have made them vary into many curious oddities in flower and foliage. Several finely illustrated books on the Morning-Glory alone are published in Japan. See also "Century Magazine," 55:281 (1897). The Japanese *Ipomoeas* are sold in this country mostly in strains, each package of seed giving flowers of many forms and colors. There are some inferior strains offered, and the flowers from these are often disappointing; yet as a class the Japanese Morning-Glories are the most gorgeous and versatile of garden *Ipomoeas*. If the seeds are notched they will generally bloom in 6 weeks from sowing.

Morning-Glories are among the least exacting of garden plants as regards soil and site. Most species love a strong soil and sunny site, with plenty of water; but they will make the best of much that is uncongential. The seeds of the annual kinds may be sown directly out-of-doors, but are preferably started indoors, at least in the North. If the plants are allowed to become slightly pot-bound before being transplanted, they will come into bloom earlier. Germination may be hastened and also made more certain by filing a small notch in each seed, or by soaking the seeds in warm water about 2 hours. The "Moonflower" and the "Japanese Morning-Glories" particularly are liable to germinate poorly unless these precautions are taken.

The perennial *Ipomoeas* are grown from seeds in some cases, but mostly from cuttings of well ripened wood, layers, or division of the rootstocks. Some of the greenhouse species, notably *I. Horsfallii*, rarely produce seed and are rooted from stem-cuttings with great difficulty. These are often propagated successfully by grafting well ripened wood on pieces of their own roots, or the roots of *I. pandurata*. *I. ternata* roots from cuttings more readily, and *I. Leari* and *I. Jalapa* are easily propagated from cuttings.

The rapid growth and dense foliage of most garden *Ipomoeas* make them especially valuable for covering arbors, verandas, walls, and for screening unsightly objects. *I. purpurea*, *I. rubro-carulea*, *I. hederacea*

and *I. Quamoclit* are the most popular annual species for this purpose; and *I. Leari*, *sellosa* and *pandurata* are among the best perennials. In the South, the perennials may be carried through the winter outside by cutting off the stems and mulching the roots heavily in the fall; in the North the tubers should be taken up and wintered like Dahlias, keeping them perfectly dry in a cool greenhouse or frost-proof cellar. *I. leptophylla* is valuable for very dry soils. *I. Bona-nox* is worthy of a place in every garden.

The tender perennials are seen to advantage when trained to pillars, trellises, or along the roof of a greenhouse. Their roots should be given plenty of room to forage and their tops to spread. *I. Horsfallii* and its closely related species, *I. ternata*, are very satisfactory for this purpose. After flowering the strong shoots should be cut back and the plant rested. Several species, particularly *I. Leari*, *rubro-carulea* and *hederacea*, make excellent pot-plants if they are kept somewhat pot-bound to induce flowering. The roots of nearly all the perennial species are more or less purgative; particularly *I. Purga*, from which comes the Jalap of commerce, *I. Jalapa* and *I. cathartica*. *I. Balata* is the common sweet potato.

The trade names of *Ipomoeas* are endlessly mixed. Thus, *I. Mexicana* of the catalogues may be *I. hederacea*, *I. digitata*, *I. Jalapa*, *I. Bona-nox*, *I. Leari* or *I. rubro-carulea*; but is rarely the true *I. Mexicana* of Gray. "Moonflower" is often applied indiscriminately



1166. *Ipomoea Quamoclit* (× 3/8)

to several species of *Ipomoea*, but it should be restricted to *I. Bona-nox* and *I. grandiflora*. It is evident that most of the plants now sold as *I. grandiflora* are forms of *I. Bona-nox*; but a few of the smaller and inferior types are the true *I. grandiflora* of Lamarek. *I. hybrida* is a trade name for strains of *I. purpurea* and *I. rubro-carulea*. The "Tree *Ipomoea*" is *I. fistulosa*. The "Japanese" or "Imperial" Morning-Glories may be referred to *I. hederacea*. Other popular catalogue

names are: Double Morning-Glory is mostly *I. purpurea*, fl. pl.; Brazilian Morning-Glory is *I. setosa*; Hardy or Perennial Moonflower is *I. pandurata*; Ipomoea Heavenly Blue is *I. rubro-cerulea*.

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- A. Plant annual; roots not tuberous.
- B. Fls. numerous, in long scorpioid racemes; corolla a bag-shaped tube, contracted at the mouth 1. **versicolor**
- BB. Fls. borne singly or few in loose cymes; corolla expanded into a limb.
- C. Lvs. pinnately divided into many thread-like segments 2. **Quamoclit**
- CC. Lvs. entire or lobed, not divided.
- D. Stem hairy.
- E. Lvs. broad-ovate, cordate, entire 3. **purpurea**
- EE. Lvs. ovate or deeply 3-lobed 4. **hederacea**
5. **Mexicana**
- DD. Stem not hairy.
- E. Lvs. linear or lanceolate, sub-sessile 6. **angustifolia**
- EE. Lvs. ovate-cordate to hastate; petioled.
- F. Fls. usually less than 1 in. across; scarlet or orange 7. **coccinea**
- FF. Fls. usually over 3 in. across; red, blue or purple .. 8. **rubro-cerulea**
- AA. Plant perennial, with large fleshy rootstocks.
- B. Lvs. palmately divided into 3-7 segments.
- C. Stem and petioles hairy .. 9. **sinuata**
10. **Lindheimeri**
- CC. Stem and petioles not hairy.
- D. Peduncles longer than the petioles 11. **digitata**
- DD. Peduncles equaling the petioles.
- E. Fls. red; leaf segments sessile, tapering to both ends, margin wavy 12. **Horsfalliae**
- EE. Fls. white; leaf segments stalked, not tapering to the ends, margin not wavy .. 13. **ternata**
- BB. Lvs. entire, angulate or lobed, not divided.
- C. Stem, lvs. and peduncles densely hairy.
- D. Corolla salverform, the lobes pointed; leaf lobes acuminate, sinuately toothed 14. **setosa**

DD. Corolla funnelform, the lobes obtuse; leaf lobes unequal, blunt, entire. 15. **Bonariensis**

CC. Plant not hairy.

- D. Stem erect or ascending, not trailing or climbing.
- E. Lvs. cordate to subsagittate, long-petioled, acuminate, pubescent beneath. 16. **fistulosa**
- EE. Lvs. linear, very short-petioled, acute, not pubescent beneath 17. **leptophylla**
- DD. Stem trailing, climbing, or twining.
- E. Lvs. pale beneath.
- F. Fls. white, with purple throat 18. **pandurata**
- FF. Fls. blue to dark purple 19. **Leari**
- EE. Lvs. not pale beneath.
- F. Fls. opening at night 20. **Jalapa**
21. **Bona-nox**
22. **grandiflora**
- FF. Fls. opening in the morning.
- G. Corolla yellow. 23. **chryssides**
- GG. Corolla purple.
- H. Lvs. notched at the end. 24. **Pes-caprae**
- HH. Lvs. acute or acuminate. 25. **Batatas**
26. **Purga**

AAA. Plant perennial by a woody stem. 27. **Wolcottiana**

1. **versicolor**, Meissn. (*Mina lobata*, Llav. et Lex.). A vigorous climber, 15-20 ft. high; lvs. with a cordate base, 3-lobed, the middle lobe longest and narrowed below; fls. $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, opening rich crimson, soon fading to pale yellow. July-Sept. Mex. Gn. 30, p. 436, 437; 39:792. R.H. 1887, p. 19. G.C. 11, 26:684, 685. P.M. 16:100. V. 10:34, 35. B.R. 28:24. — Distinguished from all other Ipomoeas by its bag-shaped corolla and scorpioid inflorescence. It is a very free bloomer, and deservedly popular.

2. **Quamoclit**, Linn. (*Quamoclit vulgaris*, Choisy). CYPRESS-VINE. INDIAN PINK. Fig. 1166. Stem smooth, slender, twining to a height of 10-20 ft.; lvs. short-petioled or sessile; peduncles few-fl'd., commonly much longer than the petioles; corolla 1-1 $\frac{1}{2}$ in. long, scarlet, the tube narrowly funnelform, inflated above; the limb nearly flat, 5-lobed. July-Oct. Naturalized from tropical America, Va. to Fla., west to Kan. and Tex.; sparingly escaped from cultivation farther north. B.M. 244. Gn. 29:33. — Beautiful in flower and foliage. Var. **alba**, Hort., has white fls.

3. **purpurea**, Roth. (*Convolvulus majus*, Hort. *Convolvulus purpureus*, Linn.). TALL MORNING-GLORY. Fig. 1167. Stem trailing or twining for 4-10 ft., branching from the base; peduncles slender, 1-5-fl'd., often longer than the petioles; corolla 1-2 in. long, light blue, purple, pink and diversely variegated. July-Sept. Trop. America. Escaped from gardens to waste places, Can. to Fla., west to Neb. and Tex.; widely distributed in most trop. regions. B.M. 113, 1005, 1682. Gn. 21, p. 295; 27, p. 473. — One of the most popular of garden annuals. Some of its varieties resemble the entire-leaved forms of *I. hederacea*, but may be distinguished by their longer and more slender peduncles, umbellate pedicels, and oblong acute sepals without the long tip usually found on *I. hederacea*. Seeds ripen freely on cultivated varieties and may be gathered for future sowings. Among the host of garden forms are: **alba**, white; **atro-cerulea**, dark blue; **atrosanguinea**, dark purple; **azorea**, sky-blue; **carminata**, light crimson; **Dickensoni** (*Pharbitis hispida*, var. *Dickensoni*), azure-blue; **Huberi** (*I. Huberi*, var. *variegata*, Hort.), lvs. marked with silvery white, fls. variously colored and margined with white; **kermesina** (*I. kermesina*), scarlet; **rosea**, blush rose;

varia, a trade name for packages containing a mixture of many kinds; *violacea-striata*, violet-purple. There are several double forms of *I. purpurea*. Var. fl. pl. has very large lvs.: fls. appearing much later than single varieties, semi- or much-doubled, bluish white streaked with light blue or pink. Int. 1892. Said to be very floriferous and a good pot-plant. G.F. 5:593. A.G. 14:246. Var. *violacea fl. pl.*, Hort., is entirely distinct from the preceding. Gt. 47, p. 133.

4. *hederacea*, Jacq. (*I. Nil*, Roth. *I. scabra*, Hort.). Stem twining or climbing, 2-8 ft.: lvs. 2-5 in. long, ovate-cordate, the lobes ovate to ovate-lanceolate, entire, or the lateral lobes repand or denticulate; the middle lobe narrowed at the base; peduncle 1-3-ld., mostly shorter than the petiole; corolla funnelform, the tube usually white, the limb light blue, purple or rose, and in various combinations of these colors; sepals hairy, lanceolate, with long and often recurved tips. July-Oct. —Widely naturalized from trop. America in fields and waste places, Pa. to Fla., west to Neb. and Mex. Perhaps native in the South. B.R. 1:85; 4:276 (as *I. cerulea*). B.M. 188 (as *Convolvulus Nil*). Gn. 27, p. 473. This species shows great variation in the form of its lvs., both on the same plant and on different plants. In some forms formerly known as *I. Nil*, the lvs. are nearly entire; in others they are very deeply lobed. Next to *I. purpurea*, this is now the most popular Morning-Glory in cultivation, and the introduction of the improved Japanese strains will extend its usefulness. Before the appearance of these oriental varieties in occidental gardens, the species had already varied into many distinct horticultural varieties; as var. *limbata* (*I. limbata*, Hort.), with the corolla violet-purple, edged with white. B.M. 5720 (as *Pharbitis Nil*); Gn. 29, p. 32. Var. *marmorata celestina*, large fls., marbled and striped with light blue; Gt. 44, p. 592. Var. *marmorata rosea*, fls. marbled with rose; Gt. 44, p. 76. Var. *foliis marmoratis*, lvs. marked with yellow, limb of corolla rose color. Var. *grandiflora*, large blue fls. Var. *Ferrandiana*, similar to var. *grandiflora*. Aside from these strains, the follow-



1167. Morning-Glory, *Ipomoea purpurea* ($\times \frac{1}{2}$). No. 3.

ing named varieties of Japanese Ipomoeas are offered: *Antigone*, lvs. variegated: fls. blue, with pink throat. *Aglaia*, lvs. variegated: fls. crimson, with white throat. *Aseria*, fls. dull copper-red. *Ceres*, like *Aglaia*, but fls. edged with white. *Euphrosyne*, lvs. variegated: fls. pure white, with pink throat. *Princess*, fls. spotted with carmine. Gt. 47, p. 133. A form with foliage dot-

ted with white is shown in I.H. 43, p. 75. The various strains give fls. which are diversely scalloped, ruffled, fringed, doubled, and show a wonderful range of color.

5. *Mexicana*, Gray. Like *I. hederacea*, but young lvs. entire or slightly angulate, becoming deeply 3-lobed and



1168. *Ipomoea coccinea* ($\times \frac{1}{2}$). No. 7.

cordate, as in *hederacea*, the middle lobe broadest: peduncles as long or longer than petioles; corolla 1 in. wide, violet-purple, sometimes with crimson plaits. —Possibly this should not be distinguished from *I. hederacea*. The plants in the trade as *I. Mexicana* are mostly *I. hederacea*, *digitata* and *Bona-noz*. *I. Mexicana vera*, Hort.; *I. Mexicana grandiflora alba*, Hort., and *I. Mexicana grandiflora hybrida*, Hort., are *I. Bona-noz* or *I. grandiflora*.

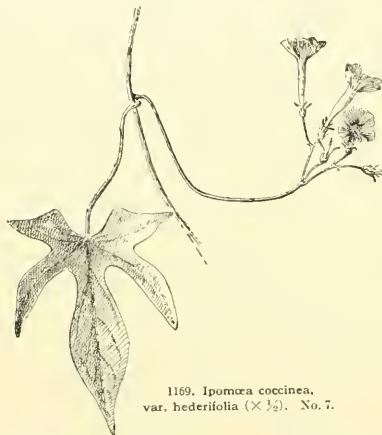
6. *angustifolia*, Jacq. (*I. filicaulis*, Blume). Stem prostrate, trailing or rarely climbing, much-branched: lvs. 1-3 in. long, less than 1 in. wide, glabrous; peduncles exceeding the petioles, bearing 1-2 small, bell-shaped fls., which are yellowish white with a purple eye. Ang., Sept. Widely distributed in tropical Asia, Africa and America. B.M. 5426. B.R. 4:317 (as *I. denticulata*). —Sometimes grown in the greenhouse, but there is hardly enough foliage to set off the pretty dark-eyed flowers.

7. *coccinea*, Linn. STAR IPOMEEA. Fig. 1168. Stem freely twining for 10 ft.: lvs. slender-petioled, entire or angulate, acuminate; peduncle 2-6 in. long, few to several-fld.: corolla $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, salverform; limb obscurely lobed, scarlet with a yellow throat. Aug.-Oct. Apparently naturalized from tropical America, on river banks in the middle and south Atlantic states; probably indigenous to northern Mex. and Ariz. B.M. 221. —Fls. are produced in abundance, but are disappointingly small. In var. *lutea*, Hort., the fls. are entirely orange, or with a tinge of scarlet.

Var. *hederifolia*, Gray (*I. hederifolia*, Linn. *Mona sanguinea*, Hort.). Fig. 1169. This Plains form of the species has angulate, 3-lobed or even 3-5-parted lvs., and fls. usually larger. B.R. 1:9. B.M. 1769. I.H. 41, p. 159. —It is superior to the type for ornamental purposes.

8. *rubro-cærulea*, Hook. (*I. Hookeri*, Hort.). Stem tinged with purple, branched, 10-20 ft. high: lvs. membranaceous, much-veined, short-acuminate; peduncle fleshy, 3-4-fld.: fls. 3-4 in. wide, the tube white and limb red before expanding, at length purple or china-blue. Aug.-Oct. Mex. R.H. 1855:441 (as *Pharbitis rubro-cærulea*). B.M. 3297. P.M. 3:99. Gn. 27:493. —One of the most beautiful of annual climbers. The fls. are often dashed, blotched and shaded with rose, or are entirely rose. It is likely to run to vine when out-of-doors unless the roots are confined in a box or pot to induce early flowering. It makes an excellent pot-plant for the greenhouse. Var. *Heavenly Blue*, from Calif., was said to be a cross between *I. Leari* and *I. versicolor*, but proves to be a blue form of *I. rubro-cærulea*, which is especially valuable for cut-fls. Var. *alba*, Hort., has pure white flowers.

9. *sinuata*, Ort. (*I. dissecta*, Pursh, not Willd. *I. sinuata*, Hort.). Stem somewhat woody at base, covered with long yellowish hairs; lvs. smooth or nearly so, palmately 7-parted, the divisions lanceolate or narrowly oblong, more or less sinuately cut and toothed; peduncles 1-2 fld., longer than the petioles; fls. 1-2 in. wide, bell-shaped, white with purple center; calyx as long as the corolla tube. June-Sept. Trop. Amer., and near the coast from Ga. to Tex.—In Tex. it expands only 2-3 hours at midday, and is there called the "Noon-flower." It may be treated as a coolhouse evergreen, and is worth growing for its delicate foliage alone. In the North the tubers must be wintered in a cellar.



1169. *Ipomoea coccinea*, var. *heterophylla* ($\times \frac{1}{2}$). No. 7.

10. *Lindheimeri*, Gray (*I. heterophylla*, Torr., not Ortog.). Plant finely pubescent, hoary when young; lvs. deeply 5-cleft or 5-parted, all of the lobes or the 3 interior ones ovate to ovate-lanceolate, with a much contracted base; peduncle 1-2 fld.; corolla long-funneliform, about $3\frac{1}{2}$ in. long, light blue. Rocky soils, W. Tex. to N. Mex.—Var. *Lindleyana*, Hort. (*I. Lindleyana*, Hort.), has smaller lvs., lighter colored fls., and is a more profuse bloomer. An improvement on the type, but more tender.

11. *digitata*, Linn. (*I. paniculata*, R. Br. *I. palmata*, Hort., not Forsk.). Stem trailing or climbing, 20-40 ft.; lvs. 3-7 in. wide, 5-7-parted, the segments elliptic, sometimes spatulate, entire; fls. numerous, in a 2-branched cyme; corolla $1\frac{1}{2}$ -3 in. wide, broadly bell-shaped, 5-lobed, pinkish purple or pink; seeds with a dense tuft of dirty white wool springing from the apex. July-Sept. Tropics of both hemispheres. R. H. 1853:381. B. R. 1:362 and 4:333 (as *I. Platensis*). B. M. 3665 (as *I. Platensis*). Gng. 2:311.—One of the best tuberous-rooted Ipomeas for the garden or warmhouse. In the North it may be used with fine effect if grown in a tub and trained to an adjacent pillar or trellis, the vine being cut off before frost and the tub stored. Further south the tubers may be planted directly in the open, and will give a profusion of bloom nearly all summer.

Var. *insignis*, Hort. (*I. insignis*, Ker.). Lvs. not palmately divided, nearly entire or lobed, the under surface sometimes purplish. B. M. 1790. B. R. 1:75.—There are few plants of var. *insignis* in cultivation.

12. *Horsfalliae*, Hook. Fls. many, in a 2-branched cyme; corolla bell-shaped, the limb of 5 broad, rounded lobes, very showy. Cosmopolitan tropics. B. M. 3315. P. M. 3:50. F. S. 16:1647. K. W. 1:29.—Perhaps the most popular Ipomea for winter-flowering in a warmhouse. If well treated it will climb 20-30 ft., and will bear hun-

dreds of fls. each day in early winter. *I. Horsfalliae* may also be grown out-of-doors, but it will not come into bloom till late fall unless the roots are crampd. Var. *alba*, Hort., is *I. ternata*; *Lady Slade* has pale rose fls.; var. *Briggsii* (*I. Briggsii*, Hort.), or *Lady Briggs*, is generally considered better than the type for most purposes. It is a freer grower and bloomer, the fls. are a rich magenta-crimson, and it roots from cuttings much more readily than *I. Horsfalliae*. This variety makes a fine plant in a 10-in. pot. G. M. 37:49. Var. *Thompsonii*, or *I. Thomsoniana*, Hort., is *I. ternata*.

13. *ternata*, Jacq. (*I. Horsfalliae*, var. *alba*, Hort. *I. Horsfalliae*, var. *Thomsoniana*, Hort. *I. Thomsoniana*, Mast.). Stem somewhat woody at base; lvs. usually 3-parted, the segments elliptic or elliptic-oblong, fleshy, smooth; fls. trumpet-shaped, about 2 in. across. Otherwise like *I. Horsfalliae*, of which it is often considered a variety. Probably from W. Indies. G. C. H. 20:817. F. 1884:118. Gn. 35, p. 440.—Not considered quite as effective for greenhouse culture as *I. Horsfalliae*.

14. *setosa*, Ker. BRAZILIAN MORNING-GLORY. Plant very vigorous, branching, covered with stiff purplish hairs; lvs. 3-10 in. wide, cordate, angular or 3-lobed, the middle lobe abruptly contracted below into a narrow neck; peduncles many-fld., longer than the petioles; fls. 2-4 in. wide, salverform, rose-purple. Aug.-Oct. Braz. B. R. 4:235.—An excellent free-growing climber for covering arbors, and especially valuable for making a dense screen because of its very leafy habit. In the latitude of New York seeds sown in the open will give flowering plants in late August. It may also be treated as a warmhouse deciduous twiner. Var. *Northern Light* is said to be a cross with *I. Bona-nox*. Plant unusually vigorous, often growing 40-50 ft.; fls. lavender-pink.

15. *Bonariensis*, Hook. (*I. ficifolia*, Lindl. *I. Perriniana*, Dammer. *I. Sellowii*, Penny). Stem branching, tinged with purple and covered with short stellate hairs; lvs. deeply cordate, 3-5-lobed, the middle lobe longest; peduncles several-fld., longer than the petioles; fls. $1\frac{1}{2}$ -2 in. wide, violet to lilac, the limb spreading into 5 crenate lobes. August-October. Trop. America and Africa. B. M. 3665. B. R. 27:13. P. M. 9:25. Gt. 47:1446.—Here belongs *I. Sellowii*, Penny, and probably *Hort.*, not *I. Selloi*, Mart., which is a distinct species.

16. *fiatolosa*, Mart. (*I. Texana*, Coulter). Stem 4-10 ft. high, subshrubby, branching, smooth or minutely pubescent; lvs. 4-6 in. long, thickish, entire or nearly so; peduncles 1-2 in. long, mostly shorter than the petioles, few-many-fld.; corolla about 3 in. long, bell-shaped, pink-purple. July-Sept. Brazil; now escaped from gardens in Mex. and southern United States.—It is known to the trade chiefly as var. *Goodellii* (*I. Goodellii*, Hort.). This var. has lavender-pink fls., with a darker throat, and is apparently more floriferous and desirable than the type. It produces seed sparingly, but is easily rooted from cuttings. In the South it is hardy if the stem is cut down and the roots mulched; in the North, the roots must be brought indoors. Advertised as the "Tree Ipomea."

17. *leptophylla*, Torr. BUSH MOON-FLOWER. Stem 2-5 ft. high, with many slender, recurring branches; lvs. 2-4 in. long, entire; peduncle stout, 1-4 fld., usually shorter than the lvs.; corolla about 3 in. across, funnel-form, rose-pink, deepening to purple in the throat. Aug.-Oct. Dry plains, Neb. and Wyo., south to Tex. and N. Mex.—This species is adapted for very dry places because of its enormous tuberous rootstocks, which often weigh 100 lbs. and extend into the subsoil for 4 ft. It sometimes thrives where no rain has fallen for one to three years. The plant is beautiful when in flower.

18. *pandurata*, MAN-OF-THE-EARTH. WILD POTATOVINE. Stem 2-12 ft. long; root very long and large (10-20 lbs.); lvs. 2-4 in. long, long-petioled, usually cordate and entire, occasionally angulate, fiddle-shape or hastately 3-lobed; peduncles 1-5 fld., commonly a little longer than the petioles; corolla 2-4 in. wide, broadly funnel-form with pointed lobes, white with a dark purple throat. May-Sept. Dry soils. Can. to Fla., west to Mich. and Tex. A. G. 12:637. R. H. 1893:574. B. M. 1603 (as *Coccolobus candicans*), 1939, and Gn. 27, p. 373

(both as *C. panduratus*). B.R. 7:588.—In some places this species is a very troublesome weed, which is almost impossible to exterminate because of its long tuberous roots. It can easily be kept within bounds in the garden with a little care, and makes a very desirable plant for covering an old dead stump or back fence. The chief merit of *I. pandurata* as a garden plant is its hardiness; hence it is often sold as the "Hardy" or "Perennial Moonflower." If well mulched the roots will stand 26° below zero. There is a double-fl. form.

19. **Léari**, Past. **BLUE DAWN FLOWER**. Stem a very rapid grower, often 30-40 ft. long, somewhat shrubby at the base; lvs. 3-6 in. long, cordate, acute, mostly entire or slightly 3-lobed, variable; fls. borne in clusters of 12-30, opening in succession; corolla 4-5 in. broad, bell-shaped, deep lilac, sometimes dark purple with five lighter plains. Very beautiful. Aug.-Oct. Tropics of both hemispheres. P.M. 4:267. B.M. 3928 (as *Pharbitis Léari*). B.R. 27:56 (as *Pharbitis Léari*).—A magnificent species for the warmhouse, but not usually satisfactory outside, at least in the North. One plant is on record as producing 60,000 fls. at the rate of 300 a day. When grown in the open the fls. are likely to be an unattractive coppery purple.

20. **Jalapa**, Pursh (*I. Michauxii*, Sweet). Stem 6-8 ft. high, branched, slightly rough, springing from an oblong root weighing 4-30 lbs.; lvs. 3-5 in. long, ovate-cordate, membranaceous, veiny, repand or deeply lobed, pubescent beneath, variable; fls. 3-4 in. wide, the corolla bowl-shaped, with narrow tube, rose, white or rose-purple. Aug.-Oct. Mex. L.B.C. 6:518 (as *Convolvulus Jalapa*). B.J. 1572 (as *Convolvulus Jalapa*). B.R. 4:342; 8:621.—A very ornamental warmhouse climber and valuable for the garden if the tubers are started in the greenhouse before being set out; otherwise the plant seldom blooms much before frost. The "Jalap" of commerce does not come from this plant, but from *I. Purga*. The roots of *I. Jalapa* are but slightly purgative.

21. **Bona-nox**, Linn. **MOONFLOWER**. Fig. 1170. Stem 10-20 ft. high; lvs. 3-8 in. long, cordate to hastate, entire, angular or 3-lobed, acute, glabrous; peduncles 2-6 in. long, 1-7-fl., equaling the petioles; corolla 3-6 in. long, 4-6 in. wide, trumpet-shaped, pure white, sometimes with greenish plaits; fls. fragrant, usually closing in the morning, sometimes remaining open till noon. Aug.-Sept. American and Asiatic tropics. B. M. 752. B.R. 11:889 (as *I. latiflora*). Gn. 21, p. 259; 27, p. 473. V. 10: 359. Known in gardens chiefly as var. **grandiflora**, Hort. (*I. grandiflora*, Roxb. and Hort., not Lam.), which does not differ materially from the type. Most of the large-fl. and very fragrant forms in cultivation may be referred here; the smaller forms are probably *I. grandiflora*, Lam. Var. **grandiflora** is also sold under the following names: *I. Childsii*, *I. noctiflora*, *I. noctiflora*, *I. Mexicana grandiflora*, *I. Mexicana grandiflora alba*, *I. Mexicana grandiflora veva*. These various trade names represent strains of varying excellence. A form with variegated lvs. is offered. The Moonflower is most popular as a garden plant, but it also does well trained along the roof of a low house or against a pillar. It is



1170. *Ipomoea Bona-nox* (A 1/4).

excellent for cut-flowers in the evening.

22. **grandiflora**, Lam. (*Calonyction grandiflorum*, Choisy. *I. Bona-nox*, Hort., not Linn.). Differs from *I. Bona-nox* in having the stem usually covered with short, sharp points; lvs. smaller, entire; peduncle much shorter (usually 1-2 in.); fls. not over 3 in. wide; sepals elliptic, obtuse (in *I. Bona-nox* ovate, mucronate); seeds shortly villous, with shaggy margins (in *I. Bona-nox*

smooth). Cosmop. trop.—Some of the inferior strains passing as *I. Bona-nox* and its synonyms belong here.

23. **chryseides**, Ker. Stem slightly woody, much twining, smooth or branches slightly hairy; lvs. 1-2 in. long, ovate-cordate to subhastate, acute, entire or toothed, 3-angled, 3-lobed and repand; peduncles 1-7-fl., longer than the petioles; corolla 1/2-3/4 in. wide, funnel-shaped. July-Oct. Trop. Asia and Africa. B.M. 4:270.—It can be grown out-of-doors, but is tardy in blooming. Best treated as a warmhouse evergreen climber. *I. chryseides* is advertised abroad. *I. chrysaëtha*, Hort., described in American catalogues as having rich, glossy foliage and golden yellow fls., may belong here.

24. **Pes-câpre**, Roth (*I. maritima*, R. Br.). Stem creeping, seldom twining, 20-60 ft.; roots often 12 ft. long and 2 in. thick; lvs. 1-4 in. long, fleshy, roundish, often broader than long, with 2 glands at the base and prominently pinnate-veined; peduncles usually few-fl., equaling the petioles; corolla nearly 2 in. long, bell-shaped, margin scarcely lobed. Aug.-Oct. Trop. coasts of both hemispheres; drifting sands of coast, Ga. to Tex. B.R. 4:319.

25. **Batâtas**, Poir. (*Batâtas edulis*, Choisy.). **SWEET POTATO**. Lvs. ovate-cordate, usually angular or lobed, variable, petioled; peduncles equaling or exceeding the petioles, several-fl.; corolla 1-2 in. wide. Origin unknown, unless it be from *I. fastigiata* of tropical America.—Largely cultivated in many varieties for its edible tubers. See *Sweet Potato*.

26. **Purga**, Hayne. Lvs. sagittate-cordate, smooth; peduncles generally 1-fl., longer than the petioles; fls. rose-purple; corolla long-tubular, with a flat limb. Sept.-Oct. Trop. Amer. B.R. 33:49 (as *Ezooptimum Purga*).—The "Jalap" of commerce is an active purgative made by grinding to a powder dried slices of the tuberous roots of this species. It was principally collected near Jalapa, Mex., of which Jalap is a corruption.

27. **Wolcottiana**, Rose. Tree, 25-30 ft. high, often 1 ft. through, with slender, slightly drooping branches; lvs. ovate to ovate-lanceolate, 3-5 in. long, smooth; fls. numerous, in short racemes or corymbs; corolla about 2 1/2 in. broad, white, broadly bell-shaped. Mex. G.F. 7: 365.—Seeds do not germinate readily.

I. âbre, Kellogg. Lvs. trifoliate or quinate, the leaflets rhombic, entire, sub-repand; fls. 2-4 in. across, funnel-form, with a widely expanded limb, golden yellow. Cal. After No. 12 in key. S. W. FLETCHER.

IRESINE (Greek name for a harvest garland wound with wool; the flowers and seeds of these plants are woolly). *Amarantaceae*. **ACHYRANTHES**. From 20 to 25 species of herbs or subshrubs, in tropical and subtropical Amer. Lvs. stalked, opposite, the margins not toothed in the domestic species; fls. very small, bracteate, in axillary or terminal panicles, perfect or imperfect (plants sometimes dioecious), the perianth of one series terete, 5-parted, with ovate-oblong segments; stamens 5; style short or none, the stigmas 2 or 3; fr. a utricle. Two or three species are in common cultivation as bedding plants, because of their highly colored lvs. and stems. The first of these to be introduced was described before the fls. were known and it was referred to *Achyranthes* (*A. Verschaffeltii*), but in that genus the anthers are 2-loculed, whereas in *Iresine* they are 1-loculed. To gardeners they are still known as *Achyranthes*.

Because of ease of propagation, ability to withstand sun and sheering, and the bright colors, the *Iresines* are amongst the most popular bedding plants. Few plants are easier to grow. Stock plants are kept over winter in a cool temperature (as in a carnation house), and in February and March they are given more heat and moisture, and cut back, to get cutting wood. Cuttings root quickly in any good cutting-bed. For mass bedding, plants are usually set 6-10 in. apart. They will not withstand frost.

Hérbstii, Hook. f. (*Achyranthes Verschaffeltii*, Lem.). Lvs. broadly ovate or orbicular, obtuse and notched at the apex, purple-red, with prominent arched veins, or in the commoner variety green or green-red with yellow veins (var. *âbreo-reticulata*). S. Amer. B.M. 5:499.—This was described and figured in August, 1864, by Le-maire as *Achyranthes* (?) *Verschaffeltii* (L.H. 11:409), and later by Van Houtte as *Iresine Verschaffeltii* (F.S.

15:1601). In July, 1864, however, Hooker had published it as *Iresine Herbistii*, in honor of Mr. Herbst, of the Kew Nursery, who introduced it from the River Platte. There are horticultural varieties with Latin names.

I. Wallisii, Ort., is a small plant, with numerous small roundish lvs., which are bronze-red or dark red above and dark blood-red beneath. Probably a form of *I. Herbistii*.

Linden, VanHoutte (*Achyroanthus acuminata*, Hort.). Fig. 1171. Lvs. ovate-acuminate or lance-ovate, with less arching or curving veins, in the original form rich, deep blood-red, but in some garden forms with light-banded veins. Equador. F.S. 17: 1737.—More pyramidal in habit than the other species, and now more common. To this species evidently belong the garden forms known as *Emersoni*, *Collensii* and *formosa*.

I. Biemülleri, Haage & Schmidt, is probably a garden form of one of the above. It is a compact, dwarf grower, withstanding severe cutting: lvs. and twigs rose-carmine. L. H. B.

IRIARTEA (after Bernard Iriarte). *Palmaëac.* Tall spineless palms, with cylindrical or swollen stems supported on a pyramid of aerial roots: lvs. few, unequally pinnate; flts. equilateral, cuculate, entire or erose, plicate; petiole channelled; sheath cylindrical; fls. small: fr. 1-2 in. long; stigmas eccentric or lateral in fr. This palm is separated from *Ceroxylon* by the cuculate leaflets. Species 10. Trop. S. Amer. *I. Bungei* was advertised in 1895 by Pitcher & Manda as *Iriarteia*, which was presumably a typographical error for *Iriarteia*. No description of this species is available.

JARED G. SMITH.

IRIS (Greek, *rainbow*). *Iridæac.* Plate XVI. Distinguished from the other members of the tribe except *Hermodactylus* and *Morea* by the 2-winged style branches, from *Hermodactylus* by the 3-celled capsule, and from *Morea* by the more or less connate perianth segments. Herbs with linear or ensiform, equitant leaves and a rhizomatous or bulbous rootstalk: stem simple or branched: flowers of 6 segments, the 3 outer reflexed, and the 3 inner usually smaller and erect, always narrowed to a distinct claw, one to many in terminal heads, from spathes which are formed of the upper bract-like leaves: spathe stalked or sessile: style divided into 3 petal-like branches, which are hid or crested at the tip; stigmatic surface immediately below the crests: ovary sessile or pedicelled, within the spathe. For a monograph of the genus, see Baker's *Irideæ*, 1888.

About 170 species of *Iris* are known to botanists. They are natives of the north temperate zone, inhabiting Asia, Europe and North America, with a few species in northern Africa. About 100 species, with innumerable garden varieties, are offered by dealers in America. Many of these, including the native species, are cultivated only to a slight extent, so that horticultural interest centers chiefly around a few groups given below:

1. *German Irises*.—The plants known to the trade, and widely advertised as *Iris Germanica*, German *Iris* or *Fleur-de-lis*, are varieties and hybrids of several species, all of which are closely related to *I. Germanica*. It is a curious fact that *I. Germanica* itself has comparatively few varieties, and forms but a small part of the group named after it. It rarely or never seeds in cultivation, even when placed near closely related species. The principal parent species are *I. Florentina*,

squalens, *sambucina*, *flavescens* and *variegata*. Owing to their diversity of origin, the varieties have a great diversity of color, ranging from pure white (in *I. Florentina* and its derivatives) through all shades of mauve and blue to dark purple. From *I. variegata* and *I. flavescens* the yellow-flowered varieties and those whose flowers are variegated with yellow were probably derived. The flowers of all the varieties are large and handsome, often stately, exhibiting beautiful variegation and shades of color. They are borne on stout, erect, branched stalks much exceeding the clumps of spreading leaves. All are hardy, and form excellent border plants, flowering in May and June.

2. *Japanese Irises*.—All the plants cultivated as Japanese Irises are referable to a single species, *Iris variegata*, more generally known as *I. Kœmpleri*. The type of the species has been so much broken that the varieties constitute a distinct horticultural group, containing perhaps as many or more named varieties than the *I. Germanica* group itself. So far as known, no hybrids or other species enter into the make-up of this class. The plants form strong clumps, attaining a height of 2 to 3 feet, and bearing several flower stems. The leaves are slender, erect, growing almost parallel to each other. In the wild type the inner segments are erect and rather small. Under cultivation they have been much broadened and have acquired a spreading habit, giving the flower a flat, expanded form characteristic of this group. In color they range from white through various shades of blue to deep purple, with the segments variegated with darker veins and streaks, or plain. All the varieties are hardy, and thrive best in cool, moist situations. They begin flowering in the latter part of June and continue through July.

3. *Dwarf Irises*.—The dwarf Irises comprise several species related to *I. pumila*, *verna* and *cristata*. They seldom grow over 9 inches high, but spread rapidly by their creeping rhizomes, soon forming large patches. This habit makes them useful border plants. *I. arenaria* lives well in dry, sandy situations. The flowers are variously colored blue, lilac, yellow, etc.

4. *Oncocyclus Irises*.—The interesting species of the subgenus *Oncocyclus* inhabit the dry mountain regions of Palestine, Persia and Armenia. They differ from other Irises in many striking characters. The plants grow from 6 to 12 inches high, the stem bearing a single flower, which in some species is of enormous size, compared with the size of the plant. The segments, of which the inner are larger than the outer, present a most singular combination of somber colors. The peculiar colors are often due to the interlacing of numerous very thin veins, usually blue or brown, on a white or straw-colored ground. The most common shades thus produced are beautiful sky-blue, light gray, and brown to almost black. In some, all the segments are colored nearly alike, but in most species the inner and outer segments are differently colored. In America this group is not widely cultivated, the most common representative being *I. Snsiana*. Many recorded hybrids have been raised in Europe. For a monograph, see Foster, *Gn.* 43, pp. 130-135.

Bulbous Irises.—About 20 species of bulbous Irises are cultivated in America. They are rather dwarf, hardy and half-hardy bulbous plants, known chiefly for the brilliant colors and strong contrasts, and for their numerous flowers. The species most commonly found in gardens are *I. Xiphium*, better known as *I. Hispanica*, and *I. zippoides* or *I. Anglica*. The latter is probably the oldest *Iris* in cultivation. See Foster, *G. C. II.* 23, pp. 567 and 726.

H. HASSELEBERG.

The Irises are a widely distributed group of plants, occurring in almost all degrees of longitude of the north temperate zone. They are found in few forms above 40 degrees north latitude, and there seem to be no species south of the Atlas mountains of Africa, the botanists rating the nearly allied southern forms as *Moræas*. There is a somewhat general localization of some of the main forms of Irises, central to southern Europe being rich in the broad-leaved species, both tall and dwarf, these giving way in Asia to many narrow-leaved forms, which forms are also abundant on our western coast, in fact east to Missouri. Spain and the Mediterranean



1171. *Iresine Lindenii* ($\times \frac{1}{2}$).



Plate XVI. Japanese Irises, *Iris laevigata*

regions of Africa are the home of bulbous forms. In southwestern Asia are found not only broad-leaved forms, but this region is also the home of a rich variety of dainty bulbous kinds and the curious *Oncocyclus* species.

As will be seen by their distribution, Irises are especially adapted by their hardiness to growth in our gardens, though some forms, as the African, the Indian, and the *Oncocyclus* species, need special treatment or protection. In the main the Irises, from a cultural point of view, are like others of nature's various families, mostly very good—not to say commonplace—with a few decidedly bad members. As there are nearly 170 species of Irises, with countless varieties, they are interesting to the amateur collector and grower both for their variety and their general beauty of flower.

The life of Iris flowers varies from three to six days. They are fragile, but if cut before the petals unroll may be forwarded to considerable distance without injury. This is the only way, in fact, by which the florist can market them. The botanists divide the Irises into two main groups, the bulbous kind and those with rhizomes, these groups being each divided by the varying characters of the more or less raised line in the middle of the fall of the flower. This, of course, gives no clue to cultural necessities or to time of flowering, two important details in a garden.

Considering the bulbous Irises as a group, these are all hardy without protection in the latitude of New York city except *I. histrio*, *I. alata*, *I. juncea*, *I. Palestina*, *I. Tingitana*, *I. Vartani*.

In the order of their flowering, the *reticulata* group is the earliest, *I. Bakeriana* and others starting into flower as soon as released by frost, usually in February or March. These are soon followed by the others of this group, the largest-flowered member being *I. histrioides*. A peaty, sandy soil seems to be most acceptable to this group, and no organic manure must be given them. A location, if possible, where they may be kept on the side of dryness in summer is desirable. The culture of these, like that of all exotic plants in our gardens, is, of course, tentative. If, on trial, they seem to be happy and increase from offsets or buds, they may remain in the borders indefinitely, but if during the second season they show no gain, the bulbs should be lifted and a trial made in another location. This group seeds freely, and the seed pods will be found just under the soil surface.

Closely following this group are the so-called Juno Irises, of which *I. Persica* is the most familiar, though not the best example. These Irises have somewhat large bulbs, with curious, persistent, fleshy roots, and seem to thrive best in somewhat stiff soil, in sheltered locations, where they will be well baked during the summer. They flower in March and April, the best forms being *I. Rosenbachiana*, *I. orchoides*, *I. Sindjovensis*, and *I. Assyriaca*. They are desirable plants in the most exclusive gardens. They seed freely, and also increase by offsets.

About the same time as above will flower the *Iris tuberosa* ("The Widow"), which is neither bulbous nor an Iris strictly, but has a weird beauty of its own, with its green and black flowers. This should have a summer baking. (See *Hemodactylus*.)

Planted out in the early fall, the so-called Spanish Irises make an early start and produce leaves which are persistent during the winter and seldom injured here. In May and June they broaden out, and are then surmounted by very bright, distinct and charming flowers. Very satisfactory flowers, these, and of the easiest culture. They probably do best in spots inclining to moisture. The bulbs make offsets rapidly, and should often be divided and replanted. There are two forms and numerous flowers of this Iris. The boldest form is that known as the "Thunderbolt."

The "English" Irises, *I. xiphoides*, follow the "Spanish" in June and July. Their flowers are wider in all their parts, and in a limited range of colors, white and purple. "Mt. Blanc," pure white, is probably the most satisfactory of the group. The foliage of the English Iris does not spear till early spring, and the varieties flourish in a rather drier position than the "Spanish."

The African bulbous Irises, *I. juncea*, *I. Vartani*, *I. alata*, are subjects for a coolhouse, though the former is rarely hardy here.

The rhizomatous Irises may be divided into a number of sections, but in a cultural way may be broadly considered in two sections: those with thick, surface-creeping rhizomes, as the hybrid German, and those with more or less thin ones, as *I. Sibirica* and *I. lavigata*, which are subterranean. While the former section comprises plants which grow in various conditions, some with the roots submerged, yet in a general way they have mostly surface-creeping rhizomes. These are best transplanted soon after flowering, at which time they commence a new growth. It is customary for the nurserymen to supply these in the fall, which usually leads to the loss of a season, as they often fail to become established when planted late. The foliage of the Iris indicates a sun-loving family, and Irises should be planted in full exposure in rich, but not manured soil, well drained. The rhizomes should be planted flat and covered to half their diameter. If the rhizomes are in a growing condition, no further care will usually be necessary with the great majority of the species, but if the rhizomes are dormant and partly dried up, as they are frequently on receipt, care should be taken that they have not much moisture till they start into growth, otherwise they are likely to rot. Not every Iris will grow in every garden, but the failure to establish these plants is most often caused by too much exposure to excitement of light, warmth and moisture when the plant is not ready to convert its reserve into food. Valuable species should have the protection of a frame in such circumstances till it seems safe to plant them out. If carefully treated and not excited, apparently hopeless dried up rhizomes may often be saved. Most of these Irises in common cultivation increase rapidly, and should be divided and replanted every two or three years; otherwise the rhizomes become matted and the abode of grass, etc. Among them will be found some of the showiest flowers of the family.

Usually in early May we have flowers of *I. Chamæiris* and its variety *I. Olbiensis*, followed quickly by the dwarfier *I. pumila* and its white form *I. Atica*. Forms of *I. fulvæ*, Lam., quickly follow, after which *I. Germanica*, *I. Florentina* and the host of "hybrid German" varieties come rapidly forward and give a great wealth of color. Every one is familiar with the great bearded purple *I. Germanica*, perhaps the most generally cultivated Iris. There are larger-fl. forms of this: *I. Amas* and *I. macrantha*. *I. Germanica alba* seems to be a variety of *I. albicans*. This and *I. Florentina* are the usual white-fl. forms seen at this time. Of bold, lighter purple kinds, *I. pallida* and its hybrids are then preëminent.

The German Irises of the garden are not varieties of *I. Germanica*, but hybrids of various species, as *I. pallida*, *I. variegata*, *I. sambucina*, *I. squalens*, *I. lurida* × wild forms and *I. neglecta*, *I. amæna*, *I. plicata* and *I. Sverrii*, which are known only in gardens. Naturally these vary much in stature, time of flowering, size and coloring of fls. They may be had in almost endless variety, but a typical collection may be made with comparatively few plants.

Among the best forms of the "hybrid German" Irises are: *I. aphylla*—Bridesmaid, Madame Cheron, Swertij; *I. amæna*—Compte de St. Clair, Fairy Queen, *Reticulata alba*, Victorine; *I. neglecta*—Cordelia, Wagner; *I. pallida*—Khedive, Mad. Paquette, Queen of May, Walmer; *I. squalens*—Amols, Jacquiniana, Harrison Weir, Mous. Cheron; *I. variegata*—Beaconsfield, Darius, Hector, Honorable, Prince of Orange.

June is flowering time for many Iris species, many of which are uncommon, but of the more available forms one could scarcely neglect the native *I. hexagona*, the dark La Mance form of which is very distinct and amongst the handsomest of the family. A white form of this is not hardy here. *I. fulva*, another native plant with copper-colored flowers, is also interesting. Irises with distinct forms of this season are *I. Monieri* and *I. orientalis* (or *I. ochroleuca*), both of which have obliquely growing rhizomes and enjoy moisture.

For margins of water *I. Pseudacorus*, with yellow fls., is invaluable, and our natives, *I. versicolor* and *I. Caro-*

linensis, seem as happy in the moisture as in the uplands. The Iris rhizomes which require deep planting are mostly smaller and thinner than those of surface creepers. The species with these roots are mostly strong-growing plants, rapidly increasing and requiring an abundance of moisture, though there are some notable exceptions to be mentioned later. Of the members of this group, *I. Sibirica*, in several purple and white forms, is a common garden plant. *I. ensata* is a common Asiatic Iris with small fls. borne among the narrow foliage, which is as ornamental as some of the large grasses.

The Japanese Irises, which usually end the general display of Irises, are a remarkable example of type-breaking, the occidental gardeners having worked up from *I. levigata* a wonderful variety of colorings and variation in number of petals, though the colors may be included in about half a dozen general types. There are few handsomer flowers than good forms of the white Japanese Iris. This Iris may be grown on the upland, but it does not do its best in such locations, for it is particularly susceptible to good treatment, and to produce large flowers both water and manure are essential. Mr. Peter Barr, the veteran fancier of good plants, lately wrote the undersigned from Japan, after consulting one of the oldest cultivators, that "this Iris is grown in the rice fields in winter and watered each month while at rest with human manure (cow manure would do); as soon as young growth appears no more manure is given and the ground is flooded. When growth has ended the water is withdrawn."

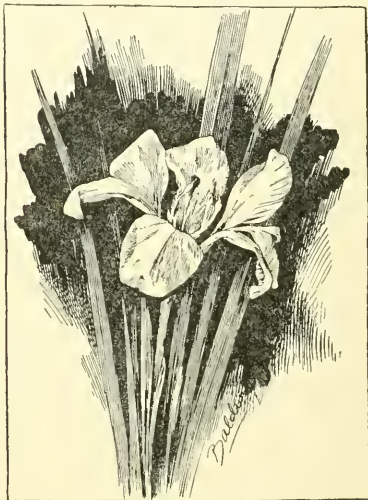
One of the most curious things in connection with the Japanese Iris is that though these plants have been in cultivation here since soon after the treaty ports were first opened, they seem to have excited little attention from gardeners until within a few years. Yet the first importations were as handsome as the later. In this connection it may be said that Japan has also *I. gracillipes*, a dark purple hardy form, and *I. japonica* or *Chikusuisai*, one of the beauties of the family but, like *I. tectorum* (the Roof Iris), another crested kind, needing here greenhouse protection and well worth it. There is, however, a perfectly hardy crested Iris, the beautiful dwarf *I. cristata* of the upper southern states—a charming plant for a front border or rockery. Equally dwarf are our lake Irises *I. lacustris* and *I. verna*.

The west coast of the United States is fortunate in possessing some beautiful and distinct Irises, mostly of the wiry-rooted, thin-leaved type. They have not yet been fully separated botanically, and they are most difficult things to establish in eastern or other gardens, so that there are really very few in cultivation. Raising from seed seems the most practical way of establishing these species. They seem to be perfectly hardy here, for some of them have been tested and flowered, but they do not tarry long.

I. macrospiphon, *I. Hartwegii*, *I. Douglasiana*, *I. bracteata*, *I. tenax*, *I. longipetala*, *I. tenuis* and *I. Purdyana* is a list which will interest the searcher after interesting plants. Max Leichtlin, who has a genius for growing difficult things, has been successful in establishing *I. bracteata*, *I. macrospiphon* and *I. Purdyana*. He says, "My experience is that they cannot be moved unless in full vegetation. We must grow them from seed, and not touch the seedlings until they have formed a solid rootstock. After this and movement to grow has begun, they can be safely handled and transplanted like other Irises."

There remain to be considered two allied groups, the *Oncocyclus* and *Regelia*. These are considered by amateurs the most interesting groups of the Iris family—interesting in the amateur's vocabulary meaning something rare and difficult. At the best, these plants give few flowers, but they compensate for this by their distinct and quaint beauty. The best known member of the family, *I. Nestiana*, has been in cultivation several hundred years, but is by no means yet a common plant. It takes more kindly to cultivation than any of the other species, will usually flower in the border the first year after planting if the spring is not too rigorous; and gardens are not unknown where from some conditions of fortunate placing or soil, they continue to flourish. It cannot be said that there is any hard and fast formula

for growing these Irises. They vary among themselves as to their requirements, and need special and different treatment in different gardens and climates. These Irises are natives of Palestine, Asia Minor, the Caucasus, Central Asia and Persia regions, all of which are hot and



1172. *Iris unguicularis*.

Type of smooth-petaled Iris ($\times \frac{1}{2}$). No. 13.

dry in summer, with a settled and sometimes severely cold winter and a genial spring. In some of the regions they are protected by a covering of snow in winter while dormant, but Palestine and Persia have open winters, and their Irises make growth at this time. After cultivating most of the species for a number of seasons, the writer's experience does not lead him to dogmatize much on their cultivation or to approve of many special devices which have been put forward from time to time as the solution of the problem. The consensus of opinion among the growers who have had the best success with these plants is about as follows, premising that we are dealing with plants which are perfectly hardy: We receive the rhizomes with the Dutch bulbs in the fall, at which time they are dormant and leafless. It is well to store them in a cool place and plant out in November in a bed of fairly light and well drained soil in a border fully exposed. They require no protection, but if the climate is one where frosts and thaw alternate, it is well to give the ground a covering while frozen to keep it firm. The Irises so planted will seldom spear here till genial weather arrives, and with plentiful supplies of moisture at the root will give flowers from strong buds. After flowering, or, more accurately, flowering time, one is forced to choose between two methods of treatment. If the garden is high, dry and hot, the best procedure is to cover the beds with a glass frame sufficiently large to protect them from moisture and allow the rhizomes to bake. This frame may be removed in the late fall. If the leaves appear, as some of them are likely to do, they may be left unprotected until very severe weather sets in, here usually in December. The protection should be something to protect the leaves from the winter sun and frequent change of temperature. Here coal ashes have proved satisfactory, though unsightly. Foliage does not seem to become as soft under them as under leaves or mats. If the spring is genial, with weather

steadily becoming warm, the plants being uncovered as soon as the conditions will seem to warrant, should be in the best possible shape to reward one with their noble blooms. It is the lack of this genial spring in the latitude of New York which, however, leads often to cultural troubles. The leaves, having been protected, are none too hard, and, with the constant alternate thawing and freezing, and the high winds, hot and cold, the plants need constant watering and application of needed covering till really genial weather. Otherwise the foliage is blighted and no flowers are produced.

In gardens which are low and never free from moisture, the best procedure is that followed in Holland, lifting the rhizomes in July and taking them under cover in dry earth, planting out again in the fall. In this case care should be used in lifting not to injure the numerous fleshy roots. The Palestine and Persian forms of these Irises are considered the most difficult to cultivate, from their habit of early growth.

Irises are not only increased by the division of the rhizomes or by offsets, but may be rapidly grown from seed, which they usually produce freely, though, in most cases, they require artificial fertilization. A large number of the common Irises of gardens are hybrids, and of late years a number of beautiful hybrids have been produced between some of the rarer *Oncocyclus* species, and between these also and common forms, as *I. variegata*, etc. There are still opportunities to produce many new and untried crosses, and experiments in this line are recommended. The pollination of the Iris is simple. The anthers should be removed when the flower first opens, and preserved in paper or vials, properly marked. The pollen will retain its potency for a week or perhaps longer, and may be applied to the stigma of the flower selected (the author of which has been removed promptly) with a camel's-hair brush. The stigma will be found near the apex of the petal-like style, and is ready for pollination when the upper edge drops down and exposes the upper surface. Many Iris seeds germinate with considerable irregularity, and failure to start promptly should not lead to discouragement or discarding of the pan in which the seeds are.

J. N. GERARD.

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SYNOPSIS OF SUBGENERA IN CULTIVATION.

Series I. Rootstock a short, thick, or creeping rhizome.

- Apogon. Outer segments of the perianth without a beard or crest.....Species 1-30
 PARANTHOPHIS. Outer segments of the perianth not distinctly bearded or crested, merely keeled; sometimes slightly hairy.....Species 31
 EVANSIA. Outer segments of the perianth distinctly crested on the claw and lower part of the blade.....Species 32-35
 PSEUDEVANSIA. Outer segments bearded or hairy; beard springing from a rudimentary crest.....Species 36
 POGONIRIS and REGELLA. Outer segments bearded or hairy; hair restricted to a dense beard along the midrib.....Species 37-68
 ONCOCYCLUS. Outer segments bearded or hairy; hairs diffused over the lower part of the blade and claw; inner segments larger than the outer.....Species 69-80

Series II. Rootstock bulbous.

- XIPHION. Inner segments of the perianth large, erect; stamens not adhering to the style branches.....Species 81-91
 GYNANDRIS. Inner segments large, erect; stamens adhering to the style branches.....Species 92
 JUNO. Inner segments small and spreading or deflexed.....Species 93-102

SUBGENUS APOGON

- A. *Lvs. linear, generally less than 1/2 in. broad.*
 B. *Sheath splitting up into fibers.*
 C. *Valves of the spathe green.*
 D. *Tube of the perianth 1 1/2-2 in. long.*
 E. *Spathe sessile*..... 1. *humilis*
 EE. *Spathe stalked*..... 2. *macrospion*
 DD. *Tube of the perianth short or obsolete.*
 E. *Fls. yellow*..... 3. *Hartwegii*
 4. *Grant-Duffii*
 EE. *Fls. some shade of blue or white.*
 F. *Stem reduced.*
 G. *Stem terete.*
 H. *Rootstock slender, wide-creeping.*
 ing..... 5. *Ruthenica*
 HH. *Rootstock short.*
 creeping..... 6. *tenax*
 7. *ensata*
 8. *Delavayi*
 GG. *Stem compressed*..... 9. *longipetala*
 FF. *Stem lvs. long, generally over 1 ft. in length*..... 10. *prismatica*
 11. *graminea*
 CC. *Valves of the spathe brown and scarious*..... 12. *Sibirica*
 BB. *Sheaths not splitting into fibers.*
 C. *Stem nearly obsolete*..... 13. *unguicularis*
 CC. *Stem present, clothed with sheathing bracts*..... 14. *bracteata*

- var. *Stem present, bearing 1-2 leaves* 15. **Missouriensis**
 16. **Douglasiana**
 AA. *Lvs. ensiform, generally much over 1/2 in. broad.*
 B. *Stem bearing several long leaves.*
 C. *Fls. reddish brown* 17. **fulva**
 CC. *Fls. yellow* 18. **Pseudacorus**
 CC. *Fls. blue, purple, lilac, etc., or white.*
 D. *Lvs. somewhat glaucous* 19. **versicolor**
 DD. *Lvs. bright green, not glaucous.*
 E. *Fls. sessile* 20. **hexagona**
 EE. *Lvs. pedicelled* 21. **Caroliniana**
 22. **setosa**
 BB. *Stem bearing 2-4 reduced lvs.*
 C. *Fls. yellow* 23. **Guldenstædtiana**
 24. **aurea**
 25. **Monnierii**
 26. **orientalis**
 CC. *Fls. some shade of blue or white* 27. **lætidissima**
 28. **lævigata**
 29. **Trojana**
 30. **spuria**

1. **humilis**, M. Bieb. (*I. Ruthénica*, Ker., not Dryand.). Rhizome wide-creeping; lvs. to 12 in. in tuft, glaucous, 6-12 in. long; fls. bright lilac; outer sepals with a suborbicular blade and a long cuneate claw. Caucasus to Georgia and Hungary. Gn. 10, p. 379.

2. **macrocephalon**, Torr. Plants rather dwarf, 6-12 in. high; lvs. grass-like, green, 12 in. long, exceeding the fls.; stem 3-6 in. long; pedicels very short; outer segments obovate-cuneate, undulate, pale yellow to cream, with a network of brownish crimson or bright lilac veins; inner segments rather small, colored like the outer. Free-flowering. Calif. and Ore. Gn. 52, p. 126.—Torrey says the fls. are bright lilac and the lvs. less than 4 lines wide.

3. **Härtwegii**, Baker. Lvs. few (2), 6-12 in. long, finely veined; stem 6 in. long, with linear leaf low down; pedicel 1-1½ in. long; limb pale yellow; outer segments with an oblong blade, shorter than the claw. Calif. Rarely cult.

4. **Grant-Duffii**, Baker. Lvs. about 1 ft. long; stem 6 in. high, with about 2 lvs., outer valves marked with fine black lines; outer segments with a yellow blade, much shorter than the claw; claw veined with lilac on a yellowish white ground. Palestine. Gt. 42, Supp. Pl.—Not valuable commercially.

5. **Ruthénica**, Dryand., not Ker. Lvs. 3-12 in. long, in crowded tufts; stem slender, 3-6 in. long, but often obsolete; tube twice as long as the ovary; outer segments with an oblong blade rather shorter than the claw, lilac, violet-scented. Apr., May. China, Siberia and Cent. Asia. B.M. 1123 and 1393. Gn. 50, p. 187.

6. **ténax**, Dougl. Sheaths short; lvs. 6-12 in. long; stem 6-12 in. long; pedicel long; outer segment broadly obovate, with an acute point; blade about as long as the claw, bright lilac, with purple veins and a variegated white and yellow spot on the throat; inner segments shorter, waved. Apr., May. Dry soils, B. C. and Ore. Int. to Eng. 1826. B.M. 3343. B.R. 15:1218. Gn. 53:1175.—Hardy.

7. **ensata**, Thunb. (*I. biglomis*, Vahl. *I. oxyptala*, Bunge. *I. fragrans*, Lindl.). Sheaths large; lvs. 1-3 ft. long; pedicel 2-4 in., often longer than the spathe; limb loose, bright blue or lilac; outer segments obovate-cuneate, 2 in. long; blade shorter than the claw, veined with dark blue, yellowish on the throat; inner segments slender, erect, bright blue. Russia, Japan, Caucasus. B.M. 2528 and 2231. B.R. 26:1. Gt. 1011.—Hardy. Variable.

Var. **pabularia**, Naudin (*I. pabularia*, Hort.). Said to be distinct. Larger, with lvs. purplish red near the base. Used as a forage plant. Does well in driest situations. Gt. 47:1452.—Described by Wittmack, Gt. 47, p. 369. The seeds should be sown in beds, and the

young plants set out the following spring, 10 in. apart each way, where they are to remain.

8. **Delavàyi**, Michx. Lvs. 2-2½ ft. long, often nearly 1 in. broad; stem 3-5 ft. high, bifurcate; spathe valves green; outer segments reflexed from the middle, oblong, obtuse or emarginate, brilliant violet, spotted with white on the lower half; claw yellow, veined with lilac; inner segments oblong-lanceolate, acute, erect, violet. Large plants, with the flower-stalks erect, high above the lvs. Thibet. R.H. 1895, p. 399.

9. **longipétala**, Herb. Lvs. 1-1½ ft. long; stem stout, solid, compressed, 1½ ft. high; fls. bright lilac; outer segments obovate, reflexing half way down; claw veined with violet on a white ground. Calif. B.M. 5298.

10. **prismática**, Pursh (*I. Virginica*, Muhl. *I. græcilis*, Bigel.). Plant tall, slender; lvs. mostly shorter than the stem, grass-like; stem 1-2 ft., simple or forked, flexuous; spathe 1-2 fld.; pedicel long, exceeding the spathe; outer segments 1½-2 in. long; blade shorter than the claw, bright lilac, yellow on the throat, marked with purple and darker veins; inner segments erect, bright lilac. May, June. Wet grounds, New Brunswick to Pa. and N. Car. B.M. 1504.

11. **graminea**, Linn. (*I. Nikiténsis*, Lange). Lvs. strongly ribbed, 1-1½ ft. long; stem compressed, angled, slender, solid; pedicel 1-1½ in. long; limb bright lilac, copiously veined; outer segments with an orbicular blade ½ in. broad and shorter than the broad claw; claw dull yellow, veined with purple; inner segments erect, nearly straight. May. Central and S. Eu. B.M. 681.—Long cult.; mentioned by Lobel, Clusius and Gerarde. Distinguished from *I. Sibirica* by its solid, angular stem.

12. **Sibirica**, Linn. (*I. acuta*, Willd.). Compact, tufted; lvs. green, not rigid, 1-2 ft. long; stem slender, terete, fistulose, much overlapping the lvs., simple or forked, bearing several clusters of fls.; limb bright lilac-blue; outer segments 1½-2 in. long, with an orbicular blade gradually narrowed to a slender claw, veined with bright violet, whitish toward the claw; inner segments shorter, erect. Central and S. Eu. and eastern Siberia. Int. in 1796. B.M. 50. R.H. 1898, p. 23.—Common in cult. The plants form large, compact clumps, producing many long flowering stems from the center. Var. **orientalis**, Thunb. (*I. sanguinea*, Don. *I. Sibirica*, var. *sanguinea*, Hort. *I. hamatophylla*, Fisch. *I. Sibirica*, var. *hamatophylla*, Hort.). Fls. larger, more fugitive; blade of the outer segments orbicular; young lvs. reddish. June. Produces a second crop later. Var. **alba**, Hort., with pure white fls. Var. **variegata**, Hort., with variegated lvs. Var. **acuta**, Hort. Narrow-ivd.

13. **unguicularis**, Poir. (*I. stylösa*, Desf.). Fig. 1172. Lvs. about 6 in. in tuft, finally 1½-2 ft. long, bright green; tube 5-6 in. long, filiform, exerted from the spathe; limb bright lilac, rarely white; outer segments 2½-3 in. long, 1 in. broad, with a yellow keel, streaked with lilac on a white ground at the throat; inner segments oblong. Jan., Feb. Algeria. B.M. 5773. Gn. 24:398; 46:979; 49, p. 236; 50, p. 187. G.C. III. 25:85.—Not hardy, but useful for cutting in early winter. Fragrant. Var. **alba**, Hort. White form; spring. Var. **superba**, Hort. Bluish purple. Oct. and later.

14. **bracteata**, S. Wats. Rudimentary lvs. brown, very rigid; produced lvs. 1 to few, much exceeding the stem, 1-2 ft. long, one side green, the other glaucous, edge revolute; stem 1-headed, angled, 2-3 in. to 1 ft. long, sheathed with bracts 2-4 in. long; tube short, funnel-form; outer segments 2-3 in.; blade ovate, as long as the claw, pale yellow, veined with bluish purple; inner segments shorter, erect, yellow; style branches long, narrow. June. Discovered in 1884 by Thomas Howell, in Ore. G.F. 1:43.—Int. 1888.

15. **Missouriensis**, Nutt. (*I. Tolmieana*, Herb.). Lvs. pale green, finely ribbed, 1-1½ ft. long; stem 1-2 ft. long, usually exceeding the lvs., bearing a single large leaf low down; pedicel long; tube very short; limb bright lilac; outer segments obovate, 1 in. broad, yellow near the claw; inner segments oblong, straight, erect, Wet soil, S. Dak. and Mont. to Ariz. Gn. 50:1082.—Not common in cult. Flowers early.

16. *Douglasiana*, Herb. Rhizome stout, short, creeping; lvs. about 6 in a tuft, broadest in the middle, strongly ribbed, 1-2 ft. long; stem 1-2 ft. high, usually simple, with one long bract leaf; tube $\frac{1}{2}$ - $\frac{3}{8}$ in. long; fls. 3-4 in. in diameter; outer segments obovate-spatulate, spreading and recurved, pale lilac, with a white disk and purple veins; inner segments shorter, erect, lanceolate, acuminate, pale lilac, not veined. Calif. B.M. 6083. Gn. 50:1086.

17. *fulva*, Ker. (*I. cyprea*, Pursh). Lvs. thin, bright green, $1\frac{1}{2}$ -2 ft. long, not exceeding the stem; stem 2-3 ft. high, forked low down; lower stem-lvs. 1 ft. long; pedicel produced; tube greenish yellow, 1 in. long; limb loosely expanded, bright reddish brown or copper-colored, variegated with blue and green; outer segments obovate-cuneate, emarginate; inner segments smaller, spreading. Late June. In swamps, Ill. to Ga., La. and Tex. Introduced into England 1811 by Lyon. B.M. 1496. Gn. 53:1175. Mn. 5:61.

18. *Pseudacorus*, Linn. Lvs. $1\frac{1}{2}$ -3 ft. long, equaling the stem; stem stout, terete, 2-3 ft., bearing several long lvs. and several clusters of fls.; limb bright yellow; outer segments broadly obovate, 2-2 $\frac{1}{2}$ in. long, yellow, with a bright spot and radiating brown veins on the claw; inner segments scarcely longer than the claw of the outer, oblong. May, June. Europe, Syria and the Barbary states; naturalized in N. Y., Mass. and N. J.—The plants form fine, large clumps, bearing numerous flowering stalks. Var. *variegata*, Hort. Lvs. striped with creamy white. Var. *pallida*, Hort. Fls. pale sulfur yellow.

19. *versicolor*, Linn. Lvs. slightly glaucous, $1\frac{1}{2}$ -2 ft. long; stem forked low down and often branched above, 2-3-headed; tube very short; limb violet-blue; outer segments spatulate, 2-3 in. long, variegated with yellow on the claw and veined with purple; inner segments oblanceolate, much smaller. British N. A. and northern U. S. Int. into Eng. 1732. B.M. 21. G.W.F. 5. D. 89.

20. *hexagona*, Walt. Lvs. 2-3 ft. long; stem usually simple, 3 ft. long, 2-3-headed, with several large lvs., the upper ones exceeding the fls.; spathe valves sometimes leaf-like; tube 1 in. long, green, dilated upward; limb bright lilac; outer segments 3 in. long; blade obovate, with a bright yellow keel on the claw; claw downy; inner segments shorter, erect; style branches very concave, green, with a central lilac band. Ky. to Tex. and Fla. B.M. 6787.

21. *Caroliniana*, S. Wats. Lvs. 2-3 ft. long, bright green; stem stout, simple or branched; tube $\frac{1}{2}$ - $\frac{3}{8}$ in. long; limb lilac, variegated with purple and brown; outer segments broadly spatulate, $2\frac{1}{2}$ -3 in. long, with narrow claws; inner segments narrower, nearly erect. Differs from *I. versicolor* by its green lvs. Discovered by W. A. Manda in N. Car. G.F. 6:335.

22. *setosa*, Pallas. Lvs. thin, green, 1- $1\frac{1}{2}$ ft. long; stem deeply forked, much exceeding the lvs.; tube $\frac{1}{2}$ in. long; limb bright lilac; outer segments 2-2 $\frac{1}{2}$ in. long; blade 1 in. broad, suddenly narrowed at the claw, conspicuously veined; inner segments very small, $\frac{1}{2}$ in., cuneate, large-cuspidate; style branches large, crested. E. Siberia, Japan, and northwestern Amer. B.M. 2326. Gt. 322.

23. *Gueldenstedtiana*, Lepech. Lvs. pale green, 1- $1\frac{1}{2}$ ft. long; stem stout, terete, $1\frac{1}{2}$ -2 ft. long, often bearing 1-2 spicate clusters below the end one; limb pale yellow; outer segments with an orbicular blade $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, shorter than the claw, which has a bright yellow keel and faint lilac veins; inner segments shorter, erect. Asia.—Var. *Sogdiana*, Baker. A variety with gray-lilac flowers.

24. *adrea*, Lindl. Lvs. scarcely glaucous, $1\frac{1}{2}$ -2 ft. long; stem 3-3 $\frac{1}{2}$ ft. long, stout, terete, with 1-2 sessile clusters below the end one; spathe 2-3-fld.; pedicel long; limb bright yellow; outer segments with an oblong blade 1 in. broad, as long as the claw; inner segments less than $\frac{1}{2}$ in. broad. July. West Himalayas. B.R. 33:59. Gn. 31:579.—Int. by Dr. Royle. This species has brighter yellow fls. than the others of this group (18-21).

25. *Monniéri*, DC. Lvs. slightly glaucous, 2-3 ft. long; stem stout, terete, 3-4 ft. long, with several sessile clus-

ters of fls.: lvs. long $2\frac{1}{2}$ -3 $\frac{1}{2}$ in. long, lemon-yellow, without veins; blade of outer segments orbicular, 1- $1\frac{1}{2}$ in. long, equaling the claw; inner segments oblong-unguiculate, 1 in. broad, Rhodes and Crete. Discovered and int. by Sieber, 1821. Not showy except in masses. This and *I. orientalis* are perhaps varieties of *I. spuria*.



1173. Habit sketch of *Iris orientalis* (X1-20). No. 26.

26. *orientalis*, Miller (*I. ochroleuca*, Linn. *I. gigantea*, Carr.). Fig. 1173. Plants growing in strong clumps; lvs. 2-3 ft. long, slightly glaucous; stem 3-4 ft., stout, terete, with 2-3 spicate clusters of fls.; outer segments obovate, 1 in. broad, as long as the claw, yellow, paler or white toward the margin; inner segments oblong, 1 in. broad, lemon-yellow to whitish. Asia Minor and Syria. B.M. 61. Gn. 20:301; 38:779; 46, p. 362 and 50, p. 186. R.H. 1875, p. 357.—One of the largest of the Irises. Grows in almost any situation. White forms of this plant are in cultivation.

27. *fœtidissima*, Linn. GLADWIN. Lvs. 1- $1\frac{1}{2}$ ft. long; stem compressed, 2-3 ft. long, 2-3-headed; tube $\frac{1}{2}$ in. long; limb bright lilac; outer segments $1\frac{1}{2}$ -2 in. long, with a suborbicular blade equaling the claw; inner segments shorter, oblanceolate. Central and S. Eu., Eng., Afghanistan and Algeria. Gn. 47, p. 30.—This plant is very distinct, and is easily recognized by the odor of the broken lvs. The capsules remain on the plants in winter, bursting open and displaying rows of orange-red berries. The fls. are rather inconspicuous. There is a whitish variety with brown veins, and a variety with white-striped lvs.

28. *lavigata*, Fisch. & Mey. (*I. Kämpferi*, Sieb.). JAPANESE IRIS. Fig. 1174. Lvs. thin, ensiform, 1- $1\frac{1}{2}$ ft. long; stem much overtopping the lvs., obscurely angled, 1-3-headed; pedicel $\frac{1}{2}$ -2 in. long; tube short; limb blue, violet, etc.; sometimes white, spreading, 3-5 in. across; outer segments broadly ovate-oblong, obtuse, with a yellow spot on the claw; claw short, distinct; inner segments oblanceolate, erect, conniving or spreading; style branches with bifid, incurved lobes. E. Siberia and Japan. Int. by Von Siebold, and flowered at Ghent in 1857. B.M. 6132. I.H. 5:157. F.S. 20:2073-74; 23:2431-36. Gt. 442. Gn. 9:21; 16:195; 21:2341; 55, p. 105. R.H. 1890, p. 188. G.C. III. 13:165, 169; 14:501. A.G. 19:596. Gnz. 1:256; 5:163; 6:339; 7:45. J.H. III. 28:205. F.E. 10:777. F.M. 1874:137; 1880:403.

29. *Trojána*, Kerner. Lvs. very acute, glaucous; stem over 3 ft. high, much branched and overtopping the lvs.; pedicel none; ds. bright violet-purple; outer segments obovate; blade longer than the claw; claw white, bordered with yellow and veined with brown-purple; inner segments elliptic, suddenly narrowed to a claw; style crests broad, denticulate. Troad, Asia Minor.

30. *spuria*, Linn. Lvs. firm, linear, glaucous, 1 ft. long; stem overtopping the lvs., bearing 1-3 spicate heads; pedicel shorter than the spathe; tube $\frac{1}{2}$ - $\frac{3}{4}$ in. long; limb bright lilac; outer segments with an orbicular, spreading blade $\frac{1}{2}$ in. broad and half as long as the claw; claws broad, concave, lilac, with a yellow

keel and purple veins; inner segments shorter, straight, oblanceolate; style crests small. Central and S. Europe. B.M. 58.

Var. *nôtha*, Bieb. (*I. holophylla*, Ker.). More robust: lvs. 1 in. broad; spathe larger; stem 2-3 ft. high. Caucasus to Kashmir. Int. 1780 by Peter Pallas. B.M. 875. —Harly.

SUBGENUS PARIANTHOPSIS.

31. *vérna*, Linn. Dwarf, 6 in. high; rhizome wide-creeping; sheaths not splitting into fibers; lvs. linear, slightly glaucous, 3-8 in. long; stem scarcely any, 1-headed; tube slender, 1½ in. long; limb deep violet; outer segments 1½ in. long, obovate, narrowed into a slender yellow, slightly pubescent claw; inner segments erect, smaller, violet. Shade, Ohio, Ky., Va. and south. L.B.C. 19:1855.

SUBGENUS EVANSIA.

- A. Stem very short.....32. *cristata*
 AA. Stem equaling or exceeding the lvs.
 B. Pedicels much shorter than the spathe.....33. *tectorum*
 BB. Pedicels as long as the spathe, and articulate at the apex.....34. *Milesii*

35. *Japonica*

32. *cristata*, Ait. Plant dwarf; rhizome slender, creeping; lvs. ensiform, thin, 4-8 in. long, green; stem 1-3 in. high, flattened, 1-headed, bearing 2-3 lvs.; tube slender, 1½-2 in. long; limb blue; outer segments obovate, 1-1½ in. long, crested; inner segments shorter, naked. Apr., May. Mts. Ky., Va. and Carolinas. B.M. 412. Gn. 45, p. 127. L.B.C. 14:1366.

33. *tectorum*, Maxim. Fig. 1175. Lvs. 1 ft. long, ensiform, strongly ribbed; stem 1½ ft., subterete; heads on long

large, plain lilac, short-clawed. Sent to En. in 1872 by Dr. Hance. Cult. in China and Japan. B.M. 6118. F.S. 22:282. Gl. 716. Gn. 50:1086.

34. *Milesii*, Baker. Lvs. 7-8 on the stem, 2-3 ft. long and 2-3 in. broad; stem 2-3 ft. high, branched, bearing 4-5 heads; fls. bright lilac, lasting only a day; outer segments oblong-cuneate, claret-purple, whitish in the center, spotted and veined with lilac, furnished with a deeply lacinated yellow crest; inner segments oblong, spreading; style crests deeply toothed. Near *I. tectorum*, but inferior. Himalayas. B.M. 6889.

35. *Japonica*, Thunb. (*I. Chinensis*, Curt. *I. fimbriata*, Vent.). Fig. 1176. Lvs. ensiform, 1-1½ ft. long; stem slender, as long as the lvs., with a raceme of lilac fls.; tube 3 in. long; outer segments 1-1½ in. long, with crimped margins, yellow on the claw, crested; inner segments smaller. Winter, Japan and China. B. M. 373. Gt. 511. Gn. 28:503. J. H. III. 31:185. A. G. 12:704. F. R. 2:149. —An evergreen greenhouse plant.



1175. *Iris tectorum* (×¼). No. 33.

SUBGENUS PSEUDEVANSIA.

36. *Alberti*, Regel. Lvs. ensiform, glaucous, 1½-2 ft. long; stem exceeding the lvs., bearing 5-6 heads in a loose panicle; outer segments obovate cuneate, 2 in. long, bright lilac, with a rudimentary crest and a dense beard of white, yellow-tipped hairs, veined; inner segments as long and broader than the outer, with convolute claws, lilac. Discovered in Turkestan by Dr. Albert Regel. Gt. 999. B.M. 7020.

SUBGENERA POGONIRIS AND REGELIA.

- A. Dwarf: lvs. generally less than 9 in. long.
 B. Pedicel obsolete, or very short.
 C. Perianth tube 2 in. or more in length.....37. *pumila*
 38. *pseudo-pumila*
 CC. Perianth tube 1 in. or less in length.
 D. Stem 6 in. or more in length.
 E. Fls. blue, purple, violet, etc.
 F. Spathe valves green or nearly so.
 G. Lvs. linear.....39. *gracilis*
 GG. Lvs. ensiform.....40. *Balkana*
 41. *biflora*
 F. Spathe valves entirely scarious.....42. *Cengialti*
 EE. Fls. yellow.....43. *virescens*
 44. *lutescens*
 DD. Stem 2 in. or less in length.
 E. Fls. blue.....41. *biflora*
 EE. Fls. yellow.....45. *Chamaeiris*
 BB. Pedicel as long as the ovary.
 C. Sheaths not splitting into fibers.....46. *arenaria*
 CC. Sheaths splitting into fibers.....47. *flavissima*
 AA. Tall: lvs. generally more than 1 ft. long.
 B. Stem 2-6-headed.
 C. Fls. yellow.....48. *variegata*
 49. *flavescens*



1174. Japanese Iris (×½).

Iris laevigata, better known as *I. Kuepferi*. No. 28.

peduncles; tube 1 in. long; limb bright lilac; outer segments 2 in. long, obovate; claw half as long as the blade, streaked with violet, with a wavy edge and a large, lacinate, white and lilac crest running up the claw and half up the blade; inner segments spreading, nearly as

cc. *Fls. blue, violet, etc., or white.*

- d. *Stem short, scarcely overtopping the lvs.*..... 50. *aphylla*
51. *lurida*
52. *Benacensis*
53. *Kochii*

DD. *Stem tall, much overtopping the lvs.*
E. *Spathe valves scarious*..... 54. *Florentina*
55. *pallida*
56. *plicata*
57. *Swertii*

EE. *Spathe valves green, or scarious only on the upper portion.*

- F. *Spathe valves tinged with purple*..... 58. *neglecta*
59. *hybrida*
60. *Germanica*

FF. *Spathe valves not tinged with purple*..... 61. *squalens*
62. *sambucina*
63. *Biliotti*
64. *Cypriana*

BB. *Stem 1-headed.*

c. *Spathe valves entirely scarious at the flowering time.* 65. *atroviolacea*

CC. *Spathe valves green.*

- d. *Lvs. thin, linear*..... 66. *Suwarowi*
DD. *Lvs. ensiform*..... 67. *Leichtlini*
68. *Korolkowi*

37. *pumila*, Linn. (*I. gracilis*, E. Berg.). Fig. 1177. Lvs. linear, 2-4 in. long; stem none or very short, 1-headed; spathe valves scarious at the tip; fls. fugitive, yellow, or bright or dark lilac; limb 2 in. long. A dwarf, hardy plant, spreading rapidly in borders. B.M. 9. L. B.C. 16:1574.—Var. *alba*, Hort., pure white. Var. *atroviolacea*, Hort., velvet-purple. Var. *azurea*, Hort., azure-blue.

38. *pseudo-pumila*, Tineo (*I. Panormitana*, Tod.). Lvs. ensiform, glaucescent, 6-9 in. long, narrowed suddenly to an oblique tip, 1-headed, 6-8 in. long, 1-fld.; tube 2-2½ in. long; spathe valves green; fls. varying from yellow to bright lilac; outer segments oblong unguiculate, 2-2½ in. long; inner segments rather broader. Mts., Sicily.

39. *gracilis*, Maxim. Tufted lvs. grass-like, shorter than the stem; stem 1 ft. long, 1-headed; fls. pale lilac; outer segments obovate-oblong, with a yellow beard; inner segments oblong-emarginate, with a short claw. Western China.

40. *Balkana*, Janka. Rhizome stout; tufts crowded; lvs. ensiform, glaucescent, 3-4 in. long; stem 6-9 in. long, 1-headed; spathe 1-2-fld.; fls. dark claret-lilac; outer segments obovate-cuneate, 2-3 in. long; beard dense, white, tipped with lilac; inner segments erect, oblong. Early May. Balkans.

41. *biflora*, Linn. (*I. fragrans*, Salisb. *I. nudicaulis*, Hook.). Lvs. 6-9 in. long; stem 2-10 in. long, compressed; fls. bright violet-purple; outer segments obovate-cuneate, 2-2½ in. long, with dark veins and a beard of long, yellow hairs. Portugal and N. Morocco. B.M. 5806.

42. *Cengialti*, Ambrosi. Resembles *I. pallida*, of which it is probably merely a dwarf variety; lvs. 6 in. long; stem about as long as the lvs.; fls. bright lilac; outer segments with a white beard. May, June. Lombardy and S. Tyrol.—Often spelled *I. Ciengialti*.

43. *virescens*, DC. Lvs. 8-9 in. long; stem 9-12 in. long, bearing 2-3 reduced lvs.; outer segments obovate-cuneate, 2-2½ in. long, 1 in. broad, greenish yellow, veined at the claw with purple; inner segments obovate, dull yellow. April. Valais.

44. *lutescens*, Lam. Lvs. 6-9 in. long; stem equaling the lvs.; fls. pale yellow; outer segments obovate-cuneate, 2-2½ in. long, pale yellow, streaked with pale brown, undulate; inner segments broader, suddenly

narrowed to a claw, which is streaked with purple, crenulate. S. France. B.M. 2861.—Var. *Statella*, Tod. Spathe valves shorter, less pointed, and more scarious; segments broader. Sicily. B.M. 6894.

45. *Chamaeiris*, Bertol. (*I. Obliquis*, Henon). Lvs. 3-4 in. long, ½ in. broad; stem very short; fls. bright yellow; outer segments obovate-cuneate, tinged and veined with brown; inner segments oblong. May. Italy, France.—Var. *Italica*, Parl. Fls. dark violet.

46. *arenaria*, Waldst. Lvs. few in a tuft, linear, 3-4 in. long; stem short; limb bright yellow; outer segments oblong-cuneate, 1½ in. long, ½ in. broad; inner segments smaller; very distinct. Rare in cult., but good for dry soils.—Hardy. Var. *minor*, Hort. Smaller. B.R. 7:549.

47. *flavissima*, Pallas. Lvs. thin, linear, 4-8 in. long; stem 1-6 in. long; limb bright yellow; outer segments 1-1½ in. long, ¾ in. broad; inner segments oblong, narrower.—Var. *Bloudovii*, Led. (*I. Bloudovii*, Hort. More robust, with broader lvs., a larger stem and larger fls. Siberia and Mongolia.



1176. *Iris Japonica*. A crested flower ($\times \frac{1}{2}$). No. 35.

48. *variegata*, Linn. Lvs. 1-1½ ft. long; stem equaling the lvs.; outer segments oblong-cuneate, claret-brown toward the tip, much veined with brown on a yellow ground; beard bright yellow; inner segments erect, oblong, bright yellow, veined. Austria, Turkey and S.

Russia. Long in cult. B.M. 16. Gn. 14:135; 52 1143 (var. *aurata*), Var. *honorabilis*, Hort. Yellow, shaded with brown.

49. *flavescens*, DC. Lvs. 12-15 in. long; stem 2-3 ft. high; fls. bright lemon-yellow; outer segments obovate-cuneate, 2½ in. long; beard deep yellow; inner segments obovate, pale yellow. Bosnia to Caucasus and Armenia. B.R. 31:35 (as *I. imbricata*).

50. *aphylla*, Linn. (*I. furcata*, Bieb. *I. Bohémica*, F. W. Schmidt. *I. Hungarica*, Waldst. *I. lateata*, Tausch.). Lvs. glaucescent, 6-12 in. long; stem equaling the lvs., sometimes forked low down, leafless; spathe valves greenish; fls. dark lilac; outer segments obovate-cuneate, 2-2½ in. long; beard white; inner segments broader, obovate. E. Eu. B.M. 2361. B.R. 10:801. L.B.C. 20:1970.—Nos. 50 to 53 cannot be easily separated from each other by the material available. They are distinguished by slight differences in the lvs., spathe valves, beard, and form of the segments, as described in the text.

51. *lurida*, Ait. Lvs. 1 ft. long, slightly glaucous; stem not much overtopping the lvs., 3-4-headed; spathe valves green, very ventricose; outer segments obovate-cuneate, reflexed from half-way down, dead purple at the top, veined with dull purple on a yellowish ground below; beard yellow; inner segments broader, dull purple. Southeastern Eu. B.M. 986.

52. *Benacensis*, Kerner. Lvs. 1 ft. long; stem about as long as the lvs., 3-headed; spathe valves lanceolate, herbaceous, tinged with purple, scarious at the tip; outer segments obovate, dark violet, veined with brown-yellow; beard yellowish white; inner segments oblong, clawed, bright violet. Limestone rocks, S. Tyrol.

53. *Köchli*, Kerner. Lvs. 12-15 in. long, glaucescent; stem as long as the lvs., 3-4-headed; spathe valves lanceolate, the outer herbaceous; outer segments obovate, dark violet; claw veined with brown; beard yellow; inner segments obovate, clawed, dark violet. Istria, near Trieste and Rovigno.



1177. *Iris pumila* (×½).
One of the best dwarf species.

54. *Florentina*, Linn. Rhizome fragrant when dried (orris-root); lvs. 1-1½ ft. long; stem exceeding the lvs.; fls. white; outer segments 3½ in. long, tinged with lavender; claw yellowish veined with purple; inner segments as large, white. Cent. and S. Eu. B.M. 671. Gn. 15:190 and 51. p. 295.—Flowers early, with *I. Germanica*. Hardy. Var. *albicans*, Lange. Pure white. Spain to Cyprus. Var. *alba*, Hort. Pure white.

55. *pallida*, Lam. (*I. Junonia*, Schott & Klotschy. *I. Asidatica*, Stapf. *I. steudai*, Tod.). Lvs. 1½ ft. long; stem much exceeding the lvs., 2-3 ft. high; fls. fragrant, violet, rarely white; outer segments obovate-cuneate, 3½ in. long; inner segments orbicular. Differs from *I. Germanica* by its scented fls., which appear a month

later. B.M. 685. Gn. 14:85; 33:631; 50, p. 119. G.M. 38:441.—Var. *speciosa*, Hort. Tall, with large, light blue flowers.

56. *plicata*, Lam. (*I. aphylla*, var. *plicata*, Ker.). Rhizome, stem and lvs. as in *I. pallida*; outer segments obovate, pure white in the center, conspicuously veined with lilac towards the margin and on the claw; inner segments very plicate, white tinged with lilac on the margin. B.M. 870.—Known only in cult. Probably derived from *I. pallida*.

57. *Swerdtii*, Lam. (*I. aphylla*, var. *Swerdtii*, Ker.). Much dwarfed than *I. Florentina* and *I. pallida*. Stem 1-1½ ft. long; spathe valves flushed with violet; outer segments 2-2½ in. long, obovate-cuneate, white, faintly veined and flushed with purple on the margin; inner segments as large, much crisped, pure white, except the purple keel and margin. Fls. May and June long before *I. pallida*.—Fragrant. Known only in cult.

The following seven species (58-64) are closely related, the distinctions between them being mainly those of degree. Some of them are known only in cultivation, and are no doubt derived forms; all are connected by numerous intermediate garden forms:

58. *neglecta*, Horn. Lvs. slightly glaucous, 12-15 in. long, ensiform, purple at the base; stem taller, 1½-2 ft., many-fl.; spathe valves green below at the flowering time, much tinged with purple; outer segments obovate-cuneate, very obtuse, 2 in. long, violet-blue on the margin, whitish veined with blue in the center; beard yellow; inner segments erect or connivent, oblong, as large as the outer, pale lilac. June. B.M. 2435.—Known only in cult.

59. *hybrida*, Retz. (*I. amena*, DC.). Differs from *I. neglecta* by its longer spathe valves, and its pure white or faintly lilac-tinted outer segments and style branches. June.—Known only in cult.

60. *Germanica*, Linn. Fig. 1178. Lvs. 1-1½ ft. long; stem 2-3 ft. high; spathe valves tinged with purple; outer segments obovate-cuneate, 2-3 in. long; beard yellow; inner segments as large, obovate, connivent. Central and S. Eu. Early May, June. B.M. 670. B.R. 10:818. L.H. 40:182 (var. *Gypsea*, pure white). Gn. 48:1033 (dark purple var.).—Var. *reticulata subberba*, Hort. Outer segments purple, veined; inner segments lavender.

61. *squalens*, Linn. Lvs. glaucous, 1-1½ ft. long; stem 2-3 ft. high; spathe valves subsarcinate; outer segments obovate-cuneate, upper part plain lilac-purple; claw yellow, veined with lilac; beard yellow; inner segments as large, obovate, dull lilac and yellow or brownish and yellow. Central Eu. to Caucasus. B.M. 787.—Many of the German Irises of cultivators belong to this form. Var. *Jacquesiana*, Hort. Outer segments dark red-violet, yellow at base; inner segments tawny yellow. Late. One of the best.

62. *sambucina*, Linn. Differs from *I. squalens* by its less robust habit, narrower segments and elder-like odor. The outer segments are colored and veined with claret, not lilac, purple; inner segments emarginate. Late May. Central Eu. B.M. 187.—Tall and handsome.

63. *Biliotti*, Post. Lvs. darker green, more distinctly striated, and more rigid than in *I. Germanica*; stem several-headed, 2½-3 ft. long; spathe valves ventricose; outer segments obovate cuneate, reddish purple, with many dark veins; beard white, tipped with yellow; inner segments orbicular unguiculate, 2 in. broad, bright blue-purple. Late June. Trebizond.—Very near *I. Germanica*.

64. *Cypriana*, Foster & Baker. Plants tall, the branching stem being 3 ft. high, bearing many fls. 6-7 in. in diameter; outer segments obovate cuneate, reddish lilac, with thin, darker veins; claw whitish, with greenish brown veins; inner segments oblong-unguiculate, lilac, spotted with reddish brown on the claw. June, July. Cyprus.—Very near *I. pallida*, from which it differs only by the longer navicular spathe valves, which are not entirely scarious at the flowering time, and the more obovate segments.

65. *atrovioletacea*, Lange. Lvs. very glaucous, 1 ft. long; stem equaling the lvs.; spathe entirely scarious; fls. dark violet, very fragrant; outer segments obovate-



Common form of Iris or blueflag (the Iris Germanica type)

cuneate, 3 in. long; beard white, tipped with yellow; inner segments as long, 2 in. broad, orbicular. Late May. — Known only in cult. Probably a hybrid between *I. Chamairis* and *I. pallida*.

66. **Swardwi**, Regel (*I. lineata*, Foster). Lvs. thin, linear, 1 ft. long, pale green; stem 1 ft. high, bearing 2-3 reduced lvs. and a single head of fls.: outer segments oblong-cuneate, $\frac{1}{2}$ in. broad, 2 in. long, closely veined with oblique lines of claret-purple on a greenish yellow ground; beard blue; inner segments oblong, with a long claw, often faintly bearded, veined and tinted on the margins with claret-purple. B.M. 7029.

67. **Leichtlinii**, Regel (*I. vâga*, Foster). Rhizome slender, wide-creeping; lvs. in tufts, not contiguous, ensiform, 1-1 $\frac{1}{2}$ ft. long, scarcely glaucous; stem 1 $\frac{1}{2}$ ft. long, 1-headed, bearing 2-3 fls. and 2 reduced lvs.: outer segments 2-2 $\frac{1}{2}$ in. long, oblong-cuneate, bright lilac, with a whitish beard; inner segments oblong, as broad as the outer, claw also bearded. Turkestan. Gn. 52:1136. — Var. *vâga*, Hort., has larger flowers.

68. **Korolkôwi**, Regel. Rhizome short-creeping; lvs. glaucous, 1 ft. long; stem 1 ft. long; limb 2 $\frac{1}{2}$ -3 in. long, milk-white, veined with red-brown in the type; outer segments oblong, 1 in. broad, with a brown beard and a brown patch in the throat; inner segments as large, erect. May. Turkestan. B.M. 7025. Gn. 28:517. G.C. III. 4:37. — Very hardy. One of the earliest. Various colored lilac, etc. in cult. Var. **concolor**, Hort. Purplish lilac, veined darker. Var. **Leichtliniana**, Hort. Creamy white, with brownish veins. Var. **violacea**, Hort. Violet, with dark veins.

SUBGENUS ONCOCYCLUS.

- A. Outer segments ligulate, much reduced 69. **paradoxa**
 AA. Outer segments not much smaller than the inner.
 B. Lvs. pale green.
 C. Lvs. ensiform 75. **atrofusca**
 CC. Lvs. linear 70. **Sarii**
 71. **Mariae**
 BB. Lvs. glaucous.
 C. Lvs. ensiform 72. **Bismarckiana**
 73. **Lortetii**
 74. **atropurpurea**
 CC. Lvs. linear.
 D. Stem very short or none 76. **Iberica**
 DD. Stem over 6 in. long 77. **Susiana**
 78. **Gatesii**
 79. **Nazarena**
 80. **lupina**

69. **paradoxa**, Stev. Plants dwarf; lvs. linear, 3-6 in. long; stem 2-6 in. high; fl. large; outer segments reduced to a mere claw, dark, covered with a dense pile; inner segments 2 in. long, orbicular, lilac to white. Mts., Georgia and N. Persia. B.M. 7081. Gn. 32:628; 46, p. 173. Gt. 386. — A flower with singular combinations of color. Grows in dry situations, but requires shelter in winter. Long cult., but not common.

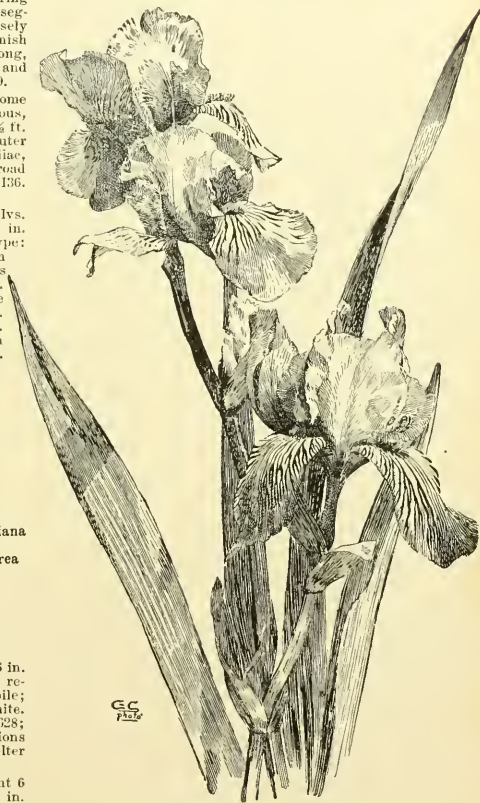
70. **Sarii**, Schott. Rhizome short, stout; lvs. about 6 in. long, finally 1 ft., linear-complicate; stem 3-6 in. long, with 2 reduced lanceolate lvs.: pedicel very short; tube 1 in. long; fls. bright lilac, large as in *I. Susiana*; outer segments obovate-cuneate, 1 $\frac{1}{2}$ -2 in. broad, reflexed from half way down; inner segments oblong, with a short claw. Very near *I. Iberica*, from which it differs chiefly by its bright lilac fls. Asia Minor. Var. **lurida**, Boiss. Outer segments with many brown-black spots and lines on a pale brownish ground. B.M. 6960.

71. **Mariae**, Barbey (*I. Helene*, Barbey). Lvs. very falcate, 3-4 in. long; stem 3-6 in. long, with 2-4 short lvs.: limb pale lilac, with fine red-brown veins; outer segments orbicular, 2 $\frac{1}{2}$ in. long, with a dark purple patch at the throat; inner segments larger, more rounded. Desert between Egypt and Palestine. Discovered 1880. Gt. 42, p. 488; Sup. Pl. J.H. III. 28:302. G.M. 37:215.

72. **Bismarckiana**, Hort. Damman. Habit of *I. Susiana*, and fls. as large; lvs. 8 in. long; stem 1 ft. high; outer segments orbicular, ash-gray, with darker veins

and a dark spot at the base; inner segments sky-blue, with blackish veins. Lebanon. G.M. 40:250.

73. **Lortetii**, Barbey. Lvs. less than 1 ft. long; stem short; limb 4 in. long; outer segments obovate, 3 in. broad, whitish, finely veined and spotted with red-

1178. *Iris Germanica* ($\times \frac{1}{3}$).

Typical of many species in which the beard is confined to the midrib.

brown, with a dark spot at the throat; inner segments orbicular, connivent, pale gray, with red-brown veins. — Quite hardy N. B.M. 7251. Gn. 43:897; 48, p. 337. Gt. 42, p. 490. G.C. III. 12:153. G.M. 36:386; 40:250.

74. **atropurpurea**, Baker. Lvs. 6 in. long; stem 4-5 in.; outer segments oblong, 2 in. long, purplish black, without veins, with a yellow patch on the throat and a beard of yellow, black-tipped hairs; inner segments larger, of the same color, with discernable veins: style crests small. Easily distinguished by its rather small, uniformly colored flowers. Gt. 42, p. 489. Pl. Supp.

75. **Var. atrofusca**, Baker (*I. atrofusca*, Baker). Lvs. pale green, 1 ft. long; stem 1 ft. long, hidden by the sheathing inner lvs.: limb dark purple-brown; outer segments obovate, 3 in. long, with a dark spot on the

throat; inner segments larger and broader; style branches very convex; crests large. B.M. 7379. Gu. 48, p. 8; 50:1089 and p. 353.

76. *Iberica*, Hoffm. Dwarf, with a large flower: lvs. 3-6 in. long, narrow, very falcate; stem 3-4 in. long; outer segments rounded-obovate, 2 in. broad, pale brown, closely veined and blotched with purple-brown and with a shining dark patch on the throat; inner segments obovate, pure white, faintly veined, with a few wine-red spots at base. Caucasus and mountains of Armenia and Persia. B.M. 5847. Gt. 386 and 723. F.S. 19:1963. R.H. 1873: 370. Gn. 10:49. I.H. 19: 106. G.C. II. 11:693. F. 1873:25. F.M. 1875: 168. —Hardy.

77. *Susiana*, Linn. Mourning Iris. Fig. 1179. Lvs. very glaucous, 6-9 in. long, nearly 1 in. broad; outer segments obovate, 3 in. long, brownish purple, veined and spotted with black-brown, with a brown beard; inner segments brownish white, spotted with violet-brown and black. Asia Minor and Persia. B.M. 91. F.S. 11:1087, 1088. R.H. 1859, p. 322, 323. Gn. 32, p. 193 and 39:800. —The best known of this group. Said to have been introduced from Constantinople in 1753. Name from a city in Persia. Not entirely hardy North, but a good pot-plant. Var. *major*, Hort. Bluish, tinted brown.

78. *Gatesii*, Foster. Habit and foliage of *I. Susiana*: outer segments orbicular, 3 in. broad, cream-white, sometimes sky-blue, covered with a network of fine veins, giving them a light gray tint; inner segments larger, pale purple or yellow. Dry regions, Armenia. Gn. 43:897, and 52, pp. 88 and 279. G.C. III. 8:17. A.G. 13:60. —The largest-fl. of its subgenus. Fls. about twice as large as in *I. Susiana*. Quite hardy.

79. *Nazarèna*, Hort. (*I. Sarrii*, var. *Nazarèna*, Fost.). Foliage and stem of *I. Susiana*, and fls. as large; outer segments obovate, straw-colored, netted with red and brown veins and blotched with a patch of black-crimson near the claw; beard dark purple, with a bare streak running down the claw; inner segments cream-white, with thin blue veins. Palestine. —Foster described this plant without definitely determining its systematic position. It is related to *I. Sarrii* and to *I. Bismarckiana*, and differs from the other members of this section by its long, creeping, stoloniferous rhizome. See Gn. 43, p. 133. I.H. 42, p. 78. Gt. 42, p. 487 and suppl. pl.

80. *lupina*, Foster. Lvs. 1 ft. long; stem 6 in. high, with 2 lvs. and 1 fl.: outer segments obovate-cuneate, yellowish green, with red-brown veins and a velvety dark brown patch on the throat; claw with a yellowish beard; inner segments orbicular, with a short claw, colored like the outer; style crests large, toothed. Turkish Armenia, where it is called "Wolf's Ear," hence the specific name. Gn. 43:897 and 54, p. 59.

SUBGENUS XIPHION.

- A. Stem 1 ft. or more in length.
 B. Tube obsolete.
 C. Lvs. subterete.....81. *Xiphium*
 CC. Lvs. linear complicate.....82. *xiphoides*
 NB. Tube more or less developed.
 C. Lvs. linear complicate.....83. *Tingitana*
 CC. Lvs. slender, terete or subterete.
 D. Pedicel 1½ in. long...84. *filifolia*
 DD. Pedicel short.....85. *juncea*
 86. *Boissieri*
 AA. Stem very short or none.
 B. Lvs. acutely quadrangular, very short at the flowering time.....87. *reticulata*
 BB. Lvs. acutely quadrangular, much overtopping the fl....88. *Histrio*
 89. *Vartani*
 BBB. Lvs. terete or linear subterete.
 C. Bulb tunics composed of parallel fibers.....90. *Bakeriana*
 CC. Bulb tunics reticulated...91. *Kolpakowskiana*

81. *Xiphium*, Linn. (*I. Hispanica*, Hort. *I. spectabilis*, Spach). SPANISH IRIS. Fig. 1180. Lvs. about 1 ft. long; stem 1-2 ft. high; pedicel long; tube obsolete; outer segments 2-2½ in. long, violet-purple, yellow in the center; inner segments as long, but narrower. Late June. Spain and N. Afr. B.M. 686. Gn. 20:308 and 30, p. 385. —Long cult. and well known. Hardy in N. J. in protected situations. Var. *Lusitânica*, Ker. (*I. Lusitânica*, Hort.). Fls. yellow. B.M. 679.



1179. Type of *Oncocyclus Iris*—*Iris Susiana* ($\times \frac{1}{4}$). Type of diffusely bearded flower.



1180. *Iris Xiphium* ($\times \frac{1}{4}$). Type of bulbous Iris.

82. *xiphoides*, Ehrh. (*I. Anglica*, Hort.). ENGLISH IRIS. Lvs. about 1 ft.; stem 1-2 ft.; fls. dark violet-purple in the typical form; outer segments orbicular, yellow in the center; inner segments shorter, oblong. French and Spanish Pyrenees. B.M. 687. Gn. 30, p. 384; 31:586.

83. *Tingitana*, Boiss. & Reut. Stem stout, 1-2-headed, about 2 ft. high, hidden by the sheathing bases of the stout, falcate lvs., of which there are 6-7 on the stem, the lower about 1 ft. long; fls. 2-3 in a cluster; outer segments 3 in. long, with an obovate, reflexed blade, pale lilac, yellow in the center, and with a bright yellow keel down the claw; inner segments shorter, oblanceolate, erect, incurved. Tangiers. B.M. 6775. (In. 36; 720. G.M. 40:377.

84. *filifolia*, Boiss., not Bunge (*Xiphion filifolium*, Klatt.). Slender and leafy, about 2 ft. high, bearing 1-2 bright violet-purple fls. 2-2½ in. in diameter; lvs. about twice as long as the stem, weak, flexuous, convolute; outer segments with a narrow claw expanding suddenly into a reflexed, suborbicular lamina, bright yellow down the center; inner segments erect, obovate-lanceolate, erose, notched. S. Spain. B.M. 5928. —Int. 1869. Hardy.

85. *júncea*, Desf. (*Xiphion júnceum*, Klatt.). Stem slender, erect, rigid, 9-18 in. high, bearing 1 (rarely 2) golden yellow flowers, 2-3 in. in diam.; lvs. rigid, the lower 1 ft. long; outer segments with an orbicular blade shorter than the cuneate claw, recurved and veined with brown; inner segments erect, oblanceolate. May, June. Algeria, Tunis, etc. B.M. 5890. (In. 54; 1200.

86. *Boissieri*, Henriq. Lvs. 1 ft. long; stem about a foot long, bearing few, reduced lanceolate lvs. and a single flower; outer segments 1½ in. long; blade obovate, reflexed, as long as the cuneate claw, bright lilac, with a yellow keel running down the claw, slightly bearded; inner segments as long as the outer, erect, obovate, clawed, bright lilac. June. S. Portugal. B.M. 7097.

87. *reticulata*, M. Bieb. Lvs. 2 in a tuft, short, erect, elongating to 1½ ft.; stem very short; fls. bright purple, very fragrant; outer segments 2 in. long, yellow at the claw, with a low yellow crest; inner segments narrower. Mid-April. Asia Minor and Persia. B.M. 5577. F. S. 5, pp. 507-9. R. H. 1890, p. 133. L. B. S. 19, pp. 1829. Gt. 779. (In. 20; 295; 54, p. 471. G.C. II. 11:501; 21:217. F. 1860:161. Var. *histrioides*, Foster (*I. histrioides*, Hort.). Outer segments much mottled with white and lilac on the claw and broad, orbicular blade. Asia Minor, Persia, and the Caucasus. Gn. 42:880. J. H. III. 34:111. —Early-flowering, and fine for notes. Var. *Krelagei*, Regel. Fls. red-purple, varying greatly in shade; claw conspicuously veined. The common wild form of the Caucasus. Nearly odorless. Var. *cœrulea*, Hort. Azure-blue. Var. *cyanea*, Hort. Blue. Var. *majior*, Hort. Like the type, but larger.

88. *Histrio*, Reichb. f. (*Xiphion Histrio*, Hook. f.). Plants tufted, slender and faccid; lvs. deeply grooved on each face, 1 ft. long; stem half as high, very slender, 1-fld.; fls. 3 in. in diameter; tube 3-4 in. long, blue above; outer segments obovate-spatulate, spreading, deep blue, with a yellow line in the center bordered with white and spotted and shaded with blue; inner segments erect, oblanceolate, blue. Related to *I. reticulata*, differing only in its paler, odorless fls., which are produced several weeks earlier. Feb. Mts. of Palestine. B. M. 6033. (In. 9, p. 29, and 33:653. G. C. III. 12:729; 21:105.

89. *Vartani*, Foster. Lvs. usually 2, 8-9 in. long, slender, finally longer; stem very short, hidden; tube 2½ in. long; outer segments with a narrow claw, suddenly enlarged into an ovate-lanceolate blade; pale, slaty lilac, with darker veins and a crisp yellow crest down the claw; inner segments erect, almost linear-lanceolate, pale lilac. Dec. Palestine, near Nazareth. B.M. 6942. —Not scented.

90. *Bakeriana*, Foster. Lvs. 3-4, 6-9 in. long, finally a foot or more after flowering; fls. single, on a short peduncle, fragrant; outer segments with a long, obovate-elliptical claw, and a small, ovate, reflexed blade, intense violet, creamy in the center, with a yellow streak down the claw; inner segments shorter, erect, oblanceolate, lilac; style crests large. Feb., Mar. Armenia. B.M. 7084. (In. 37:753. G.C. III. 7:293, and 21:103. J.H. III. 34:177. G.M. 40:118.

91. *Kolkpowskiana*, Regel (*Xiphion Kolkpowskianum*, Baker). Lvs. 5-6, wrapped round by a sheath at the base, very short at the flowering time, but growing

longer; scape very short, 1-fld.; outer segments with a long, erect claw and an ovate, acute blade, deep violet-purple with a yellow keel down the claw; inner segments oblanceolate, erect, pale lilac. Mts., Turkestan. Very near *I. reticulata*, fls. at the same time, and is sweet-scented. B.M. 6489. Gn. 17, p. 75, and 33:653.

SUBGENUS GYNANDRIS.

92. *Sisyrrinchium*, Linn. (*Xiphion Sisyrrinchium*, Baker. *Moraea Sisyrrinchium*, Ker. *I. maricoides*, Regel). Stem 6-12 in. high, stout or flexuous, 1-3-headed; lvs. 2, slender, as long as the stem; fls. fugitive, lilac-purple, with a yellow, oblong spot on the outer segments, which are oblong spatulate; inner segments narrow-lanceolate, erect, pale; style crests large, lance-deltoid. Widely spread through S. Eu., Afr. and Asia. Easily killed by frost. B.M. 1407 (not good), and 6096. In *I. maricoides*, Regel, the filaments are said to be distinct from each other and from the style.

SUBGENUS JUNO.

- A. Lvs. hollow, tetragonous, produced after the flowers..... 93. *Danfordia*
 AA. Lvs. linear complicated, short at the flowering time..... 94. *Persica*
 AAA. Lvs. lanceolate, very short at the flowering time..... 95. *Rosenbachiana*
 AAAA. Lvs. lanceolate, falcate at base; 3-9 in. long.
 B. Stem 1-2-headed; inner segments pendulous
 C. Lvs. with a distinct white margin..... 96. *Fosteriana*
 CC. Lvs. all bright green... 97. *Sindjarensis*
 BB. Stem 1-headed; inner segments spreading..... 98. *Palestina*
 99. *alata*
 BBB. Stem 3-6-headed; lvs. 3-6 or 9 in. long.
 C. Lvs. with a horny border..... 100. *Caucasica*
 CC. Lvs. without a horny border..... 101. *fumosa*
 102. *orchoides*

93. *Danfordia*, Boiss. Fl. stems 2-4 in. high; lvs. finally a foot long; fls. bright yellow, 1½ in. in diameter; outer segments with an orbicular blade spotted with brown; claw cuneate; inner segments reduced to minute, spreading, subulate teeth; style crests large. Spring. Cilician Taurus. B.M. 7140. —Fragrant.

94. *Persica*, Linn. Bulb ovoid; lvs. 4.5, 2-3 in. long; stem short, 1 headed; tube 2-3 in. long; limb pale lilac; outer segments with an orbicular blade with a dark purple blotch, an orange keel, and purple lines and spots; claw auriculate; inner segments small. Should be lifted in summer. Asia Minor and Persia. B.M. 1. Gn. 11, p. 207; 14:156; 33:653; 54, p. 103 & 470. F.S. 10:1045. G.C. III. 7:577. Var. *purpurea*, Hort. A bright purple variety. Fine. Krelage.

95. *Rosenbachiana*, Regel. Lvs. 4-5, finally 6-8 in. long; stem short, 1-3-headed; outer segments obovate-cuneate; blade reflexed, white at the tip, deep purple in the middle and creamy below, with a yellow keel and dark lilac veins; inner segments spreading or reflexed, obovate, pale lilac. The color of the fls. is very variable. Mts., Turkestan. B.M. 7135. J.H. III. 28:189. G.C. III. 7:577. G.M. 34:171.

96. *Fosteriana*, Aitch. Lvs. 4-6 in. long; stem short; outer segments yellow, streaked with black, obovate-cuneate; claw not auriculate; inner segments shorter, obovate, bright purple. March. Afghan and Russian boundary. B.M. 7215. —Very different from the allied species *I. orchoides*, *I. Sindjarensis*, etc., on account of the difference in color of the sepals and petals.

97. *Sindjarensis*, Boiss. & Haussk. Lvs. about 8, crowded, 1 in. broad; stem short; fls. slaty lilac; outer segments with an obovate, reflexed blade narrowed to a claw, with darker lilac lines and a small yellow crest; inner segments oblong, clawed. Feb. Deserts of Mesopotamia. Plants half a foot high. B.M. 7145. G.C. III. 7:365. J.H. III. 28:227.

98. *Palæstina*, Boiss. Lvs. 3-6 in. long; stem very short; fls. pale yellow, tinged with lilac; outer segments oblong, upper $\frac{1}{4}$ reflexed; claw auriculate; inner segments minute, narrowly lanceolate. Fls. in winter. Mts. of Palestine. Very near *I. Caucasica*, but distinguished by its longer acuminate spathe and the color of the fls.

99. *alata*, Poir. (*I. scordioides*, Desf.). Lvs. about 6, plane, 6-9 in. long; stem very short; outer segments 3-4 in. long, obovate-cuneate, bright lilac, variegated with white, and having a yellow keel down the claw; inner segments obovate-unguiculate, spreading from the base of the outer; style erect large, incrinately toothed. Winter-flowering. Plants very dwarf. Spain to Sicily and Algeria. B.R. 22:1876. Gn. 10, p. 579 and 54, p. 102. G.M. 35:614.

100. *Caucasica*, Hoffm. Lvs. about 6; stem short; fls. pale or bright yellow; outer segments with an ovate blade and a very broad rhomboidal claw, with small au-

ments more spotted. Var. *cærulea*, Hort. Fls. bright lilac, with a yellow blotch on the blade of the outer segments. Mts., Turkestan. B.M. 7111. Gn. 53, p. 482. R.H. 1880, p. 337.

Of the following names, which are found in catalogues, no complete description is available: *I. Assyriaca*. Bluish white. — *I. andalusica*. Deep yellow, marked with maroon. Gard. form of Lvariegata. — *I. Battandieri*. White. Algeria. Bulbous. — *I. Bosniaca*. Yellow. Rhizomatous. — *I. bruchisiphon*. Pale blue. Rhizomatous. — *I. Britannica*. Pale pink, with the outer segments veined with purple. Gard. form of *I. squaleus*. — *I. Caudiana*. Outer segments reddish purple; inner segments light lavender. Germanica. — *I. Corœna*. Lake El-Sibirica, early and a free bloomer. — *I. edna*. Light purple and violet. Var. of *I. neglecta*. — *I. Eggeri*. Blackish brown. Onocycelus. — *I. Fisheri*. Apogon. — *I. flava*. Pale yellow. Germanica. — *I. Gladstoniana*. Hybrid from *I. atropurpurea*. Pale black with yellow markings. — *I. gracilis*. Lichte. — *Morea tenuis*. See also index given above. *I. ignitilla*, probably Ignavite, a form of *I. neglecta*. Lilac, with the outer segment shaded purple. — *I. ligularis*. Purple. Germanica. — *I. monspur*, Foster. — *I. Monnier* \times *I. spurœa*. — *I. nigricans*. Lvs. short ensiform; fls. dull black to deep black. Distinct from *I. atropurpurea* by its uniform dark color and dwarf foliage. Onocycelus. — *I. paucra*, probably paucra, var. of *I. variegata*. Buff and purple. — *I. parœa*. = *I. parœa* \times *I. variegata*. — *I. Robinsoniana*. F. Muell. = *Morea Robinsoniana*. — *I. Rudini*, Hort. Herb. Fls. black-brown and chert. Said to be stronger and more free-flowering than the other Onocycelus Irises. — *I. Sikkimensis*. Lilac. Rhizomatous. — *I. stenophylla*. This plant was discovered in the Cilician Taurus in 1895-6. Haussknecht named it *stenophylla* without describing it. J. G. Baker gives a short description in G.C. III. 27:170. Near *I. Persica*. Lvs. 5-9 linear, tufted, channeled down the face, short and stiffly erect at the flowering time; fls. springing from the ground, the long tube lightly wrapped round by the lanceolate spathe valves; outer segments 2 in. long; blade reflexed, blackish blue towards the tip, with many black spots on a pale ground below it; inner segments small, horizontal; style branches lilac. Not in American trade. G.C. III. 27:171. Gn. 57:203. — *I. tuberosa*, Linn. = *Hermodyctylus tuberosus*. — *I. Vogelia*. Similar to *I. Persica* and *I. Rosenbachiana*, but earlier-flowering. Fls. variable in color, silver-gray predominating, with violet, rose or lilac markings. Var. *grandiflora*. Large-flowering.

The following numbers are not mentioned in catalogues of American dealers. They are procurable through foreign growers, and are advertised in Dutch-American catalogues: 1. 4, 5, 8, 29, 34, 38, 39, 40, 42, 51, 52, 53, 56, 58, 59, 62, 65, 64, 66, 67, 72, 80, 83, 84, 85, 86, 88, 89, 90, 91, 92, 93, 95, 96, 97, 98, 99, 100, 101, 102.

H. HASSELERING.

IRIS-ROOT, or ORRIS-ROOT. *Iris Florentina*.

IRONBARK. *Eucalyptus*.

IRONWEED. Weed.

IRONWOOD, in America, *Ostrya Virginica*.

IRRIGATION. Irrigation in its broadest sense includes all problems of collecting, storing, delivering, and applying water to the land through the construction of dams, reservoirs, canals and laterals, and the application of power when necessary to deliver the water; while in a restricted horticultural sense it is a method of cultivation, having for its object to increase and regulate the water supply in the soil.

In this latter sense Irrigation is a necessary practice in the arid regions, and is advisable in the humid regions in proportion to the intensity of the cultivation and the value of the crop grown. Thus in Florida, with an average of 60 to 70 inches of annual rainfall—usually well distributed—Irrigation has been largely introduced in the past few years for horticultural crops and even for tobacco, as an insurance against loss or damage by the occasional droughts. The first cost of a small Irrigation plant in Florida, for 20 acres or over, is said to be approximately \$100 to \$150 per acre; the interest on which, and the necessary repairs, would amount to from \$5 to \$10 per acre per annum. This is a small expenditure to insure a crop against loss or injury where the value per acre is so great as in many horticultural lines. Irrigation is needed not only to prevent the actual death of the plants, but to promote a uniform, rapid, and continuous growth, which is necessary for the development of the finest texture or flavor of the commercial crop.

King has shown that the value of a crop saved in Wisconsin, such as the strawberry, in a season when the crops generally are injured by drought, may pay all the expenses of the original cost of the Irrigation plant.



1181. *Iris orchoides* ($\times \frac{1}{2}$)
A good species for pots.

rioles and a toothed or ciliated crest; inner segments oblanceolate. Dwarfier habit than *I. orchoides*. Caucasus to Asia Minor, etc.

101. *fumosa*, Boiss. & Haussk. Lvs. about 10; stem 6 in. long; outer segments spatulate-oblancoate, curved above the middle, claw with a yellow crest; inner segments minute, spatulate, toothed. The fls. are greenish yellow, shaded with smoky gray. Dry fields, Syria.

102. *orchoides*, Carr. Fig. 1181. Lvs. about 6; stem 12-15 in. long, with distinct internodes; spathe 1-fl. 2 in. long; fls. yellow; outer segments with an obovate blade, and a purple blotch on each side of the crest of the claw; inner segments oblanceolate, less than an inch long, and generally sharply reflexed, with a long siliform claw. Spring. Var. *oculata*, Maxim. Blade of the outer seg-

In the semi-arid regions west of the 100th meridian, with a rainfall of from 20 to 30 inches, crops are liable to be entire failures three or four years out of five; while with an Irrigation plant there should not be a failure one year in five. In the arid regions with less than 15 or 20 inches of rain, Irrigation is a necessity on most soils. Here the work has been highly organized and systematized, so that the cost of water delivered at the field amounts from \$2 to \$5 per acre per annum. Under skilful management the most abundant yields are secured. The most careful management is required in the application of water to prevent serious injury to the land and to avoid actual injury to the crop in rendering the plants tender and liable to disease, and in maintaining the quality and flavor, both of which are liable to depreciate unless good judgment is displayed in supplying water.

Sources of Water Supply.—The principal sources of water supply are streams, surface wells, artesian wells, and the storage of storm waters. For small irrigated tracts near cities the city water supply may often be used to advantage. In other localities the nature of the conditions will determine the most economical source from which to obtain the water. Perpetually flowing streams, if situated in such a way that water can be carried to the land by gravity, have the advantage of cheapness of construction and maintenance. On the other hand, if the stream supplies others in the community, there is liable to be trouble and expense in establishing and maintaining water-right claims and in securing water when needed for the crop. Questions arising out of the water rights on streams and rivers in the western states, with the various state laws, the multiplicity of court decisions on the most intricate legal questions—both in different states and different counties along the line of the stream—the absence in most states of adequate police or judicial powers vested in the Irrigation commissioner, have led to the most perplexing and bewildering state of affairs, and have involved the states and individuals in enormous costs for law suits, resulting in many cases in the apportionment of many times the volume of the stream to the settlers along its bank.

The large planter must seek some perennial and abundant supply of water, as is furnished by streams, but it is safe to say that all streams of any size in the western part of the United States are already appropriated to their fullest extent, although the water so appropriated is not all in present use. Smaller planters are much more independent with some of the other sources of supply mentioned above. Wells from 10 to 20 feet deep, with pumps operated by windmills, or wells of a maximum depth of 50 feet operated by many forms of gasoline, hot air or portable engines, attached to direct acting pumps or centrifugal pumps, form in general a very satisfactory means of irrigating small areas.

Over limited areas artesian wells have been very successfully used. If they are flowing wells delivering a considerable stream, they can be used over small areas without storage reservoirs, or over much larger areas with reservoirs. They should be capped in all cases, where possible, so that the flow can be stopped when not actually needed.

In many places it is possible, at a comparatively small expense, to construct a dam to collect the storm waters. The magnitude and expense of such work will depend entirely on the configuration of the surface, the area of the watershed, the volume of the water to be handled as well as the nature of the soil, and the material out of which the dam is to be constructed.

Methods of Raising Water.—Various methods are used for raising water from streams, wells, or storage reservoirs which may lie below the general level of the land to be irrigated. Hydraulic rams are sometimes used for small areas, but these are not economical when a small volume of water is at hand, as only about one-seventh of the water can be collected. Open buckets carried on an endless belt, operated by either windmills, steam power or even horse-power, are used with success and offer the advantage of cheap construction. The ordinary cylinder or plunger pumps are usually employed when the water has little or no sediment, and are operated by windmills or by steam or other form

of engine. When the water carries considerable sediment such pumps are liable to wear away rapidly, and the centrifugal pump is the most economical form to use. The relative first cost of equipment for pumping with windmills or with gasoline or hot air engines of approximately equal horse-power is about the same. The windmill, however, is dependent upon a mean velocity of wind of about eight miles per hour, while the engine may be operated at any time, and is thus more reliable when either form of motive power is taxed to nearly the extreme limit. There are many kinds of windmills on the market, and many forms of home-made construction are in use.

Storing and Conducting Water.—Storage reservoirs for streams and for storm waters vary in size and in cost as well as in mode of construction, according to the character of the land, size of area, volume of water, nature of the material of construction, and demand for the water. The construction of such reservoirs sometimes involves engineering problems of the most difficult kind, demanding the expenditure of immense sums of money.

In the use of windmills it is necessary to have small distributing ponds or tanks, as the direct flow from the pump is usually so small and varies so much with the velocity of the wind that it cannot be depended on to water any considerable area. Where it is stored it can be turned out onto the land in large volumes, so that it spreads over the surface and waters the whole area uniformly. For an ordinary windmill the ponds are from 50 to 100 feet square. They can be stocked with fish and thus be a source of some revenue and variety in the family supplies. Unless the pond is situated on a slight elevation, the earth for the embankment must be taken from the outside. The banks are usually made with a slope of $1\frac{1}{2}$ to 1 foot. For a bank 5 feet high and 2 feet across the top, the side would be about $7\frac{1}{2}$ feet and the base about 17 feet wide. If the ground is at all pervious to water, the bottom of the pond should be protected from undue seepage and loss of water by puddling. This should be done with clay, if this is obtainable. This puddling is often done by driving horses or cattle in the pond while the surface is wet. A pond of the size indicated above, operated by a windmill where the mean wind velocity is about 8 miles per hour, will irrigate from 3 to 5 acres of land in the semi-arid regions. Such a pond could be counted upon to irrigate from 5 to 10 acres where, as in the East, only one or two irrigations would be required during the season. The size of the reservoirs and the area they will irrigate, when supplied by steam or other kind of engine, will depend upon the available water supply and upon the size of pump and power used.

Ditches and Flumes.—The water is usually carried from the stream or storage reservoir by gravity in open ditches. This involves loss by evaporation from the surface and by seepage through the soil. When the water supply is limited and its value is consequently great, terra-cotta pipes, iron pipes, cement or wooden pipes may be used. When the surface of the country is uneven and ravines have to be crossed, flumes are used to carry the water on an even grade across the depression. These flumes may be iron pipes, open wooden troughs, or wooden pipes held together with substantial hoops. If the depression is not too great the ditch may be built up on an earth embankment. When the water has to pass through a gravelly soil, or when for other reasons the soil is very pervious, special precautions should be taken to prevent seepage by using pipes, cementing the sides of the open ditch, or puddling the ditch with clay or similar material.

Application of Water.—The water is usually applied to the ground by flooding over the whole surface. For this purpose the surface must be perfectly level and the ground carefully prepared, so that the water will flow uniformly and quickly over the entire area and be of uniform depth throughout. Where crops are cultivated in rows or on beds the water is allowed to flow down in the troughs between the rows, and there must be a sufficient head of water to reach the end of the rows in a reasonably short time, so that the whole width of the field will be properly watered.

Where the surface of the ground is so uneven that surface flooding cannot be used, basins are formed by

throwing up slight ridges, with a plow or other implement, and the water turned into these basins in succession and allowed to accumulate to a sufficient extent. This method is particularly applicable to fruit trees, although it is occasionally used in other crops. In very sandy soils the water is occasionally carried through the field in wooden troughs, which admit of sufficient seepage to water the land. This prevents the undue seepage which might occur in such soils if the water was flowed over the surface. Another method is to distribute the water through the field in iron pipes, with openings at frequent intervals, in which nozzles can be attached to deliver a fine spray over a small area. With four or five such nozzles an attendant can water a considerable area of ground in the course of a day. Such an irrigating outfit in Florida was supplied with a power equivalent to about one horse-power per acre. The mains and laterals were of 1-inch or 1½-inch iron pipes laid near the surface of the ground, the laterals about 100 feet apart, with hydrants every 50 feet. Tanks were originally used, but it was found desirable to pump directly into the mains to insure a sufficient pressure.

Care should be exercised in applying water to the land. Where water is plentiful there is a common practice of using such an excess as to injure the flavor of fruit, increase the liability of disease, and eventually injure the land by the accumulation of seepage waters and of alkali. As a rule, there has been very much more damage from over-irrigation than from the use of too little water. The first two or three years a soil usually requires a considerable amount of water, but after becoming well moistened to a considerable depth it should require comparatively little water thereafter to maintain its fertility. As it is not easy to apply just the proper amount, the excess should be provided for. If there is any reason to fear lack of drainage, the land should be thoroughly undrained before irrigation is started, or at any subsequent time when the need of it becomes apparent.

Irrigation always should be supplemented by the most thorough cultivation. After going to the expense of watering the soil in this way, it is poor economy to allow the water to escape by evaporation or otherwise; therefore every precaution should be used in thorough, subsequent cultivation and in the exclusion of weeds, to conserve the moisture so applied. The intelligent horticulturist will find that in the use of this expensive method of maintaining a proper water supply in the soil, it is incumbent upon him, even more than if the method were not used, to give careful attention to all the ordinary methods of preparation and cultivation in order to maintain the advantages he has established by the irrigation plant.

MILTON WHITNEY.

SUB-IRRIGATION IN THE GREENHOUSE.—The term sub-irrigation is used to describe a method of supplying water to the roots of plants by means of some form of conduit placed below the surface of the soil. In greenhouse operations, the essential features of the plan are a level, water-tight bench-bottom, and tile or pipes to serve as conduits for the water. The tile, or pipes, are laid directly on the bench bottom, and over these the soil is spread, usually to the depth of about 6 inches. When water is introduced in sufficient quantities through the tile or pipes, it passes out at the joints or perforations into the soil.

When applied to greenhouse operations, the term sub-watering has been proposed by Goff and Cranefield for the reason that irrigation is used to denote watering on a large scale out-of-doors. It may be said, however, that the words watering and irrigation do not indicate the scale of operations with any degree of accuracy, hence it seems as well to use an old word as to coin one, especially when the familiar word expresses the meaning intended.

Experiments in watering plants by this method were begun in the winter of 1890 and 1891, at the Ohio Experiment Station. The suggestion came from the result obtained in an effort to check the lettuce rot. Water was introduced to the soil in boxes by means of a pipe, in a similar manner to the method often employed in watering hills of melons and cucumbers. When the plants were watered in this manner, the lettuce showed

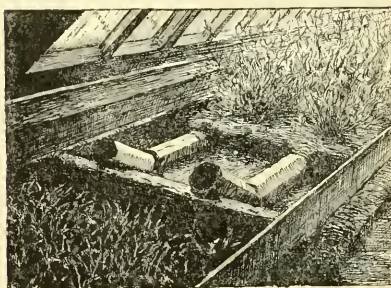
so much more vigor than that watered in the ordinary way that operations were begun at once on a larger scale—first in a bed on the ground having a clay bottom, then on a water-tight bench, made of lumber, and finally on tile benches, covered with cement.

In all of the earlier experiments the water was introduced through pipes, or drain-tile, laid about 2 feet apart on the bottom of the benches. Goff and Cranefield have used brick instead of tile, placing them near enough together to touch. They were set on edge in a galvanized-iron pan, made for the purpose. J. C. Arthur clipped off the corners of the bricks, so as to facilitate the flow of water. The Ohio Station has modified this plan by using common drain-tile, laid so as to touch, thus covering the entire bench bottom, instead of a line of tile every 2 feet, as at first.

Benches made of lumber have proved unsatisfactory because of the swelling and warping of the boards. Solid beds on the ground have not been successful, except where an impervious clay bottom existed. Galvanized-iron adds greatly to the cost of construction, and lasts only a short time. The only suitable bench for greenhouse sub-irrigation is one made of materials which are not acted upon by water.

A well-made tile- and cement-bench seems to be the only form of construction that will meet the requirements. Such a bench does not cost so much as to preclude its use, and will last as long as any other part of the greenhouse. In describing such a bench, it will not be necessary to enter into details, except such as relate to the method of watering under discussion. The bench must be water-tight, or nearly so, and this condition is secured by spreading a layer of cement, an inch or more in thickness, over the tile bottom. It is not a matter of any moment whether flat tile or common drain-tile are used, except in the quantity of cement required. The cement must be spread with care, so as to secure a perfectly flat, level bottom, otherwise the water will not flow uniformly in all directions. The sides of the benches are made of cement also, but need be only 2 or 3 inches high, or of sufficient height to merely retain the water. Boards or slate are placed outside the cement wall to retain the soil. The tile-bottom may rest on iron or wood cross-pieces. Wood has been in use for this purpose at the Ohio Station for seven years and shows no signs of decay, because it is out of reach of the water.

Nine years' experience shows that a perfectly constructed bench bottom, with the tile laid 2 feet apart, will serve satisfactorily in distributing the water to all parts of the bed, provided the tile are straight, so as not to impede the flow of water. The tile are laid in the

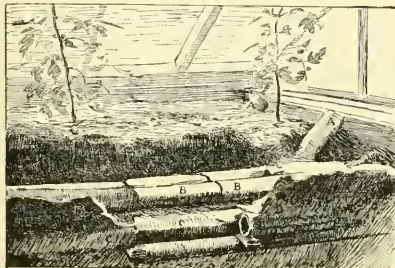


1182. Sub-irrigation with two runs of tile.

same manner as tile-drains, and lengthwise or crosswise the bed, as preferred. Better results are usually secured if they are laid crosswise than lengthwise, as it is difficult to secure an even flow through long lines of tile. A little cement or mortar is used at each joint merely to hold the tile in place when the soil is put in the bench, but not enough to impede the flow of water from the

joints. The first tile where the water is introduced is laid at an angle, one end resting on the edge of the bench side. This leaves a wide opening at the first joint, which is closed with cement. A better plan is to use a curved sewer-pipe for the inlet, but this is not always available. The picture (Fig. 1182) shows how the tile is laid on the bench bottom, being a view of a side bench in a carnation house.

Following Goff's suggestion in the use of brick, tiles



1183. Sub-irrigation with two tiers of tile.

have been used over the entire bench bottom with good results, and it seems probable that this will be found to be the best form of construction, as it appears more certainly to insure an even distribution of water. The method of construction is the same as above described, for the two plans differ only in the number of tiles employed to distribute the water. When the bench bottom is covered with tile, placed near enough together so that the soil will not fall between, it will be readily seen that water introduced at any point will flow to all parts of the bed in and around the tile. It needs simply to be brought up to such a level that it will reach the soil, when capillary attraction will complete the distribution. Fig. 1183 shows a bench in a tomato house constructed after this plan. AA are the inlets; B the irrigating tile, from which the soil has been removed; C is the tile bench bottom, covered with cement. The same size of tile, viz., $2\frac{1}{2}$ - or 3-inch, is used both above and below. D is the cement side, which has been broken away to show the method of construction. The outer board has been removed also.

The cost of construction need not be discussed here, except to state that the only items extra, more than are required in any well-constructed greenhouse, are the cement bottom and the tile in which the water is distributed.

A plan has been devised for applying water to small plants in flats which may properly be mentioned under this head. The flats are shallow boxes with slatted bottoms. When the plants require water, the flats are placed in a shallow vat of water and allowed to remain until the surface of the soil appears to be damp, or even wet.

A watering in this manner is far more efficient than by the ordinary method. Taken in connection with sub-irrigation in the benches, a crop of lettuce can be brought to marketable size nearly two weeks earlier than when surface watering is practiced. Anything like a full discussion of results of experiments in watering plants in the greenhouse by sub-irrigation would be too voluminous for an article in this connection. A brief review of the results obtained at some of the stations, together with a short discussion of some general principles, will serve the purpose intended. The increase in weight of lettuce from sub-irrigated plots over those watered in the ordinary manner has been reported by Rane, of West Virginia, as 25 per cent and by Goff and Craneheld as 26 per cent. At the Ohio Station the range has been from 25 to 100 per cent. In the latter case the result was obtained by commencing with the plants as soon as taken from the seed-bed, and carrying

the two lots through to the termination of the experiment, one by watering altogether on the surface of the soil, the other by sub-irrigation. Each of the experimenters speaks of a gain in earliness of several days by sub-irrigation. Rane secured similar results with long-rooted radishes by this method of watering, but not with the turnip-rooted sorts, while Munson, of Maine, doubled the crop by watering below. Better results have usually been secured at the Ohio Station with the turnip-rooted than with the long varieties, but in all cases there has been a gain in favor of sub-irrigation, varying from 50 to 100 per cent. Rane found that sub-irrigation increased the yield of tomatoes, but the gain was not large. Essentially the same results have been secured in Ohio. The tomato crop has not been greatly influenced by the manner in which the water was applied, and the same is true of beets, while sub-irrigated cucumbers and parsley have shown a decided gain over surface-watered. Carnations, roses, chrysanthemums, sweet peas, violets and snailax have been under experiment by the two methods of watering, and while no such marked results have been secured as with lettuce and radishes, the sub-irrigated plots have shown superiority over those watered in the ordinary manner, in nearly all cases. With carnations the improvement has been mainly in length and stiffness of stem.

Aside from the increase of crop secured by sub-irrigation, there are other considerations which may be urged in its favor, and these are embodied in the following general propositions:

(1) *Watering by sub-irrigation in the greenhouse saves labor.* The amount of labor saved depends mostly on the completeness of the arrangements for watering, but there is a saving in the number of applications as well. It is possible to reduce the time employed in watering a house, or series of houses, to one-fifth the time usually required.

(2) *Watering by sub-irrigation assures an abundant and uniform supply of water to all parts of the bed.* Perfect construction of the benches is assumed in this case, but with such construction watering becomes almost automatic, the only care necessary being to look after such portions of the beds as may, by position, be subject to unusual conditions of air or sunlight.

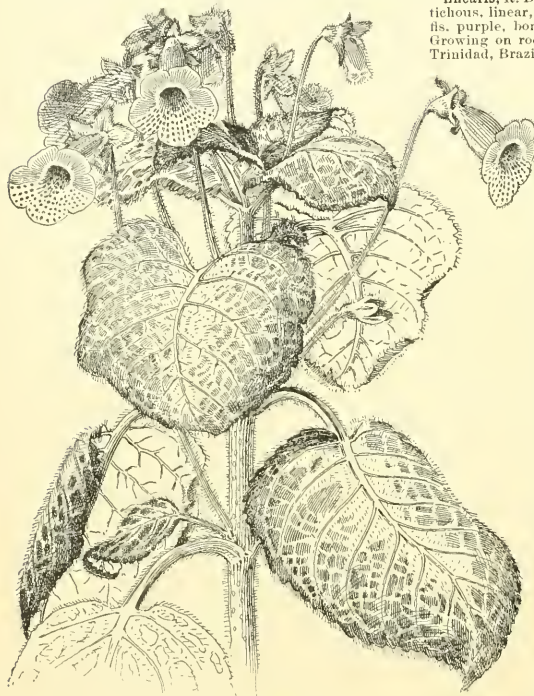
(3) *Where sub-irrigation is practiced in the greenhouse, the surface of the soil does not become compacted, but retains its original loose, friable condition.* It is true that where frequent syringing is practiced the surface of the soil becomes more or less hardened, but not to the extent that occurs in surface-watering, and the condition is easily remedied, whereas in the other case it is not. It follows that a heavier soil may be used for sub-irrigation than with surface-watering.

Still other considerations might be urged in favor of this method of watering, but many of them would apply to special cases only. Regarding the effect of the method upon insects and diseases, but little can be said. Lettuce rot is less prevalent upon sub-irrigated plots than upon those which are surface-watered, but in extreme cases plants succumb to the disease, whichever method of watering is practiced. Munson found that radishes suffered more from the attacks of millipedes upon sub-irrigated plots than upon plots watered in the usual manner. Nematodes work upon the roots of roses, whichever way the plants are watered. The manner of watering has no apparent effect upon the red spider. Even in houses watered wholly by sub-irrigation this pest is no worse than in houses in which the water is applied to the surface of the soil. It may be said, however, that nearly all classes of plants are more easily kept in a healthy growing condition, and are thus better able to resist enemies of all sorts, when sub-irrigated than when supplied with water in the ordinary way.

This method of applying water to plants in greenhouse benches has now been sufficiently tested to determine its value. All that now remains is to devise ways and means to utilize what is known concerning it. The adaptation to suit particular cases must be made by individuals, but this will be far easier in the future than in the past, because better methods of construction prevail than formerly. The success of sub-irrigation in the greenhouse is now simply a question of mechanics.

W. J. GREEN.

ISÁTIS (meaning obscure). *Crucifera*. This includes the Dyer's Woad, *I. tinctoria*, formerly cult. for a blue dye, but no longer advertised. Cæsar relates that with



1184. *Isoloma Tydaea* ($\times \frac{1}{2}$).

ancient Britons used the Woad for staining their bodies, and the word Britain itself comes from an old Celtic word meaning painted. Before indigo became common in Europe, the Dyer's Woad produced the chief blue coloring matter for woollen cloth. The introduction of indigo in the seventeenth century destroyed this important industry, not without opposition. Dioscorides and Pliny mention both the Dyer's Woad and indigo.

I. tinctoria, Linn., is rather tall, glabrous and glaucous: stem-lvs. lanceolate, entire, sessile, somewhat arrow-shaped: fls. small, yellow, borne in early summer, on panicle racemes. Instead of a pod, opening lengthwise by valves, it has a closed fruit like on the samara of an ash, 1-celled, 1-seeded, indehiscent, wing-like. It is a biennial, and common in Europe.

ISCHÁRUM. See *Biarum*.

ISMÈNE. Now referred to *Hymenocallis*.

ISNÁRDIA. Includes a few species of *Ludwigia*.

ISOCHILUS (Greek, equal tip). *Orchidæceæ*. A genus of no commercial value. Plants epiphytic, with tall, slender, leafy stems, without pseudobulbs, bearing a few small fls. at the summit. Sepals erect, free, keeled: petals similar but plane; labellum like the petals and united

with them to the base of the column, somewhat sigmoid below the middle: column erect, long, without wings: pollinia 4. About 5 species in Braz., Mex., and W. Ind.

lineária, R. Br. Slender, 1-1½ ft. high, leafy: lvs. distichous, linear, striate, obtuse, emarginate, 1½ in. long: fls. purple, borne in a short, terminal spike. March. Growing on rocks and trees in thick woods, Jamaica, Trinidad, Brazil, etc. B.R. 9:745. L.B.C. 14:1341.

H. HASSELBRING.

ISÓLEPIS. See *Scirpus*.

ISOLOMA (equal border). *Gesneriæceæ*. Includes *Tydaea*. Sixty or more tropical American plants, very closely allied to *Gesneria* and *Achimenes*. From *Gesneria* distinguished by absence of well-formed tubers and characters of capsule and anthers, and the 5 lobes of the disk equal; from *Achimenes* in the more tubular flowers and lobed disk. The culture is the same as for *Achimenes* and *Gesneria*. Seeds of the newer hybrids germinate quickly, and plants bloom the same year. It is probable that the pure species are not in the trade. Like *Achimenes*, *Gesneria* and *Gloxinia*, they have been much hybridized and varied. It is probable that they are hybridized with *Achimenes* and *Gesneria*. *Tydaea* is a garden genus. It is not known how the current forms have originated. Some of the recent ones have fringed fls. (Gn. 55:1223).

Tydaea (*Achimenes picta*, Benth. *Tydaea picta*, Dene.). Fig. 1184. One to 2 ft., hairy: lvs. cordate-ovate, coarsely serrate, spotted and reticulated with pale green or silvery green, with a broad light zone down the center: fls. single, on long, axillary stems, nodding, the orifice oblique and lobes obtuse, the upper longitudinal half of the fl. red, the lower half yellow and red-spotted. Colombia. B.M. 4126 (adapted in Fig. 1184). B.R. 31:42. F.S. 1:17-18.—On this species Decaisne founded the genus *Tydaea* in 1848. This species has been called *Isoloma pictum*, but this name was taken by Planchon in 1850 to '51 for the *Gesneria picta* of Hook., which is a very different plant. See F.S. 6:586. B.M. 4431. This latter plant, the first *Isoloma pictum*, is apparently not in commerce.

amabile, Mottet (*Tydaea ambidilis*, Planch. & Lind.). Erect, hairy: lvs. ovate, more or less tapering to the



1185. *Isoloma Jaliscanum* ($\times \frac{1}{2}$).

petiole, bluntly serrate, purplish on the veins: fls. hairy, pendent, dark rose dotted with purple, paler inside. Colombia. B.M. 4999. R.H. 1859, p. 25. F.S. 10:1070.

Ceciliae, Nichols. (*Tydaea Ceciliae*, André). Much like *I. amabile*, but lvs. marked with violet and silvery zones or blotches: fls. 2 or 3 from each axil, the fls. pale rose outside and striped in the throat, and the limb purple-spotted. Colombia. I.H. 23:260.

ocellatum, Benth. & Hook. (*Achimenes ocellata*, Hook.). Short-hairy on the stem: lvs. ovate-acuminate, serrate, green: fls. small, on peduncles shorter than the lvs., the tube and short, rounded lobes red, the segments marked with whitish and black spots. Panama. B.M. 4359.

Jaliscanum, Wats. Fig. 1185. Herbaceous or some what woody at the base, 1 ft., pubescent: lvs. opposite, oblong-lanceolate to ovate-lanceolate to ovate, short-acuminate, short-stalked, serrate: fls. 2-4 on an axillary peduncle, the corolla an inch long, tubular and short-lobed, pubescent, scarlet. Mex.—A worthy plant, not yet in the trade, but has been cult. L. H. B.

ISONANDRA (Greek, *equal anthers*). Sapotaceae. *Isonandra Gutta* is a large-leaved E. Indian tree, which furnishes the best commercial gutta-percha. The name has appeared in one southern catalogue, but the plants were found to be not true to name. This plant should be called *Dichopsis Gutta*. In *Dichopsis* the floral parts are in 6's, stamens 12, and the seeds have no albumen, while in *Isonandra* the floral parts are in 4's, the stamens 8, and the seeds albuminous. See *Rubber Plants*.

Gutta, Hook. Properly *Dichopsis Gutta*, Benth. & Hook. GUTTA-PERCHA TREE. Lvs. leathery, elliptic, abruptly pointed Malaya. R.H. 1898, p. 441.

ISOTOMA (Greek, *equally cut*; referring to the corolla, and true only by contrast with *Lobelia*). Campanulaceae. This includes a plant treated as a half-hardy annual, which grows about a foot high, has curiously cut foliage, and odd fls. with slender bent tube 1 in. or more long, and 5 slender spreading lobes, each $\frac{1}{2}$ in. long. Among allied genera of garden value, *Centropogon* and *Siphocampylus* have the stamens fastened at the base of the tube, while in *Isotoma* they are at the top or above the middle. (*Centropogon* has an indehiscent berry: *Siphocampylus* a capsule 2-valved at the top like *Isotoma*.) *Downingia* has a tube of stamens free from the corolla.

axillaris, Lindl. Perennial, flowering the first year so as to appear annual, but forming at length a hard root-stock, erect, with few spreading branches: lvs. linear, irregularly pinnatifid, 2-3 in. long, lobes linear: pedicels axillary, 2-6 in. long: fls. large, bluish purple, pale outside. Australia. B.M. 2702 (as *Lobelia senecioides*) and 5073 (as *Isotoma senecioides*, var. *subpinnatifida*).—Not in cult.

petraea, F. Muell. Identical with the above, except that the lvs. are ovate-oblong or elliptical. Australia. The plant in the trade is said to have cream-colored fls., and is sold as a "Lemon Verbena," a name which properly belongs to *Lantana*.

ITALIAN MAY. *Spiraea hypericifolia*.

ITEA (Greek name of the willow; because it has willow-like lvs., and grows near the water). Saxifragaceae. A genus of trees and shrubs, numbering about 5 species, inhabiting eastern N. Amer. and eastern Asia, whose one representative in cultivation is *I. Virginica*, a low, upright, somewhat coarse shrub, best known by its long, upright racemes of small white fls. appearing about July 1, in Massachusetts, and its brilliant autumn coloring. In nature it inhabits low, wet places. In cultivation it seems to adapt itself to almost any soil. It is not perfectly hardy, but grows rapidly and seems enduring of both sun and shade. In ornamental use it is planted in masses or mixed with other shrubs of similar character in the shrubby border or at the edge of woods. Its somewhat coarse character does not favor its approach to more refined objects. In autumn it becomes a brilliant red. It is prop. from seed, by cuttings and by division of roots, which spread slowly and form clumps of stems. It may be collected from the wild.

Virginica, Linn. VIRGINIAN WILLOW. Fig. 1186. A shrub, 1½-6 ft. high, usually not more than 2-3 ft. high, of upright, somewhat slender habit: lvs. deciduous, alternate, oblong, pointed, minutely serrate, smooth green above, pale and slightly pubescent below, petioled, without stipules, 1-3 in. long: fls. regular, 3 lines long, fragrant, white, in solitary, erect, hairy, simple, dense, terminal racemes 2-6 in. long, given a greenish white effect by the stamens and pistils, not particularly showy, appearing late June and July; calyx 5-cleft, persistent, nearly free from the base of the ovary; corolla of 5 lan-



1186. *Itea Virginica* ($\times \frac{1}{2}$).

ceolate, nearly erect petals and longer than the 5 stamens: capsule slender, longitudinally 2-furrowed, 2-celled, many-seeded, splitting through the simple style and partition. Pa. and N. J. to Fla. and La. B.M. 2409.

A. PHELPS WYMAN.

IVA (named after *Ajuga Rea*, from its similar smell). Compositae. This includes *I. frutescens*, Linn., the Marsh Elder or High-water shrub, a native hardy perennial of no garden value, which is, nevertheless, on record as having been cult. It grows 3-12 ft. high in salt marshes and on muddy seashores, has serrate lvs. and fls. as inconspicuous as those of a ragweed. See B.B. 3:292 and Gray's Manual.

IVESIA. All referred to *Potentilla*.

IVY. The common or English Ivy is *Hedera*. **Boston I.** = *Ampelopsis tricuspidata*. **German I.** = Climbing *Senecio* and *Herniaria glabra*. **Ground I.** = *Nepeta Glechoma*. **Kenilworth I.** = *Linaria Cymbularia*. **Poison I.** = *Rhus*, *R. Toxicodendron*. Some authors think that two species of *Rhus* are confused, *R. radicans* being the common Poison Ivy of the North, and *R. Toxicodendron* being a shrub of the South.

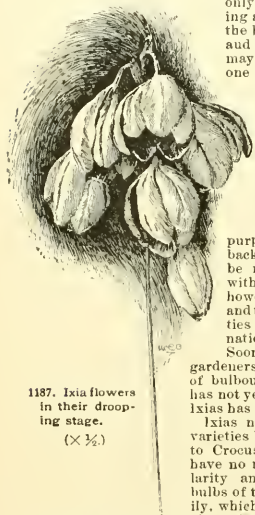
IXIA (Greek, *bird lime*; said to refer to the juice). *Iridaceæ*. *Ixias* are delightful tender bulbs originally from the Cape of Good Hope, with attractive grass-like foliage and spikes of flowers borne in early spring, exhibiting an exceptionally wide range of colors. They grow about 1½ ft. high on the average, with an unbranched stem, a spike 3-8 in. long, containing 6-12 fls. each 1½-2 in. or more across. The fls. have a very slender tube usually about ½ in. long, and 6 segments. The following colors are all well marked in *Ixia*: white, yellow in at least 3 shades, orange, lilac, rose, pink, crimson, light and dark purple, pale blue, and the even green. Perhaps the only important colors lacking are sky-blue and red in the bright shades of scarlet and vermilion. The flowers may be concolorous (all of one color) or these same shades may be combined with an eye. Most of our cultivated forms seem to have an eye of brown, purple or almost black, but there have been kinds with a white, blue or green eye. Occasionally there is a ring of brown color above the purple. Add to this that the backs of the segments may be more or less suffused with various colors (usually, however, that of the eye) and the interesting possibilities of *Ixias* in color combinations can be imagined.

Sooner or later all good gardeners yield to the fascination of bulbous plants, and whoever has not yet succeeded in growing *Ixias* has something to live for. *Ixias* number their cultivated varieties by the hundreds. Next to Crocuses and Freesias they have no rivals in point of popularity among spring-blooming bulbs of the important Iris family, which rejoices in the possession of such splendid summer-

blooming bulbs as Iris, Gladiolus and Montbretia. Culturally they belong to the same class with *Babiana* and *Sparaxis*, which are also desirable and distinct in general appearance and coloring, but are outstripped by *Ixias* in popularity and in number of varieties. Botanically, these three genera belong to the *Ixia* tribe, in which the fls. are spicate, not fugitive and never more than one to a spathe. The stamens of *Ixia* are equilateral; those of *Babiana* and *Sparaxis* unilateral. *Ixias* have about 6 erect grass like lvs. arranged in 2 ranks; *Babiana* has plaited, hairy lvs.

1187. *Ixia* flowers in their drooping stage.

(× ¼)



Bulb catalogues give no hint whatever as to the parentage of the numerous named varieties. Not one of them mentions *I. maculata* nor *I. columellaris*, which were the two all-important parent stocks. Of the 23 species recognized by Baker in *Flora Capensis*, vol. 6, 1896, only *I. viridiflora* appears as a trade name, but *I. speciosa* and *paniculata* are advertised under their synonyms *craterioides* and *longiflora*. *I. crocata* is *Trilonia crocata*, and *I. hybrida* of the trade is not the *hybrida* of the botanists, but means nothing more than mixed varieties.

Before speaking of the dominant types, it is convenient to mention some very distinct species which are still cultivated in a condition not essentially different, botanically, from the wild types. *I. paniculata* is instantly distinguished from all other *Ixias* in cult. by its very long tube, which is often 3 in. long. It is the genus for the last to bloom. *I. viridiflora* is unique in the genus for its green flowers, and it is one of the few green-flowered plants that are attractive. Whether this species has hybridized with the other dark-eyed species is conjectural. At any rate, the prototype is a popular plant to-day.

Of 86 named varieties received from 3 leading dealers in America, England and Holland, and supposed to be a representative collection, all but a bare dozen seem to be the offspring of *I. maculata* and *I. columellaris*. Both of these species have a purple or purple-black eye, sometimes brown, and the white and yellow colors of the segments are derived from *maculata*, while the lilac and purple shades of the segments are derived from *columellaris*. Baker makes no distinction between these two prototypes except that of color. The common opinion is that *Ixia* hybridize freely, both at the Cape and in cultivation, and it is usually said that they are now so thoroughly mixed by hybridization and selection that it is impossible to refer any of the named horticultural varieties to their proper species. Nevertheless, from a study of the specimens mentioned above and the colored plates cited below, the writer ventures the opinion that the vast majority of cultivated *Ixias* are eyed forms, which, with the exception of *viridiflora*, can be readily referred either to *maculata* or to *columellaris*, and that all such forms could be reproduced without hybridization if the original types were re-introduced from the Cape and subjected to an equal period of selection.

The real mystery in *Ixia* is why the self-colored forms are so little cultivated. There are at least 7 species with self-colored fls. which should be obtained directly from the Cape, if necessary, for they would all make decided additions to the *Ixias* that are in common cultivation. These are: *polystachya*, pure white; *flexuosa*, white, veined rose, with fine red and purple varieties; *aristata*, a superior pink; *lutea*, orange; *patens*, bright red; *speciosa*, ruby-red, and *odorata*, yellow. Of the eyed forms *orata*, a bright red flower, should be added, as this color seems to be lacking among the varieties that are commonly cultivated; also *mondalpa* in its variety with pale blue segments.

One of the most desirable of all these little-known types is *I. speciosa*, which is shown in the Botanical Magazine, with a delightful ruby-red color, untouched with any suggestion of purple, lilac or allied shades. This form would seem to promise to the hybridizer the possibility of several distinct shades of red that now seem to be practically unknown in cultivated *Ixias*. A synonym of *I. speciosa* is *I. craterioides*, which is a common trade name, but it is doubtful if the ruby-red form is in general cultivation. At any rate, it has not been sufficiently exploited. The dearth of good colored plates of modern cultivated *Ixias* is out of all proportion to their commercial and artistic value. The writer has no record of any good one since that published in 1884 in "The Garden."

Ixia flowers are charming in every stage of development. At first the flowers are erect and cup-shaped. They close at night and remain closed on dark days. As they grow older they open wider and become more star-shaped. The reader may judge by Fig. 1187 of the beauty of the flowers in their drooping stage. The plants remain in flower for three weeks, though the faded flowers at the bottom of the spike should be taken off toward the end of the period. As cut-flowers, they are presentable for a week or two.

W. M.

CULTURE OF IXIAS OUT-OF-DOORS.—The writer has always liked *Ixias*, but has considered that it is too much trouble to grow them under glass. They are vastly more satisfactory when grown outside. The planting of the bulbs should be delayed until the last moment, because *Ixias* are more inclined than most things to make an autumnal growth. They should be planted 3 inches deep, as late as November 30. In planting bulbs it is always

well to sprinkle a handful of sand on the spot where the bulbs are to lie. This helps the drainage, especially on heavy lands, and prevents rotting. The bulbs should then be covered with about 3 inches of leaves, hay, or better still, pine needles. In the latitude of Boston, bulb beds can be uncovered during the first week of April. However, there will still be sharp frosts to nip the tender shoots that have started beneath the winter covering. Consequently a little hay or other covering material should be left near by, where it can be easily gotten when a chilly evening threatens. In ten days the young sprouts will become sufficiently hardened to withstand any subsequent cold. Even such hardy things as *Allium*, when first uncovered, can hardly withstand any frost at all. It is, however, a mistake to wait two weeks longer and then permanently uncover the bulb beds, for by that time the early-starting things are likely to be so lank and long that they never attain ideal sturdiness. It is better to uncover too early than too late. The secret of success with *Ixia* outdoors is largely in hardening the plants in early spring and in never allowing them to grow too fast under cover, where they become yellow and sickly. During the winter shutters can be placed over the bulb beds to shed the rain; but the bulbs do as well without this protection, though they may be later in starting. Of course,

Ixia bulbs cannot stand any freezing, and they must, therefore, be planted in unfrozen soil. After flowering, let the bulbs remain in the soil until the end of July; then take them up, and store them, not in dry earth, but in boxes without any packing. Let them remain in a dry place until they are wanted for November planting. In the southern part of England *Ixia* can be planted 6 inches deep in hardy borders as late as December, and Krelage, perhaps thinking of still warmer regions, considers *Ixia* as summer-blooming bulbs, and advises planting from October to December. In the writer's experience, the flowers from the old bulbs are not at all inferior in succeeding years: indeed, the contrary has been the case, and the bulbs he raises are vastly superior to the ones he buys. Anateurs are commonly advised to throw away the offsets because fresh bulbs are cheap. Yet the undersigned finds that many of the offsets bloom the first year and nearly all of them the second.

It is commonly thought that if Cape bulbs are ever raised commercially in America, California or the coastal plain of the southern states would be the fittest regions for the industry. The writer knows of *Ixia* being raised commercially near Boston with every prospect of success. It is strange that *Tritonias*, *Sparaxis* and *Babianas* cannot be grown in the same way, though it is some consolation that they can be so easily grown in pots. To the undersigned *Ixia* are the most pleasing of all bulbs. He has thousands in bloom in the month of June, and thinks they make a braver show even than tulips. W. E. ESCOTT.

CULTURE OF IXIA IN GREENHOUSES.—*Ixia* bulbs can be planted any time from September 15 to October 30, the sooner the better. In general, tender bulbs of small size tend to lose vitality when kept a long time in the dry air of warehouses. *Ixia* bulbs should be planted an inch deep, 5 or 6 in a 5-in. pot, or 8 to 10 in a 6-in. pot. They

like a compound of sandy soil and leaf-mold. It is supposed that three-fourths of the failures with *Ixia* are due to hasty forcing. The pots should be stored under a bench or in a rather dark cellar, at a temperature of 45°. The object is to hold back the tops while the roots are growing, in order to get stocky, well colored, slowly started shoots. They need no water until growth has started. Then water carefully until the flowers come, as the young plants are liable to rot at the surface of the ground. While flowering water freely. After flowering, some gardeners give the plants no water. Others keep the soil moist until the leaves turn yellow, and then gradually withhold water. As to temperature, the plants may be brought into a cool greenhouse (50°) when well started, and towards the end of January may be given 5° more heat if flowers are desired as early as the middle of March. *Ixia* have to be staked and tied. The old bulbs, from which the offsets have been removed, may be used again. *Ixia* bulbs, which are really fibrous-coated corms about ½ in. thick, keep as well as *Freesias*. Seedlings flower the third year.

W. M.

CULTURE OF IXIA IN COLD-FRAMES.—Choose for the frame an open place, sheltered from north and west winds. In its construction give especial care to providing good drainage, to close-fitting and snug banking, so that frost, mice and moles can be kept out. A sandy soil, without manures, is safest and best for *Ixia*. If fertilizers are used they must be placed several inches below the bulbs, never in contact with them. As in outdoor culture, the bulbs must be planted late and in soil well dried by placing the sashes over the frame some time beforehand. Plant about 3 inches deep, as far apart, and treat afterwards much as in greenhouse culture. Take off the sashes in early May to show the mass of rich, odd flowers which, ordinarily, will open about that time and last for several weeks. If the frame is to have other tenants through the summer, the *Ixia* may be taken up after their tops are dead and stored in dry sand till planting time comes around again. Otherwise, merely cease watering as the tops of the *Ixia* die down, and put on the sashes again, tilting them so that they will give air and shed rain. L. GREENLEE.

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A. Tube of perianth dilated below the limb into a distinct funnel.

1. *odorata*, Ker. Fls. pure yellow. B.M. 1173.

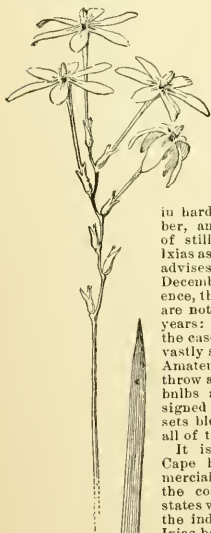
AA. Tube of perianth not dilated.

B. Length of tube 2½–3 in.

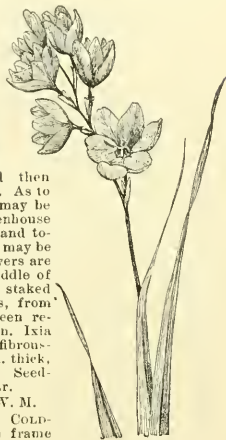
2. *paniculata*, Delarocbe (*I. longiflora*, Berg.). Fig. 1188. Segments white, often tinged red; throat same color or black. B.M. 256 and 1502.

BB. Length of tube 1 in.

3. *aristata*, Ker. Fls. whitish, according to Baker, but a fine pink in B.M. 589.



1188. *Ixia paniculata* (× ½).



1189. *Ixia maculata*. (× ½.)

BBB. Length of tube $\frac{1}{2}$ - $\frac{3}{4}$ in.

C. Segments $\frac{1}{2}$ in. long or less.

D. Color white.

4. *polystachya*, Linn. No eye. B.M. 623.

DD. Color shades of red or lilac.

5. *hexuosa*, Linn. No eye. B.M. 624.

CC. Segments more than $\frac{1}{2}$ in. long.

D. Fls. self-colored.

E. Color yellow or orange.

6. *lutea*, Baker. Fls. "uniformly deep bright yellow," according to Baker, but orange in B.M. 846.

EE. Color red.

F. Segments $\frac{3}{4}$ -1 in. long.

7. *pitens*, Ait. Fls. pale red, according to Baker, but deep rosy red in B.M. 522.

FF. Segments $\frac{3}{4}$ -1 in. long.

8. *speciosa*, Andr. (*I. craterioides*, Ker.). Fls. dark crimson, according to Baker, but rich ruby-red in B.M. 594.

DD. Fls. with an eye of brown, purple or black.

E. Color of segments white to yellow.

9. *maculata*, Linn. Fig. 1189. Fls. typically yellow, according to Baker. B.M. 539 (orange). The following natural varieties show the range of color. Var. *ochroleuca*, Ker. Segments sulfur-yellow; eye brown. B.M. 1285. Var. *nigro-albida*, Klatt. Segments white; eye black. Var. *ornata*, Baker. Fls. flushed bright red or purple outside.

EE. Color of segments lilac to purple.

10. *columnaris*, Ker. Typically with bright, mauve-purple segments and blue throat. B.M. 630.

EEE. Color of segments bright red.

11. *ovata*, Klatt. Andrews Bot. Rep., plate 23.

EEEE. Color of segments green.

12. *viridiflora*, Lam. Typically with pale green segments and black throat. B.M. 549. L.B.C. 16:1548. F.S. 2:124. Var. *cana*, Eckl. Segments pale blue; throat black. B.M. 789 (*I. maculata amethystina*). Var. *casia*, Ker. Segments pale lilac; eye greenish. B.R. 7:530.

EEEE. Color of segments pale blue.

13. *monadelphica*, Delaroché. Only species in the genus that does not have free anthers. B.M. 607; 1378.—Segments typically lilac, but there are forms with claret-red, blue or pale yellow segments, combined with eyes and markings of various colors. W. M.

IXIOLIRION (Greek, an *Iris-like lily*). *Amaryllidaceae*. A genus of 2 species of hardy bulbs from western Asia, with umbels of 5-9 deep blue or violet, 6-lobed fls. each 2 in. across, borne in spring. Perianth regular, without any tube above the ovary; segments oblanceolate; stamens shorter than the segments, attached to their claws. The nearest cultivated allies are *Alstromeria* and *Bomarea*, which have no distinct rootstock, while *Ixiolirion* has a bulbous rootstock. Monogr. by Baker, *Amaryllidaceae*, 1888.

montanum, Herb. (*I. Pallasii*, Fisch. & Mey.). Bulb ovoid, 1 in. thick, with a neck 2-3 in. below the basal tuft of lvs.; stem about 1 ft. long; lvs. about 4, persistent, and a few smaller ones above; fls. on long unequal pedicels and often 1 or 2 fls. below; perianth bright blue according to Baker. Syria to Siberia. B.R. 30:66. F.S. 22:270. R.H. 1880:310. J.H.H. 31:583.

Var. *Tataricum*, Herb. (*I. Tataricum*, Hort.). Stems more slender; lvs.awl-shaped; fls. all in a terminal umbel, smaller than the type. Altai Mts. G.C.H. 19:757. Regel calls the collective species *I. Tataricum*, and describes 5 species of it.

IXORA (a Malabar deity). *Rubiaceae*. Many species (100 or more) of shrubs or small trees with opposite or verticillate lvs. and terminal or axillary corymbs of very showy fls., inhabiting the tropical parts of Asia, Africa, America, Australia and Pacific islands. The species are very difficult to distinguish. The fls. are white, rose or scarlet, on bracteate pedicels; corolla very long- and

slender-tubed, the throat sometimes barbed, the limb 4- or 5-lobed and wide-spreading; stamens 4 or 5, inserted on the throat, the filaments short or none; ovary on a fleshy disk, 2-lobed, the style filiform and exserted, 2-branched; ovules solitary. L. H. B.

IXoras, which are handsome dwarf flowering shrubs, belong to the tropics. The species, as well as their hybrids, all bear beautiful trusses of flowers of various shades, from a creamy white to a rich crimson. They require a stove temperature during most of the time, although, after having finished their growth in the early autumn, they could be placed for a time into a lower or greenhouse temperature, in which they would more fully ripen their young growth and set and develop their flower buds. After this, when again placed in the warmhouse, the plants will keep flowering until spring. Sandy leaf-mold, with plenty of drainage, is best to cultivate them in. They like plenty of heat and moisture, and care should be taken not to overwet them. The foliage should be syringed often, as otherwise the mealy bug and other insects will infest them. They do best in a sunny spot in a greenhouse temperature, but should not fall below 60° while growing. They propagate freely from cuttings of half-ripe wood, and they produce their best flowers when the pots are filled with roots; then a little feeding with liquid manure will bring out the size and color of the flowers to perfection. H. A. SIEBRECHT.

Many of the Latin names of IXoras are of horticultural forms. Of this class, the following are in the Amer. trade: *Chifsoni*, fls. brilliant salmon-orange. *Colvi*, fls. pure white; cross of *I. coccinea* and *I. stricta*, var. *alba*. *Conspicua*, fls. yellow, becoming orange. *Diariana*, fls. deep orange. *Fraseri*, fls. scarlet in the tube, and brilliant salmon above. *Ornata*, salmon-orange. *Princeps*, fls. whitish, becoming orange; said to have come from Java. *Regina*, fls. shaded violet-salmon. *Sanguinea*, fls. crimson, shaded with violet. *Splendida*, crimson-orange. I.H. 29:463. *Weslii*, fls. pale rose, becoming brilliant; hybrid (Gn. 42:886. G.M. 36:35). *Williamsonii*, fls. reddish salmon. Other horticultural forms are: *Armenica*, yellow; *Ducora*, yellow; *Ilustris*, orange; *Insignis*, rose; *Pilgrimi*, orange-scarlet; *Profusa*, rose; *Speciosa*, yellow; *Splendens*, orange; *Vanusta*, orange.

A. Fls. usually in shades of red (sometimes varying to rose).

stricta, Roxb. (*I. coccinea*, Hort. *I. blanda*, Ker. *I. crocata*, Lindl.). Apparently the common species, known in greenhouses as *I. coccinea*; glabrous shrub, with sessile or subsessile lvs. which are obovate or obovate-oblong, and very slender-tubed fls. in dense corymbs, the corolla lobes short and rounded. Moluccas and China. B.M. 169 (as *I. coccinea*). B.R. 10:782.—Runs into nearly pure white forms. *I. stricta* of the importers of Japanese plants is probably a misprint for *stricta*. There are said to be yellowish fl. forms. Prince of Orange is said to be a form of this species.

coccinea, Linn. (*I. grandiflora*, Br. *I. Bandhica*, Roxb.). Much like the last, but lvs. oblong and corolla lobes acute. E. Indies. B.R. 2:154; 6:513.

macrothrysa, Tejss. & Binn. (*I. Diutii*, Moore). Very large, glabrous; lvs. a foot long, linear-oblong to oblong-lanceolate; cluster very large, 8 in. across, bearing very many deep red tinged long fls., with lanceolate obtuse lobes about $\frac{1}{2}$ in. long. E. Indies. B.M. 653.—Probably the finest of the genus.

AA. Fls. in shades of yellow or orange.

Javanica, DC. Glabrous shrub with lvs. 5-7 in. long, ovate-oblong, acute or acuminate; corymb terminal, with forking coral-red branches; fls. deep orange-red, the lobes rounded. Java. B.M. 4586.

congesta, Roxb. (*I. Griffithii*, Hook.). Evergreen tree in its native haunts, glabrous, except the cymes; lvs. very large (6-12 in. long), stalked, elliptic or elliptic-oblong, acute or acuminate; cymes sessile or nearly so; fls. orange-yellow, changing to reddish, the segments rounded. Indies. B.M. 4325.

AAA. Flowers white.

parviflora, Vahl. Evergreen tree, with subsessile oblong or elliptic-obtuse lvs. 3-6 in. long; cymes sessile; fls. white, the tube only $\frac{1}{2}$ in. long. India. L. H. B.

J

JACARANDA (Brazilian name). *Bignoniaceae*. *J. ovalifolia* perhaps ranks among the 100 best flowering trees or shrubs for subtropical regions. The foliage is as finely cut as a fern, symmetrical and elegant. The leaves are decussate, distant, each one with 16 or more pairs of pinnae, each pinna having 14-24 pairs of leaflets. The plant bears loose, pyramidal panicles, 8 in. high, of 40-90 blue fls., each 2 in. long and $1\frac{1}{2}$ in. wide, which have a long, bent, swelling tube and the 2 lobes of one lip smaller than the 3 other lobes. From S. Fla. It is one of the best of foliage plants for the S., valuable alike for florists' decorations, conservatory, subtropical bedding in the North, or for lawn specimens in Florida, where, if cut back by frost, it rapidly recovers its beauty. It reaches a height of 20 ft. or more. It is commonly planted in parts of S. Calif., and attains a height of 50 ft. and more. This species is also cult. in Europe under glass. Jacaranda is a genus of about 30 tropical American species, mostly Brazilian; trees, with lvs. opposite, 2-pinnate, rarely 1-pinnate; lfts. usually numerous, entire or dentate; fls. showy blue or violet, paniced; corolla lobes rotund; perfect stamens 4, didynamous; staminode about as long as the stamens, club-shaped at the apex and often bearded at the top.

ovalifolia, R. Br. (*J. mimosafolia*, D. Don). Lvs. distant, spreading, oblong, villous; fls. more or less horizontal. S. Amer. B.R. 8:631. B.M. 2327. R.H. 1897:132.

E. N. REASONER and W. M.

JACK BEAN. Refer to *Canavalia*.

JACK FRUIT. *Artocarpus integrifolia*.

JACK-IN-A-BOX. *Hernandia*.

JACK-IN-THE-PULPIT. See *Arisaema*.

JACOBÆA. All included in *Senecio*.

JACOBÍNIA (probably a personal name). *Acanthaceae*. A polymorphous genus of 30 or 40 tropical American herbs or shrubs, including the genera *Libonia*, *Sericographis* and *Cyrtanthera*. Plants cultivated for their narrow-tubular red, orange or yellow fls.: lvs. opposite and entire; calyx deeply 5-parted, with linear or awl-shaped segments; corolla more or less 2-lipped, one lip 2-lobed and the other 3-lobed; stamens 2; staminodia represented by two hairy elevations on the corolla tube; pistil ripening into an oblong or ovate capsule, the style filiform, the ovary surrounded by a disk.

Jacobinias, in common with other *Acanthads*, are much confused as to species. A closely allied genus is *Justicia*, which, among other characters, is distinguished by having spurs or appendages at the base of the anther lobes, whereas *Jacobinia* has no such appendages. Other allied genera are *Aphelandra*, *Dianthera*, *Adhatoda*, *Thysanacthis*, *Eranthemum*, *Barleria*, *Dædalanthus*.

Jacobinias are mostly subshrubs in their native places, but they are usually treated as herbs under cultivation. They are showy greenhouse or conservatory subjects. When well grown they are attractive plants, but they soon become weedy under neglect. They propagate very readily from cuttings, after the manner of fuchsias, and the most satisfactory plants are usually those which are allowed to bloom but once. Most of them thrive well under conditions suited to begonias.

A. Fls. in a more or less dense terminal panicle or thyrses: corolla long, more or less curved; stamens fixed to the middle or near the top of corolla tube. (Subgenus *Cyrtanthera*.)

magnifica, Benth. & Hook. (*Cyrtanthera magnifica*, Nees, *Justicia magnifica*, Pohl). Strong forking herb or subshrub, blooming when 1 or 2 ft. high, but becom-

ing several feet high if allowed to grow: stems 4-angled; lvs. opposite, lanceolate to ovate-lanceolate to oval-oblong, narrow or broad at base, attenuate to apex, wavy-margined, veiny, downy, sometimes a foot long; fls. rose-purple, ascending, arched at the top and the lower lip recurving, borne in dense terminal spike-like thyrses. Brazil. G.F. 5:317. Var. **carnea** (*Justicia carnea*, Hook.) has flesh-colored fls. B.M. 3383. B.R. 17:1397.—A handsome old plant, of comparatively easy culture in a conservatory temperature. Cuttings made in Feb. or March should bloom early the following winter. Young plants are usually most satisfactory, the old ones being kept over only for cutting stock. Give rich soil, and plenty of water in the growing season.

Pohliana, Benth. & Hook. (*Cyrtanthera Pohliana*, Nees). Much like *J. magnifica*, but more robust and leafy: lvs. ovate-acuminate and rounded or nearly or quite cordate at the base, more glabrous, often purple-tinged; fls. bright crimson; bracts short-aente, or in one form obtuse. Brazil.—Voss considers *J. magnifica*, var. **carnea** to be synonymous with *J. Pohliana*.

Var. **velutina**, Hort. (*J. velutina* and *Justicia velutina*, Hort. (*Cyrtanthera Pohliana*, var. **velutina**, Nees). Dwarf; bracts obtuse: lvs. villous-pubescent on both surfaces: fls. 2 in. long, rose-color. Brazil. Gng. 7:212. A.F. 14:998.—A worthy plant of comparatively recent introduction in this country. It is an excellent pot subject and has been considerably advertised recently as the "New Dwarf *Justicia velutina*." A profuse and continuous bloomer. Cultural remarks under *J. magnifica* also apply to this.

AA. Fls. in a dense terminal spike: corolla long and curved; stamens fixed to the base of the tube. (Subgenus *Polystachys*.)

coecinea, Hiern. (*Justicia coecinea*, Aubl.). Erect herb or subshrub, usually grown from cuttings each year and treated as a pot subject; 2-5 ft. high; branches terete: lvs. elliptic or ovate-lanceolate, entire, glabrous



1190. *Jacobinia Pennhosiensis* ($\times \frac{1}{2}$).

or nearly so: fls. crimson, in a dense terminal spike, pubescent, the long upper lip more or less arched and the lower one reflexed. Brazil. B.M. 432.—Blooms in summer. Said to be known sometimes as *Aphelandra cristata*.

AAA. *Fls. scattered or in loose more or less leafy panicles; of medium length, straight or nearly so, not deeply cleft. (Subgenus Libonia.)*

pauciflora, Benth. & Hook. (*Scierigraphis pauciflora*, Nees. *Libonia floribunda*, C. Koch.). A common conservatory plant, subshrubby, but usually treated as a carpet plant, with terete, short-jointed, close pubescent branches; lvs. elliptic or elliptic-oblong, short and rather small, entire, very short-stalked; fls. 1 in. long, tubular, drooping or nearly horizontal, scarlet with yellow at the end, the lips short. Brazil.—A most floriferous plant, almost as easy to grow as a fuchsia, and to be handled in essentially the same way.

Penrhosiensis (*Libonia Penrhosiensis*, Carr.). Flg. 1190. Much like the last, but lvs. more pointed and fls. larger and more showy. R.H. 1876:50. Gug. 2:131.—It is a most excellent plant, and is taking the place of *J. pauciflora*. It is hybrid of *J. pauciflora* and *J. Ghiesbreghtiana*. Another and very similar hybrid of the same parentage is *Scierobonia ignea*, Lindl. & André. L.II 22:198. *J. Penrhosiensis* is a winter bloomer, a little earlier than *J. pauciflora*. Cuttings struck in spring make full blooming subjects by fall and early winter. This and *J. pauciflora* are common conservatory plants.

Ghiesbreghtiana, Benth. & Hook. (*Cyrtanthura Ghiesbreghtiana*, Decne. *Scierographis Ghiesbreghtiana*, Nees. *Justicia Ghiesbreghtiana*, Lem. *Aphelandra Ghiesbreghtiana*, Hort.). Lvs. narrower (lance-ovate) and longer, acuminate; fls. in a terminal, very loose panicle, tubular, scarlet, appearing at the same season as those of *J. Penrhosiensis*. Mex. F.S. 4:339.—Introduced by Ghiesbreght; but when the plant was transferred to the genus *Jacobinia* the name was misspelled *Ghiesbreghtiana*.

J. Lindenii, Nichols. (*Justicia Lindenii*, Honll.), is a Mexican subshrub, with lance-ovate lvs., and a fasciated head of orange yellow fls. Does not appear to be in the Amer. trade. R. 1870:250. L. H. B.

JACOB'S LADDER. *Polemonium corratum*.

JACOB'S STAFF. *Fouquieria splendens*.

JACQUEMONTIA (after Victor Jacquemont, a French naturalist; died 1832). *Convolvulaceae*. About 50 species of tropical and subtropical twining herbs, allied to *Ipomoea* and *Convolvulus*, to which they are inferior for garden culture. They are distinguished from *Ipomoea* by having two stigmas instead of one; and from *Convolvulus* by having the stigma ovate or oblong instead of linear-filiform to subulate. *J. violacea* makes an attractive greenhouse climber for summer and autumn flowering, but is not as desirable for this purpose as several species of *Ipomoea*. It is apt to become leggy after a few years. Propagated readily by seeds or cuttings. For other botanical characters and cultural directions, see *Ipomoea*.

violacea, Choisy (*Convolvulus pentanthus*, Jacq.). Stem perennial, somewhat shrubby at base, twining 6-8 ft., pubescent or nearly glabrous; lvs. cordate to ovate-lanceolate, acuminate; peduncles slender, bearing 5-12 fls. in a loose cymose cluster; corolla about 1½ in. wide, short-funnelform, sharply 5-angled, rich violet-blue. June-Sept. Trop. Amer., and as far north as Fla. B.M. 2151. B. 4:197. P.M. 6:219. In var. *canescens*, Hort. (*J. canescens*, Benth.), the whole plant is covered with short, brownish down. B.R. 33:27.

tannifolia, Griseb. Plant annual, usually low and erect, at length twining if support is near, covered with tawny yellow hairs; lvs. cordate, ovate, long-petioled; peduncles bearing many fls. in dense, involucrete clusters; fls. less than ½ in. long, violet. Cult. and waste ground, S. C. to Ark., and southward.

S. W. FLETCHER.

JACQUINTIA (Nicholas Joseph de Jacquin, 1727-1817, distinguished botanical painter and writer, who painted many West Indian plants from nature). *Myrsinaceae*. About 20 species of tropical American trees and shrubs, one of which is called Bracelet Wood in the West Indies, because the brown and yellow shiny seeds are made into bracelets. It is a low tree, with evergreen lvs. some-

what like box but obovate, and racemes of small, white, honey-scented fls. which in the North under glass would be borne in winter. It seems to be cult. only in S. Fla. and S. Calif. outdoors. Generic characters are lvs. rigid, margined, entire; fls. white or orange, borne in racemes, umbels or singly; corolla 5-fid, wheel- or salver-shaped, crowded at the throat and with the lobes with 5 roundish appendages (staminodia); berry leathery, several-seeded. In the allied genus *Theophrasta* the corolla is cylindrical, shortly 5-lobed, the appendages are fastened at the base of the corolla instead of the throat, and the berry is many-seeded.

armillaris, Linn. Lvs. cuneate-spatulate or obovate, blunt, revolute at the margin, usually whorled, 4 in. long, 1½ in. wide; berry ¼ in. thick. W. Indies.

JAMBOLAN and JAMBOS. See *Eugenia*.

JAMESIA (after its discoverer, Dr. Edwin James, 1797-1861, botanical explorer of the Rocky Mountains). Syn., *Elmnia*, *Saurifragdaceae*. Low, hardy shrub of upright habit, with deciduous, opposite, petioled, serrate lvs., and white fls. in terminal, short panicles. Handsome shrub for borders of shrubberies or rocky slopes in sunny situations, thriving in any well-drained garden soil, best in a peaty and sandy one. Prop. by seeds or by cuttings of ripened wood. One species in the Rocky Mountains from Utah to New Mex. Lvs. without stipules; calyx lobes and petals 5; stamens 10; styles usually 3; fr. a 3-celled, many-seeded, dehiscent capsule.

Americana, Torr. & Gr. Shrub, to 4 ft.; lvs. broadly ovate to oblong-ovate, acute, serrate, dentate, pubescent or almost glabrous above, whitish tomentose beneath, ½-2 in. long; fls. about ½ in. across, white, sometimes pinkish outside. June. B.M. 6142. J.H. III. 32:37. Gn. 32, p. 522, and 33, p. 606. ALFRED REHDER.

JAMESTOWN WEED is *Datura Stramonium*.

JAMRODSE. See *Eugenia Jambos*.

JAPONICA. Popular name for *Cydonia Japonica* and *Camellia Japonica*.

JARRAH. *Eucalyptus marginata*.

JASIONE (ancient name of no application to this plant). *Campanulidaceae*. This includes the Shepherd's Scabious, a hardy herbaceous perennial plant of compact habit, about a foot high, and bearing globose heads 2 inches in diameter, composed of very many light blue flowers. It is of easy culture in any garden soil, grows either in full sunlight or partial shade, and is equally adapted for borders, edgings, or the rockery. The common annual Scabious belongs to the tassel family, and has 4 stamens, while the Shepherd's Scabious has 5 stamens. *Jasione* has about 12 species, mostly European, and is easily distinguished from its allies by the fls. being borne in a head with an involucre, the corolla cut in 5 awl-shaped strips, and the anthers somewhat united at their bases. They differ widely in duration and habit. Prop. by division and seed.

perennis, Lam. SHEPHERD'S SCABIOUS. SHEEP SCABIOUS. SHEEP'S-BIT. Stem erect, sparingly if at all branched; root-lvs. obovate, in the non-floriferous plants forming a tufted rosette; stem-lvs. oblong-linear, entire; peduncles long, leafless; bracts ovate, serrate-dentate. July, Aug. B.R. 6:505. B.M. 2198.

J. B. KELLER and W. M.

JASMINEUM (Arabic name). *Oleaceae*. JASMINE. JESSAMINE. Climbing or erect shrubs, of more than 100 species in warm regions of the Old World. Fls. fragrant; corolla yellow or white (sometimes reddish outside), salver-shaped, the 4-9 lobes convolute in the bud, much exceeding the calyx; stamens 2, included in the corolla tube; ovary 2-loculed, with a single erect ovule in each locule, becoming in fr. a twin berry; lvs. pinnate, but sometimes reduced to 1 lft. (petiole jointed). Jasmynes are of diverse horticultural groups. Some of them are hardy in the middle and southern states, whereas others are winter-flowering warmhouse plants. Most of them are known as coolhouse or temperate-house shrubs, of half-climbing habit. They are all of

easy culture. They propagate readily by cuttings of nearly mature wood and by layers. Often the fls. are very fragrant. The species are usually called Jasmines, and the word Jessamine is commonly restricted to *J. officinale*, which is the Jessamine of poetry. Some of them (particularly *J. grandiflorum*) are grown for perfume-making. The Cape Jessamine is *Gardenia*. Yellow or Carolina Jessamine is *Gelsemium*.

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A. Lvs. reduced to one lft.: fls. white.

B. Calyx pubescent or hairy.

1. *Sambae*, Soland. ARABIAN JASMINE. Climbing, the angular branchlets pubescent; lvs. opposite or ternate (the ternate-ld. specimens giving rise to the name *trifoliatum*), firm in texture, shining, nearly or quite glabrous, the petiole short and abruptly curved upwards, elliptic-ovate or broad-ovate, either prominently acute or completely rounded on the end, entire, prominently veined; clusters 3-12-fl.; calyx lobes linear and prominent, hirsute on the edges (sometimes almost glabrous); corolla tube $\frac{1}{2}$ in. long; lobes oblong or orbicular. India.—Much cult. in the tropics. Fls. white, but turning purple as they die. B.R. 1:1. A full double button-fl. group is in cult., one form of which is the Grand Duke of Tuscany (or Grand Duke). The double form is shown in B.M. 1785. This double form sometimes passes as *J. trifoliatum*. *J. Sambae* is a perpetual bloomer, particularly in frostless countries, where it can stand in the open.

2. *undulatum*, Ker. Climbing, with hairy branches, slender; lvs. opposite, short-petioled, rather small (about 2 in. long), ovate-lanceolate and acuminate, somewhat pubescent beneath, somewhat undulate; fls. 6-10, in terminal cymes, white, long-tubed; calyx teeth short; corolla tube $\frac{1}{2}$ in. long, and slender; lobes half or less as long, acute. India. B.R. 6:436.—Lvs. sometimes ternate. Little known in cult. in this country.

3. *pubescens*, Willd. (*J. hirsutum*, Willd., *J. multiflorum*, Andr.). Climbing, rusty hairy; lvs. very short-petioled, rather thick, ovate-acute; calyx teeth usually $\frac{1}{2}$ in. long (nearly or quite twice as long as in *J. undulatum*), with spreading yellow hairs; fls. white, much like those of *J. undulatum*, the lobes broad, often half-double. India. B.M. 1991. B.R. 1:15.—Will stand some frost.

4. *gracillimum*, Hook. f. Climbing or scrambling, soft pubescent or hairy; lvs. very short-petioled, ovate-lanceolate, acuminate, the base cordate or truncate, bright green above and pubescent beneath, $1\frac{1}{2}$ in. or less long; fls. white, in very large, dense hanging heads, an inch or more across, fragrant; calyx teeth long and awl-like, half as long as the slender corolla tube; corolla lobes many (usually about 9), acute. N. Borneo. G.C. II. 15:9. B.M. 6559.—Long, lithe branches spring from near the ground and bear heavy clusters at their ends. Handsome winter bloomer. Nearly hardy in eastern N. Car.

BB. Calyx glabrous.

5. *trinerve*, Vahl. Tall-climbing, with terete glabrous branches; lvs. short-stalked, ample, ovate-oblong and acuminate, strongly 3-nerved from the base; fls. white, in small clusters; calyx teeth narrow but much shorter than the long corolla tube; corolla lobes only half as long as the tube, acute. India. B.R. 11:918.—Perhaps only a form of *J. anastomosans*, Wall.

6. *simplicifolium*, Forst. (*J. lucidum*, Banks). Climber, or sometimes a tree in its native place, glabrous or pubescent; lvs. mostly short-stalked, shining, varying from oblong-elliptic to ovate-lanceolate to cordate-ovate, acute or obtuse, usually less than 3 in. long; fls. white, in terminal forking, many-fl. clusters; calyx teeth short and sometimes scarcely any; corolla tube

$\frac{1}{2}$ - $\frac{3}{4}$ in. long, the acute lobes somewhat shorter. Austral. B.M. 980. B.R. 8:606 (as *J. gracile*, Andr.).—Summer bloomer.

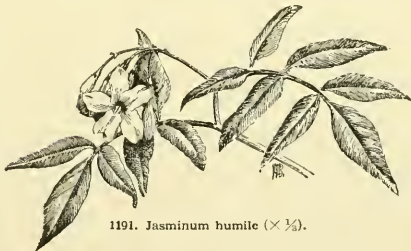
AA. Lvs. of 3 or more lfts.

B. Flowers white.

7. *officinale*, Linn. (*J. poeticum*, Hort.). JESSAMINE. Long, slender grower requiring support, but scarcely self-climbing, glabrous or very nearly so; lvs. opposite, odd-pinnate, the lateral lfts. 2-3 pairs and rhomboid-oblong-acute, the terminal one longer; fls. 2-10 in terminal more or less leafy clusters; calyx teeth linear, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, or sometimes as long as the rather short corolla tube; corolla lobes oblong, more or less involute on the margins. Persia, India. B.M. 31. R.H. 1878, p. 428.—Long cultivated. The glossy foliage and fragrant white summer-blooming fls. render the plant very attractive in the S., where it is hardy. With protection it will stand as far N. as Phila. Var. *affine*, Nichols. (*J. affine*, Hort.), is a form with larger fls. R.H. 1878, p. 428.

8. *grandiflorum*, Linn. CATALONIAN, ITALIAN, ROYAL or SPANISH JASMINE. Nearly erect-growing, the branches drooping and angular, glabrous or very nearly so; lvs. opposite, the rachis flattened or winged, the lfts. 2-3 pairs, elliptic or round-elliptic, mostly ending in a very small point or cusp; calyx teeth $\frac{1}{4}$ in. long or rarely half as long as the corolla tube; corolla star-shaped, larger than in *J. officinale*. India. B.R. 2:91.—Probably the best white-flowered species. Summer and fall, or nearly perpetual in warm countries. Much grown in Eu. for perfumery. Stands 10°-12° of frost.

9. *Azoricum*, Linn. Climbing, glabrous or nearly so, the branches terete; lvs. evergreen, opposite, the lfts. 3, ovate-acuminate, the 2 side ones often smaller; calyx teeth very small; oblong corolla lobes about as long as the tube. Canary Isl. B.M. 1889.—A good white-fl. temperate-house species blooming in summer and winter.

1191. *Jasminum humile* ($\times \frac{1}{2}$).

BB. Flowers yellow.

10. *humile*, Linn. (*J. revolutum*, Sims., *J. flavum*, Sieb., *J. triumphans*, Hort.). ITALIAN YELLOW JASMINE. Fig. 1191. A diffuse shrub, in the open ground in the S. reaching 20 ft. and requiring support, but in glasshouses usually grown as a pot bush; branches glabrous, angled; lvs. alternate, odd-pinnate (rarely reduced to 1 lft.), the lateral lfts. 1-3 pairs, all lfts. thickish and acuminate, and more or less revolute on the edges, varying from oblong to oblong-lanceolate to oblong-ovate; fls. bright yellow, in open clusters; calyx teeth very short; corolla tube $\frac{1}{2}$ -1 in. long, usually considerably exceeding the mostly obtuse and reflexing lobes. Trop. Asia. B.M. 1731. B.R. 3:178; 5:350. L.B.C. 10:966.—The commonest Jasmine in American glasshouses, usually known as *J. revolutum*. It is hardy in the open as far north as Maryland. Lvs. thick and evergreen. Needs a cool house if grown under glass. Summer and fall bloomer. *J. Reevesii*, Hort., may belong to this species.

11. *odoratissimum*, Linn. Much like the last, but more erect and less leafy when in flower; lvs. alternate, the leaflets 3 or 5, shining, oval or broad-oval and obtuse; fls. yellow, in a terminal cluster; calyx teeth very short; corolla lobes oblong-obtuse, mostly shorter than the tube.

Summer. Madeira. B.M. 285.—It is an erect, glabrous shrub with straight, stiff, terete or faintly angular branches.

12. *nudiflorum*, Lindl. (*J. Sieboldianum*, Blume). Twiggy, nearly erect shrub with 4-angled glabrous stiff branchlets: lvs. opposite, small, with 3 little ovate ciliate lfts., the entire foliage falling in autumn or when the growth is completed: fls. solitary, in early spring (or winter), from long, scaly buds, subtended by several or many small leaf-like bracts, yellow; calyx lobes leafy and spreading or reflexed, shorter than the corolla tube; corolla segments obovate, often wavy. China. B.R. 32:48. B.M. 4649. R.H. 1832:201. G.C. III. 11:181.—A most interesting plant, reminding one of Forsythia when in bloom. Hardly south of Washington, and blooming nearly all winter. With protection, it will stand as far north as Hudson river valley, and bloom very early in spring. In northern glasshouses, used mostly as a late winter and early spring bloomer. Strong-growing specimens need support.

J. angulare, Vahl. Fls. very long-tubed, white: lvs. opposite-ternate. S. Afr. B.M. 6865.—*J. catcaicum*, Muell. (J. Nova Zelandicum, Bosse), is a spring- and summer-blooming Australian species with white fls. and simple, opposite, thick, 3- or 5-nerved lvs.—*J. didymum*, Forst. Climber: fls. small, white, in narrow axillary cymes which exceed the lvs.: lvs. opposite, ternate: lfts. often retuse. Austral. B.M. 6349.—*J. truncatum*, Linn. Bushy: branches angular: lvs. alternate, small, ternate, the lfts. obovate: fls. yellow. Mediterranean region. B.M. 461.—*J. polyanthum*, Franch., a recent Chinese species in the way of *J. grandiflorum*, may be expected to appear in cult. Fls. white inside, reddish outside, long-tubed: lvs. opposite, with about 5 long-acuminate lfts. R.H. 1891, p. 270.—*J. pubigerum*, Don. Much like *J. humile*, but fls. smaller and plant villosous. India. L. H. P.

JÁTROPHA (Greek, referring to its medicinal use). *Euphorbiaceæ*. This includes the French Physic Nut, *J. Curcas*, which is grown commercially in the Cape Verde Islands for the seeds, which yield a purgative oil resembling castor oil. It is also grown for ornament in S. Fla. and S. Calif. About 68 species of tropical herbs or tall shrubs: lvs. alternate, petiolate, usually palmately lobed: fls. at the tips of branches in forking cymose panicles, monœcious; calyx 5-parted; corolla twisted; stamens 10 or fewer: column surrounded by 5 glands: capsule 2-3-seeded.

multifida, Linn. Shrubby, 5-10 ft. high: lvs. long-petioled, 7-9-parted, glabrous, not glandular; segments pinnatifid; stipules many-parted, the divisions bristly: cymes umbel-like: petals distinct, 3 times as long as the calyx; stamens 8-10. Tropics; naturalized in Jamaica and common there.—Cult. at Santa Barbara, by Francesechi, who says its curiously divided leaves and scarlet flowers are very ornamental, and adds that it is called "Coral Bush."

Curcas, Linn. FRENCH PHYSIC NUT. Subshrub, 6-12 ft. high: lvs. subcordate-roundish, angular or obsoletely 3-5-lobed, glabrous; stipules deciduous: corolla 5-parted, villous inside, twice as long as the calyx; stamens 10-15. Tropics.—A weed at St. Vincent. Reasoner says it grows 20 ft. high.

gossypifolia, Linn. Subshrub, a few feet high: lvs. long-petioled, 5-parted, with prominent gland-tipped hairs on the margin, petioles and many-parted stipules, those on the petioles branched; petals distinct, dark purple; stamens 8-10. Tropics. L.B.C. 2:117. B.R. 9:716.—Long cultivated for ornament. Has been recently advocated as a specific for leprosy.

J. stimulosa, Michx., the Spurge Nettle, is a common weed in the South. J. B. S. NORTON.

JEFFERSONIA (after Thomas Jefferson, third president of the U. S.). *Berberidaceæ*. A genus of 2 species, one of which is a native hardy herbaceous perennial plant, growing about 8 in. high, with characteristic foliage and a naked scape, bearing a solitary white (sometimes reddish) flower in May. Distinguished from the group of cultivated allies mentioned under *Epimedium* by the following characters: lvs. 2-parted: sepals 4; petals 8, larger than the sepals, and flat; stamens 8; ovules in an indefinite number of series along the venter. The capsule is half-circumscissile near the top, making, with the scape, an object resembling a pipe. Mn. 5, p. 226.

binata, Bart. (*J. diphylla*, Pers.). Fig. 1192. Becoming 16-18 in. high in fruit: lvs. glaucous beneath, 3-6 in. long, 2-4 in. wide: fls. about 1 in. across. Woods, E. Pa. to Va. and Tenn. B.B. 2:92.

JERUSALEM ARTICHOKE. See *Artichoke*, *Jerusalem*, *J. Cherry*, *Solanum Pseudo-capsicum*, *J. Cross*, *Lycium Chalcædonia*, *J. Oak*, *Chenopodium Botrys*, *J. Sage*, *Phlomis fruticosa*, *J. Thorn*, *Parkinsonia aculeata*.

JESSAMINE is *Jasminum officinale*. Cape Jessamine is *Gardenia jasminoides*. Malayan Jessamine is *Rhycospernum jasminoides*.

JEWEL WEED, *Impatiens aurea* and *biflora*.

JIMPSON or JIMSON WEED, *Consulc Datura*.

JOB'S TEARS, *Coix*.

JOE-PYE WEED, *Eupatorium purpureum*.

JOHNNY APPLESEED. See *Appleseed*, *Johnny*.

JOHNSON GRASS, *Andropogon Halepensis*.

JONQUIL. See *Narcissus*.

JOVE'S FRUIT, *Beuzoin melissifolium*.

JUBÆA (after Juba, king of Numidia). *Palmaceæ*. This includes the Wine Palm of Chile, *J. spectabilis*, which in this country is cult. outdoors in S. Calif. and in the North under glass. "It is one of the hardest palms," says Francesechi, "and can endure drought and many degrees of cold. If liberally treated, it makes a large tree in a few years." A full-sized trunk yields about 90 gallons of sugary sap, which is boiled by the Chileans and called palm honey. There is some danger of the species being exterminated in Chile. The fruits look like diminutive cocoanuts, and are called Ccoquitos, or by the trade "Monkey's Cocoanuts." In Europe, it is cult. under glass, and also used for subtropical bedding.

Jubæa spectabilis is a handsome and satisfactory palm for the cool palm house, where it would be treated in common with such plants as *Chamaerops humilis*, the Sabals and *Euterpe montana*, which may be grown well in a night temperature of 50°, providing the plants are properly established. In general appearance, *J. spectabilis* reminds one of some kinds of *Phoenix*, and, like them, does not show the true character of its foliage in a very small state, the seedling *Jubæa* producing several simple lvs. before developing foliage of the pinnate type. In *Jubæa*, however, the lower pinnae do not revert to spines, as is usually the case with *Phoenix*, and the pinnae are also arranged irregularly on the midrib, thus giving the fronds a feathery effect. The culture of *Jubæa* is by no means difficult, propagation being effected by means of imported seeds, which usually give a fair percentage of germination, providing they are started in a warmhouse and kept moist. The seedlings should be potted as soon as the second leaf appears, and kept in a warmhouse until they are large enough for a 4-inch pot, and from this time forward cooler treatment will give the best results, always remembering the fact that while many palms (and *Jubæa* among the number), will bear much neglect, yet the best results are only to be had by giving plenty of nourishment.

Jubæa has 2 species of tall, unarmed S. American palms: caudex thick, covered with the bases of the



sheaths: lvs. terminal, pinnatisect; segments spreading, linear-lanceolate, rigid; margins recurved; rachis laterally compressed, convex on the back, acute beneath; sheath short, open. Allied genera in cult. are *Attalea*, *Cocos*, *Maximiliana* and *Scheelea*, which are distinguished chiefly by the staminate fls. In *Jubæa* the petals are lanceolate: stamens numerous, included, the anther cells connate: fr. 1-seeded. In *Attalea* the petals are lanceolate: stamens 10-24, included, anther cells connate: fr. 2-6-seeded. For distinctions from other genera consult, also, *Cocos*, *Maximiliana* and *Scheelea*.

spectabilis, HBK. Height 40-60 ft.: lvs. 6-12 ft. long. G.C.H. 18: 401; III. 18: 516. (Ga. 5, p. 413. V. s: 340. —The southernmost American palm.

W. H. TAPLIN and W. M.

JUDAS TREE. *Cercis*.

JUGLANS (ancient Latin name from *Jovis glans*, nut of Jupiter). *Juglandæceæ*. WALNUT. BUTTERNUT. Ornamental and fruit-bearing trees, rarely shrubs, with deciduous, alternate, odd-pinnate lvs., and with inconspicuous greenish fls., appearing with the lvs., the staminate in pendulous slender catkins, the pistillate in few- to many-fl. racemes: the fr. a large drupe, containing an edible nut. Most of the species are hardy, and are very valuable park trees, with a massive, straight trunk, and a light and airy broad top, the best being probably *J. nigra*, one of the noblest trees of the American forest. *J. regia*, *J. Californica* and the Mexi-

J. cinerea has some medicinal properties. The nuts of all species are edible, and are an article of commercial importance, especially those of the European Walnut, which are the best. This species is extensively grown



1194. Pistillate flowers of *Juglans cinerea*. Natural size.

in the warmer parts of Europe, in California and in the east from Pennsylvania to Georgia. The nuts of the native species are also sold on the market, but mostly gathered in the woods, though a number of improved varieties are in cultivation. *J. Sieboldiana* and *J. cordiformis*, with nuts superior to those of the native species, will probably become valuable nut trees where *J. regia* is too tender; the nuts of both are much valued in Japan. The Walnut grows best in moderately moist, rich soil, but *J. cinerea* is more moisture-loving and *J. regia* prefers well-drained hillsides. They are not easily transplanted when older, and therefore the nuts are often planted where the trees are to stand, but they may be safely transplanted when 2 or 3 years old, or even later when they have been transplanted in the nursery. Prop. by seeds, which should be stratified and not allowed to become dry. A light, sandy soil is to be preferred, as the young plants produce more fibrous roots, while in stiff soil they are liable to make a long taproot. The young seedlings are transplanted when about 2 years old; sometimes the taproot is cut by a long knife. Varieties are often grafted on potted stock in the greenhouse in early spring or are budded in summer, either shield- or flute-budding being employed; even top-grafting of old trees is sometimes practiced. About 10 species in N. Amer., south to Mex. and from S. E. Europe to E. Asia. Trees, rarely large shrubs: the stout branches with laminate pith: lvs. without stipules, of aromatic fragrance when bruised: staminate fls. with a 2-5-lobed perianth and 6-30 stamens, in slender catkins; pistillate fls. in few- to many-fl. racemes: ovary inferior, 1-celled, with 4 calyx lobes and included in a 3-lobed involucre: fr. a large drupe with a thick, indehiscent husk; nut 2- or 4-celled at the base, indehiscent or separating at last into 2 valves. For culture and further information, see U. S. Dept. of Agric., Nut Culture in the U. S., quoted below as U. S. N. C.; see, 1195. *Juglans Mandshurica*, also, Walnut.



Natural size.

can species are tender in the North. Though many fungi and insects prey on the Walnut, none of them do very serious damage, the worst being, perhaps, the hickory-borer. The wood of the Walnut, which is easily worked and susceptible of receiving a beautiful polish, is much used for cabinet-making and the interior finish of houses, especially that of *J. nigra* and *regia*, which is heavy, strong and durable, and of dark brown color, while that of *J. cinerea* and *Sieboldiana* is light and soft. The husks of the nuts are sometimes used for dyeing yellow, and the bark for tanning leather. The husk of

A. Fr. glabrous or finely pubescent: nut 4-celled at the base.

B. Lfts. 5-15, almost entire.

regia, Linn. PERSIAN or ENGLISH WALNUT. Round headed tree, to 70 ft.: lvs. oblong or oblong-ovate, acute



1193. Leaf of *Juglans nigra* ($\times \frac{1}{2}$).

BB. *lfts. 13-25, serrate.*1196. *Juglans Sieboldiana* (X1.5).

or acuminate, almost glabrous, bright green, 2-5 in. long; fr. almost globular, green; nut usually oval, reticulate and rather smooth, rather thin-shelled. S. E. Europe, Himal., China. U. S. N. C., pl. 6. Many vars. are cultivated as fruit trees, for which see *Walnut*. Of the ornamental vars. the most distinct and decorative is var. *laciniata*, Loud. (var. *filicifolia*, Hort., var. *asplenifolia*, Hort.), with narrow, pinnately cut lfts.; very effective as a single specimen on the lawn; remains usually shrubby. Var. *monophylla*, Hort., has the lvs. simple or 3-foliolate. Var. *pendula*, Hort., has pendulous branches. Var. *praeparuriensis*, Hort., is a shrubby var., producing rather small, thin-shelled nuts on very young plants. Var. *Bartheriana*, Hort. (var. *elongata*, Hort.). Nut elongated, narrow-oblong. R. H. 1859, p. 147; 1861, p. 427. Gn. 50:478.

1197. *Juglans Sieboldiana* fruits.

With and without the husk. Natural size.

Californica, Wats. Round-headed tree, occasionally to 60 ft., with puberulous branchlets; lfts. ovate-oblong to oblong-lanceolate, acute or acuminate, almost glabrous or puberulous when young, 2-4 in. long; stamens 30-40; ovary almost glabrous or puberulous; fr. globose, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. across; nut obscurely sulcate, rather thin-shelled. Calif. S. S. 7:337. Gn. 49, p. 278.—A graceful, ornamental tree, also used as stock for grafting in Calif. The nut is of good quality but rather small.

rupéstris, Engelm. Shrub or small tree, rarely to 50 ft.; branchlets pubescent when young; lfts. ovate-lanceolate to lanceolate, acuminate, puberulous or pubescent when young, 2-5 in. long; stamens about 20; ovary pubescent or tomentose; fr. globular, rarely ovoid, often pointed, usually pubescent, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. across; nut deeply sulcate, with longitudinal grooves, thick-shelled, with small kernel. Colo. to Tex. and northern Mex. S. S. 7:335.—The typical form has narrower, more glabrous lvs. and smaller frs., while var. *major*, Torr., the western form, is of more vigorous growth, has broader, more coarsely serrate and more pubescent lvs. and larger, less thick-walled nuts. S. S. 7:336. Probably *J. longirostris*, Carr. (R. H. 1878, p. 53), belongs here.

nigra, Linn. BLACK WALNUT. Fig. 1193. Lofty tree, to 150 ft., with rough brown bark and pubescent branchlets; lfts. oblong-lanceolate, acuminate, appressed-serrate, glabrous and somewhat shining above at length, pubescent beneath, 3-5 in. long; fr. usually 1-3 on a short stalk, 1 $\frac{1}{2}$ -3 in. across, with papillose surface; nut thick-shelled, globular or somewhat depressed, deeply furrowed. Mass. to Fla., west to Minn. and Tex. S. S. 7: 333-334. Em. 211. G. C. II. 11:373; 26:617. U. S. N. C. 7, pp. 1-3. Gn. 27, pp. 269, 270.

AA. *Fr. coated with viscid hairs: nut 2-celled at the base: lfts. with stellate and glandular pubescence beneath, serrate.*

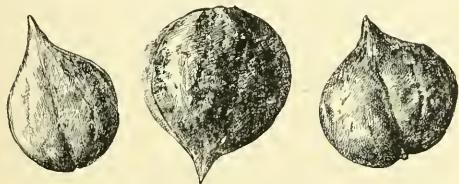
cinerea, Linn. BUTTERNUT. WHITE WALNUT. Fig. 1194. Large tree, occasionally to 100 ft., with gray bark; lfts. 11-19, oblong-lanceolate, acuminate, appressed-serrate, usually pubescent on both sides, more densely below, 3-5 in. long; fr. in short racemes, 2-5, oblong, pointed, 3-5 in. long; nut oblong, with 4 more and 4 less prominent irregular ribs and many broken sharp ridges between. New Brunswick to Ga., west to Dak. and Ark. S. S. 7:331-332. Em. 207. U. S. N. C. 7, p. 4.

Mandshurica, Maxim. Fig. 1195. Broad-headed tree, to 60 ft. lfts. oblong, acute, obtusely serrate, at length almost glabrous above, pubescent beneath, rarely almost glabrous at length, 3-8 in. long; fr. in short racemes, globular-ovate to oblong; nut similar to that of the former, but less sharply ridged. Mandshuria, Amurland. G. C. III. 4:384. R. H. 1861, p. 429 (as *J. regia octogona*). Gn. 50, p. 478 (by error as *J. regia cordata*). U. S. N. C. 7, p. 5.

Sieboldiana, Maxim. (*J. ailantifolia*, Carr.). Figs. 1196-8. Broad-headed tree, to 50 ft.; lfts. 11-17, oval to oval-oblong, short-acuminate, densely serrate, glabrous above, pubescent beneath, 3-6 in. long; frs. in long racemes, sometimes twenty, globose to ovate-oblong; nut more or less globose, with thick, wing-like sutures and pointed apex, the surface rather smooth, slightly rugose and pitted, 1-1 $\frac{1}{2}$ in. long, rather thick-shelled. Japan. Gn. 47, p. 442. A. G. 11:701; 12:179. R. H. 1878, pp. 414-415. U. S. N. C. 7, p. 7.

1198. Winter twig of *Juglans Sieboldiana*. Natural size.

cordiformis, Maxim. Fig. 1199. In habit and foliage very near to the preceding, but lvs. less pubescent, and nut very different, heart-shaped, much flattened, sharply 2-edged and with a shallow longitudinal groove in the middle of the flat sides, smooth and rather thin-shelled. Japan. U.S.N.C. 7, p. 6.



1199. *Juglans cordiformis* Natural size.

intermedia, Carr. (*J. nigra* × *regia*). Hybrid of garden origin of which two forms have been described. Var. *pyriformis*, Carr., with a fr. more resembling that of *J. regia*. R.H. 1863, p. 30. Var. *Vilmoriniana*, Carr., with a fr. more like that of *J. nigra*. G.F. 4:52-53. Probably also *J. regia gibbosa*, Carr., with a large, thick-shelled, deeply rugose nut, belongs here. R.H. 1861, p. 428. Gn. 50, p. 478. Another not uncommon hybrid is *J. quadrangulata*, Carr. (*J. cinerea* × *regia*). *J. alata*, Hort.), of which large trees are known as well in this country as in Europe. G.F. 7:435. R.H. 1870, p. 494. Hybrids between *J. California* and *J. regia* and between *J. California* and *J. nigra* have been raised by Luther Burbank, and a hybrid of *J. cinerea* and *nigra* has been reported from Germany as *J. cinereo-nigra*, Wender.

ALFRED REHDER.

JUJUBE. *Zizyphus Jujuba*.

JUNCUS (classical name, "to join"). *Juncaceae*. RUSHES. Grass-like plants growing in wet or rarely in dry places, and sending up from the rootstock numerous cylindrical, strict, commonly unbranched stems, which bear a terminal cyme of greenish flowers: lvs. grass-like, terete or flat; perianth of 6 rigid, chaffy parts: stamens short, either 3 or 6; capsule 3-celled or rarely 1-celled, many-seeded. Rushes differ from the true grasses and sedges in having a true perianth and a many-seeded pod. The genus includes a host of species distributed throughout the temperate regions, but only the following are in the American trade, and are used for planting in bogs and around aquatic gardens. The kind used in making mats in Japan is procurable from dealers in Japanese plants.

effusus, Linn. (*J. communis*, Hort.). COMMON RUSH. Fig. 1200. Stem soft, 1-4 ft. high, not leaf-bearing: cyme diffuse, 1-2 in. long, appearing lateral: sepals acute, equalling the short, retuse and pointless greenish brown capsule: stamens 3; seeds small, not tailed. North temperate zone. Used also for weaving into mats, etc. Var. *congestus*, Hort. Cyme dense and capitate. Var. *vittatus*, Buch. (*J. effusus*, var. *aureo-strigosus*, Hort.). *J. conglomeratus variegatus*, Hort.). Foliage striped with yellow. Var. *spiralis*, Hort. A curious form with stems spirally twisted like a corkscrew.

conglomeratus, Linn. Very similar to the above: cymes congested and capitate, appearing lateral: capsule obovoid, obtuse or retuse, apiculate. North temp. regions. Differs mainly in the apiculate capsule. Probably much of the trade material named this to be referred to congested forms of *J. effusus*.

J. zebrius, Hort. = *Scirpus Taberuemontanus*, var. *zebrinus*.

K. M. WIEGAND.

JUNEBERRY. *Amelanchier*.

JUNIPERUS (ancient Latin name). *Conifera*. JUNIPER. Ornamental evergreen trees and shrubs with opposite or whorled, needle-shaped or scale-like lvs., often on the same tree, and with inconspicuous small fls.: fr.

a berry-like small cone, usually globose. Many of the species are hardy North, as *J. Virginiana*, *communis*, *rigida*, *Sabina*, *Chinensis*, *Pseudo-sabina*, *spharica*. *Davurica*, *recurva* var. *squamata*; others are half-hardy, as *J. Orycedrus*, *macrocarpa*, *recurva*, *excelsa*, *occidentalis*, while some, as *J. procera*, *Bermudiana*, *thurifera* and the Mexican species, can only be grown South. All are valuable ornamental plants, and the erect-growing species, mostly of pyramidal or columnar habit, are decorative as single specimens on the lawn or if planted in groups. Some varieties form a very narrow column, and are valuable for formal gardens; the columnar form of *J. Virginiana* is a good substitute in the North for the classical cypress. The low Junipers, as *J. communis* var. *nana*, *Sabina*, and *recurva* var. *squamata*, are well adapted for covering rocky slopes or sandy banks. The close-grained, fragrant wood is much used for the interior finish of houses and in the manufacture of small articles, also for posts, since it is very durable in the soil; that of *J. Virginiana* and *Bermudiana* is in great demand for pencil-making. The fruits and also the young branchlets of some species contain an aromatic oil used in medicine. The fruit of *J. drupacea* is edible. The Junipers thrive best in sandy and loamy, moderately moist soil, but grow well even in rather dry, rocky and gravelly ground. They prefer sunny, open situations. They are well adapted for hedges and for planting as shelter or wind-breaks: also for seaside planting. Prop. by seeds, which ger-



1200. Common Rush, *Juncus effusus*. The flower-cluster, a, is natural size. The single flower, b, is enlarged.

minate usually the second and sometimes the third year, or by cuttings of nearly ripened wood in fall under glass, either outdoors or in the greenhouse. As a rule, those with needle-shaped lvs. root much easier

than those with scale-like lvs., and the latter are therefore mostly increased by side-grafting during the winter in the greenhouse on young potted plants of the typical form or an allied species. The shrubby species, especially *J. Sabina*, are also prop. by layers.

About 35 species distributed throughout the extra-tropical regions of the northern hemisphere, in America south to Mexico and W. India. Trees or shrubs with the branchlets spreading in all directions; lvs. either all needle-shaped and in 3's, or needle-shaped and scale-like, and usually opposite, often found on the same plant, the needle-shaped lvs. prevailing on younger plants and vigorous branches, the scale-like ones on older plants; fs. dioecious, rarely monocious; staminate yellow, consisting of numerous anthers united into an ovoid or oblong catkin; pistillate greenish, minutely globular, with several bracts; each or some bearing 1 or 2 ovules; the bracts become fleshy and unite into a berry-like cone, usually wholly enclosing the 1-6, rarely 12, seeds. The fr. ripens either the first year, as in *J. Virginiana*, or the second, as in *J. Sabina* and most species, or in the third, as in *J. communis*.

Juniperus is closely allied to Cupressus, and sometimes hard to distinguish without fr.; but young plants with needle-shaped lvs. can be almost always told apart, since Juniperus has whitish lines or marks on the upper surface of the lvs., while the similar juvenile forms of allied genera have the whitish marks beneath. Most species are very variable, as well in habit as in the shape of the lvs., which renders the determination of an unknown form, at least without fr., a rather difficult task.

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A. *Foliage always needle-shaped and in 3's, rigid, jointed at the base; fls. axillary, dioecious; winter-buds with scale-like lvs.* (see also No. 6).

B. *Fr. large, 3/4-1 in. across, with the seeds connate into a usually 3-celled bony stone.* (*Caryocedrus*.)

1. *drupacea*, Labill. Pyramidal tree with narrow head, to 45 ft.; lvs. lanceolate, spiny-pointed, 3/8-3/4 in. long and 1/8-1/2 in. broad (the broadest of all species), with 2 white lines above; fr. bluish black, edible. S. E. Eu., W. Asia. G.C. 1854:455; III. 19:519. R.H. 1854, p. 165.

BB. *Fr. smaller; seeds not connate, usually 8.*

C. *Lvs. with 2 white lines above.*

2. *macrocarpa*, Sibth. (*J. Neoborivensis*, Gord.). Shrub or small tree, to 12 ft., of dense pyramidal habit; lvs. crowded, linear-lanceolate, spiny-pointed, spreading, 1/2-3/4 in. long; fr. to 1/2 in. across, dark brown, glaucous. Mediterranean region.

3. *Oxycedrus*, Linn. Bushy shrub or small tree, to 12 ft., with rather slender branches; lvs. linear, spiny-pointed, spreading, 3/8-3/4 in.; fr. globose, 1/2-1/2 in. across, brown, shining, not or slightly glaucous. Mediterranean region.

CC. *Lvs. with one white line above.*

4. *rigida*, Sieb. & Zucc. Small, pyramidal tree, to 30 ft., or spreading shrub with the slender branches pendulous at the extremities; lvs. in closely set whorls, narrow-linear, stiff, yellowish green, 1/2-1 in. long; fr. about 1/2 in. across, dark violet. Japan. S.Z. 125.-Graceful, hardy shrub, somewhat similar to *J. communis*, var. *oblonga*, but the lvs. more crowded and stiffer.

5. *communis*, Linn. COMMON JUNIPER. Shrub, with procumbent, spreading or erect branches, sometimes tree becoming 40 ft.; lvs. linear or linear-lanceolate, concave and with a broad white band above, spiny-pointed, 1/8-3/4 in. long; fr. almost sessile, dark blue,

glaucous, 1/4-1/2 in. across. Widely distributed through the colder regions and mountains of the northern hemisphere in many different forms. Some of the most important varieties are the following: Var. *aureo-variegata*, Hort. Upright form, with the tips of the branchlets golden yellow. Var. *Canadensis*, Loud. (*J. Canadensis*, Burgsd. *J. nana Canadensis*, Carr.). Similar to var. *nana*, but higher and more erect and the lvs. somewhat longer and narrower. Var. *Canadensis aurea*, Hort. Like the former, but tips of branchlets golden yellow. Var. *hemisphaerica*, Parl. (*J. hemisphaerica*, Presl.). A low, dense, rounded bush, rarely more than 3 ft. high; lvs. straight and stiff, short. Mountains of southern Eu. and N. Afr. Var. *Hibernica*, Gord. (var. *stricta*, Carr.). Fig. 535, Vol. I. Narrow, columnar form,



1201. *Juniperus communis*, var. *nana*.

with upright branches, deep green, tips of branchlets erect. Var. *nana*, Loud. (*J. nana*, Willd. *J. alpina*, S. F. Gray. *J. Sibirica*, Burgsd.). Fig. 1201. Low-spreading or procumbent shrub, seldom over 2 ft. high; lvs. oblong-linear, abruptly pointed, usually incurved, densely clothing the branches, with a broad silvery white line above, 1/4-1/2 in. long. Arctic and mountainous regions. Var. *oblonga*, Loud. (*J. oblonga*, Bieb.). Upright shrub, with slender, diverging and recurring branches; lvs. thin, long-attenuate, horizontally spreading, bright green. Transcaucasia. Var. *oblongo-pendula*, Carr. (var. *retecta*, Parl.). Similar to the preceding, but more decidedly pendulous. A very graceful form. Var. *pendula*, Carr. Shrub, with spreading, recurring branches and pendulous branchlets. Var. *Suecica*, Loud. (var. *fastigiata*, Hort.). Narrow, columnar form, growing sometimes into a tree to 40 ft. high, with rather long, spreading lvs., the branchlets with drooping tips; of lighter and more bluish color than the similar var. *Hibernica*. Var. *vulgaris*, Loud. Bushy shrub or small tree, with usually upright or sometimes spreading branches; lvs. linear, straight and spreading. This is the common European form, sometimes hard to distinguish from the American upright form, var. *erecta*, Pursh, which, however, has not the columnar habit so common with the European variety, and has the lvs. more silvery white above, of lighter green and mostly slightly curved.

AA. *Foliage usually of two kinds of lvs.* (Fig. 1203) and opposite, decurrent; fls. terminal; no distinct winter-buds.

B. *Lvs. in 3's, lanceolate, short, loosely appressed; fr. oblong.*

6. *recurva*, Hamilt. (*J. repanda*, Hort.). Shrub or small tree, to 30 ft., with spreading and usually recurring branches; branchlets rather thick; lvs. linear-lanceolate, pointed, grayish or glaucous green with a whitish band above; fr. about 1/2 in. long, 1-seeded. Himalayas. G.C. II. 19:468. Gn. 36, p. 215. Var. *densa*, Carr. Dwarf, with short, crowded branchlets; lvs. curved, grayish green. Var. *squamata*, Parl. (*J. squamata*, Hamilt.). Prostrate, with long, trailing branches and numerous short branchlets; lvs. straight, slightly spreading, glaucous or bluish green. Much harder than the type.

BB. *Lvs. mostly opposite, scale-like or of two kinds, usually with a gland on the back; fr. mostly globular.*

C. *Fr. erect or nodding; mostly trees.*

D. *Color of fr. reddish brown, with rather dry, fibrous flesh; lvs. minutely denticulate.*

7. *phenicea*, Linn. Shrub or small tree, to 20 ft., with ovate-pyramidal head and upright branches;

branchlets slender: lvs. acicular and spreading or scale-like, imbricate, rhombic, obtuse, opposite, often bluish green: fr. $\frac{1}{2}$ - $\frac{1}{2}$ in. across, shining, with 3-6 seeds. S. Eu., N. Afr.

8. *Californica*, Carr. Fig. 1202. Pyramidal tree, to 40 ft., or shrub with many erect branches: branchlets rather stout: lvs. usually in 3's, imbricate, rhombic, obtuse, thick, yellowish green, with conspicuous gland, only on vigorous branches acicular: fr. $\frac{1}{2}$ - $\frac{1}{2}$ in. long, with bluish bloom and with 1-2 large seeds. Calif. S.S. 10:517. R.H. 1854, p. 353.

DD. Color of fr. bluish black or blue, with juicy, resinous flesh.

E. *Imbricate lvs. usually in 3's, minutely denticulate.*
9. *occidentalis*, Hook. Tree, to 40 feet, rarely to 60 ft., with spreading branches forming a broad, low head, or shrub with several upright stems: branchlets stout and thick, imbricate, ovate, acute, grayish green, rarely acicular: fr. subglobose or ovoid, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, with 2-3 seeds. Washington to Calif. S.S. 10:521.

EE. *Imbricate lvs. opposite, entire or nearly so.*

F. Seeds of fr. 2-6.

G. *Shape of imbricate lvs. acute: branchlets slender.*
10. *excelsa*, Bieb. Tree, to 60 feet, with pyramidal head and upright or spreading branches: lvs. ovate, spreading, in 3's, on the lower branches, but mostly opposite, rhombic, bluish green: fr. bluish black, bloomy, globular, about $\frac{1}{2}$ in. across, with 3-6 seeds. Greece, W. Asia to Himal. Gt. 46, p. 209. Var. *stricta*, Hort. Of upright, columnar habit, with very glaucous foliage. Var. *venusta*, Hort., seems hardly different from the former.

11. *procera*, Hochst. Tree, to 100 or 150 ft., similar to the preceding: lvs. in 3's, or opposite, lanceolate and

$\frac{1}{2}$ in. across, with 2 or 3 seeds. Himal., China, Japan. S.Z. 126, 127.—Very variable in habit: the staminate plant usually forms a much-branched, upright, pyramidal bush, often almost columnar, while the pistillate has slender, spreading branches. They are therefore often distinguished as var. *mascula* and var. *femina* (var. *Revesti*, Hort.). The first one is the most desirable as an ornamental plant. Var. *argenteo-variegata*, Hort. Dwarf, dense form, with dimorph lvs.: tips of branchlets mostly white. Var. *aurea*, Hort. (var. *mascula aurea*, Hort.). Upright form, with the young branchlets golden yellow, the color becoming more brilliant in the full sun. Var. *pendula*, Hort. With spreading branches, pendulous at the extremities. Var. *pyramidalis*, Carr. Narrow, pyramidal form, with bluish green, mostly needle-shaped foliage. Var. *procumbens*, Endl. (*J. procumbens*, Sieb. *J. Japonica*, Carr.). Dense, low shrub with spreading, sometimes procumbent branches and mostly acicular lvs. in whorls, with two white lines above, longer and stouter than in the type. S.Z. 127, fig. 3. Var. *procumbens aurea*, Hort. Branches robust and long, decumbent, with rather few branchlets, young growth golden yellow at first, changing to light green. Var. *procumbens albo-variegata*, Hort. Rather dense, bluish green form, variegated with white. Var. *procumbens aereo-variegata*, Hort. Dwarf, dense form, variegated with golden yellow.

13. *sphaerica*, Lindl. (*J. Förtunei*, Van Houtte). Similar to the former. Densely branched shrub or tree, to 30 ft., with upright branches: branchlets short, rather thick, quadrangular: lvs. acicular and whorled, but less rigid than those of the former, or scale-like, rhombic-oblong, somewhat spreading: fr. globular, about $\frac{1}{2}$ in. across, not bloomy, 3-seeded. N. China. P.F.G. 1, p. 59. Var. *glauca*, Gord. (*J. Shephardi*, Hort.). Dense form, with usually needle-shaped glaucous foliage.

FF. Seeds of fr. 1-2, small, $\frac{1}{8}$ - $\frac{1}{4}$ in. across.

14. *Virginiana*, Linn. RED CEDAR. SAVIN. Fig. 1203. Tree, to 100 ft., with conical head and spreading or upright branches: lvs. acicular, spiny-pointed, spreading or scale-like, rhombic, acute or subacute, imbricate, very small: fr. brownish violet, bloomy, globular or ovoid. Canada to Fla., east of the Rocky Mts. S.S. 10:524. G.F. 8:65; 10:145.—A very variable species. Some of the most important varieties are the following: Var. *albo-variegata*, Hort. Branchlets variegated with white. Var. *aereo-variegata*, Hort. With golden yellow variegation. Var. *Barbadensis*, Gord. (var. *griffithii*, Sarg. Var. *Bedfordiana*, Veitch. *J. Bernadina*, Hort., not Linn.). Tree, with slender, spreading branches, pendulous at the extremities: lvs. bright green, spiny-pointed, mostly needle-shaped on the cult. plants. Gulf states, Jamaica, Barbadoes. Tender. Var. *dumosa*, Carr. Dense shrub, forming a rounded pyramid, with mostly needle-shaped, bright green lvs. Var. *elegantissima*, Hort. Tips of young branchlets golden yellow. Var. *glauca*, Carr. Vigorous-growing form, with glaucous foliage. Var. *pendula*, Carr. With spreading limbs and slender, pendulous branches: lvs. usually scale-like. Var. *pyramidalis*, Carr. Dense, columnar form, with the foliage glaucous (var. *pyramidalis glauca*) or bright green (var. *pyramidalis viridis*). Var. *reptans*, Beissn. Low shrub, with horizontally spreading, procumbent branches and slender, curving branchlets: bright green. M.D.G. 1896:296. Probably the same as var. *horizontalis*, Arb. Kew. Var. *Schottii*, Hort. A dwarfish, dense, pyramidal form, with bright green and rather light foliage. Var. *tripartita*, Hort. A dwarf, spreading form, densely branched, with acicular, glaucous lvs.—The dwarf forms are often very similar to *J. Sabina* and hard to distinguish without frs. except by the strong, disagreeable odor of the bruised branchlets of the latter.

15. *secopulorum*, Sarg. Closely allied to the preceding, but considered by the author as a distinct species, chiefly distinguished by the somewhat larger fr., ripening not until the second year; by its habit, forming a broad head with stout, spreading branches and often dividing into several stems near the base, and by its shredding bark. The branchlets are somewhat shorter and stouter, and the foliage usually glaucous or yellow-



1202. *Juniperus Californica* ($\times \frac{1}{2}$).

spreading or loosely appressed and ovate-lanceolate: fr. globose, small, about $\frac{1}{4}$ in. across, 2-3-seeded. Mts. of E. Afr.—Probably the tallest species of the genus.

GG. *Shape of imbricate lvs. obtuse.*

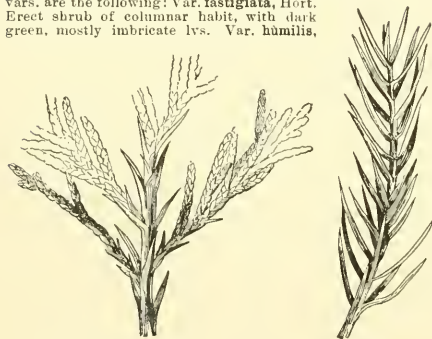
12. *Chinensis*, Linn. Tree, to 60 ft., or shrub, sometimes procumbent: branchlets rather slender: lvs. opposite or whorled, linear, pointed and spreading, with a white band above or scale-like, appressed, rhombic, obtuse: fr. globular, brownish violet, bloomy, one-fifth to

ish green. Brit. Columb. to Calif. in the Rocky Mts. G.F. 10:423.

16. *Bermudiána*, Linn. Tree, to 40 ft., in habit much like *J. Virginiana*, but branches much stouter and foliage pale bluish green; branchlets thickly set, quadrangular, stout and short; lvs. mostly imbricate, thick or acicular, spiny-pointed, rigid, erect-spreading; staminate catkins larger; fr. usually 2-seeded and depressed-globular. Bermuda and cult. in other W. Indian Islands. G.C. II. 19:657. G.F. 4:295.

cc. *Fr. pendulous, on curved peduncles, small; shrubs, usually spreading or procumbent.*

17. *Sabina*, Liun. Spreading or procumbent shrub, rarely with erect stem, to 10 ft.; branchlets rather slender, of a very strong, disagreeable odor when bruised; lvs. needle-shaped, acute and slightly spreading or imbricate, oblong-rhombic, acute or subacute, usually dark green; fr. one-fifth to $\frac{1}{4}$ in. thick, globular, 1-3-seeded. Mts. of middle and southern Eu., W. Asia, Siber., N. Amer.—Very variable. The most remarkable vars. are the following: *Var. fastigiata*, Hort. Erect shrub of columnar habit, with dark green, mostly imbricate lvs. *Var. humilis*,



1203. The two kinds of red cedar leaves. Natural size.

The right hand specimen shows the foliage of red cedar on young shoots; the other shows the two kinds.

Endl. Procumbent, with ascending thickish branchlets; lvs. usually imbricate, scale-like, often bluish green. *Var. prostrata*, Loud. (*var. procumbens*, Pursh. *J. prostrata*, Pers. *J. repens*, Nutt. *J. procumbens*, Nichols.). Procumbent, rarely ascending, with usually trailing, long branches, furnished with numerous short branchlets; lvs. acicular, spiny-pointed or imbricate, acute, bluish or glaucous green; fr. globular, blue and bloomy. Nova Scotia to Brit. Columb., south to N. Y. and Wyo. Sometimes called Waukegan Juniper. *Var. tamariscifolia*, Ait. (*J. sabinoides*, Griseb.). Procumbent or ascending, rarely erect; lvs. usually all needle-shaped and often in 3's, slightly incurved, dark and bright green, with a white line above. Mountains of S. Eu. *Var. variegata*, Hort. Branchlets variegated with creamy white; lvs. mostly imbricate.

J. Davurica, Pall. Allied to *J. Sabina*. Procumbent, with slender, spreading or drooping branchlets; fr. 1-4-seeded, small. Siberia.—*J. fedtschikowii*, Willd. Allied to *J. excelsa* To 12 ft. high; branchlets thicker; lvs. with spreading apex, mucronate, usually eglandular; fr. larger, 1-2-seeded. Greece, W. Asia.—*J. flaccida*, Schlecht. Graceful tree, to 30 ft., with spreading branches and slender, remote, pendulous branchlets; lvs. acute, with spreading tips; fr. globular, 5-10-seeded. Tex., Mex. S.S. 10:519.—*J. litoralis*, Max. (*J. conferta*, Parl.). Allied to *J. rigida*, but prostrate, with long, trailing branches; fr. larger. Japan.—*J. macrospora*, Boiss. Allied to *J. excelsa*. Shrub or small tree, to 30 ft., sometimes procumbent; lvs. closely appressed; fr. nodding, globular, 4-seeded. Persia to Himal.—*J. Mexicana*, Schiede. Pyramidal tree; branchlets numerous, short and rather stout; lvs. acute, loosely appressed; fr. 2-4-seeded. Mex.—*J. monosperma*, Sarg. (*J. occidentalis*, var. *monosperma*, Engelm.). Closely allied to *J. occidentalis*. Branchlets more slender; lvs. usually opposite and eglandular; fr. smaller and usually 1-seeded. Rocky Mts., from Col. to New

Mex. S.S. 10:522.—*J. pachyphloea*, Torr. Tree, to 60 ft., allied to *J. occidentalis*, with broad, pyramidal or round-topped head; lvs. usually opposite, glandular, bluish green; fr. dark reddish brown, bloomy, with usually 4 seeds. Has a checkerboard bark like a black-jack oak. Col. to Tex. and New Mex. S.S. 10:520.—*J. Pseudosabina*, Fisch. & Mey. Allied to *J. Sabina*. Erect shrub, with thick, dense and short branchlets; lvs. usually dimorphic; fr. ovate, blackish, glossy, 1-seeded. Silver.—*J. sabinoides*, Endl.—*J. thurifera*—*J. sabinoides*, Nees—*J. tetragona*—*J. Säuerli*, Hort., recently introduced from Japan, is a juvenile form of a *Chamaecyparis*, probably *C. obtusa*. It is a dense shrub with needle-shaped bluish green lvs.—*J. tetragona*, Schlecht. Allied to *J. occidentalis*. Small tree, to 20 ft., rarely to 40 ft., with round-topped or pyramidal head and slender, quadrangular branchlets; lvs. obtuse, usually eglandular; fr. subglobose, mostly 1-seeded. Tex. to Mex. S.S. 10:523.—*J. thurifera*, Linn. Shrub or tree, to 40 ft., with round-topped head and spreading branches; branchlets slender; fr. globular, 2-3-seeded. Spain, Algeria.—*J. Utahensis*, Lemm. (*J. Californica*, var. *Utahensis*, Engelm.). Bushy tree, rarely more than 20 ft., with broad, open head; branchlets slender; lvs. obtuse, light yellowish green; fr. usually 1-seeded. Col. to Calif., west to Utah. S.S. 10:518.

ALFRED REHDER.

JUPITER'S BEARD. *Centranthus ruber* and *Anthyllis Barba-Jovis*.

JUSSIEA. See *Jussiaea*.

JUSSIEUA (the *Jussiaea* family contained five botanists, of whom the most distinguished was Antoine Laurent de Jussieu, 1748-1836, who laid the foundations of a modern natural system of the vegetable kingdom). Also written *Jussiaea*. *Onagraceae*. About 30 species of tropical plants, largely bog and aquatic herbs and shrubs, one of which is cult. in America. It grows 2-3 ft. high, and produces numerous axillary fls. of a bright yellow, somewhat like an evening primrose. It is little cult., but desirable for planting at the edge of a pond of tender aquatics or for tub culture. *Jussiaea* is allied to *Ludwigia*, and distinguished by the following characters: petals 4-6, not clawed, entire or 2-lobed; stamens 8-12; ovary 4-celled. *Jussiaeas* have alternate lvs., which are mostly membranous and entire, rarely leathery and serrate; fls. yellow or white, solitary, short or long-pedicelled.

longifolia, DC. Erect, glabrous; stem 3-angled; lvs. sessile, lanceolate-linear, acuminate at both ends, glandular beneath at the margins; pedicels 1-fl'd. longer than the ovary, and bearing 2 bractlets at the apex; petals 4, obovate, scarcely notched at the apex; stamens 8. Brazil. W. M.

The plant in the trade as *J. longifolia* is a summer-flowering aquatic herb, and differs somewhat from the description given above. The stems of young seedlings are 4-winged, and a specimen before the writer of a plant of the previous season is 5-winged. The main root of these old plants may be tuber-like, 3 in. long, $\frac{1}{2}$ in. thick, or 8-10 in. long and more slender. Also the lower lvs., at least, are opposite. *J. longifolia* is best treated as a tender annual.

The seed may be sown in fall or spring in shallow water, using seed-pans or pots, as with other flower seeds. Cover the seed, which is very fine, with finely sifted soil, place the pot or seed-pan in water, but do not submerge until the second day, when the seed will be thoroughly soaked and will not float on the surface of the water. When the plants attain a few leaves they should be potted, singly, into thumb-pots, and later into 3-in. pots, and from these planted into their summer quarters. It is not absolutely necessary to keep these plants always submerged in water after potting. The plants will do well on a bench, which should be covered with sand or ashes and the plants kept well watered.

WM. TRICKER.

JUSTICIA (James Justice, a Scotch gardener and author of 18th century). *Acanthaceae*. A large and polymorphous genus (perhaps 100 species) in the warm parts of the Old and New World. They are mostly herbs of various habits, with showy entire lvs., and are cult. under glass for the showy fascicles or heads of fls. Most of the garden plants which are known as *Justicias*

are Jacobinias. Consult Jacobinia, for example, for *Justicia magnifica*, *J. carnea*, *J. Pohliana*, *J. velutina*, *J. coccinea*, *J. Ghiesbreghtiana* and *J. Lindenii*. *Justicia Adhatoda* is *Adhatoda Vasica*. Others may belong to *Thyrsacanthus* and *Dædalacanthus*. The *Justicia variegata* of catalogues is probably not the *J. variegata* of Aublet and the botanists, but is very likely a variegated-leaved form of some Jacobinia. From Jacobinia the species are distinguished by the spurred or appendaged anthers. The corolla is red, purple or white, tubular, deeply 2-parted or lipped; stamens 2; seeds normally 4, in an ovate or oblong capsule; fls. in bracted heads or fascicles.

The remarks on the culture of Jacobinias will apply here. Plants are secured readily from cuttings made in late winter or spring, and these should bloom the coming fall or winter. After blooming, discard the plants,

except such as are to be kept for furnishing cuttings. Unless well headed back, old plants become loose and weedy, and they take up too much room.

It is not known what any true *Justicias* are in the Amer. trade. *J. flava*, recently introduced, is *Scaevola flavicoma*, which see. "It is covered for months with large, feather-like clusters of pure yellow flowers, remaining perfect for a very long time, and enhanced by dark green, shiny foliage."

L. H. B.

JUTE is a fiber plant, of easy culture in warm climates. It has been successfully grown in the Gulf states, but, according to the Department of Agriculture, the want of a suitable machine for separating the fiber is the great obstacle which prevents the growth of the Jute-fiber industry in America. See *Corchorus*.

K

KADSŪRA (Japanese name). *Magnoliaceae*. About 7 species, tropical Asian woody climbers, of one of which Charles S. Sargent writes (G.P. 6:75): "The flowers are not at all showy, but it is a plant of extraordinary beauty in the autumn when the clusters of scarlet fruit are ripe, their brilliancy being heightened by contrast with the dark green, lustrous, persistent leaves. * * * It might well be grown wherever the climate is sufficiently mild, as in the autumn no plant is more beautiful." Kadŭras have leathery or rarely membranous foliage: fls. axillary, solitary, whitish or rosy, unisexual; sepals and petals 9-15, gradually changing from the outermost and smallest to the innermost and petaloid; staminate fls. with an indefinite number of stamens, which are separate or coalesced into a globe; carpels indefinite in number, 2-3-ovuled; mature berries in globular heads.

Japónica, Linn. Small, procumbent, warty shrub; lvs. oval or oblong-oval, thick, serrate; peduncles 1-fl'd., solitary. Japan, as far as 35° north latitude.—The type is advertised by Japanese dealers; also a variety with foliage blotched with white, and another var. with foliage margined white.

KEMPFERIA (Engelbert Kämpfer, 1631-1716, traveled in the Orient, and wrote on Japan. He is also commemorated by *Iris Kämpferi*). *Scitamineae*. About 12 species of tropical African and Asian plants with tuberous or fleshy roots, often stemless, and bearing the peculiar fls. of this order in which the showy parts, as in the Cannas, are the stamnodes. For culture, see *Hedychium* and *Zingiber*.

A. *Foliage margined with white.*

Gilberti, Hort. Fleshy-rooted: lvs. oblong-lanceolate, deep green, bordered white, waxy at the margin: fls. purple and white. East Indies. G.C. II. 17:713. R.B. 21:169. S.H. 2:131.—Int. by W. Bull. 1882. Reasoner Bros. cultivate this outdoors in S. Fla., and say, "The fls. are borne on ornamental crimson heads rising from the ground on separate stalks, and resembling in outline small pineapple fruits. These heads retain their beauty all summer."

AA. *Foliage not margined with white.*

B. *Lvs. tinged purple beneath.*

rotūnda, Linn. Stemless, tuberous: lvs. not produced until after the fls., oblong, erect, petioled; corolla segments long-linear; stamnodes oblong, acute, white, 1½-2 in. long; lip lilac or reddish, deeply cut into 2 sub-orbicular lobes; anther-crest deeply 2-fid; petiole short, channelled; blade 12 in. long, 3-4 in. wide, usually variegated with darker and lighter green above and tinged purple beneath; spikes 4-6-fl'd., produced in Mar. and Apr. India. B.M. 920 and 6054.—Adv. 1855 by Pitcher & Manda, who said the fls. were fragrant.

BB. *Lvs. not tinged purple beneath.*

Kirkii, Schumann (*Clenkowskya Kirkii*, Hook.). Leaf-stem 3-4 in. long; lvs. about 4, crowded at the apex of the stem, oblong, acute, 8-9 in. long, 2½-3 in. wide at the middle; flowering stems short, slender, 1-fl'd.; corolla lobes oblong-lanceolate, 1 in. long; stamnodes more than twice as long as the corolla lobes, pale rose-purple; lip rounded at the apex, slightly notched, 2 in. broad, with a yellow mark at the throat. Trop. Afr. B.M. 5994. I.H. 30:495.—Once adv. by John Saul.

W. M.

KAFFIR CORN. See *Sorghum*.

KAGENÉCKIA (after an Austrian minister to Spain). *Rosaceae*. Six species of tender evergreen trees from Chile and Peru, one of which is cult. at Santa Barbara. The fls. are white, 5-petaled, about ¾ in. across, and unisexual. The male fls. are borne in racemes or corymbs; the females are solitary; all are terminal:

lvs. leathery, serrate, short-stalked; stamens 16-20, inserted on the mouth of the calyx, in 1 series; carpels 5, free; ovules numerous, in 1 series.

oblonga, Ruiz & Pav. Lvs. oblong, acuminate at both ends, the serrations obtuse and rather callous. Chile.—Int. 1900 by Franceschi.

KAKI. See *Persimmon* and *Diospyros*.

KALÁNCHOË (Chinese name). *Crassulaceae*. Sometimes spelled *Calanchoë*. About 50 species of succulent erect shrubs, chiefly of tropical Africa, but also inhabiting tropical Asia, S. Africa and Brazil. Lvs. opposite, sessile or stalked, varying from entire to crenate and pinnatifid: fls. yellow, purple or scarlet, in many-fl'd. terminal cymes, rather large and often showy; calyx 4-parted, the narrow lobes shorter than the corolla tube, usually falling early; corolla 4-parted and usually spreading; stamens 8; carpels 4. A few species are prized by amateurs. The fls. are lasting in bouquets. The foliage is ornamental and interesting. Culture of *Crassula*; which see also for a conspectus of the garden crassulaceous genera. The four following species are novelties. *K. pinnata*, Pers. (Mn. 2:56), is *Bryophytum calycinum* (which see).

A. *Flowers scarlet or orange.*

coccinea, Welw. Somewhat hairy above, 2-4 ft. tall: lower lvs. ovate-obtuse, coarsely crenate-dentate, stalked; upper lvs. linear-lanceolate-obtuse, sessile; fls. scarlet or orange, on short pedicels, in broad, forking panicles which have stalks about 1 ft. long; calyx pubescent, the segments lanceolate-acute; corolla tube ½ in. long, the limb ½ in. across, and the segments deltoid-ovate. Trop. Africa.

flāmmea, Stapf. A foot to 18 in. high, glabrous, little branching: lvs. ovate-oblong, obtuse, narrowed into a short petiole (blade about 2 in. long and 1¼-1½ in. wide), fleshy, obscurely crenate-dentate or almost entire: fls. yellow and orange-scarlet, ½ in. across; calyx parted to the base, the segments linear-lanceolate and somewhat acute; corolla tube 4-angled, less than ½ in. long, yellowish; fls. ovate-acute, orange-red. Trop. Afr. B.M. 7595. G.C. III. 26:47.—First fully described in *Kew Bulletin*, Aug.-Sept., 1897, p. 266, but it was named and partially described in G.C. July 10, 1897, as *K. flamea*, which is evidently an orthographic error. The plant is one of the leading novelties of 1900. Thrives in a comparatively cool greenhouse.

AA. *Flowers pink.*

cárnea, Mast. Stems simple, 2 ft. or less, glabrous: lvs. oval or obovate, obtuse, crenate-dentate, narrowed into a short petiole, the upper ones nearly linear and sessile; fls. light rose or pink, very fragrant, nearly ½ in. across; calyx parted to the base, the segments linear-pointed; corolla tube swollen at base, and 2-3 times longer than calyx; corolla lobes broad-oval, acute. S. Afr. G.C. III. 1:211. G.F. 3:53.—Good winter bloomer, prop. by seeds or cuttings. Seeds sown in spring give blooming plants for the following Christmas.

AAA. *Fls. white or white-yellow, very long.*

marmoráta, Baker (*K. grandiflora*, Rich., not Wight). Stem stout and branching: lvs. large (6-8 in. long), obovate, narrowed to a short broad petiole, crenate, blotched with purple: fls. long and tubular (3 in. or more long), creamy white or yellowish, the lobes ovate-acuminate. Abyssinia. B.M. 7333. I.H. 43, p. 45.—Interesting pot-plant, with large trusses of erect fls.

L. H. B.

KALE or **BORECOLE** (*Brassica oleracea*, var. *acephala*, Figs. 295, 296) is thought by some to be the original type of the cabbage. Members of this section of the cabbage tribe do not form heads, but have variously

colored, often finely cut, leaves with fleshy leaf-stems, which form part of the edible portion. The leaf-stems are tough in the early autumn, but become crisp and palatable with the accession of autumn frosts. The plant is exceedingly hardy; in the southern states it winters without injury and in the Atlantic states may be carried through with slight winter protection. For autumn use the seeds are sown in early spring under glass or in coldframes and treated exactly as eabbage. In the South the seed may be sown in August or September, and the plants are ready for use the following spring. In the colder regions they may be carried through the winter in coldframes. Leading types: (1) Dwarf Scotch Curled; (2) Tall Green Curled; (3) Variegated; (4) Purple. There are many intermediate forms. The finely cut varieties of Scotch Kale are now frequently used for bedding purposes. Their hardiness gives them special features of usefulness in the autumn.

Kale is adapted to a wide range of country. One of the leading Kale centers is Norfolk, Va., where it is grown during fall and winter for the early northern market. See also *Brassica* and *Cabbage*.

JOHN CRAIG.

The Dwarf Scotch Kale makes a most excellent plant for spring greens. It is hardy enough to stand the winters of western New York without protection uninjured, and to make a new growth of tender sprouts very early in spring. These sprouts are serviceable for greens, salads, etc. For this purpose we sow seed early in June, either in a seed-bed and transplant the seedlings, just as we do eabbages, or directly in the hill, thinning to one plant in a hill. In a general way, the plant is handled like late cabbage.

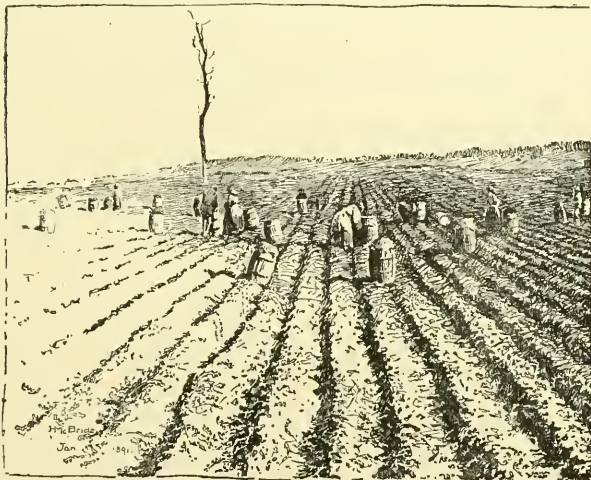
T. GREINER.

KALE AT NORFOLK (Fig. 1204).—Truckers about Norfolk, Va., grow both the Scotch and the Blue Kale, more of the former than of the latter. The amount of Kale shipped from Norfolk one year with another will average somewhere between 175,000 and 200,000 barrels. The number of barrels shipped in a single season has reached as high as a quarter-million.

The soil most desirable is a clay loam,—just such land as is best adapted to the growth of cabbages. The seed is sown with a hand drill in August, and shipments therefrom begin in October following, and continue off and on throughout the winter, until the crop is entirely shipped,—say until April 1 to 15 following. As soon as the frosts in the vicinity of New York and Philadelphia have been sufficiently heavy in the fall to kill all outdoor vegetables, Norfolk Kale is in fairly good demand and brings from 75 cts. to \$2 per barrel in northern markets. The yield per acre ranges from 200 barrels up to 400. Instances have been known in which more than 600 barrels of the Mammoth Kale have been raised from an acre of ground. It is a cheap crop to raise, requiring not more than half as much fertilizer as the spinach crop.

The soil is prepared, generally, in the following manner: It is thoroughly plowed, say about August 1, and harrowed level and smooth, and as the lands are very loose the Kale bed, although it may comprise 100 acres, is as mellow and as friable as the best of garden lands anywhere. A little later in the month the soil is thrown up with a single plow into small beds or ridges. Sometimes a single row will be sown by itself on a little ridge. Sometimes a ridge will be wider, and two rows will be

grown thereon. Sometimes four or five rows are thus sown; but as the soil must be relieved of the winter's rains, the beds are generally narrow, with little furrows between them to draw off any surplus water which may fall during the winter months, as we have from 2 to 6 inches of rain per month throughout the year. After the plants are well up they are tilled between the rows with cultivator or small plow, and hands are sent through the field with small hand hoes to thin out the crop, leaving healthy plants at about 6 inches apart. In the warm and sunny days of September, October and November the plant makes a heavy growth, covering the earth entirely in many instances. Then the trucker, if the demand for Kale be good, can thin out and sell the surplus plants, leaving the remainder to reach a greater degree of development; or he can cut clean as he goes, and put the same land into radish or winter peas later in the winter.



1204. A Norfolk Kale field at the Christmas harvest time.

There is money in the Kale crop at 75 cts. per barrel. During the past season the price has ranged from 50 cts. to \$2 per barrel, and has paid very well indeed. Within 15 miles of Norfolk, something over 1,000 acres is devoted to Kale each year. It is considered one of the cheapest crops to grow, yielding a moderate percentage of profit. If the soil is in good or fair condition, very little fertilizer or manure is required for the Kale crop. Its cultivation is simple and inexpensive. It is cut when ready for market and packed in barrels, using canvas for one of the barrel heads, at a cost of 5 cts. per barrel for cutting.

A. JEFFERS.

KALE, SEA. *Crambe maritima*; but treated under *Sea-Kale*.

KALMIA (after Peter Kalm, Swedish botanist, traveled 1748-51 in N. America). *Eriodendron*. AMERICAN LAUREL. Beautiful ornamental evergreen shrubs, rarely deciduous, with entire opposite or alternate lvs. and purple, pink or almost white showy fls. in terminal corymbs or in axillary umbels, rarely solitary; fr. capsular. Most of the species are hardy North, particularly the most ornamental member of the genus, *K. latifolia*, which next to *Rhododendron* is the most beautiful flowering hardy evergreen. Massed in groups or as single specimen on the lawn, it is one of the most decorative plants when covered with its abundant pink flowers. Even small plants produce flowers. The foliage is very

decorative, contrasting well with the red and yellowish branches. The species is also easily forced and makes a very handsome pot-plant. The other species are pretty border plants for evergreen shrubberies. The *Kalmias* thrive well in a sandy, peaty or loamy soil, but dislike clay and limestone. They grow almost as well in swamps as in drier locations and prefer partly shaded situations, but thrive also well in sunny places, provided there be sufficient moisture. They require generally almost the same treatment as the hardy *Rhododendron*, but are less particular about soil and position. Transplanting, if carefully done either early in fall or in spring, is not difficult; a mulching the first season after planting will be of much advantage to keep the roots from drying in summer and from frost in winter. Propagation usually by seeds sown in sandy, peaty soil in pans or boxes in early spring and kept in a cool frame or greenhouse. The seedlings should be pricked off as soon as they can be handled, and after they are again established gradually hardened off and the following year transplanted in frames or beds outdoors. Vars. of *K. latifolia* are usually increased by side-grafting on seedlings in the greenhouse or by layers, since it grows less readily from cuttings, while the other species may be prop. by cuttings of half-ripened wood under glass. Six species in N. Amer. and Cuba, allied to *Rhododendron*: fls. in terminal or lateral corymbs or umbels, rarely solitary; calyx 5-parted; corolla saucer-shaped or broadly campanulate, 5-lobed; stamens 10, with slender filaments, the anthers held back in little pouches of the corolla, springing up suddenly and discharging the pollen if touched; ovary 5-celled, superior; capsule



1205. *Kalmia latifolia* (X $\frac{1}{2}$).

globular, parting into 5 valves, with numerous minute seeds. The lvs. of the *Kalmias* are said to be poisonous to animals, especially those of *K. angustifolia*. The flower of *Kalmia* is one of those proposed as a national flower emblem, especially on account of the exquisite symmetrical beauty of the single flower. It is a purely American genus, but unfortunately it is popularly known only in the eastern states.

A. Fls. in umbels or corymbs.

B. Lvs. evergreen.

C. *Branchlets terete*: lvs. pale green beneath.

latifolia, Linn. MOUNTAIN or AMERICAN LAUREL. CALICO BUSH, Fig. 1205. Shrub, 4-10 ft. high, rarely tree to 30 ft., with dense, round-topped head: lvs. petioled, alternate or irregularly whorled, oblong or elliptic-lanceolate, acute at both ends, dark green above, yellowish green below, 3-4 in. long: fls. in large, terminal compound corymbs on viscid peduncles; corolla rose-colored to white, with purple markings within, about $\frac{3}{4}$ in. across. May, June. New Brunswick to Fla., west to Ohio and Tennessee. B.M. 175. Em. 443. S.S. 5:236-237. A.F. 13:32. Gng. 3:1; 7:289. Gn. 22:343; 27, p. 549 & 33, p. 607. -Var. *alba*, Hort. Fls. almost white. Var. *monstruosa*, Moilleff. (var. *polypétala*, Arb. Kew.). Corolla divided into 5 narrow petals. G. F. 3:453. Var. *myrtifolia*, Rand (var. *nana* or *minor*, Hort.). Lvs. small, 1-2 in. long, deep green, of slow growth, forming a low, dense bush. Var. *rubra*, C. Koch (var. *Parviflora*, André). Fls. deep pink. R.H. 1888:540.

angustifolia, Linn. SHEEP-LAUREL. LAMBKILL. WICKY. Shrub, to 3 ft.: lvs. usually in pairs of 3's, petioled, usually oblong, obtuse, light green above, pale beneath, 1-2 $\frac{1}{2}$ in. long; corymb lateral, many-fl., compound or simple: fls. $\frac{1}{2}$ - $\frac{3}{4}$ in. across, purple or crimson. June, July. From Newfoundland and Hudson bay to Ga. B.M. 331. Em. 445. -There are vars. with light purple fls., var. *rosea*, Hort.; with crimson fls., var. *rubra*, Hort.; with ovate or oval lvs., var. *ovata*, Pursh, and of dwarf habit, var. *nana*, Hort.

cc. *Branchlets 2-edged*: lvs. glaucous-white beneath, all opposite or in 3's.

polifolia, Wangh. (*K. glauca*, Alt.). Low, straggling shrub, to 2 ft.: lvs. almost sessile, oval to linear-oblong, obtuse, revolute at the margins, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long: fls. in simple terminal umbels, slender-pedicelled, $\frac{1}{2}$ - $\frac{3}{4}$ in. across, rose-colored or purplish. May, June. Newfoundland to Pa. and in the Rocky Mts. from Sitka to Calif. B.M. 177. L.B.C. 16:358. Em. 441. G.W.F.A. 3: -Var. *microphylla* is the alpine form of the Rocky Mts. growing only a few inches high and with very small lvs., $\frac{1}{2}$ in. or less long. Var. *rosmarinifolia* has narrow, oblong-linear, strongly revolute lvs.

BB. Lvs. deciduous, alternate.

cuneata, Michx. Erect shrub, with slender, straggling stems, to 3 ft.: lvs. petioled, cuneate, obovate-oblong, acute or obtuse, pubescent beneath when young, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long: fls. slender-pedicelled, in few-fl. lateral umbels, creamy white with a red band within, $\frac{1}{2}$ - $\frac{3}{4}$ in. across. June. N. C. and S. C. G.F. 8:435.

AA. Fls. solitary, axillary; plant hirsute.

hirsuta, Walt. Low shrub, with many erect or ascending stems, to 1 ft.: lvs. almost sessile, oblong to lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. long: fls. slender-pedicelled, $\frac{1}{2}$ in. across, rose-purple; sepals oblong-lanceolate, hirsute, longer than the capsule. June. S. Va. to Fla. B.M. 138. L.B.C. 11:1058. ALFRED REHDER.

KALOPANAX. See *Acanthopanax*.

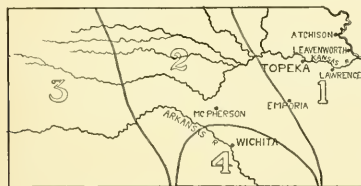
KANSAS, HORTICULTURE IN. Fig. 1206. In 1854, when Congress passed a law opening this territory for settlement, it was considered as part of the great American desert, and it was almost universally thought to be fit only for grazing purposes. As to fruit-growing, such a possibility was not considered. This impression did much to retard tree-planting. Another great drawback was the fact that every settler planting fruit trees must have the favorite varieties of his former home grown. This resulted in the planting of over 2,000 kinds of apples alone. Few of these could be made to succeed, and, in time, so many failed that the impression was deepened that Kansas could not grow fruit. But amid these losses occasionally a man would succeed with some variety, and his success was heralded over the state until eventually the worthless kinds were weeded out and the road to success was perceived. Eventually the people could plant trees with some as-



Kalmia latifolia, mountain laurel, one of the choicest of American shrubs

urance that they would gather fruit therefrom. Since then, rapid progress in tree-planting has been made.

Apple trees do not bear heavy crops every year, but there has not been a total failure any year since the trees commenced bearing, some forty years ago. Peaches bear in some parts of the state every year, the south having few failures. Pears succeed throughout the state, although some varieties blight in some localities.



1206. Climatological regions of Kansas.

Plums and cherries are successful throughout the state, if the curculio is destroyed. Grapes bear heavy crops nearly every year. Strawberries yield good crops. Raspberries and blackberries also do well.

Market-gardening is profitably carried on around Kansas City, Leavenworth, Atchison, Lawrence, Topeka, Ft. Scott, Wichita, and many other towns. Sweet potatoes are at home here and are grown in large quantities. They are on the market from early in September to March and sometimes in May. Irish potatoes are not a sure crop on the uplands, but immense quantities are grown on the bottom-lands. Hundreds of ear-loads are grown and shipped from the Kansas river bottom, between Topeka and Kansas City, every year.

The uplands are rolling prairies, with a deep, alluvial soil, with enough clay and sand intermixed to make it an ideal soil for fruit-growing. The subsoil is red clay, with some sand. This is underlain with limestone from one to forty feet below the surface. This limestone is full of seams or cracks which afford a good subdrainage, so that little of the land needs artificial drainage. These lands, as above described, embrace a very large percentage of the entire state. The bottom-lands are wide, ranging from one to ten miles in width. These bottom-lands are composed largely of sand, with enough humus intermixed to make them very productive. They support some of the finest orchards.

Kansas City is the lowest point in the state, and is about 750 feet above the sea level. It gradually gets higher west, until it is over 4,000 feet on the western border. The rainfall is of the usual amount on the eastern border, but gradually decreases as the western boundary is approached.

FRED WELHOUSE.

Kansas is, to the eye, practically level. There are no mountains within its boundaries, yet the eastern third is rolling. Some parts are rough, while the west is practically level, yet the state runs steadily up-hill from its eastern border, which is 750 feet above sea level, to the western limit, which is 4,500 feet above sea level. This naturally gives a varying climate. It is like climbing a mountain 3,750 feet high, and passing through the varying atmospheric changes as one goes upward, from a moist, easy-growing climate to a clear, windy, dry elevation 3,750 feet higher.

In the eastern third of the state (1, Fig. 1206) the apple and pear are at home, and when well grown are excellent. New varieties originating in the state or in the west are taking the place of eastern and imported varieties. Orchards and gardens are scattered all over the eastern half, and are very successful. The commercial horticulturist finds his early market in Nebraska, Colorado and Iowa; his later market in the cities and towns of Kansas, and a still later market in Texas, when the heat of summer has paralyzed Texan products. Oklahoma and the Indian Territory have for years been good markets for the southern part of Kansas. Many orchardists in the middle west sell every

apple, good, bad or indifferent, for cash to wagoners who come from the south and west annually in large numbers to carry away the orchard products. Toward the west, cherries, plums and peaches seem more at home. The two former are very prolific, and a success in the central part (2). Peach pits are planted in rows throughout the west for wind-breaks, and such trees bear considerable fruit, some of it very fine. Along the Arkansas river, where the roots of trees penetrate to water, all fruits do finely, and on irrigated lands back from the bottom-lands, horticulture prospers in all departments. The bluffs along the Missouri river, in the northeastern part of the state, seem peculiarly adapted to the apple, and it is grown there in immense quantities. Here are some of the greatest apple orchards of the world. The total number of apple trees in the state is 11,065,607; pears, 398,975; peaches, 5,734,337; plums, 919,527; cherries, 1,666,456. The acreage of vineyards is 6,543; of nurseries, 2,803; blackberries, 3,253; raspberries, 1,504; strawberries, 1,864 (1900).

Strawberries do well anywhere in the state. Some prominent varieties originated here. Raspberries are of easy culture. The "Kansas" originated in Lawrence, and has become the mainstay among blackcaps over a wide range. Blackberries are indigeneous, and cultivated varieties mainly do well, though some of them rust badly. Raisin grapes are grown in the south by winter covering. Prunes and figs will also grow there. Vegetables of all kinds do well and are of fine quality, the tomato being especially at home. Early potatoes of the Kaw valley are widely known, and millions of bushels are exported yearly. Fertilizers are little used, and the stable manure of the cities is largely dumped on the commons. Only gardeners seem to value it. Melons are of easy growth, and of the finest quality. Sugar-beets have been tried at various points, but on analysis do not often come up to the required standard of saccharine qualities. Indian corn is the great staple, and all the sugar and popping varieties come to the finest maturity in quality. The lack of water in western Kansas (3) is the greatest drawback to agriculture there.

WILLIAM H. BARNES.

KARATAS (Brazilian name). *Bromeliaceae*. Bentham & Hooker refer about 10 West Indian and Brazilian bromeliads to this genus, but Mez, the latest monographer (DC. Monogr. Phauer. 9), refers the species to other genera. Baker retains it. As understood by Bentham & Hooker, Karatas differs from Bromelia chiefly in its dense, capitate flower-clusters, which are sessile in the axils of the upper leaves. The species are cult. the same as Bromelia, Billbergia, and the like. They are little known in this country. Apparently the only common one is *K. spectabilis*, Ant. (*Nidularium spectabile*, Moore. *Repelia spectabilis*, Linden. *Argelia spectabilis*, Mez). It is a stemless, tufted perennial, with broadly strap-shaped, spine-edged lvs., which are green above, gray-banded beneath and red-tipped at the end; fls. numerous, sunk among the lvs., the corolla with bluish lobes. Braz. B. M. 6024. L. H. B.

KARRI. *Eucalyptus diversicolor*.

KAULFUSSIA (G. F. Kaulfuss, professor of natural history at Halle). *Compositae*. A small, branching, hardy annual, 6-12 in. high, with blue or red aster-like fls., on long stems; plant pubescent or hispid; lvs. oblong-spatulate or oblong-lanceolate, entire or remotely denticulate; heads many-fl., radiate, the ray fls. pistillate.

the disk-fls. perfect; akenes obovate and compressed, those of the disk with plumose pappus; involucre scales in two rows. *K. amelloides*, Nees (Figs. 1207-8), is an excellent annual, of easy culture in any garden soil. Var. *atroviolacea*, Hort., has dark violet fls. Var. *kermesina*, Hort., has violet-red fls. Sown seeds where



1207. *Charietis heterophylla*. Natural size.

the plants are to grow; or they may be started indoors and the plants transplanted to the open. The genus *Kaulfussia* was founded by Nees in 1820. In 1817, how-



1208. *Chariëis heterophylla*, commonly known as *Kaulfussia amelloides*.

ever, the plant was described by Cassini as *Chariëis heterophylla*, and this name should stand. S. Africa.

L. H. B.

KENILWORTH IVY. *Linaria Cymbalaria*.

KENNÉDYA (Kennedy, of the nursery firm of Kennedy & Lee, important English nurserymen of the latter part of last century). *Leguminosæ*. Australian woody trailers or twiners of about a dozen species, making excellent plants for the intermediate house or conservatory. Fls. red to almost black, pea-like; lvs. mostly pinnately 3-foliolate; standard orbicular or obovate, narrowed to a claw, and bearing minute aricles; wings falcate, joined to the keel; stamens diadelphous, — 9 and 1; pod linear, flattened or cylindrical, 2-valved, with pithy divisions between the seeds. *Kennédya*s are easily grown from cuttings of nearly ripe wood; also from seeds. They are mostly spring and summer bloomers, and should rest in winter. Give plenty of water during summer. They should be given support: they grow from 3-10 feet high, making stiff, woody stems. They may be trimmed back freely when at rest. The taller kinds, like *K. rubicunda* and *K. coccinea*, are excellent for rafters. Well-rooted plants may be planted permanently in the greenhouse border.

A. Fls. nearly black.

ngricæns, Lindl. Twining, robust, somewhat pubescent; lfts. (sometimes reduced to 1) broad-ovate or rhomboid, entire, obtuse or emarginate; fls. slender, 1 in. or more long, in short one-sided axillary racemes, deep violet-purple or almost black; pod flattened. B.R. 20:1715. B.M. 3652.—*K. carulea*, Hort., with blue fls., is perhaps this species.

AA. Fls. red or scarlet.

B. Standard narrow-obovate.

rubicunda, Vent. Pubescent; lfts. 3-4 in. long, ovate to orbicular or ovate-lanceolate, entire; fls. dull red, drooping in racemes, usually not exceeding the lvs.; standard narrow-obovate, reflexed; wings narrow and erect; pod flat or nearly so. L.R.C. 10:954. B.M. 268 (as *Glycine rubicunda*). B.R. 13:1101 (as *Amphodus ovalus*).

BB. Standard broad-ovate or orbicular.

prostrata, R. Br. Prostrate or twining, pubescent; lfts. broad-obovate or orbicular, less than 1 in. long, often wavy; stipules leafy, cordate; fls. 2-4 on each peduncle (which usually exceeds the lvs.), scarlet, $\frac{3}{4}$ in. long; standard obovate; keel incurved and obtuse; wings narrow and short; pod nearly cylindrical, pubescent. B.M. 270 (as *Glycine coccinea*).

Var. **majör**, DC. (*K. Märryattii*, Lindl. *K. Märryattiana*, Hort.). Larger and more hairy; lfts. larger, strongly undulate; stipules sometimes 1 in. across; fls. large, deep scarlet. B.R. 21:1790. Gn. 28:501. A.F. 3:547.—A very handsome winter-flowering twiner.

coccinea, Vent. Densely pubescent; lfts. 3 or 5, ovate or oblong, very obtuse, often 3-lobed; stipules very

small; fls. $\frac{3}{4}$ in. long, scarlet, in long-peduncled clusters of 15-20; standard orbicular; keel very obtuse; pod flattened. B.M. 2664. L.B.C. 12:1126.—Known under several names, as *K. inophylla*, Lindl., B.R. 17:1421; *K. dilatata*, Gunn., B.R. 18:1526; *Zitrygia tricolor*, Lindl., B.R. 25:52; *Z. villosa*, Lindl., B.R. 28:68, and others. Handsome slender twiner or trailer. L. H. B.

KENRICK, WILLIAM, was born in 1795, and was the oldest son of John Kenrick, one of the pioneer American nurserymen. His father commenced his nursery in the year 1790 on Nonantum Hill, near the line of the town of Newton and Brighton, Mass., and on the very ground where the apostle Eliot began his labors for the Indians, under Waban, their chief. The raising of peach seedlings was the commencement of Mr. Kenrick's work. He soon acquired the art of budding, and thus offered named varieties for sale. In the year 1823 his son William became a partner in the nursery, and we find the first advertisement of the stock in the October number of the "New England Farmer" of that year. It named 30 varieties of finest budded peaches 5 to 8 feet high at 3 $\frac{3}{4}$ cents each; 40 varieties of European grapes; 4 American: Isabella, Catawba, Blue and Scuppernon; currants, horse-chestnut, catalpa, mountain ash, lilacs, roses and a few other ornamental trees. It was stated that the trees would be packed with clay and mats. The son, William, appears to have assumed early control, having planted in 1823 two acres in currants alone. In 1824 they made 1,700 gallons of currant wine, increasing the amount to 3,000 gallons in 1825 and to 3,600 in 1826. Mr. Kenrick was an enthusiast in whatever he did, his extensive cultivation and introduction of the Lombardy poplar being an illustration of his sanguine temperament. A still more marked instance was his culture of the *Morus multicaulis* about the year 1835, and his advocacy of silk culture. For a time he found this to be a more profitable venture to himself than to his patrons. But it should be said that, however sanguine and confident were his opinions, they were honestly held and with no intent to mislead. In the year 1835 Mr. Kenrick published "The American Silk Growers' Guide," a small treatise on mulberry culture. In 1833 appeared the "New American Orchardist." This is a larger work, and is a full description of the fruits of that date. The author acknowledges his large indebtedness to other cultivators, especially to Mr. Robert Manning, of Salem, who published his "Book of Fruits" in 1838. Mr. Kenrick died in February, 1872. WM. C. STRONG.

KENTIA (after William Kent, horticulturist, companion of Reinwardt in journeys through the Indian archipelago). *Palmææ*. Spineless palms with pinnate lvs., sharp-pointed or 2-toothed, linear-lanceolate lfts., mid-nerves acutely beak, and rachis angled above; petiole channeled above, rounded on the back. It differs from *Areca* in the sharply 4-angled branchlets of the spadices; and from *Hedysepe* and *Kentipopsis* in having only 6 stamens. Species at most 6 or 7, from the Moluccas to northern Australia. The type is *K. proceræ*, Blume, from New Guinea, which is not cult. It is probable that none of the *Kentias* known to the American trade belong properly in this genus.

K. australis, Hort. (from Lord Howe's Island, is probably one of the foregoing palms which, according to Maiden in Proc. Linn. Soc. N. S. W. 1898, are the only palms on that island: *Clinostigma Mooreana*, *Howea Belmoreana* and *Forsteriana*, and *Hedysepe Canterburyana*. *K. australis* was int. 1873 and advertised 1893 by John Saut.—*K. Belmoreana*, C. Moore = *Howea Belmoreana*.—*K. Bakeri*, Seem. = *Rhoplostylis Bakeri*.—*K. Belmoreana*, F. Muell. = *Howea Belmoreana*.—*K. Brönnei*, Hort. Dedicated to D. S. Brown, of St. Louis, Mo. Resembles *K. Macarthurii*. Lvs. pinnate, arching; lfts. truncate and pre-morse. Very graceful. A.G. 15:266 and 20:223. This is, perhaps, *Neoua* or *Hydrastyle*.—*K. Canterburyana*, F. Muell. = *Hedysepe Canterburyana*.—*K. divaricata*, Planch. = *Kentipopsis divaricata*.—*K. Dumoniæna*, Hort. Adv. 1895 by Pitcher & Manda. F.R. 1:379.—*K. elegans*, Brongn. & Gris. = *Cyphophoenix elegans*.—*K. exorrhiza*, H. Wendl. = *Exorrhiza Wendlandiana*.—*K. Forsteriana*, F. Muell. = *Howea Forsteriana*.—*K. Irisesens*, Hort. Cult. by Siebrecht & Son. = *K. Inuleta*, Brongn. = *Cyphophoenix falcata*.—*K. gracilis*, Hort. = *Microrhiza gracilis*.—*K. Kirsteniana*, Hort. Lvs. very slender, dark green, arching, ascending, widely pinnated; lfts. broadly cuneate shape like a fan, the lower part of the rachis extremely serrated, the upper margin extending into a long, sharp tip; peti-

oles covered with light grayish brown pubescence. New Ireland. A. G. 20:223 (1899). G. C. III. 24:391. This is probably a *Nenga*—*K. Lindenii*, Hort.—*Kentopsis macrocarpa*.—*K. Luciana*, Lind.—*Kentopsis macrocarpa*.—*K. Macarthuri*, Hort. An elegant palm, with smooth, suberect lvs.; fls. semi-pendulous, alternate, 4-8 in. long, $\frac{1}{4}$ -1 in. wide, the midvein prominent above, obliquely truncate and ragged or premorse. Stems smooth, suckering quite freely. New Guinea. Int. 1878. Veitch & Sons. F. 1878, p. 115. Perhaps a *Nenga*.—*K. Mooreana*, F. Muell.—*Chlostigma Mooreanum*.—*K. Mori*, Hort. Dreer. Possibly same as *K. Mooreana*.—*K. rubricaulis*, Hort. Lvs. pinnate, ovate, with red petioles. Adv. 1895 by Pitche & Manda.—*K. rapicola*, Hort. Adv. 1895 by Pitche & Manda.—*K. Sanderiana*, Hort. Very slender in habit, very hard foliage spreading; fls. very narrow, arranged on an arching rachis similar to *Cocos Weddelliana*. A graceful plant for jardinières or conservatories. A. G. 20:223.—*K. Napida*, Mart.—*Rhopalostylis sapida*.—*K. Van Houttei*, Hort.—*Veitchia*, sp. l. Adv. 1895 by Pitche & Manda.—*K. Vitchei*, Hort. probably—*Hedysepe Canterburyana*.—*K. Wendlandiana*, F. Muell.—*Hydriastele Wendlandiana*.

JARED G. SMITH.

KENTIOPSIS (Greek: *like Kentia*). *Palmaceae*. Spineless palms: lvs. equally pinnate; pinnae subopposite, very coriaceous, narrow, sword-shaped, narrowed to the obtuse or toothed apex, with strong mid-nerve, prominent veins and thickened margins. Species 2. New Caledonia.

Kentopsis belongs to a large group of genera mentioned under *Hedysepe* (p. 718), which differ from *Kentia* in having the ovule fastened on the side of the locale, and more or less pendulous, instead of fastened at the base and erect, as in *Kentia*.—*Kentopsis* is distinguished from *Hydriastele* by having its fls. arranged spirally instead of in 4 ranks. From numerous other cultivated allies it is distinguished by the following characters: stamens numerous, 20-25; leaf-segments narrowed, obtuse or dentate; sepals of the staminate fls. triangular-orbicular, broadly overlapping.

macrocarpa, Brongn. (*Kéntia Lindenii*, Hort. Linden. *Kéntia Luciana*, Linden). Rachis flat above, convex below. The form known as *Kéntia Luciana* has bright green lvs., tinged with brown on the under surface, the young petiole yellowish, later becoming brown. I. H. 29:451 and 24:276. F. 1884, p. 71. S. H. 2:117.—The species is distinguished by the reddish tinge of the young leaves.

K. divaricata, Brongn. (*Kentia divaricata*, Planch.), is referred by Drude in Engler & Prantl, to *Dryophloeous*. It may be distinguished from the preceding by the alternate pinnae and triangular rachis, keeled above. I. H. 28:409. This has been confused in the trade with *Kentia gracilis*, which is referred by Index Kewensis to *Microkentia gracilis*. See I. H. 23:245. Advertised 1895 by Pitche & Manda.—*K. elaeoformis*, Brongn., is characterized by the 4-angled rachis. Not cultivated.

KENTUCKY HORTICULTURE.

Fig. 1209. The state of Kentucky, while its interests have not been distinctively developed in the direction of horticulture, is, nevertheless, in its various parts, admirably adapted to nearly all the fruits and vegetables of the temperate zone. Its cultivation has been primarily that pertaining to general agriculture and stock-raising, rather than horticulture.

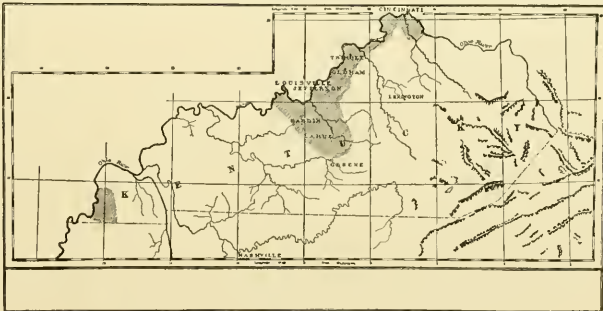
Before the civil war the people of wealth and culture, particularly over large areas through the central portion of the state, dwelt very largely in the country rather than in the towns, which at that time were nearly all small and comparatively unimportant. There are many evidences still remaining, in stately country homes surrounded by magnificent old trees and old-fashioned gardens, to bear witness to the high appreciation of the people of that period for the amenities of

rural life. At that time commercial horticulture in the state was almost unknown; but with the steady advance in fruit-growing throughout the country, and with increasing facilities for rapid transportation for perishable products, there have been developed in recent years several well-defined fruit- and vegetable-growing areas, in which these industries have assumed large proportions.

The most important of these districts are two which lie respectively to the northeast and south of Louisville, and the boundaries of which, to some extent, overlap. The first of these is comprised largely of the counties of Trimble and Oldham. Trimble county is especially noted for its extensive peach orchards, which are situated upon the elevated lands adjacent to the Ohio river, much of the fruit being shipped by water to Louisville, Cincinnati, and other river towns. Oldham county has a large acreage of grapes. The first vineyards were established in the decade of 1850-60, of the Catawba and Isabella varieties. On account of the rot, the culture of these varieties was not very successful, but early in the next decade the Ives was introduced, and owing to its productiveness and shipping qualities, it has since been grown almost exclusively. The growth of the industry was quite steady until about 1890, when one or two seasons of large crops, accompanied by high prices, led to a very large increase in the acreage. During the past few years the business has been somewhat depressed, on account of the competition of earlier grapes from Georgia and other southern states.

To the south and southwest of Louisville lies the fruit district, known as Muldraugh Hill, a low, mountainous elevation, extending, in Kentucky, in a southeasterly direction from the Ohio river in Meade county, through Hardin, Larue, Green, and portions of adjacent counties. In this hill country fruit-growing is most largely developed on its southern slope, peaches and apples holding the first place in importance, while pears, plums and the small fruits are also extensively grown. This locality seems peculiarly adapted to the apple and peach, orchards of the latter having produced, according to good authorities, nineteen paying crops in twenty three years, with comparative freedom from disease, and attaining, when permitted, a great age and size. The fruit from this district is shipped to various points in the Mississippi valley, but especially to such northern cities as Indianapolis and Chicago, where it holds high rank.

Between and connecting the two fruit districts men-



1209. Kentucky. Shaded areas designate pomological districts.

tioned is the county of Jefferson, containing the largest city in the state—Louisville. In this county fruit-growing and market-gardening are very extensively developed, particularly for the local market, and here also are found the most extensive florists' establishments in the state, as well as many forcing-houses, devoted to growing winter vegetables, chiefly lettuce.

Throughout much of the fruit districts mentioned, as in many other parts of the state, the favorable results

secured in fruit-production are possible largely on account of the immunity from late spring frosts, due to elevated locations and to the deeply eroded river channels, which afford abundant cold air drainage.

In the extreme southwestern corner of the state (near K in Fig. 1209), in the counties of Carlisle, Hickman and Fulton, a combination of favorable conditions has led to an extensive development of the trucking and small fruit interests. Chief among these conditions are a fertile soil, a warm spring temperature, and direct and rapid transportation, both by water and rail, to northern cities. Many hundreds of acres of strawberries are grown, and the production of beans, spinach, melons and other garden crops is of nearly equal importance.

In the vicinity of Cincinnati, Ohio, the fruit and vegetable-growing interests are quite extensive, although the conditions for market-gardening have led to a greater development of that business upon the northern than upon the Kentucky side of the Ohio river.

About two-fifths of the eastern portion of Kentucky, comprising the mountainous part of the state, is still sparsely settled, its agriculture is confined to a few staple crops produced, in many cases, by primitive methods, and true horticulture is comparatively unknown over a great part of this vast area, although, as shown in isolated localities, nearly all our fruits and vegetables can be grown with perfect success. Within the borders of this mountain region, in the southeastern part of the state, are several prosperous German and Swiss colonies, nearly every member of which, with characteristic industry and thrift, has possessed himself, on some part of his farm, of a vineyard and orchard, and so produces an ample supply of the best fruits. Here and there in other localities, enterprising individuals have demonstrated the easy possibility of producing orchard and garden products without stint; but the average farmer of the mountain region, as too often elsewhere, is apparently content to let his table remain bare of the best fruits and vegetables, as his home surroundings are so often bare of trees and flowers.

The public parks of the state are confined almost exclusively to those of the city of Louisville, which was itself without any park system until recent years. After the passage of an act providing for their establishment, a board of park commissioners was elected in 1890, since which time the development of the park system has been vigorously prosecuted. At the present time there has been secured for this purpose a splendid public possession of over 1,100 acres, composed of Iroquois park, 589 acres; Cherokee park, 304 acres; Shawnee park, 167 acres; and the southern parkway, 48 acres, together with a number of small city squares. These parks are being improved under the direction of the most skillful landscape architects, and promise soon to bring the city of Louisville to an equality in this respect with other great cities of the country.

Of other public grounds in which the work of the landscape horticulturist is manifest, the two cemeteries, Cave Hill, of Louisville, and that of Lexington are perhaps the most notable examples in the state. The former comprises an area of about 300 acres, and is situated upon a beautiful tract of land, elevated 100 feet above the Ohio river. It contains several beautiful lakes, and is especially rich in its collections of aquatics.

The cemetery at Lexington contains over 100 acres, and was established in 1849. It is exceptionally fortunate in having been under the same superintendent during its entire history of almost fifty years, and in having the landscape method of treatment followed from the first. Among many interesting horticultural features, the most notable to-day are the magnificent old bur oaks and white elms, many of which are 4 or 5 feet in diameter.

CLARENCE W. MATHEWS.

KENTUCKY BLUE GRASS. *Poa pratensis*.

KENTUCKY COFFEE TREE. *Gymnocladus Canadensis*.

KÉRNERA. *Cruciferae*. Under this name amateurs cultivate a rock plant growing about 4 in. high, which blooms profusely all summer, its fls. being small, white,

and borne in elongated umbels. It should probably be known as *Cochlearia saxatilis*. Four genera, representing 4 orders, have been named after Johann Simon von Kerner, 1755-1830, Prof. of Botany at Stuttgart. Bentham and Hooker regard the cruciferous Kerneria as a subgenus of *Cochlearia*, in which the stamens are longer and bowed at the apex; pods turgid; valves very convex; cotyledons acumbent or incumbent.

The following species is a compact, branching, neat habitated plant thriving in any light soil that is moderately rich. It requires a sunny but not too dry situation. Prop. by cuttings, division or seed.

K. saxatilis. Reiebb. Properly *Cochlearia saxatilis*, Linn. Root-lvs. oblong, dentate, pilose; stem-lvs. linear-oblong; petals 4, ovate, 2-3 times as long as the calyx; seeds numerous, not margined. Eu. J. B. KELLER and W. M.

KÉRIA (after William Kerr, a gardener who introduced this and many other plants from China; not J. Bellenden Ker or M. Kerr, as often stated). *Rosaceae*. A monotypic genus, one of the first shrubs brought from Japan; best known by its weak, slender green branches, slender irregularly toothed lvs. and large yellow fls. It grows 4-8 ft. high and as broad as high, with numerous short-branched, spreading stems, attractive in winter from its light green branches, in early June when its blossoms appear in greatest abundance; in November, when the lvs. are of a clear yellow, and is not unattractive throughout the whole year. It is a refined plant and deserves free use in ornamental planting, either in simple masses or at the front of a shrubby group or border. It is not thoroughly hardy in all situations in the northern states, the tips of its branches often winter-killing, which causes it to demand a well-drained and partially sheltered position. It grows in any good garden soil. Although enduring sunlight, it is best in partial shade, since the intensity of full sunlight partially bleaches the fls. It is prop. by cuttings, layers and root divisions.

Japónica, DC (*Córchorus Japonicus*, Thunb.). **GLOBE FLOWER.** **JAPANESE ROSE.** Fig. 1210. Lvs. simple, alternate, ovate-lanceolate, acuminate, largely unequally serrate, 1-2 in. long, clear green above, pale below, thin, slightly pubescent; fls. abundant, solitary, terminal, peduncled, 1-2 in. in diameter, appearing in June and



1210. *Kerria Japonica*.

Showing single and double flowers ($\times \frac{1}{2}$).

more or less throughout the year; calyx persistent, 5-lobed; petals 5, large, yellow, ovate; stamens numerous; carpels 5-8, globose, distinct. A.G. 18:425. P.E. 9:593. R.H. 1869, p. 293. S.B.F.G. II. 337. Gn. 21, p. 275.—Var. *florè plèno*, double, more vigorous and more frequent in culture than the single. B.M. 1296. Var. *grandiflora*, a vigorous form with large fls. Var. *areovittatis* (*ramulis variegatis aureis*), a dwarf form, the branches striped with yellow and green. Var. *argenteo-variegata*, 2-3 ft. high, with small green lvs. edged with white.

A. PHELPS WYMAN.

KIDNEY BEAN. Common name in England for the common beans in distinction from the Lima bean, the former being *Phaseolus vulgaris*, the latter *P. lunatus*.

KIDNEY VETCH. See *Anthyllis*.

KINGNUT. *Carya sulcata*.

KIN-KAN. See *Kumquat*.

KINNICKINICK. Dry bark of *Cornus Amomum*, smoked by western Indians.

KITCHEN GARDEN. See *Vegetable Gardening, Gardens, and Horticulture*.

KLEINIA. Of the 3 genera of Compositae of this name, 2 are referred to *Porophyllum* and *Jaumea*, but the trade names will be accounted for under *Senecio*.

KNAPWEED. See *Centaurea*.

KNIGHT'S STAR. *Hippeastrum equestre*.

KNIPHOFIA (Johann Hieronymus Kniphof, 1704-1765, professor at Erfurt). *Liliaceae*. This genus includes the Red-hot Poker Plant (Fig. 1211), which is unique in its appearance and one of the most striking plants in common cultivation. No one who has ever seen its pyramidal spike of blazing red fls. borne in autumn is likely to forget when and where he "discovered" this plant. It is herbaceous and nearly hardy N., has sword-shaped lvs. 2-3 ft. long, and several scapes 4 or 5 ft. high surmounted by a spike 4-8 in. long composed of perhaps 100 tubular, drooping fls., each 1 in. or more long, and fiery, untinged red. A sky-rocket is not more startling. By far the commonest species is *K. aloides*, which has perhaps a dozen varieties with Latin names and twice as many with personal names. All the other species have much the same general effect, and are of interest chiefly to collectors and fanciers. Poker Plants are hardy south of Philadelphia when well covered in winter, but in the North it is generally safer to dig up the plants in November, place them in boxes with dry earth, and store them in a cellar in winter. In spring place them in a warm, sheltered, well-drained spot, preferably with a background of shrubbery to set off the flowers.

The genus is confined to Africa and Madagascar, and all but two of the species numbered below are from south Africa. The plants seem to be still better known to the trade as species of *Tritoma*, but the following account omits most of such synonyms. Benth and Hooker placed *Kniphofia* between *Funkia* and *Notosepium*. The latter genus is not in cultivation, and *Funkia* has blue or white fls., which colors are not found in *Kniphofia*. Poker Plants have fls. of red, orange or yellow. Blandfordia has similar colors and agrees in having pendulous tubular fls. with short lobes, and also long, narrow lvs., but the stamens are fixed at the middle of the tube, and the capsule has septical dehiscence, while in *Kniphofia* the stamens are fixed near the pistil and the capsule has loculicidal dehiscence.

Kniphofias are often classed by dealers as bulbous plants, though they have only a short rhizome and numerous, clustered, thickish root-fibers. Baker speaks of the "raceme" of a *Kniphofia*, but the pedicels are so short that the inflorescence is here spoken of as a "spike," particularly as a spike signifies to the popular mind a denser inflorescence than a raceme. Most of the species have been very recently monographed by Baker in *Flora Capensis*, vol. 6 and *Flora of Trop. Afr.* vol. 7. When the height of the plants is given below, it refers to the height of the scape.

Index of names exclusive of those in the supplementary lists (varieties and synonyms in italic>):

<i>aloides</i> , 1.	<i>corollina</i> , 5.	<i>Nelsoni</i> , 4.
<i>Burchelli</i> , 3.	<i>glaucescens</i> , 1.	<i>nobilis</i> , 1.
<i>carnea</i> , 1.	<i>grandiflora</i> , 1.	<i>pauciflora</i> , 8.
<i>caulescens</i> , 6.	<i>gracilis</i> , 1.	<i>Rooperi</i> , 2.
<i>comosa</i> , 10.	<i>Leichtlinii</i> , 9.	<i>Saundersii</i> , 1.
<i>coronatum</i> , 5.	<i>Macowanii</i> , 5.	<i>Tuckii</i> , 7.

A. Length of perianth 1 in. or more.

B. Stemless or nearly so.

C. Form of lvs. sword-shaped-acuminate.

D. Color of lvs. dull green.

E. Width of lvs. $\frac{3}{4}$ -1 in. 1. *aloides*

EE. Width of lvs. $1\frac{1}{2}$ in. 2. *Rooperi*

DD. Color of lvs. bright green. 3. *Burchelli*

CC. Form of lvs. linear.

D. Width of lvs. one-sixteenth to one-twelfth of an inch. 4. *Nelsoni*

DD. Width of lvs. one-eighth to one-sixth of an inch. 5. *Macowanii*

BB. Stem 6-12 in. long. 6. *caulescens*

AA. Length of perianth $\frac{1}{2}$ - $\frac{3}{4}$ in.

B. Form of perianth subcylindrical. 7. *Tuckii*

BB. Form of perianth funnel-shaped.

C. Width of lvs. one-eighth to one-sixth of an inch. 8. *pauciflora*

CC. Width of lvs. $\frac{1}{2}$ in.

D. Stamens $1\frac{1}{2}$ times as long as the perianth. 9. *Leichtlinii*

DD. Stamens twice as long as the perianth. 10. *comosa*

1. *aloides*, Moench (*K. Uvária*, Hook. *Tritoma Uvária*, Ker.). RED-HOT POKER PLANT, POKER PLANT, TORCH LILY, FLAME FLOWER. Fig. 1211. LVS. slightly



1211. *Kniphofia aloides*
Separate flower natural size.

glaucescens, 2-3 ft. long, scabrous on the margin, acutely keeled, with 30-40 close vertical veins; raceme dense, often 6 in. long, $2\frac{1}{2}$ -3 in. thick; upper fls. bright red, lower ones yellow; perianth cylindrical; stamens sometimes barely exerted. F.S. 13:1393. B.M. 4816:758.—The following varieties with Latin names are in the trade and usually advertised as apparent species under *Kniphofia* or *Tritoma*. They may be all more or less distinct horticulturally. An everblooming kind is advertised in 1900 and said to flower from June to Dec. Var. *carnea* is figured in Gn. 19:286 with the fls. opening from the top instead of the bottom, and with red filaments and yellow anthers. Leichtlin introduced it about 1881 and said it grew $1\frac{1}{2}$ -2 ft. high, the arctic-red of the fls. toned down by a glaucous bloom. Var. *floribunda* is early-flowering, says Van Tubergen. Var. *glauca* is less known than the next. Var. *glaucescens* is figured in Gn. 36:727 with a spike 9 in. long, of "vermillion-scarlet fls. changing to a more orange color." One of the freest bloomers. Int. 1859." Foliage somewhat glaucous. Var. *grandiflora*, one of the earliest improvements on the type. John Saul said it grows 2-3 ft. high. Var. *gracilis*. "The largest-flowered of all; fls. red and yellow. 5 ft." Woolson. Referred by Kew authorities to var. *maxima*. Var. *nobilis* is said by Carrière, R.H. 1885:252, to have

shorter and stricter lvs. than *Saundersii*, the spikes more ovoid, the fls. uniformly red and less deflexed. Lvs. not glaucous. G. III, 55, p. 167. Var. *Saundersii*, in R. H. 1882:504, is shown with "red-orange fls." in an elliptical shape and said to grow 6 ft. and more high. Woolson finds it grows 4-6 ft. high in rich soil, with cylindrical spikes 18-24 in. long and fls. often $\frac{1}{2}$ in. across. Var. *serotina* is a late-fl. form.

Baker's treatment of the varieties is as follows:

Var. *máxima*, Baker (K. and *T. grandiflora*, Hort. *T. Saundersii*, Carr.). More robust; lvs. 4-5 ft. long, 1 in. wide; raceme and fls. longer; stamens more decidedly exerted. B.M. 6553 (fls. yellow, more or less tinged red). R.H. 1882:504 (colored like the type).

Var. *nobilis*, Baker (*T. nobilis*, Gull.). Still more robust; scape including raceme sometimes 6-7 ft. long; fls. $\frac{1}{2}$ in. long. R.H. 1885:252.

Var. *serotina*, Hort. A late-flowering form with slender perianth $\frac{1}{2}$ in. long and distinctly exerted stamens. Baker also mentions varieties *carnea* and *glaucescens* without discrimination. Other varieties with Latin names are mentioned in Gn. 36, 727.

2. *Rooperi*, Lem. Lvs. 4 ft. long, scabrous on the margin, glaucous. Later-fl. than No. 1: fls. paler. B. M. 6116.

3. *Burchelli*, Kunth. Lvs. 2-3 ft. long, $\frac{3}{8}$ - $\frac{1}{2}$ in. wide, smooth on the margin; spike 6-12 in. long; fls. bright yellow, much tinged with red when young. "A much dwarfier plant than No. 1 and for many purposes equally desirable. Height $1\frac{1}{2}$ ft. Fls. tinged green." *J. B. Keller*.

4. *Nelsoni*, Mast. Lvs. $1\frac{1}{2}$ -2 ft. long, with a thick midrib and recurved serrulate edges. G. C. III, 11:561. Gn. 50, p. 400; 55:1213 (brick-red, no trace of yellow).

5. *Macowanii*, Baker. Lvs. with a thickened scabrous margin, many upper fls. bright dark red. B.M. 6167. R.H. 1879:390.—"A very neat dwarf species with orange-scarlet fls. in early autumn, 1-2 ft." *Woolson*. *K. corollina*, Hort., R.B. 19:25 (1893), a hybrid between this species and *K. Uvaria*, was raised by Deleuil, of Marseilles. *Woolson* says it grows 18-24 in. high and bears ovoid spikes of coral red fls. all summer and fall. He says it is good for cutting. *K. corollinum* of one of our nursery catalogues is presumably an error for *K. corollina*. *K. media Macowanii*, Hort. "A hybrid between *K. aloides grandiflora* and *K. Macowanii*. This is an earlier blooming sort than either of its parents, as dwarf as *Macowanii* and much earlier and more brilliant. Thoroughly tested." *Woolson*.

6. *caulescens*, Baker. Lvs. sword-shaped-acuminate, broadly channelled, not acutely keeled on the back, 4-5 ft. long, 5-6 in. wide, margin serrulate; spike over 1 ft. long, 3 in. thick; lower fls. yellow, upper ones red. G. C. III, 6:564. R.H. 1887:132.—"This differs from all described above in having stamens much exerted. Gn. 41:861 is perhaps the most artistic of all colored plates of Kniphofias.

7. *Tückii*, Baker. Lvs. ensiform (linear in Nos. 8-10), 1-1 $\frac{1}{2}$ ft. long, $\frac{3}{4}$ in. wide, margin serrate; spike very dense, 5-6 in. long; fls. yellow, tinged bright red when young. One of the hardiest.

8. *paniculata*, Baker. Lvs. 1-1 $\frac{1}{2}$ ft. long, margin smooth; raceme lax (dense in Nos. 9-10), 2-3 in. long; fls. pale yellow; stamens shortly exerted, as in No. 7. G. C. III, 12:65 shows it with only 25 fls. and the loosest raceme of any species here described.

9. *Leichtlinii*, Baker. Fls. bright yellow; perianth more narrowly funnel-shaped than in No. 10, becoming $\frac{3}{4}$ in. long; scape speckled with red, sometimes bearing a bract 4-5 in. long. This and No. 10 are from tropical Africa; the rest from South Africa. B.M. 6716. R.H. 1884, p. 557. Var. *distachya*, Baker, has a forked scape and small accessory lateral raceme.

10. *comosa*, Hochst. Fls. bright yellow, dilated suddenly at the middle, $\frac{1}{2}$ in. long; filaments red; anthers yellow. B.M. 6569.—"This has relatively longer stamens than any other species and is perhaps more conspicuous by reason of its mass of stamens than the outline of the spike. One of the tenderest.

Supplementary list of imperfectly known Latin names rep-

resenting kinds now advertised in America: *K. hybrida*, Hort., is a rare name used to include varieties with personal names, of miscellaneous or unknown parentage.—*K. ostabile*, Hort. "Height 5-6 ft." *Woolson*.—*K. Fitzcarr*, Hort. John Saul, 1863, said "rose-scarlet without a trace of yellow." Dreer, 1900, says it is a great improvement of *K. aloides*, var. *grandiflora*, the scapes more numerous, often $\frac{1}{2}$ ft. high; spikes over 12 in. long; fls. rich orange-scarlet, shading to salmon rose at the edge.—*K. speciosa*, Hort. Van Tubergen.—*K. Woodii*, Hort., is advertised by Franceschi, who says it comes from Natal, and has lemon yellow fls. Not in Flora Capensis.

Twenty-five varieties with personal names are advertised by Van Tubergen and Krelage. How much variation in habit and season of bloom does not appear. The color-range is about as follows: dark brick red, carmine-red, coral red, scarlet-orange, orange, bronzy yellow, deep yellow, pure yellow and primrose or straw-colored. The filaments may be red or yellow, the anthers apparently sometimes differently colored. The filaments. Some hybrids are recorded, and some form of *K. aloides* is usually concerned. W. M.

KOCHIA (after W. D. J. Koch, 1771-1849, professor of botany at Erlangen; wrote a flora of Germany and Switzerland). *Chenopodiaceae*. This includes a plant treated as a hardy annual which is called the Mock Cypress or Summer Cypress. J. Wilkinson Elliott says, "It grows 2-2 $\frac{1}{2}$ ft. high, resembling a small, closely sheared evergreen, the foliage being light green until September, when the whole plant is a solid mass of crimson. The fls. are minute but countless. The plant dies within two weeks after blooming. It germinates very quickly, even in the warm spells of late winter." Elliott called it the Mexican Fire Plant, because the seeds were procured in Mexico. However, the genus has no species native to the western hemisphere. It is probably this same plant which is advertised by Bridgeman as *Belvédere Kochia*. There is no genus called *Belvédere*. The French popular name for this plant is *Belvédere*, and it is a native of Europe and northern Asia. Bridgeman, however, says the fls. are yellow, and gives the height as 3 ft., while Voss (Vilmorin's *Blumengärtner*) says it is 3-5 ft. high or more. Voss advises a clay soil and sunny position, and since it likes a salty soil recommends that about an ounce and a half of saltpetre be sprinkled over each square yard of soil. This plant is used abroad as a "foliage plant," because of the vivid color of the whole plant from July to September.

The seed may be sown indoors in April, and the plants set out in May, or the seeds may be sown in the open ground about May 1. The plants should stand about 2 ft. apart.

Kochia is a polymorphous genus of about 30 species of herbs which are often woody at the base; lvs. often minute and narrow, alternate, more or less silky, rarely glabrous; fls. small or minute, sessile, solitary or clustered in the axils of the lvs.; calyx enlarging into a flask-shaped body, which incloses the fruit; perianth orbicular; lobes 5, incurved and bearing horizontal wings on the back or on the tube which are membranous or scarious, distinct or confluent; stamens 5; filaments short or long and compressed; stigmas 2, rarely 3.

scoparia, Schrad. MOCK CYPRESS. SUMMER CYPRESS. Erect, much-branched, densely pyramidal; branches striate, slender, and close to the main stem; lvs. linear-lanceolate, ciliate, 2-3 in. long, 2-4 lines wide; fls. inconspicuous, green; perianth in fruit provided with very short, triangular, pointed appendages.

KELERIA (Georg Ludwig Kœler, professor of natural history at Mainz, published in 1802 a description of the grasses of Germany and France). *Gramineae*. This includes a tufted, perennial grass sometimes offered by collectors of native plants. Wilfred Brotherton suggests its cultivation for ornament in dry, silvery sand. It is a very variable plant, growing 1-2 $\frac{1}{2}$ ft. high, erect and unbranched, and has shining spikes. The genus contains about 15 widely scattered species, and its nearest cultivated allies are *Eatonia* and *Molinia*, which are discriminated elsewhere. Important generic characters are the spicate panicles, which are cylindrical or somewhat interrupted; flowering glumes more or less hyaline-scarious, blunt, or tipped with a mucro or rarely a short awn.

cristata, Pers. Stems rigid, pubescent just below the panicle; sheaths often shorter than the internodes,

smooth, scabrous or hirsute; lvs. 1-12 in. long, flat or involute; spikelets 2-5-fld. July-Sept. Widely distributed in N. Amer. in sandy and prairie soil. B.F. 1:194.

W. M.

KELREUTERIA (Joseph G. Kœlreuter, 1733-1806, professor of natural history at Karlsruhe). *Sapindaceæ*. An arborescent genus of about 3 species occurring in China and Japan, one of which is *K. paniculata*, a medium-sized, irregular, round-headed tree, 25-30 ft. high, with large, compound, irregularly toothed lvs., yellow fls. in July and large, bladdery fruits in panicles in autumn. It is hardy in Mass., although single limbs are occasionally killed back in winter. It also endures dry weather and hot winds in the West. It is of easy culture, but requires a fairly rich soil. As an ornament it may be used as a single specimen, though not a particularly refined tree, or it may be mixed with other genera in the woody border. It is prop. by seeds, which it ripens early and freely, by layers in autumn, by cuttings of the young branches in spring, and by root-cuttings.

paniculata, LAMX. (*Sapindus Chinensis*, Murr.). VARNISH TREE. Lvs. deciduous, alternate, 12 in. long, unequally pinnate, without stipules; fls. ovate, largely and irregularly dentate, glabrous, in 4-7 pairs, opposite and alternate; fls. yellow, $\frac{1}{2}$ in. long, in large, upright, terminal, many-fld. panicles; sepals 5; petals 3-4, hypogynous, irregular, each claw with a scale-like appendage, the disk enlarging before each petal; stamens 5-8; ovary oblong, pubescent, becoming a 3-lobed, 3-celled bladdery, inflated, triangular pod, $1\frac{1}{2}$ -2 in. long, usually red, becoming brown, borne in large, erect panicles. G.C. III. 2:561. Gng. 2:353 and 8:219. Gn. 32, p. 378.

K. bipinnata, Franch. A vigorous tree, 60 ft. high, with doubly pinnate lvs. over 2 ft. long, growing in W. China. R.H. 1888, p. 303. Ga. 34, p. 305.—*K. Japonica*, Sieb. A more branched form with deeply cut lvs. and smaller fruit, but not specifically distinct from *K. paniculata*.

A. PHELPS WYMAN.

KENIGA. See *Alyssum*.

KOHLRABI (*Brassica oleracea*, var. *cavo-rapa*). Fig. 1212. This plant exhibits a remarkable variation from the normal form of the specific type, as represented by the cabbage. A prominent writer on vegetables, referring to the botany of the plant, says: "It comes between the cabbage and turnip." Had this reference been made to the edible portion it would be literally true. In the turnip the edible part is the swollen root; in the cabbage it is the fleshy and tightly curled leaves, while in the Kohlrabi it is the globular enlargement midway between root and top. This plant is mainly grown for cattle food. It is but little known in America. In France and Germany its usefulness is generally recognized. In Italy the partially developed stems are used as substitutes for cauliflower and cabbage. It is not likely that as a cattle food it will grow in popularity in this country, as rape is better adapted for sheep-grazing purposes, and turnips can be grown with equal ease and kept through winter with greater satisfaction. Its treatment in the garden is essentially that of early cabbage. The plants are very hardy. For very early crop it is desirable to start them in a hotbed. If properly hardened off, they may be set out as soon as the frost is out of the ground. Plant and cultivate like early cabbages. The seed of main field crop may be sown directly in the hill. The rows should be $2\frac{1}{2}$ ft. apart, and the hills 2 ft. apart in the row. Several seeds are planted in each hill, and all plants pulled out but one, after danger of destruction by flea-beetle is over. Many growers in the western states follow this plan in growing late cabbages, as well as kale and brussels sprouts. The seed may be planted, according to locality, from May 10 to June 20. When the plants are grown in the seed bed the treatment is essentially the same as that described under *Cabbage*. In northern regions, only the early varieties should be grown on account of the slowness of the plant in maturing. No special effort seems to have been made to develop many distinct varieties of Kohlrabi. The two leading types are the Purple and the White Vienna, which mature sufficiently for table use in $2\frac{1}{2}$ -3 months from time of sowing seed; the common white requires 3-4 months to reach edible size, and much longer to attain maturity. Where corn is largely grown as a cattle

food, the culture of Kohlrabi is not likely to extend. Viñuorin describes Arichoke-leaved and Neapolitan. Other varieties are Erfurt, Goliath, Green, Imperial, Late Purple, Purple Vienna, Short-leaved Vienna, White Forcing, and White Vienna. Persons who like turnips will also like Kohlrabi. The almost universal error in using it is to allow the tubers to get too large. When they are partially grown they are soft and palatable. Cabbage worm and clubroot are the most important enemies. Consult, also, *Brassica* and *Cabbage*.

JOHN CRAIG.

Kohlrabi may be grown, bunched and put on the market in exactly the same manner as early table beets are handled. In our eastern cities, where the population consists to a large extent of people of German extraction, Kohlrabi for table use is in good demand, or such a demand as is easily cultivated. We find it an easy crop to grow, and invariably profitable, simply because few gardeners make a specialty of it. As early in spring as the ground can be brought into best shape, sow seed in rows with the drill, the rows to be about 18 inches apart, and afterwards thin the plants to stand 4 to 6 inches apart in the rows. Begin pulling and bunching when the bulbs have attained a size of 2 to 3 inches in diameter. Make successional sowings to keep up a continuous supply of the tender bulbs. They grow tough when nearing full development and maturity. Plants often winter well on their summer stems, and seed may be grown from them.

T. GREINER.

KOLA. See *Cola*.

KONJAK. See *Conophallus Konjak*.

KRAÜSSIA (C. F. F. Krauss, of Stuttgart, collected plants at the Cape, and wrote on South Sea corals). *Rubiaceæ*. *K. lanceolata* is a shrub cultivated in southern Florida, bearing small white fls. in axillary, many-fld. cymes $\frac{1}{2}$ in. or more long. *K. coriacea* of the trade will be found under *Trichostema*, an allied genus, in which the fls. do not have a densely bearded throat, as in *Kraussia*, but are quite glabrous. *Kraussia* has 3 species of shrubs from the Cape of Good Hope; lvs. opposite, short-stalked, entire, leathery, elliptical or lanceolate; stipules short, persistent, grown together into a small cup; corolla broadly funnel-shaped; lobes 5; ovary 2-celled; berry pea-shaped, 1-3-seeded. E. N. Reesner writes that the *Kraussias* have been frozen so many times in Florida that he has never seen them in flower.

lanceolata, Sond. Branches yellowish, 4-grooved; lvs. lanceolate, acuminate, 3-3 $\frac{1}{4}$ in. long, 8-10 lines wide; filaments exerted, nearly as long as the anthers; stigma 2-cut, one-third as long as the style.

KRIGIA (David Krig or Krieg, an early collector in Maryland and Delaware). *Compositæ*. Five species of hardy herbaceous plants, annual and perennial, yellow-fld. and sometimes called "Dwarf Dandelions." They differ from the common dandelion in having a pappus composed of both chaff and bristles, instead of bristles alone. They are natives of the Atlantic states. Three perennial species are cult. by dealers in native plants. These have heads about 1 in. across and 15-20



1212. Kohlrabi

ppang bristles. Unlike the common dandelion, these plants do not become weedy.

A. *Stem a leafless scape, bearing 1 head.*

B. *Has tubers.*

Dandelion, Nutt. Height 6-18 in.: lvs. lanceolate or almost linear, varying from minutely toothed to pinnatifid. Apr.-June. Moist ground, Md. to Fla. and Tex. —The only kind that has tubers.

BB. *Has no tubers.*

montana, Nutt. (*K. Dandelion*, var. *montana*, Chapman). Height 9-12 in.: lvs. oblong to linear, varying from entire to pinnatifid; head smaller than in *K. Dandelion*. Crevices of rocks, Alleghenies, N. and S. Car. and Ga. —Harlan P. Kelsey writes that this is an admirable rock plant, thriving in any soil or situation, and blooming profusely from March to June or July. Prop. by seed or division.

AA. *Stem 1-3-ld., branched above, bearing 2-6 heads.*

amplexicaulis, Nutt. (*Cynthia Virginea*, Willd.). Height 12-24 in.: lvs. oblong or oval, obtuse, entire or repand and denticulate, or the root-lvs. somewhat lyrate; stem-lvs. partly clasping. May-Oct. Moist banks, N. Y. to Ga., west to Colo.

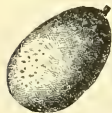
KRYNITZKIA (Prof. J. Krynitzki, of Cracow). *Boraginaceae*. Chiefly North American herbs, annuals and some perennials, with small fls. nearly always white. Two species have been listed in eastern catalogues, and are procurable from western collectors. The following descriptions give some idea of what the plants are like, and for specific distinctions from numerous allies the student is referred to Gray's "Synoptical Flora."

glomerata, Gray. Biennial, coarse, grayish prickly-hirsute, 1-3 ft. high; lvs. spatulate or linear-spatulate; fls. white, thyrsoid-globose. Plains, along eastern base of Rocky Mountains.

barbigera, Gray (*Eritrichium barbigerum*, Gray) Hirsid and hirsute, 9-12 in. high; lvs. linear; fls. white in solitary or panicle, elongating spikes. S. Calif.

KUDZU VINE. *Pueraria Thunbergiana*.

KUMQUAT or **KINKAN**, of the Japanese, is a dwarf member of the citrus tribe (*Citrus Japonica*), seldom growing more than 6 or 8 ft. high on the most vigorous stock, and when worked on a dwarf stock making but a good-sized bush; but no matter what its size may be, it freely produces very pretty golden yellow fruit, which is very palatable either in a fresh state or preserved. The plant may be budded or grafted on any citrus stock—orange, lemon, lime, etc.—but is most commonly worked on *Citrus trifoliata*, making but a bush, eminently adapted for growing in restricted places, both in- and outdoors. As a



1213. The oblong Kumquat ($\times \frac{3}{4}$).

pot-plant for the house it is a gem, making a very handsome evergreen bush and blooming freely through the spring or early summer, then setting its interesting fruit. The flowers are much like the orange, white and scented, but smaller. The soil best adapted to the Kumquat is a light loam or sand; it thrives in any soil suited to the orange or lemon.

There are two well-defined varieties of this species, the oblong and round fruited; the oblong fruit (Fig. 1213) is about $1\frac{1}{4}$ inches long by 1 in diameter, and the fruits of this variety are almost of an exact size, not



1214. Round Kumquat ($\times \frac{1}{2}$).

so much variance being noticed among them as in hens' eggs. On the contrary, the round fruits (Fig. 1214) are produced with great difference in size, varying from $\frac{1}{4}$ to a full inch in diameter. There is also some difference in flavor and thickness of skin between the varieties, the oblong being more esteemed. For an account, with illustrations of the two types of Kumquat, see A. G. 21:345 (1900). The fruit, when eaten out of hand, is entirely consumed, excepting the few small seeds; almost everyone tasting it seems to relish the combined flavor of skin, pulp and juice. Its chief use, however, is in making marmalade or preserves. The fruit is used whole in heavy syrup, and makes a delicious dainty. It is also candied and used in fine confectionery.

E. N. REASONER.

KYDIA (Col. Robert Kyd, founder of the Calcutta Botanic Garden, died 1794). *Malvaceae*. Three species of oriental trees, one of which is cult. in S. Fla. and S. Calif. *K. calycina* has white or pink fls. somewhat like those of Hibiscus, and borne in long panicles. This genus belongs to a subtribe characterized by having 2 or more ovules. Kydia has 4-6 bractlets; Abutilon none; Sphaeralcea 3. Kydia has fls. polygamous; petals 5; staminal tube divided about the middle into 5 divisions, each bearing 3 anthers, which are imperfect in the pistillate fls.

calycina, Roxb. Tree, attaining 25 ft.: lvs. 4-5 in. long, 3 in. wide, rounded, cordate, palmately 7-nerved, more or less lobed, midlobe longest, close felt beneath; petiole 1-2 in. long; inflorescence much-branched, many-fl.

L

LABELING. Figs. 1215-1218. The characters demanded in a good plant label are legibility, convenience, durability and a reasonable cheapness. The purposes for which labels are needed by the horticulturist may be grouped as follows: (1) For pots, boxes, frames and benches; (2) for stock in storage or transit; (3) for rows, plots or beds in garden, nursery, orchard, etc.; (4) for individual trees, shrubs and plants.

Of the materials that may be used for labels, wood holds the first place, and the soft, easily worked nature of white pine makes this the favorite, though other more durable woods, such as cedar, cypress, spruce and mulberry, are used to some extent. Machine-made, ready painted wooden labels of convenient shapes and sizes, from 4 to 12 inches in length, (see 1, Fig. 1215) are carried in all stocks of gardeners' supplies, and are in common use in all work with plants in pots, boxes, benches, etc., and to some extent in out-of-door gardening; but these should not be trusted when the label is expected to endure for a considerable time. In the storage of grafts and cuttings in pits or cellars, two of these labels should be written and slipped together under the tie, the outer one for immediate reference and the under and protected one for security when the other becomes defaced.

Notched or perforated labels (2, 3, Fig. 1215), with or without wires, are also prepared for nurserymen's use, those strung with soft copper wire being the best. These are used in the shipping of nearly all trees and shrubs, and here great annoyance would be saved if all names were written distinctly and with a heavy impression. If such labels are used on stock after planting, the grower should use great care that stems and branches are not choked by the wire. The printing of any desired names may be procured on order, effecting a great saving of time and a gain in distinctness.

For marking rows, plots, etc., stakes should be used large enough to readily attract attention and not be broken over or moved in cultivation. A very serviceable stake for nurseries, trial grounds and gardens is made by cutting 2 inch pine or cypress plank 2½ inches wide and 2 feet long, pointing and giving two good coats of paint. Inscriptions may be stenciled on these as suggested in 4, Fig. 1215, written with a heavy pencil, or better, when names, dates and list or plot numbers are wanted, written on a square of sheet zinc and fastened to the face of the stake with small nails. (No. 5.) An annual coat of paint obliterates old lettering and preserves the wood.

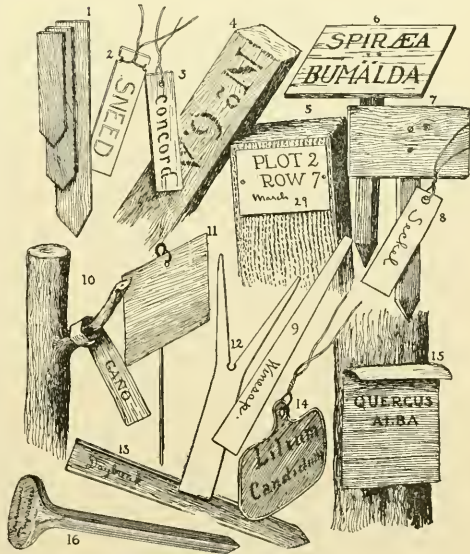
A common wooden label for borders, groups or specimen plants is shown by No. 6 and a variation by No. 7. The stakes should be of some durable wood, and the whole well painted. A paint of pure lampblack and oil is the most indestructible that we have, and letters of this will stand out like type after the lead paint and the very wood surface have weathered away from them. An effective contrast is obtained by painting the face of the label black and doing the lettering in white.

For more permanent labels in a variety of forms, sheet zinc has proved superior to all other materials. It may be stamped with steel letter dies or written upon with a common lead pencil, but more commonly a chemical ink is used. The common formula for this in horticultural books is substantially that prepared by the French chemist, Brainnot, in 1837, and is as follows: Take two parts by weight of verdigris (acetate of copper), two of sal ammoniac (ammonium chloride), one part of lampblack and thirty parts of soft water.

The chemicals should be incorporated with a little of the water, and the balance added. Keep in a glass bottle tightly corked and shake frequently while using, as the lampblack tends to separate. The zinc, cut in the desired forms, should be prepared by scouring slightly with emery dust or fine sand paper. The ink may be applied with a quill or coarse steel pen, but a fresh one will be needed with each batch of labels. Inks of an aqueous solution of chloride of copper or of chloride of mercury are also recommended for writing on zinc, which should first be cleaned with a weak solution of muriatic acid. Bichloride of platinum is one of the blackest inks for zinc. A slightly oxidized zinc surface may be written upon with a soft lead pencil, and while the inscription will not be very distinct at first will grow more so with age, and will endure for years.

A wired zinc label, as shown in 8, Fig. 1215, if exposed to the wind will sometimes cut out the eye completely, unless care is taken to twist the wire up tightly. Strips of zinc five-eighths of an inch wide and 7 inches long (9, Fig. 1215), coiled loosely around a branch, as in No. 10, are the most serviceable form of tree label, but even these should be noticed every year, that they do not become fastened into the fork of a rapidly-growing tree.

For borders or beds of herbaceous perennials, bulbs, and the like, the label shown in No. 11 is excellent and inexpensive. A piece of galvanized wire Nos. 6-8 in size, is cut 1½ to 2 feet long, bent to shape and the written zinc tablet closed in. For a more conspicuous label, the zinc may be given a coat of white lead, then one of black enamel paint, and the letters be traced in white. In some European botanical gardens a zinc tablet stamped with sunken letters brought into relief by paint are used for similar purposes. A zinc label, with two wire legs to



1215. Various types of labels.

prevent it from turning around, is shown in Fig. 1216. It can be made for about \$2 per hundred, with the face $3\frac{1}{4} \times 1\frac{1}{2}$ inches.

There are many designs of expensive cast or enameled metal or porcelain labels, that have found little use in this country. A label of stamped zinc of English manufacture (shown in Fig. 1215) is one of the best garden labels. For labeling specimen tree trunks, a sheet of zinc or copper with a little water-jedge bent at the top, painted, enameled black and lettered in white, is about the best thing we have. It should be secured with copper tacks, and given occasional attention. (See No. 15.) The white bronze tree tablets with letters cast in relief have so far failed to secure general introduction. A series of thin sheet-copper labels, to be written on with a stylus against a soft, yielding surface, as a piece of leather, are shown in Nos 12, 13, 14. These have proved too frail for exposed out-of-door use, but are very good for conservatory plants, orchards, etc., though the inscription needs rather close examination. In making copper labels, the



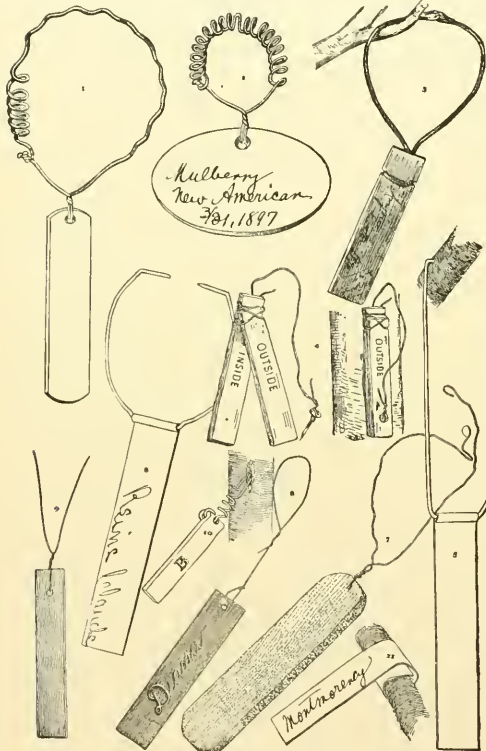
1216. A metal garden label.

temper should be taken out and the metal folded on the edges. A neat label for conservatory use is made of white sheet-celluloid with a mat surface, as pencil marks show very plainly on it.

Bailey describes (in "Principles of Fruit-growing") the tree labels shown in Fig. 1217. "1, 2, German labels, made of glazed earthenware, with the name colored blue and sunken. Strong copper wire, coiled, to allow of the growth of the limb, holds the label to the tree. 3, Cornell label, made of wood. 4, double wooden label, consisting of two common wooden labels fastened together. The name is written on the outside of the double label, as in any other label, but it is also written on the inside to insure permanence. When the outside writing is worn off, the label is opened and the inside is still bright. The label is fastened to the tree by a tack or small nail, as shown in the cut at the right. The label is seen opened in the cut at the left. 5, 6, zinc labels, used at the New York State Experiment Station, Geneva. The wire is driven into the tree, and the name is written or printed on the zinc with black



1218. Paddock's vineyard label.



1217. Tree labels of many patterns.

paint. 7, common hand-made wooden tag, taken from an old tree in the test orchard of the late Charles Downing, Newburgh, N. Y. 8, thin copper label, with the name indented into the metal by the use of a hard-pointed instrument. Some metal labels are liable to tear out at the hole when exposed to winds. 9, common painted pine label used by nurserymen, and costing (without the copper wire) about 25 cents per thousand for the common size, which is $3\frac{1}{2}$ inches long. 10, Lodeman's label, used somewhat at Cornell, consisting of a tag of sheet lead securely fastened to a coiled brass wire. The wire is secured to the body of the tree by a staple or screw-eye, and it is expected that the wire will become imbedded in the trunk as the tree grows. No. 11, common zinc label or tally." A good vineyard label is shown in Fig. 1218, described by Bailey as follows: "The figure is Paddock's vineyard label (designed by W. Paddock, State Experiment Station, Geneva, N. Y.). The label is a strip of heavy zinc secured to a stiff galvanized wire. This wire or shank is provided with a hook at the lower end and a half-hitch near its middle, so that it can be securely adjusted to the wires of the trellis, holding the label well above the foliage."

S. C. MANON.

LABLAB BEAN. See *Dolichos*.

LABRADOR TEA. See *Ledum*.

LABURNUM (ancient Latin name). *Leguminosae*. Including *Podocytisus*. GOLDEN CHAIN. Ornamental shrubs or small trees, with alternate trifoliate petioled lvs., and yellow papilionaceous, showy fls. in many-fl'd., usually pendulous racemes. *L. alpinum* is hardiest, *L. vulgaris* is almost hardy in Mass., while *L. Carananicum* is tender. They are adapted for planting on rocky slopes or in borders of shrubberies, when they should be allowed enough space to show to the best advantage their graceful, drooping racemes of golden fls., which contrast with the dark green foliage. They are hardly ever attacked by insects or fungi. The lvs. fall late in autumn without changing color. They thrive in any kind of well-drained soil, including limestone, and grow as well in

partly shaded positions as in sunny ones. Prop. by seeds, sown usually in spring, and also by layers; the vars. are mostly grafted or budded on seedlings of one of the species. Three species in S. Europe and W. Asia, often included under *Cytisus*. Lvs. exstipulate; fls. slender-pedicelled, in terminal simple racemes, mostly pendulous; calyx 2-lipped, with obtuse, short lips; corolla papilionaceous, with the petals all distinct; ovary stalked; fr. a linear pod with several seeds, compressed, tardily deliquescent; seed without appendage at the base. All parts of the plants are poisonous, especially the young fruits. The hard, tough and close-grained wood is susceptible of a very fine polish, and is manufactured into various small articles. Consult *Cytisus*, *Genista* and *Petteria* for names not found in this genus.

vulgare, Griseb. (*L. anagyroides*, Medic. *Cytisus Laburnum*, Linn.). GOLDEN CHAIN. BEAN TREE. Fig. 1219. Large shrub or small tree, to 20 ft., with erect or spreading branches; branchlets appressed-pubescent, grayish green; lvs. long-petioled; fls. elliptic or elliptic-ovate, usually obtuse and mucronulate, glaucous-green and appressed-silky pubescent beneath when young, 1-1½ in. long; racemes silky-pubescent, 4-8 in. long; fls. about ¼ in. long; pod appressed-pubescent, with thick peel, about 2 in. long; seeds black. May, June, S. Europe. Gn. 25, p. 518; 34, p. 30, and 51, p. 302.—There are many garden forms, as var. **atereum**, Hort., with yellow foliage, F.S. 21:2242-43; var. **bulbatum**, C. Koch (var. *incolatum*, Hort.), with curled

alpinum, Griseb. (*Cytisus alpinus*, Mill.). SCOTCH LABURNUM. Shrub or tree, to 30 ft., similar to the former: branchlets glabrous or hirsute when young; fls. usually elliptic, acute, pale green and glabrous beneath or sparingly hirsute, ciliate, 1-1½ in. long; racemes long and slender, glabrous or sparingly hirsute; fls. smaller; pod thin, with the upper suture winged, glabrous; seed brown. June. Als., S. Europe. B.M. 176 (as *Cytisus Laburnum*). (Gn. 25, p. 519 and 34, p. 30). This species flowers about two weeks later than the former, and has much longer and more slender racemes; it also is of more upright and stiffer growth and hardier.

Watereri, Dipp. (*L. Pirkstii*, Hort. *C. alpinus × vulgare*, Wittst.). Hybrid of garden origin, but found also wild. Lvs. beneath and racemes sparingly pubescent; racemes long and slender; pod with narrow wing, sparingly appressed-pubescent.—As hardy as *L. alpinum* and sometimes considered to be a variety of that species.

Adami, Kirehn. (*C. Adami*, Poit. *C. Laburnum purpurascens*, Loud. *L. vulgare × Cytisus purpureus*). Probably graft-hybrid, originated at Vitry, near Paris, about 1826. Habit and foliage usually almost like *L. vulgare*, but fls. dull purplish, rarely yellow; sometimes bearing a few branches with the fls. and lvs. of *Cytisus purpureus*. A very interesting form, but of less ornamental value. B.K. 23:1965. B.H. 21:16-18.—Much discussed by Darwin and others as an example of graft-hybridism.

L. Caramanicum, Benth. & Hook. (Podocytisus Caramanicus, Boiss.). Erect shrub, to 4 ft., much resembling in foliage and habit the *Cytisus sessilifolius*, with long and slender terminal upright racemes. July-Sept. Asia Minor. R.H. 1861, p. 410.—*L. fragrans*, Griseb., *L. ramentaceum*, C. Koch, and *L. Weldenii*, Laval.—=*Petteria ramentacea*.

ALFRED REHDER.

LABYRINTHS or mazes are still kept up in some Old World gardens as relics of the past. They were popular in the sixteenth and seventeenth centuries. Fig. 1220 is the plan of an English Labyrinth of two centuries ago. It would be vandalism to destroy so fine an example of a style of gardening no longer fashionable, but folly to copy it in a modern garden. Mazes are made of clipped evergreens of various kinds.

LACÆNA (one of the names of Helen, which Lindley states may be applied to this plant on account of its beauty, a compliment which the plant does not at all merit; but he adds it may also be derived from *Lakis*, a cleft, alluding to the divisions of the lip, but this derivation is impossible), *Orchidaceæ*. A little-known genus containing only 2 species inhabiting Central America. Pseudobulbs rather long, ovoid, smooth at first; lvs. large, elliptic-pointed and contracted into a petiole, plicate venose; raceme pendent from the base of the pseudobulbs, loose, bearing up to 10 medium-sized fls.; sepals and petals nearly equal, elliptical, half-spreading; labellum equaling the petals, articulated to the base of the column, clawed, with the lateral lobes incurved, terminal larger, spreading and narrowed at the base to a broad claw; column rather long, winged, hooded at the top; pollinia 2 on a simple stipe.

The plants should be grown in baskets or on blocks of wood like Stanhopeas; if potted the racemes are likely to bury themselves in the soil. At the end of October water should be almost entirely withheld for a few weeks. The flower-stalks appear in spring.

bicolor, Lindl. Racemes drooping, about 18 in. long, bearing 9 or 10 fls. The fls. are greenish yellow, covered externally with short hairs; petals with 3 purple streaks; labellum hairy, spotted with purple. Discovered about 1843 in Guatemala, at an elevation of 7,000 ft. B.R. 30:50.—Var. **glabrata**, Lem. Fls. everywhere nearly glabrous, creamy white. Not in the American trade. I.H. 1:33.

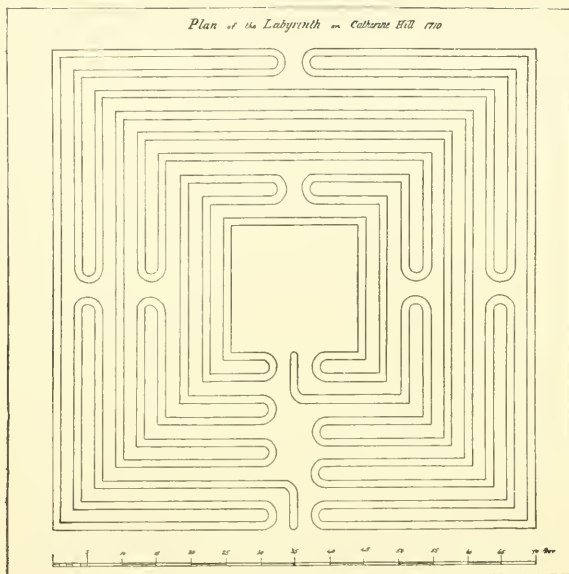
spectabilis, Reichb. f. Fls. about 1 in. in diam., whitish, suffused with pink and speckled with purple; sepals concave orbicular; petals smaller connivent. B.M. 6516.—Far more handsome than the former, but not advertised in America.

HEINRICH HASSELBRING.



1219. Golden Chain, *Laburnum vulgare* (×½).

fls.; var. **Carliëri**, C. Koch, with very small and narrow fls. and long and slender racemes; var. **pendulum**, C. Koch, with pendulous branches, Gn. 25, p. 522; var. **quercifolium**, C. Koch, with sinuately lobed fls., Gn. 25, p. 520 and 34, p. 30; var. **sessilifolium**, C. Koch, with crowded, sessile lvs.



1220. The maze on St. Catherine's Hill, Winchester, England.
From a plan made in 1710. (See Labyrinths, p. 865.)

LACHENALIA (Werner de Lachenal, 1796-1800, professor of botany at Basel), *Liliacae*. CAPE COWSLIPS. Lachenalias (Fig. 1221) are Cape bulbs that are easily flowered in a cool greenhouse in early spring or even in winter. They have a remarkable range of color, and with good management may be kept in an attractive condition for two months or more. There are species with bell-shaped flowers, and some in which the flowers are all more or less erect, but the favorite types are the long, cylindrical, pendulous flowers with the brilliant red and yellow colors. Of the 42 species, about 9 are cult., the most popular being *L. tricolor*, particularly its var. *Nelsoni* and some of the recent forms with personal names. *L. pendula* is perhaps second in popularity, the rest being known chiefly to bulb fanciers. Lachenalias are very distinct in coloring and general appearance. They usually have 2 leaves (sometimes 5 in cult.), rarely 1, and the bulbs are globose, truncated, and about $\frac{1}{2}$ -1 in. thick. An exceptionally strong bulb, under the most favorable conditions sends up 3 or 4 erect flower-stalks 9 in. high, with as many as 40 flowers, each 1-1 $\frac{1}{2}$ in. long. Under careless treatment the leaves and flower-stalks are weaker, and bear perhaps 6-12 flowers. Lachenalias are fine subjects for hanging baskets.

This genus is also interesting when studying the evolution of the perianth. In our common lilies the 6 segments are all the same size and all colored like petals. Lachenalia has only 1 species in which the segments are practically equal. The others vary wonderfully, but usually the inner segments are longer, and sometimes the outer segments are small and more or less greenish, thereby suggesting the division of perianth into calyx and corolla. The genus is monographed in English by Baker in the sixth volume of *Flora Capensis*, which contains all the Cape bulbs and should be in the hands of every bulb specialist.

It should encourage the amateur to know that the recent improvement of Lachenalias is largely due to two

English amateurs. *L. Nelsoni*, the first and one of the best hybrids, was raised, not in a greenhouse, but in a home window, by the Rev. John Nelson. Four fine hybrids, raised by T. H. Marsh, are shown in Gn. 46:981, where their parentage is given. *L. Nelsoni* has played an important part in the production of these hybrids, Ruby, Cawston Gem, Little Beauty and Topaz, all of which are in the trade.

W. M.

It is well to make one job of it, planting Freesias and Lachenalias together. Six are planted in a 6-inch pot, in good rich loam. They probably do as well without leaf soil, if the drainage be good. They are stored in a well-protected coldframe until late in November, but might be kept longer as a pinch of frost will not hurt them. After they are brought into the greenhouse, and make good growth, plenty of water may be given, and, occasionally, liquid manure. A night temperature of 50° F. will be found about right, but they scarcely bear forcing until the flowering scapes show. If forced before the buds show, the flowers are often malformed. With good management they remain in bloom from six to eight weeks.

After blooming, the plants should be set on a shelf in a light position and watered as carefully as before the blooming season, less water being given as signs of maturity appear; viz., discolored leaves and withered flower-stems. When thoroughly ripened, they are stored in the pots they have grown in and kept quite dry until the month of August. They must be repotted then. If by chance drip should strike the soil, the plants may be found starting into growth. The bulbs multiply rapidly, more than doubling in a season. Fully one-third of the extra bulbs will be serviceable, and still more would make bloom of less decorative value. There are many more—bulbets—which can be sown on the borders of carnation or violet benches, a large number making good-sized bulbs in one season. Seeds of Lachenalias germinate readily in a few weeks, and with good treatment many seedlings will bloom before going to rest. In the opinion of the writer, *L. Nelsoni* is still the most satisfactory kind to grow.

T. D. HATFIELD.

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aurca, 6.	orchioides, 2.	reflexa, 1.
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glauca, 3.	pastulata, 7.	unifolia, 9.
luteola, 6.	quadricolor, 6.	violacea, 7.
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A. Base of perianth oblique 1. reflexa
AA. Base of perianth equally rounded.

B. Form of perianth more or less cylindrical.

C. Fls. all erect or at most spreading.

D. Length of perianth 4 lines... 2. orchioides

ED. Length of perianth 6-9 lines... 3. glauca

CJ. Fls. drooping or pendulous, at least the lower ones.

D. Inner segments scarcely longer than the outer 4. pendula

- DD. Inner segments 2-3 lines longer than the outer..... 5. *rubida*
 DDD. Inner segments 3-4 lines longer than the outer..... 6. *tricolor*
 BB. Form of perianth bell-shaped.
 C. Lvs. pustulate, i. e., covered with blister-like elevations.
 D. Inflorescence spicate..... 7. *pustulata*
 DD. Inflorescence racemose..... 8. *pallida*
 CC. Lvs. not pustulate..... 9. *unifolia*

1. *reflexa*, Thunb. Lvs. clasping the base of the stem for 1-2 in.; spike usually few-fl.; fls. all erect or spreading, yellowish.

2. *orchoides*, Ait. Lvs. strap-shaped, often spotted, 1 in. wide, clasping the base of the stem; fls. white, yellow, red or blue. B. M. 834 and 1269. L. B. C. 11:1076 (as *L. nutabilis*). "The most striking color forms," says Baker, "are *atroviolacea*, hyacinth blue; *virenti-illava*, greenish yellow, and *nutabilis*, inner segments dull yellow, tipped red-brown."

3. *glaucina*, Jacq. Lvs. as in No. 2; fls. long, white-red, yellow or tinged blue. B. M. 3532 (wonderfully varied in color). B. R. 16:1350 and 23:1945.

4. *péndula*, Ait. Bulb globose, about 1 in. thick; peduncle 6-12 in. long, more robust than in Nos. 5 and 6; raceme few- or many-fl., 2-6 in. long, all except the upper fls. more or less nodding; outer segments yellow, passing upwards into red, not spotted; inner bright red-purple at the tip. B. M. 590. Gn. 18:241; 23, p. 142; 33, p. 249, and 45, p. 355. F. 1871:265. V. 8:172. Var. *Aureliana* has outer segments red, barely tipped yellow; inner ones tipped green. R. H. 1890:396. G. C. 111. 23:195.

5. *rubida*, Jacq. Bulb about 1/2 in. thick; peduncle 6-9 in. long; fls. spotted; raceme 6-20-fl.; outer segments bright red, tipped green; inner ones yellow below the tip.

6. *tricolor*, Thunb. Lvs. often spotted; lower fls. nodding; outer segments yellow, tipped green; inner purplish red at the tip. L. B. C. 8:767. B. M. 82. F. 1871: 265. Gn. 18:241 and 47, p. 163. Var. *quadricolor* (*L. quadricolor*, Jacq.), perianth with a red base and greenish yellow middle; outer segments tipped green; inner ones tipped red-purple. L. B. C. 8:746. Var. *lutcola* (*L.*

tinged green. Gn. 49, p. 470. Gng. 5:262. J. H. 111. 30:231. Var. *aurea*, Hook. (*L. aurea*, Lindl.), perianth bright orange-yellow. F. 1871:265. B. M. 5992. — "The varieties are connected by intermediate stages. Several hybrids between *L. pendula* and the varieties of *L. tricolor* are in cult., the finest of which is *L. Camii*, Hort., which combines the bright yellow fls. of *L. aurea*, with the habit of *L. pendula*."

7. *pustulata*, Jacq. Lvs. lanceolate; fls. white or faintly tinged red. B. M. 817. Perhaps synonymous with No. 8. Var. *violacea* is cult.

8. *pállida*, Ait. Lvs. strap-shaped; fls. white; outer segments tipped green. B. M. 1372.

9. *unifolia*, Jacq. Differs from all described above in having only one leaf, which is linear to awl-shaped, and has a band of brown at the base; fls. white, or more or less tinged with red or blue. B. M. 766.

L. viridis, Thunb., is *Dipcadi flamentosum*, which is distinguished from the species of *Lachenalia* by having 3-6 lvs., which are linear; raceme very lax; fls. bright green. Caps. In *Dipcadi* the outer segments usually have a tail, which is lacking in *Lachenalia*; and the seeds of *Dipcadi* are strongly compressed, while in *Lachenalia* they are obovoid or globose. *D. viride* is distinguished from all other species in its genus by the outer segments being falcate, 9-12 lines long, distinctly longer than the inner ones, which are connate; lvs. linear, not crisped, 3-6 lines broad. W. M.

LACTUCA (from the old Latin name *lac*; referring to the milky juice). **COMPPOSITE**. LETTUCE. A well-known genus of hardy annual or perennial herbs, mostly native of the northern hemisphere. More than 200 specific names have been given to the genus, probably half of which are synonyms with but only 8 or 9 known in cult., and these are doubtless forms of but 2 or 3 species. Plants 2-4 or more feet high, with alternate, variously shaped lvs. and small-paniced heads of yellow, white or blue fls. Only 1 species is to be found in the American trade, though wild plants of other species are often gathered for medicinal purposes or used as a salad. All of the species possess narcotic and sedative properties, the sedative known as lactucarium or lettuce-opium, being obtained principally from the European species, *L. virosa*. Lettuce has been known and used as a salad from a very remote period. It is said to have served at the tables of Persian kings 400 B. C. See *Lettuce*.

satlva, Linn. LETTUCE. An annual plant, not known in the wild state but generally supposed to have originated from *L. Scariola*, Linn., in Asia. There are many garden varieties assuming an endless variety of forms but which may be divided into 4 quite distinct types.

Var. **capitata**, Hort. (*L. capitata*, DC.). COMMON CABBAGE LETTUCE. Lvs. entire or sparingly dentate, broad, rounded, yellowish or brownish green, more or less wrinkled and in some garden varieties much curled, spreading, 6-14 in., usually quite compact.

Var. **intybacea**, Hort. (*L. intybacea*, Jacq. *L. quercina*, Linn.). CUT-LEAVED LETTUCE. Lvs. 6-10 in. long, deeply and irregularly cut on the edges, loosely spreading.

Var. **Romana**, Hort. COS LETTUCE. One to 2 ft. high; lvs. entire or sparingly dentate, much longer than broad, quite erect, forming a cylindrical or conical-shaped plant.

Var. **angustana**, Hort. (*L. angustana*, Hort.). Lvs. 1-2 in. wide, 6-12 in. long, entire, slightly spreading in habit.

L. Canadensis, Linn. Biennial, 4-9 ft. high; lvs. entire or nearly so. Wild plants often gathered for salad.—*L. perennis*, Linn. Root perennial, 2-3 ft. high; lvs. 8-10 in. long, deeply cut; fls. large, purple. Native of Eu.—*L. Scariola*, Linn. FRISPLY LETTUCE. Annual or biennial, sometimes 6 ft. high; lvs. 1-2 in. wide, 4-6 in. long; fls. yellow, inconspicuous. Int. from Old World, and now a widely distributed weed.

H. C. IRISH.

LADRONES. The Ladrone or Mariana Islands (Fig. 1222) lie about 1,200 miles east of the Philippines. The seventeen islands contain about 400 square miles. Guam is the southernmost of the islands, and is about as large as all the rest together. It is 600 miles from the



1221. *Lachenalia Nelsoni* ($\times \frac{1}{4}$).

lutcola, Jacq.), perianth lemon-yellow, tinged green towards the tip. L. B. C. 8:734. F. S. 18:1873. B. M. 1704 and 1020. Var. *lutcola maculata* (*L. lutcola maculata*, Hort.), differs from the preceding in having spotted foliage. Var. *Nelsoni* (*L. Nelsoni*, Hort.). Fig. 1221. Perianth bright yellow, both series of segments faintly

northernmost of the group. The Ladrone lie in an almost straight line north and south. They were captured from Spain in July, 1898, and Guam was retained by the United States chiefly as a coaling station.

The Ladrone were discovered in 1521 by Magellan in the first voyage round the world. They were the first islands in the Pacific to come into continuous contact with European civilization. The aboriginal race, the Chamorros, is extinct, and was replaced chiefly by Tagals from the Philippines. These have deteriorated.

The chief settlement is Agana, on the island of Guam, which contains a majority of the population of the whole group. The Spaniards had but one mail a year between the Ladrone and the Philippines.

The Ladrone are well wooded, but the original flora has almost vanished. None of the Pacific islands possesses any metal, or any native mammal, save a kind of bat.

The Ladrone are said to have a more agreeable climate than is common within the tropics. There is moisture at all times, but a so-called "dry season" lasts

showy fls. borne singly or in 2- to many-fl. racemes, which arise from the top of 1-2-ld. pseudobulbs. The plants greatly resemble Cattleyas, and differ only by the presence of 8 perfect pollen masses instead of 4, as in Cattleya. Lvs. oblong, coriaceous or fleshy, not plicate; pseudobulbs terminating the annual growth, ovate, clavate, fusiform or stem-like, long or short, consisting of 1 to several thickened internodes, or of slender and quill-like form with merely a small bulbous swelling at base, sheathed with scales and bearing 1 or 2 lvs. at the summit; sepals subequal, free, spreading; petals wider and sometimes longer, spreading; all usually plane; labellum free from the base of the column, more or less distinctly 3-lobed, the lateral lobes short, erect, folding over the column; middle lobe long, expanded, lanceolate-ovate, etc.; column concave in front, and thus narrowly 2-winged on the edges; pollinia 8, 4 in each locule; scape terminal, long or short, bracted.

The genus contains about 30 species, dispersed in the maritime provinces of Mexico and Guatemala and in S. Brazil. No species is common to the two widely separated regions. A single species, *L. monophylla*, inhabits the mountains of Jamaica. In their native homes the plants are often found clinging to bare rocks and trees, where they are exposed to the full force of the tropical sun, and, in the wet season, to daily drenching rains. Some of the species grow at great altitudes. Thus, *L. autumnalis*, var. *furfuracea*, is always found in alpine regions at elevations of 7,500-8,500 ft. For a list of cultivated kinds, see R. A. Rolfe, G. C. III. 7: 107, 256, 333, 355; and 8: 241, 652.

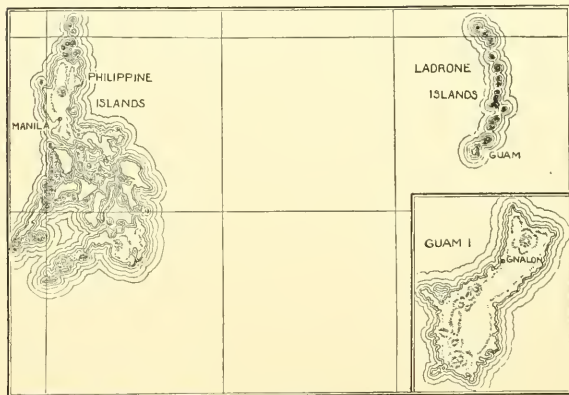
Lælia may be conveniently divided into groups, as follows:

GROUP I (species 1-10).—Pseudobulbs rounded, pyriform or ovate. The plants of this section are medium-sized, with the pseudobulbs terminating each year's growth sessile at intervals on the rhizome, and sheathed at least at first with bract leaves. The scape, except in *L. grandiflora*, is long and slender, erect, nodding or sub-horizontal, and bears at its end 1 or 2 fls. (*L. anceps*), or a raceme of 2-7 fls. (*L. albida*). *L. grandiflora*, placed here on account of its thickened pseudobulbs, bears greater resemblance to the members of the next group.

GROUP II (species 11-13).—Pseudobulbs short-cylindrical, stem-like, or swollen jointed, i. e., consisting of several internodes and sheathed with bracts. These plants are of dwarf habit, bearing 1-2 very large fls. on short scapes, so that the top of the flower scarcely exceeds the lvs., which are oblong, about 6 in. long, and leathery.

GROUP III (species 14-23).—Pseudobulbs long-oblong, fusiform or clavate, tapering below to a sheathed and jointed stalk. This group contains the largest and most showy Lælias. The pseudobulbous stems are tall and tufted, a foot or more in length, forming robust, compact, almost bushy plants. The flowering stems of *L. superbiens* are said to attain a height of 12 ft. The racemes bear 3-7 large, handsome flowers.

GROUP IV (species 24-26).—Pseudobulbs slender, reed-like and tufted, clothed with scales and often somewhat swollen at base. This group includes a few species which are very distinct on account of their bright scarlet or orange-colored fls. and slender, reed-like pseudobulbs. *L. monophylla* is perhaps the smallest of all Lælias, being scarcely over 6 in. high, with pseudobulbs about as thick as a crow-quill. One variety of *L. cinnabarina* has purple fls.



1222. Ladrone.

from June to Sept., during which time the northeast trade winds prevail. The rainfall is in most places abundant. The highest part of Guam is 1,500 feet above the sea.

The Ladrone have exported no fruit to speak of. Coconuts and bananas are perhaps the chief fruits. Guava figs and breadfruit grow well. Other products are rice, sugar, indigo, arrow-root, cotton, tobacco, and even wheat.

One of the best recent accounts of the Ladrone Islands is in Appleton's Annual Cyclopaedia for 1898. For maps of the Ladrone, see Century Atlas, and Overland Monthly 33:92. For references to recent literature, see the Cumulative Index of Periodical Literature. There is a book on the history of the Ladrone written in Spanish. It is an octavo of 210 pages published at Granada in 1886, and entitled *Historia de las islas Marianas*. The author is Luis de Ibañez y García.

LADY'S EARDROPS. Short-flowered Fuchsias. *L. Garters*. *Phalaris arundinacea*, var. *pieta*. *L. Mantle*. *Ache-milla vulgaris*. *L. Slipper*. *Cypripediums*. *L. Smock* or Meadow Cress. *Cardamine pratensis*. *L. Tresegs*. *Spiranthes*.

LÆLIA (meaning uncertain). *Orchidaceæ*. A useful and attractive genus of orchids, mostly with large,

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The following names must be sought under *Laelocattleya*: *L. amanda*, *Dominiana*, *Dormaniana*, *elegans*, *espatha*, *Ezoniensis*, *Nyleptha*, *prasiata*, *Schilleriana*, *Tarneri*.

GROUP I.

- A. *Pseudobulbs* not compressed or edged.
- B. *Fls. bright yellow* 1. *flava*
- BB. *Fls. rose, purple or white*.
- C. *Scapae scarcely equaling the lvs.; dwarf plants, with very large fls.* 2. *grandiflora*
- CC. *Scapae slender, much exceeding the lvs.*
- D. *Fls. small, white or pale yellow* 3. *albida*
- DD. *Fls. large, rose-purple; variety white*.
- E. *Lip 2-keeled* 4. *autumnalis*
- EE. *Lip 3-keeled*.
- F. *Lvs. oblong* 6. *Eyermanniana*
- FF. *Lvs. lance-linear or oblong-linear* 7. *Crawshayana*
8. *Gouldiana*
- AA. *Pseudobulbs compressed and edged*.
- B. *Lip with a broad, elevated line down the center; ovary viscose*.
- BB. *Lip with 3 keels; ovary not viscose* 10. *rubescens*
1. *flava*, Lindl. (*L. caulescens*, Lindl.). Lvs. 3-5 in. long, oblong-lanceolate, acute, very thick and stiff; scape 1 ft., erect, bearing 4-8 bright yellow fls., 2-2½ in. in diameter; sepals and petals spreading, oblong-lanceolate, obtuse or subacute; labellum not longer than the petals; middle lobe recurved, crisped and undulate, having 4 elevated ridges running down the center; lateral lobes obtuse. Autumn. Braz. B.R. 28:62.
2. *grandiflora*, Lindl. (*L. majdis*, Lindl.). Lvs. solitary, oblong, coriaceous, 6-7 in. long; fls. solitary, rarely 2, on a short peduncle, scarcely equaling the lvs., 5-8 in. across, showy, rose-lilac; sepals lanceolate, plane; petals oblong, acute, shorter and much broader than the sepals; middle lobe of the labellum large, expanded, emarginate, center white, shading to lilac at the margin, spotted with dark lilac; side lobes small, white inside, streaked with lilac. May, June. Mex. B.M. 5667. B.R. 30:30. P.M. 12:1. G.C. II. 19:628. — A magnificent orchid. Var. *alba*, Reichb. f. White. A.G. 19:109; 20:371. Var. *mayas* is advertised.
3. *albida*, Batem. Lvs. lance-linear, acute; scape twice as long as the lvs.; fls. 2 in. across, pure, transparent white except a yellow streak down the lip and a few crimson dots at its base, sweet-scented; sepals lanceolate, spreading; petals similar but broader, all very acute; labellum 3-lobed; side lobes small, erect; middle lobe large, round-ovate, reflexed. All autumn and winter. Oaxaca, Mex. B.M. 3957. B.R. 25:54. Gn. 35:695. — The first white-flowered species discovered.

Var. *sulphurea*, Reichb. f. Larger; fls. sulfur-yellow, with a rose-colored border on the middle lobe, and rose spots on the inner surface of the side lobes. Var. *bella*, Hort., ex-Williams, not Reichb. f. Fls. larger than the type; sepals and petals creamy white, faintly bordered with lilac; lip white, the middle lobe broadly bordered with deep rose and having three yellow ridges down the center. Var. *rosea*, Hort. Fls. rose-colored. Var. *mayas* is advertised.

4. *autumnalis*, Lindl. Lvs. oblong-linear, obtuse, coriaceous, 5 in. long; scape 1½-2 ft. long, 5-6-dia., with sheathing scales; fls. showy, fragrant; sepals lanceolate-acute; petals oblong-lanceolate, undulate; lateral lobes of the labellum large, erect, round-truncate, whitish; middle lobe obovate, obtuse, apiculate, recurved, deep purple; disk with two narrow yellow lamellae. In color and general appearance much like *L. anceps*, but the segments lack the green ribs. Autumn. Mex. B.M. 3817. B.R. 25:27. I.H. 1:17. P.M. 6:121. G.C. 1872:1069.

— Grows on bare rocks and stunted trees in most exposed situations, often at great altitudes. Less valuable than *L. anceps*. Var. *furfuracea*, Rolfe (*L. furfuracea*, Lindl.). This seems to be a dwarf alpine form, with the ovary more squarish and the petals unusually broad. It is always found at great elevations, occurring frequently at 7,500-8,500 ft. Intermediate forms exist. B.M. 3810. B.R. 25:26. Var. *atrorubens*, Backhouse. Pseudobulbs short; fls. large, deep rose or magenta, darker toward the ends of the segments and the labellum; base of the labellum and lateral lobes white. Gn. 17:229. Var. *venusta*, Hort. Goldring. In habit resembles var. *atrorubens*; stalk 2-3 ft.; fls. large, rose magenta. Gn. 25:438. Var. *Fournieri*, Ed. André. Fls. about 6-7 in. across; sepals recurved at the summit, purple-red; petals rhomboid, of the same color, all paler toward the base; labellum white, with the middle lobe colored like the segments. Larger than var. *atrorubens*. R.H. 1896:548. Var. *alba*, Hort. Fls. pure white.

5. *Arnoldiana*, Manda. Pseudobulbs 4-6 in. long, pyriform, deeply furcate, 2 lvd.; lvs. 5-7 in. long, leathery, lanceolate, thick and dark green; scape 1-4 ft. long, 3-11-dia.; sepals oblong-lanceolate, pointed; petals broader, ovate, all somewhat reflexed, rose-colored; middle lobe of the labellum reflexed, deep rose-purple, paler toward the center; the center with 2 yellow keels, spotted purple; lateral lobes straight, pale rose or white. A species closely related to *L. autumnalis*, from which it differs in having bulbs growing erect and rigid lvs. and in the absence of the fetid odor of *L. autumnalis* (W.A. Manda). Mex. A.F. 5:303. — Var. *Forstermannii*, Hort. Identical with the type, but has pure white fls., with a tinge of delicate pink on the ends of the segments (W.A. Manda).

6. *Eyermanniana*, Reichb. f. Natural hybrid. Pseudobulbs like those of *L. grandiflora*: lvs. oblong, acute, very leathery, 6 in. long and 2 in. broad; racemes bearing 3-4 fls. up to 4 in. across (as large as those of *L. Gouldiana*, but smaller than *L. autumnalis*), rose-purple (white suffused with bright rose crimson); sepals lance-oblong, acute; petals broadly oblong or almost round, obtuse; side lobes of the labellum oblong; middle lobe rounded, wavy, white bordered with rose and having 3 yellow keels on the disk fading to whitish on the blade, *L. autumnalis* × *L. grandiflora*, Reichb. *L. autumnalis* × *L. albida*, Rolfe. G.C. III. 4:109.

7. *Crawshayana*, Reichb. f. Natural hybrid. Pseudobulbs and lvs. as in *L. albida*: scape few-(2)-fld., long as in *L. anceps*, but thinner and with shorter, narrower sheaths; sepals and petals narrower than in *L. anceps*, of a fine amethyst color; labellum open near the column; side lobes obtuse angled, antorse, rich purple at the tips; middle lobe emarginate, abruptly blunt, lower half rich purple; throat yellow, veined with purple, 3-keeled. According to Reichb., a hybrid between *L. anceps* (?) and *autumnalis* (?) or *albida* and *anceps*. J.H. III. 30:67 (as *L. anceps* var. *Crawshayana*). The plant there figured is probably the species in question, although, according to the figure and the accompanying description, the sepals and petals are wider than those of *L. anceps*.

8. *Gouldiana*, Reichb. f. Pseudobulbs ovate, 2-lvd.; lvs. oblong-linear: scape slender, 1-2 ft. long, bearing as many as 6 deep rose-purple fls. resembling those

of *L. anceps*: sepals lance-oblong, pointed; petals broader, ovate, acute; middle lobe of the labellum large, deeply colored, throat white and veined; side lobes white. Dec. to Jan. Mex. G.C. III. 7:169.—A useful species, large plants often bearing 5-10 racemes. Perhaps only a var. of *L. autumnalis*.

9. *anceps*, Lindl. Fig. 1223. Pseudobulbs scattered on the rhizome, ovate; lvs. 5-9 in. long, oblong-lanceolate; scape from the top of the pseudobulbs, 1½-2 ft. long, clothed with keeled scales and bearing 1-2 very showy, purplish rose-colored fls.; sepals lanceolate-acuminate; petals ovate-acuminate, all with a greenish line on the back; labellum inside of the lateral lobes yellow, with red marks; middle lobe oblong, acute, deep purple, white on the disk, with a thickened yellow keel terminating in 3 ridges. Mex. B.M. 3804. B.R. 21:1751. G.C. II. 24: 405; III. 15: 172. P.M. 4:73.—One of the most beautiful *Lelias*, possessing many fine varieties. Var. *Barkeriana*, Lindl. Sepals and petals subequal; middle lobe of the labellum rather narrow, acute. B.R.



1273. *Lelia anceps*.
(× ¾)

23:1947. F.S. 11: 1100. Gn. 25:446. Var. *Dawsoni*, J. Anders. Scape 2-5 ft. long, 2-3-fl.; fls. white; interior of the labellum marked with radiating purple lines, with the usual yellow ridges; Juquila, Mex. Gn. 25: 446. G.C. III. 1:424. S.H. 2, p. 175. F.M. 1871:530. Var. *alba*, Reichb. f. Sepals and petals as in var. *Dawsoni*; fls. pure white, with the disk of the lip pale yellow. Dec., Jan. G.C. III. 1:485; III. 15:172. Var. *Hilliiana*, Reichb. f. Sepals and petals white; front lobe of the labellum bilobed-emarginate. I.H. 33:584. Pale violet, with a yellow disk. Gn. 25:446 (*Hilli*). G.C. III. 1:425 (*Hilli*). Var. *Williamsi*, Hort. Sander. Sepals and petals pure white, of good form, narrower than in var. *Stella*; labellum white, large, with the disk and throat yellow, marked with crimson-purple. G.C. III. 1:339. Gn. 25:446 (as *Williamsiana*). Var. *Leeana*, Reichb. f. Fls. white, smaller than in *L. anceps*; petals very narrow and very acute; side lobes of the labellum blunt; middle lobe small, triangular, wavy, with a thick, well-developed keel; throat yellowish, veined with reddish-purple. Var. *Schroderiana*, Reichb. f. Fls. unusually large; sepals, petals and middle lobe of the labellum pure white; side lobes and throat streaked with broad lines of purplish crimson. A strong grower. Gn. 44:928. G.M. 33:813. Var. *Sanderiana*, Reichb. f. Fls. white; disk of lip crimson. G.C. III. 1:281 and 25:136. Gn. 44:928. G.M. 37:88. Var. *Veitchiana*, Reichb. f. Sepals and petals white; disk of the labellum yellow, veined with brown; lateral lobes and anterior part of the middle lobe veined with purple.

Gn. 25:446 (*Veitchi*). Var. *Stella*, Reichb. f. Fls. pure white; labellum with yellow throat, marked with light crimson lines. G.C. III. 1:280 and 8:500. Var. *Ameisiana*, O'Brien. Sepals and petals broad, feather-veined with mauve; labellum white; middle lobe crimson-purple. G.C. III. 23:59. Var. *Ashworthiana*, J. O'Brien. Sepals pure white, lance-oblong; petals broadly ovate, also white; front lobe of the labellum broad, expanded, white, with a few blue dots and yellow keels on the throat; side lobes with lines of slaty blue. G.C. III. 15:103. J.H. III. 28:125. Var. *Waddoniensis*. Fls. pure white; side lobes of the lip marked with purple lines. disk yellowish. G.C. III. 23:125. G.M. 41: 115. Var. *Percivaliana*, Reichb. f. Fls. small, but freely produced; sepals and petals white, tinged with bluish pink; lateral lobes of the labellum deep purple at the tips and spotted; throat yellow, with purplish crimson lines; middle lobe creamy yellow at the base; apex purplish. Gn. 25:446. Var. *delicata*, Hort. ex Williams. Labellum white, suffused with mauve; throat orange-yellow; sepals and petals rose, mauve or lilac. Var. *rosea*, Reichb. f. A variety having bright rose-colored fls., with the margins of the labellum darker rose. Gn. 25:446. Var. *grandiflora*, Williams. A robust form resembling the type. G.C. III. 3:105. Var. *holochila*, Rolfe. Sepals and petals nearly alike, pale lilac; lip petaloid, elliptical-lanceolate, light purple, yellow and white at the base. G.F. 4:173. Var. *Scottiana*, Warn. and Will. Sepals and petals mauve; labellum deep purple, with a yellow throat. Var. *marida*. This is a name under which importations of large, highly colored forms of *L. anceps* were sold by the Liverpool Hort. Co., Eng., as var. *grandiflora*.

10. *rubescens*, Lindl. (*L. acuminata*, Lindl., *L. peduncularis*, Lindl.). Pseudobulbs ovate to subrotund, clustered, sometimes rugose. 1-1½ ft. lvs. oblong to lance-oblong, emarginate, 4-5 in. long; scape slender, jointed, sheathed with brown scales at the joints, 1 ft. long, with 2-8 graceful, fragrant fls.; sepals spreading, linear-oblong, acute; petals slightly longer and twice as wide, undulate; labellum as long as the petal; middle lobe of the same form but more undulate and with a stain of yellow on the disk, purplish red on the inner surface. A slender, graceful plant with small, whitish, lilac-tinted or rose-colored fls. B.M. 4905 and 4099. B.R. 26:41; 27:24; 31:69. F.S. 1: 9; 7:742. P.M. 10:49.—Flowers much smaller than *L. anceps*.

GROUP II.

- A. *Pseudobulbs ovate, evidently thickened*.
 B. *Lip with about 7 undulate keels*. 11. *Jongheana*
 BB. *Lip without or with plane keels*. 2. *grandiflora*
 AA. *Pseudobulbs oblong, more stem-like*.
 B. *Fls. greenish yellow*.....15. *glauca*
 BB. *Fls. bright colored or white*.
 c. *Labellum firm, fleshy; lateral lobes convolute over the column*.....12. *pumila*
 CC. *Lateral lobes of the lip resting on the middle lobe*.....13. *Leeana*
 11. *Jongheana*, Reichb. f. Rhizome with remarkably thick root-fibers; pseudobulbs ovate-oblong, 1-1½ ft. lvs. broadly oblong, 3-5 in. long, very thick and dark green; scape stout, shorter than the leaf, 1-2-fl.; fls. 4 in. in diameter, bright anethy-odor; sepals linear-lanceolate, acute; petals broadly oblong-obtuse; labellum convolute; lateral lobes very shallow; middle lobe emarginate, white and crisp, with about 7 golden yellow undulate ridges in the throat. Braz. B.M. 6038. R.H. 1873:290. G.C. 1872:425.—A dwarf species with remarkably leathery lvs. Said to equal *L. grandiflora* and *Cattleya Mossii*. Rare in cultivation.

12. *pumila*, Reichb. f. (*Cattleya pumila*, Hook. C. *marginata*, Paxt. *Lelia praeaus*, Lindl. & Reichb. f. *L. Dayana*, Reichb. f. *L. Pinellii*, Hort.). Pseudobulbs small, stem-like, with one oblong to linear-oblong leaf 5-6 in. long; peduncle shorter than the lvs., each bearing a single, large, drooping, rose-purple fl.; sepals oblong, acute; petals ovate-oblong, broader, undulate; labellum very involute; lateral lobes subquadrate, middle lobe short, emarginate, wavy and crisped;

throat yellow, apex rich purple. A pretty dwarf species from Braz. B. M. 3656 and 5498. P. M. 10:265. F. M. 1877:249. B. K. 30:55. P. 1850:89 (*Cattleya spectabilis*). G. C. III. 23:597. — Many variations of this plant have been described as distinct species, although botanically but one species. Some of them are well-marked horticultural varieties. Var. *praestans*, Veitch (*L. praestans*, Lindl. & Reichb. f.). A large-fl., highly-colored variety, with the sepals and petals much broader than in the type; labellum rich purple, very rigid and fleshy, lines almost obsolete. B. M. 5498. Gn. 53. p. 550. Var. *marginata*, Hort. (as *Cattleya marginata*, Paxt.). Fls. large; sepals and petals rose-crimson; labellum with a white border, crisp. Braz. P. M. 10:265. I. H. 6:193 (as *Cattleya pumila*, var. *major*, Lem.). F. S. 18:1900. G. C. III. 22:262. A. G. I. 1:158. Var. *Dayana*, Dean (*L. Dayana*, Reichb. f.). Sepals and petals rose-purple; labellum with a deep purple margin. Earlier than the type. Braz. R. H. 1890, p. 490. F. M. 1877:249. Var. *alba*, Hort. Fls. like var. *praestans*, but pure white with the base of the lip yellow. G. C. III. 21:11. J. H. III. 34:27.

13. *Leeana*, Reichb. f. Hybrid: pseudobulbs cylindrical, somewhat swollen, 1-1½; lvs. truncate-oblong, very coriaceous; sepals and petals spreading, ligulate, acute, somewhat undulate, rose color; lateral lobes of the labellum semi-ovate, acute, the tips resting on the middle lamella, white, tips purple; middle lobe broad, obovate. Sept. "Natural hybrid of *L. marginata* and —" Hansen. — As this plant has a 4 pollinia, it is probably nearer *Cattleya*. It was imperfectly described by Reichb. as a doubtful hybrid.

GROUP III.

- A. Fls. greenish yellow.
 B. Labellum deeply fringed on the margin 14. *Digbyana*
 BB. Labellum not fringed.
 b. Evidently 3-lobed. 15. *glauca*
 dd. Obsoletely 3-lobed. 16. *virens*
 AA. Fls. all yellow 17. *xanthina*
 AAA. Fls. with only the sepals and petals tawny yellow; labellum some other color 18. *grandis*
 AAAA. Fls. purple, rose or white.
 B. Labellum with several prominent toothed crests 19. *superbiens*
 BB. Labellum destitute of crests.
 c. Petals and labellum waved and crisped.
 D. Fls. uniformly purple 20. *Boothiana*
 DD. Fls. white and purple.
 E. Lip ovate-acuminate 21. *crispa*
 EE. Lip rounded. 22. *purpurata*
 cc. Sepals and labellum plane, or nearly so 23. *Perrinii*

14. *Digbyana*, Benth. (*Brassavola Digbyana*, Lindl.). Pseudobulbs elongate, stem-like, 1-1½; lvs. elliptical, thick, fleshy, plane, slightly keeled; peduncle with a solitary, very large, fragrant flower 3-5 in. across; sepals and petals similar, oblong, spreading, pale purplish green; petals slightly broader; labellum very large-ovate, entirely surrounding the column, white or cream-colored, with the margin cut into a broad lacinate fringe, which makes the flower very striking. July, Aug. Honduras. B. M. 4474. B. R. 32:53. F. S. 3:237. G. C. III. 18:153. — A slow-growing orchid.

15. *glauca*, Benth. (*Brassavola glauca*, Lindl.). Stem short, creeping; pseudobulbs short, oblong, stem-like, compressed and sheathed with scales, bearing a single oblong glaucous, very thick and leathery leaf; fls. usually single, on a stalk shorter than the leaf, fragrant; sepals and petals spreading, oblong-lanceolate, obtuse, greenish yellow; labellum with a short claw surrounding the column, then expanding into a large 3-lobed limb, yellowish white, streaked with red in the throat. Mex. and Guat. B. M. 4033. B. R. 26:44. G. C. III. 7:357.

16. *virens*, Lindl. Plants about 6 in. high; fls. 1 in. across; sepals suberect, ovate; petals lanceolate, subequal; labellum obsoletely 3-lobed, cucullate; apex ovate, crisp, with obscure raised lines toward the base. The fls. are pale yellowish green of no beauty. Brazil.

17. *xanthina*, Lindl. Lvs. oblong, longer than the fusiform pseudobulb; raceme 3-5-fl.; fls. 3 in. across, buff-yellow except the lip, which is white in front streaked with crimson-purple; sepals and petals subequal, oblong-obovate, undulate, leathery and convex; labellum nearly quadrate when spread out, without raised veins. Brazil. Int. 1858. B. M. 5144 F. S. 23:2418. — A second-rate species.

18. *grándis*, Lindl. & Paxt. Pseudobulbs stem-like, 1-1½, 1 ft. high; lvs. rigid, oblong-lanceolate; scape erect, bearing 2-5 fls. 4 in. across; sepals and petals lanceolate, the latter a little broader, slightly curled or twisted; labellum white; front lobe large, bell-shaped, crenate-toothed, veined with purple. Spring. Brazil. B. M. 5533. F. S. 7, p. 238 and 23:2473. — A curious species with the sepals and petals colored tawny yellow, contrasting strongly with the whitish purple-veined lip. Var. *tenebrosa*, God. Lebeuf. Sepals and petals citron-yellow, less undulate; labellum trumpet-shaped, purple, with a broad border of white with many purple veins. G. C. III. 14:221. G. M. 36:531.

19. *superbiens*, Lindl. Pseudobulbs 1 ft. or more in length, oblong, with one or two coriaceous oblong lvs. equaling the pseudobulbs in length; scape drooping, 5-6 ft. long, bearing a globose cluster of 10-20 fls. each about 6 in. in diam.; sepals and petals nearly equal, spreading, oblong-lanceolate, obtuse, lilac-purple, paler below; labellum as long as the segments; middle lobe broad obovate, waved and crisp; disk with several prominent toothed crests, yellow, deep crimson-purple on the margins; side lobes yellow with purple margins and stripes. Guatemala. B. M. 4090. F. S. 11:1178-79. P. M. 11:97. R. H. 1886:324. — A very large plant.

20. *Boothiana*, Reichb. f. (*L. lobata*, Veitch. *Cattleya lobata*, Lindl.). A strong-growing plant: pseudobulbs clavate, furrowed, 1-1½; lvs. lanceolate-oblong, about as long as the scape; scape 8-10 in. long, from the axil of the leaf, 2-5-fl.; fls. about 5 in. across, uniformly violet-purple with rich crimson veins on the lip; sepals lanceolate, with reflexed margins; petals broad, oblong, undulate, crisp; labellum cucullate, the middle lobe reflexed, all beautifully waved and crisped. Much like *L. crispa* in habit. Apr. May, S. Brazil. R. H. 1874:331 (*L. Rivieri*, Carr.). G. C. 1848:403 and III. 10:577. F. S. 20, p. 132. A. G. 13:608. — This plant is not free-flowering, hence it is little cult., although a beautiful and distinct species.

21. *crispa*, Reichb. f. (*Cattleya crispa*, Lindl.). Pseudobulbs clustered, elongate-ovate, 1-1½; lvs. large, 1 ft. long, oblong-lanceolate, emarginate; scape with 5-6 large, handsome, fragrant fls.; sepals linear-oblong-ovate or spatulate, acute, margins revolute; petals much broader, with the margins beautifully waved and crisped; labellum standing forward, recurved at the apex; side lobes rounded, white, yellow at base, streaked with red; middle lobe long, ovate-acuminate, deep purple inside, veined, all remarkably waved and crisped. Summer. On lofty trees, fully exposed. Brazil. B. M. 3910. B. R. 14:1172. Gn. 48, p. 504. J. H. III. 33:199. F. M. 5:55. — A fine white-fl. species resembling a *Cattleya* in habit. Var. *Cauwelartiae*, L. Linden. Sepals and petals tinged with greenish yellow; base of labellum yellow. I. H. 38:121.

22. *purpurata*, Lindl. & Paxt. Fig. 1224. Pseudobulbs long-elliptical, 6-8 in. high; lvs. solitary, oblong, leathery, dark green, 1 ft. or more in length; scape erect, 3-7-fl.; fls. very large, 6-8 in. across; sepals linear-oblong, spreading, white, suffused with light rose; petals much broader, ovate, undulate, crisp, base attenuate, colored like the sepals; labellum very large, bell-shaped; middle lobe rounded, undulate-crisp, rich purple with darker veins, throat yellow. A robust plant, whose large fls., borne on strong, erect stalks, make it one of the grandest *Lælias* in cultivation. Spring. Brazil. I. H. I, p. 54, and 3:83. F. S. 11:1138-39. Gn. 54, p. 17 and 56, p. 46 (var. Mrs. Measures). G. C. II. 14:45 and 20:533. A. F. 6:223. — Var. *atropurpurea*, Williams. Sepals and petals deep rose; labellum large, expanded, purple-magenta; throat yellow, veined with purple. Var. *Ashworthiana*, J. Anders. Petals wider than in the type, 2 in. wide, purplish rose, with darker stripes. A highly colored form. G. C. III. 20:39. Var. *Nélsii*, Hort., Verschaff. Sepals and petals subsessile,

the former rose-colored outside; midlobe of the labellum ovate; acute. Much like the type in color. I.H. 15:569. Var. *Russelliana*, Williams (*L. Russelliana*, Hort.). Fls. large; sepals somewhat narrow, white, suffused with lilac; petals broader, deeper lilac; labellum large, rose-lilac; throat yellow, marked with rose, Autumn. Var. *Schroederi*, Reichb. f. Sepals and petals white; labellum white, with a tinge of rose in the center; tube pale yellow, with fine, dark purple lines. I.H. 38:139. Var. *Mandaiana*, Hort. Pseudobulbs thinner and narrower



1224. *Lælia purpurata* ($\times \frac{1}{4}$).

than in the type; fls. as large as those of the type, pure white, with a faint tinge of pink on the labellum. Var. *pretéxta*, Reichb. f. No description of this plant is available.

23. *Pérrinii*, Lindl. (*Cattleya Pérrinii*, Lindl.). Pseudobulbs elongate; lvs. solitary, oblong, coriaceous, 8 in. long, equalling the stem; fls. showy, 2-3 on a short stalk; sepals oblong-linear, obtuse; petals a little broader, all rose-purple, darker at the tips; middle lobe of labellum cucullate, expanded, oblong, obtuse, undulate, with an inflated fistular cavity at the base, destitute of ridges, color deep crimson; lateral lobes erect, acute, pale. Oct.-Dec. Brazil. B.M. 3711. B.R. 24:2. P.M. 13:5. G.M. 37:717. A.F. 13:1196.—Fls. rather pale. Var. *alba*, O'Brien. Fls. white, with the labellum tinged with yellow. There are several pale varieties of this plant.

GROUP IV.

- A. Lvs. solitary.
 n. *Scapæ 1-fld.*.....24. *monophylla*
 bb. *Scapæ several-fld.*.....25. *harpophylla*
 AA. Lvs. usually 2.....26. *cinnabarina*

24. *monophylla*, N. E. Brown. Rhizome a matted mass sending up tufts of leaf- and flower-stems; flowering stems 6-10 in. long, as thick as a crow-quill, rigid and erect, bearing a single linear-oblong, obtuse leaf 2-3 in. long, and several sheathing bracts: fls. 1-2 in. across,

vivid orange-searlet; sepals and petals similar, spreading, oblong, subacute; labellum very small, lateral lobes embracing the column, terminal minute papillous on the disk. Mts. of Jamaica, growing on trees at elevations of 3,000-5,000 ft. B.M. 6683.

25. *harpophylla*, Reichb. f. Hybrid much like *L. cinnabarina*. Pseudobulbs slender, about 10 in. long, each bearing a single lance-linear leaf; raceme short, sub-erect, bearing 5-10 brilliant scarlet-orange fls.; sepals and petals oblong-lanceolate, acute; middle lobe linear, acuminate, crisp, with a whitish spot. A luxuriant free-flowering species. Feb., March. Brazil. Gn. 24:400. F.M. 1879:372.—Probably a hybrid between *L. cinnabarina* and *Brassavola* (?) Reichb. f.

26. *cinnabarina*, Batem. Pseudobulbs elongate, cylindrical, but broadest at the base, sheathed with scales, bearing 1-2 linear-oblong, reflexed, acute, coriaceous lvs.; raceme terminal, erect, 15-20 in. long, with 4-5 medium-sized reddish orange fls.; sepals and petals linear-oblong, obtuse, spreading; labellum convolute, reflexed; lateral lobes acute, middle lobe large, oval, crisp. Brazil. B.M. 4302. P.M. 7:193.—A summer-flowering species whose peculiar color and graceful habit render it very ornamental. Var. *crispilabia*, Veitch (*L. crispilabia*, A. Rich. *L. Lawrenceana*, Hort.). Fls. anæthyst-purple; labellum darker, finely crisp and undulate; raceme 12-14 in. long, bearing 3-5 fls. A pretty, free-flowering variety.

Lælia Latona, Hort. Veitch. Sepals and petals light orange-yellow; labellum whitish at base, the rest purple bordered with orange-yellow; middle lobe much undulate. A garden hybrid between *L. cinnabarina* and *L. purpurata*. Not advertised in America. A. Pericat, Philadelphia, writes as follows of this plant: "Lælia Latona, raised by Veitch, is a beautiful hybrid Lælia of a distinct and unusual color from *L. purpurata* \times *L. cinnabarina*, the latter being the seed parent. The sepals and petals are of light orange-yellow; lip whitish at the base, the remainder red-purple bordered with orange-yellow, the margin of the apical spreading; lobe is much undulate."

HEINRICH HASSELBRING.

Lælias may be divided into three cultural groups: (1) those which have clavate pseudobulbs and which bear a nearer affinity to *Cattleya* than the others; (2) those with long, rounded, slender stems, and (3) those with pseudobulbs more or less pyriform in shape.

Those of the first group should be placed among the warmer-growing *Cattleyas*. Examples are *L. purpurata*, *L. grandis*, *L. Digbyana*, *L. glauca* and *L. Boothiana*. Those of the second, or slender-bulbed group, succeed in a much cooler and shadier spot, and need more moisture, both in the atmosphere and at the roots. Examples are *L. pumila*, *L. harpophylla* and *L. monophylla*. Of the group with pear-shaped bulbs, *L. anceps*, with its numerous varieties, is perhaps the best known.

Others are *L. autumnalis*, *L. majalis* and *L. albidula*. To these may be added such species as *L. cinnabarina*, *L. flava*, and some few others of similar habit. These require at all times a sunny, airy position, with abundance of overhead watering during their period of growth, and after flowering a severe resting period, the one great object being to keep them inactive for as long time as possible. *L. autumnalis* and *L. majalis* require somewhat different treatment, since they flower from an incompleting bulb, and should, therefore, receive attention until the bulbs are solid, when the drier condition must be observed.

The best method for cultivation of specimens of the first group is to pot them in the ordinary flower-pot, but for very large specimens a basket is preferred as a more ready means of carrying off the water and affording better and sweeter conditions for the roots. The potting material should be composed of about two-thirds good peat or fern root and the remainder fresh sphagnum moss. The cultivator should use good judgment as to when to water the plants. No hard and fast rules can be laid down in regard to this. More can be accomplished by watchfulness than ever can be written.

The slender-bulbed species require about equal parts of peat and moss. Such species as *L. pumila* do best in rather small pans and may be suspended from the roof. All these thin-bulbed species enjoy shade rather than direct sunlight. More moisture is essential both atmospherically and at the roots, and at no season should

it be withheld for very long periods. Watch carefully for any symptom of suffering from lack of water.

The Mexican Lælias do best with a smaller quantity of moss and peat, and thrive best when put up in baskets or cribs. They enjoy a great amount of direct sunshine, and should have during the time of active growth an almost unlimited supply of water, which is best supplied to them after the sun begins to lose its power. At this time it comes as a welcome, refreshing bath. A good syringing in the early morning is needed to help the plant through the day. With such treatment plenty of strong flowers must result. *L. cinabarinia*, *L. flava* and allied kinds enjoy the above treatment equally well. Many beautiful hybrids have been raised in gardens, and the needs of each from a cultural view will be best obtained by noting to which section or group they belong, and giving the treatment recommended for such.

A really good selection of Lælias for the adornment of the orchid house is herewith appended: *L. anceps* and its varieties, *alba*, *Ducosoni*, *Hilliana*, *Sanderiana*, *stella*, *rosea*, *Veitchii*, *Williamsii*, *Schradleriana* and *Amesiana*, all of which have pure white sepals and petals and various colored labellums; *Scottiana* and *grandiflora*, distinguished for size; and a wonderful peloriate form known as *Koblingianum*. *L. albidia*, *autumnalis*, *cinabarinia*, *flava*, *pumila*, *Dugana*, *pratsana*, *Dormaniana*, *grandis*, *Lindleyana*, *majalis*, *leucobrosa*, *monophylla*, *harppophylla*, *Perrinii*, *purpurata*, *superbiens*, *rauhina*. In some species almost endless variety occurs, notably so with *L. purpurata*, *Perrinii* and *albidia*, and pure white varieties are known in many of the rarer species.

HENRY T. CLINKBERRY.

LÆLIACATTLEYA. A name proposed by R. A. Rolfe to designate the bigneric hybrids of Lælia and of Cattleya, which readily hybridize. The species of the two genera have 8 and 4 pollen masses respectively, while the hybrids are irregular in this respect. Many of the plants are natural hybrids, and many others have been produced by artificial crossing. For a list of Læliacattleyas, see Rolfe in G. C. III. 6:78, 155. In the following account L=Lælia; Le=Læliacattleya; C=Cattleya.

H. T. Clinkberry writes that the cultivation of Læliacattleyas is the same as for Lælia and Cattleya. It is therefore important to know the parentage in each case, from which one may know whether warm or coolhouse treatment is needed. He adds that many Læliacattleyas are of such a vigorous constitution that they are nearly always in growth.

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A. <i>Fls. light or bright rose</i>	1. <i>elegans</i>	
	2. <i>amanda</i>	
	3. <i>Corbelliensis</i>	
	4. <i>Stelzneriano-Hardya</i>	
	5. <i>callistoglossa</i>	
AA. <i>Fls. rose-purple, mauve, violet, etc.</i> ..	6. <i>Dominiana</i>	
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	8. <i>Sallieri</i>	
	9. <i>radiata</i>	
	10. <i>Duvalliana</i>	
	11. <i>eximia inversa</i>	
	12. <i>Martineti</i>	
AAA. <i>Fls. white or whitish, or yellow</i>	3. <i>Schilleriana</i>	
	14. <i>velutino-elegans</i>	
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AAAAA. <i>Fls. tinted light blue</i> ..	17. <i>Exoniensis</i>	

1. *elegans*, Rolfe (*Lælia elegans*, Reicheb. f. *Cattleya elegans*, Morren). Pseudobulbs terete, stem-like, 15–20 in. high; lvs. solitary, linear-oblong, coriaceous, 10–12

in. long; scape short, stout, 3–7-fl.; fls. 5 in. in diam., light or bright rose, fragrant; sepals oblong, acute, often somewhat twisted or with revolute edges; petals much wider, lanceolate, margin somewhat undulate; labellum with the lateral lobes elongate-obtuse, whitish with purple apices, convolute over the column; middle lobe broadened in front, subreniform, margin undulate, crisp, entirely a very deep purple, without raised lines or callosities. May–Sept. Brazil. B. M. 4700. 1. H. 4:134 (as *L. Brysiana*); 11:402. —A showy, tall-growing species.

Var. *Nylephtha*, O'Brien. Fls. large; sepals tinted with yellow and rose, lightly spotted with purple toward the tips; petals broader, more suffused with purple; lip bright purple in front, paler at the side lobes. G. C. III. 3:176.

Var. *Turneri*, Warn. Fls. large, richly colored; sepals and petals bright amethyst-purple, with deeper veins; lip with a large purple blotch on the middle lobe; side lobes white, tipped with rose. Gm. 47, p. 319; 49:1067 and p. 385. —One of the finest of the genus.

Var. *prasiata*, Reicheb. f. Sepals and petals rose, tinged with green; labellum white at the base and side lobes, middle lobe crimson-purple. —Var. *superbum* is advertised.

2. *amanda*, Rolfe (*Lælia amanda*, Reicheb. f.). Natural hybrid between *C. intermedia* and perhaps *Lælia crispata*. Pseudobulbs thin, fusiform, 5–7 in. long, 1–2 lvs.; lvs. shorter than the pseudobulbs, cuneate-oblong, acute; fls. in pairs, from a small, narrow spathe; sepals oblong-ligulate, acute, light rose, with a grayish hue outside, wavy; petals similar but broader, with darker tinted nerves on the inside; lateral lobes of the labellum enveloping the column, rich dark purple; middle lobe transversely oblong, short, emarginate, wavy, separated from the others by an exceedingly short isthmus, veined with rich purple. Brazil. 1. H. 38:135.

3. *Corbelliensis*, Maron. Garden hybrid of *C. Loddigesii* and *L. pumila*, var. *marginata*. Pseudobulbs 5–6 in. long, fusiform; lvs. about 6 in. long; fl. stalk 2–3 in. long, bearing 1–2 showy fls. about 5 in. across; sepals and petals bright rose, the latter veined with deeper purple lines; throat of the labellum veined with yellow on a white ground; blade intense purple, bilobed and undulate.

4. *Stelzneriano-Hardya*, Maron. A garden hybrid of *L. elegans*, var. *Stelzneriana* and *Cattleya Hardya*. Plants vigorous; pseudobulbs 7–8 in. long; lvs. 10 in. long by 2½ in. wide; sepals pale clear rose, deeper on the edges; petals undulate, rose on the margins, fading almost to white at the center; labellum purple-magenta, undulate lacerate on the margin, with a broad purple line in the center of the blade and 2 large white spots in the throat.

5. *callistoglossa*, Rolfe (*Lælia callistoglossa*, Reicheb. f.). Garden hybrid of *L. purpurata* and *Cattleya labiata*, var. *Worcestedii*. Pseudobulbs as in *L. purpurata*; lvs. 12 in. long; petals broad, oblong, acute; sepals narrower, all pure rose; middle lobe of the labellum broad, retuse, dark purple, with yellow on the disk; side lobes small obtuse-angled.

6. *Dominiana*, Rolfe (*Lælia Domingana*, Reicheb. f.). Garden hybrid. Plants having the general habit of *Cattleya Mossia*: pseudobulbs fusiform, rather short, 1-1½; lvs. linear-oblong; raceme bearing few large, handsome fls.; sepals narrowly oblong, acute, light purple, with dark reticulations; petals broadly cuneate-oblong, wavy, light purple; labellum cucullate, with the middle lobe large, spreading, all wavy and crisp, deep blackish purple. F. M. 1878:325. Raised for Veitch by Mr. Dominy from a cross between *Cattleya Doxiana* and some Lælia, —according to Reichenbach, *Lælia (Læliacattleya) elegans*. Mr. R. A. Rolfe suggests the more probable parentage of *Cattleya Doxiana* and *Lælia lobata*. The first plant flowered in August, 1878.

7. *Andreaana*, Maron. A garden hybrid between *C. bicolor* and *Læliacattleya elegans*. Pseudobulbs 8–12 in. long, stem-like; lvs. oblong, 6 in. long; fls. 6–7 in. across, rose-white; sepals and petals spreading, narrowly oblong, with the margins recurved, those of the

petals undulate; labellum contracted in the middle, with a subquadrate toothed and undulate middle lobe, violet-purple. R.H. 1896:328.

8. **Salliéri**, Maron. Garden hybrid between *Lælia purpurata*, var. *Williamsii*, and *Loddigesii*. Pseudobulbs 1-2-lvd., about 10 in. high; lvs. 8 in. long, 3 in. wide; fls. several on a stalk, which is shorter than the lvs., 5-6 in. across; sepals and petals mauve, with deeper lines; labellum tubular, colored like the segments, and expanding into a carmine blade, pale at the tip.

9. **radiata**, Maron. Garden hybrid of *Lælia purpurata* and *C. nobilior*. Pseudobulbs almost round, bearing 1-2 coriaceous lvs. 7 in. long by 2½ in. wide; fl. stalks about 7-8 in. long, bearing several large, showy, violet-red fls.; labellum deep red, with purple veins and a whitish throat.

10. **Duvaliana**, Hort. Hybrid between *L. purpurata* and *C. Luddemansiana*. Sepals and petals half-spreading, light mauve; labellum broad, dark maroon-crimson on the lobes and in the throat, which is traversed by darker lines.—Said by Arnold & Co., handsome flower of striking appearance.

11. **eximia inversa**, Hort. Hybrid between *L. purpurata* and *C. Warneri*, the inverse cross of *L. eximia*. Sepals and petals deep rose-purple; labellum bright magenta-crimson.—Said by Arnold & Co. to be one of the finest hybrids yet raised between these genera, resembling *C. Warneri*.

12. **Martineti**, Maron. Garden hybrid between *Cattleya Mossia* and *Lælia grandis*, var. *teschbyosa*. Fls. resembling those of the *Cattleya labiata* group; sepals and petals rose-violet; labellum red to mauve, pale at the margins, and netted with numerous deep red veins.

13. **Schilleriana**, Rolfe (*Lælia Schilleriana*, Reichb. f.). Lvs. 8 in. long; fl. stems 20 in. long; sepals and petals white, elongate-lanceolate; labellum veined with purple on the throat; disk purplish yellow, middle lobe spotted crimson-purple. A natural hybrid between *C. intermedia* and *L. elegans*, Brazil. Var. **alba**, Hort. Petals and sepals pure white; middle lobe of the labellum rich carmine-magenta, presenting an agreeable contrast. June, July. L.H. 31:526. Gn. 17:218.

14. **velutino-elegans**, J. O'Brien. Garden hybrid of *C. velutina* and *L. elegans*. Resembles in habit a stout form of *Cattleya velutina*: fls. fragrant, 3-4 on an upright stem; sepals and petals creamy white, tinged with nankeen-yellow and veined with rose; labellum bluish white at base, side lobes folded over the column; middle lobe broad, toothed and crisp on the margin, rich crimson purple, veined with white and having an orange blotch at the base.

15. **intermedio-flava**, Maron. Garden hybrid of *C. intermedia* and *L. flava*. Of medium habit; sepals and petals clear yellow; labellum with a bright rose-purple blotch in front.

16. **Dormaniana**, Rolfe (*Lælia Dormaniana*, Reichb. f.). Natural hybrid of *C. bicolor* and *L. pumila*. Pseudobulbs terete, thin, slender, about 1 ft. long, 1-2-lvd.; lvs. oblong-ligulate, acute; peduncle 2-5-fl'd.; petals and sepals narrow oblong-ligulate, olive-brown, marbled outside with wine-red spots; labellum light purplish white, with darker veins; middle lobe transversely obovate, mauve-purple. Brazil.

17. **Exoniensis**, Rolfe (*Cattleya Exoniensis*, Reichb. f.). Garden hybrid probably between *C. labiata* and *L. crispata*. Sepals ligulate acuminate; petals oblong-cuneate, plicate, all tinted light blue; labellum undulate, crisp, deep orange at base with whitish side lobes; middle lobe rich purple, with darker veins.

L. Aelandiae (*L. purpurata* and *C. Aelandia*), is also advertised. H. HASSELBRING.

LAGENARIA (Latin, *lagena*, a bottle). *Cucurbitacea*. GOTTREID. CALABARSE. **L. vulgaris**, Ser., is the only species, now grown of spontaneous in all warm countries, originally from tropical Africa and Asia. It is exceedingly variable in its fruit, and has received many species-names as *L. microcarpa*, R.H. 1855:61; *L. clavata*; *L. pyrotheca*, R.B. 23, p.198; *L. virginialis*, white-fruited,

G. C. III. 11:85; var. *longissima*, Gt. 48:159. The smooth, hard shells of the fruits are used for drinking cups, water jugs, and many domestic utensils. From the pear-shaped shell of a small-fruited form the Paraguanians drink their famous *mate*, or Ilex tea. The commonest forms are shown in the engraving (Fig. 1225). The long curved forms are often called snake gourds in this country (not to be confounded with snake cucumber, which is a Cucumis). These are sometimes several feet long. The form with a constricted middle is the bottle gourd. See *Gourd*.

Lagenaria is a tender annual, which should receive the culture of squashes. The season in the northern states and Ontario is often too short for the full maturity of the fruits, particularly if seeds have been brought from the South. Give a quick warm soil and sunny exposure. In the North, seeds may be started inside in pots, or in inverted sods, after the manner of cucumbers. The *Lagenarias* are rampant growers, often running 30-40 feet, and covering the ground or a fence with a dense mass of large, roundish, soft leaves. The plant has a musky odor and a sticky feeling.

Plant monoicous: fls. solitary, white, funnellform, very soft in texture, withering in the sun; staminate fls. on very long, slender stalks (usually exceeding the leaf); pistillate fls. mostly short-stalked with 3 2-lobed stigmas and hairy ovary; tendrils forked, long and slender; stem striate-grooved, soft hairy; lvs. large, soft-pubescent, cordate-ovate or reniform-ovate, sometimes angled, the



1225. Various forms of gourds, *Lagenaria vulgaris*.

edges obscurely apiculate-sinuate, on prominent or long petioles. To this species belong the gourds known in this country as Hercules' Club, Sugar Trough, Dipper, Snake, Calabash, Bottle, Miniature Bottle, Depressa. In some countries, the young fruit is eaten as we eat summer squash. Monogr. by Cogniaux, DC. Monogr. Phaner. 3:417. L. H. B.

LAGERSTRÆMIA (Magnus N. Lagerström, 1696-1759, a Swede and friend of Linnaeus). *Lythraceæ*. The Crane Myrtle, *Lagerstromia Indica*, is to the South what the lilac and snowball are to the North—an inhabitant of nearly every home yard. It is a strong-growing shrub, reaching a height of 10-25 ft., deciduous-leaved, producing an abundance of soft-fringed flowers in spring and summer. The normal form has pink flowers, but varieties with bluish, white and purple fls. are not uncommon. It is hardy as far north as Baltimore, but north of that latitude it needs protection; even with protection it can not be grown north of the Long Island region.

Lagerstromia is a South Asian genus of nearly 20 species of shrubs and trees. The lvs. are opposite or the uppermost alternate, mostly ovate, entire; fls. in axillary and terminal panicles, the pedicels bracted; calyx with a funnel-shaped tube and 6-9 lobes; petals mostly 6, crinkled or fringed, with a long, slender claw (Fig. 1226); stamens many, long, some of them upward-curved; ovary 3-6-celled, with a long, bent style and capitate stigma; fr. a capsule; seeds winged at the top.

India, LINN. **CRANE MYRTLE**. Fig. 1226. Glabrous brown-barked shrub, with rather small (2 in. long) elliptic or oblong sessile mostly acute lvs.; panicle open, sometimes minutely pubescent; calyx not ribbed, glabrous or nearly so. Widely cult. in India, but probably native to China. B.M. 405. R.H. 1857, p. 627; 1874:130. (Gn. 1:151) 5:281. A.F. 9:85. G.M. 36:449.—Common everywhere in the South, particularly in the pink, bluish

and white forms. It can be prop. readily by cuttings of the ripe wood. In the N., the plants may be lifted in the fall and kept in a cellar. In spring they may be planted out, or flowered under glass. The Crape Myrtle



'726. Crape Myrtle, *Lagerstremia Indica*.
Natural size.

blooms continuously for 2 or 3 months, beginning in June in the Gulf states. The bark is smooth, as if polished. Several named vars.

Flos-Roginae, Retz. Tree, 50-60 ft., with elliptic or long lanceolate obtuse lvs. 4-8 in. long; panicle large; fls. 2-3 in. across, varying from rose to purple from morning to evening, the calyx grooved, the petals rose-way; capsule 1 in. or more long. India. G.C. III. 15:77.—A noble plant in tropical India; also int. in S. Calif. In the Old World sometimes grown under glass.

L. H. B.

LAGUNARIA (named for its resemblance to *Lagunæa*, which is now considered a section of *Hibiscus* and commemorates a Spanish botanist, André de Laguna, 1494 or 1499-1560, physician to Pope Julius III.). *Malvaceæ*. One species, an Australian tree cult. outdoors in S. Calif. and indoors in Europe. It has large, pale rose fls. like *Hibiscus*, 2½ in. across, with 5 spreading lobes, a column of stamens and a 5-lobed shield-shaped stigma. It differs from *Hibiscus* in having no bractlets or only 3, while *Hibiscus* usually has 5 or more. Lvs. entire, scurfy-tomentose; fls. axillary; calyx 5-toothed; ovary 5-celled.

Pateronii, G. Don. About 12 ft. high, spotted brown on trunk and branches; lvs. ovate, entire, 2-3 in. long, dark green above, ashy gray beneath; peduncle 1½ in. long; corolla lobes ovate, covered with minute hairy scales inside, villous outside. B.M. 769 as (*Lagunæa Patersonia*.)

LAGÜRUS (Greek, *lagos*, a hare; *oura*, a tail). *Gramineæ*. HARE'S TAIL GRASS. Contains a single species, native of the Mediterranean region, and cultivated for ornament, the small white heads being used for dry bouquets. Spikelets 1-fl'd., aggregated in a close panicle, forming an ovoid head; scarious empty glumes persistent and clothed with fine woolly hairs. Flowering glume with a dorsal awn. A hardy annual. Seeds sown in fall and plants set out in spring.

ovatus, Linn. Culms about 1 ft. high, in bunches; lvs. and sheaths downy. R.H. 1890, p. 488. V. 3: 217 and 247.

A. S. HITCHCOCK.

LAMÁRKIA (J. B. Lamarck, 1744-1829, distinguished French naturalist, and author of the Lamarckian philosophy of organic evolution). *Gramineæ*. Contains a single species, native from Mediterranean region to Afghanistan, and introduced in California. An ornamental annual grass, often cultivated under the name of *Chrysurus cynosuroides* and *C. aureus*. Spikelets of two sorts, fertile 1-fl'd., long-awned, surrounded by the long sterile spikelets of many obtuse glumes, arranged in a one-sided crowded panicle. Seeds may be sown in the spring, or better in the fall and plants set out in the spring.

aurea, Moench. Culms 6-12 in. high. R.H. 1890, p. 546.

A. S. HITCHCOCK.

LAMBKILL. *Kalmia angustifolia*.

LAMB'S LETTUCE. Consult *Corn Salad*. L. Quarter. *Chenopodium*, particularly *C. album*. Used as a pot-herb.

LÁMIUM (Greek for *throat*, referring to the shape of the corolla). *Labiátæ*. DEAD NETTLE. About 40 annual and perennial herbs of the Old World, of which several run wild in this country as weeds and others are cult. as hardy border plants. Botanically, they are distinguished by a 2-lipped corolla, of which the tube is somewhat longer than the calyx, the upper lip ascending and concave, and the lower one 3 lobed; stamens 4, in 2 pairs, ascending under the upper lip; fls. in axillary or terminal whorls, often rather showy; lvs. opposite, mostly crenate-dentate and petiolate; calyx awl-toothed. Not to be confounded with *Nepeta*.

Lamiums are diffuse mostly pubescent or hairy herbs, commonly decumbent at the base and often almost trailing. They are of the easiest culture in any open soil. Useful for rockwork. The cult. kinds are perennial, and are commonly propagated by division.

maculátum, Linn. (*L. album* and *L. purpureum*, Hort., not Linn. *L. variegatum*, Hort.). Straggling or half-trailing herb, the tips ascending, slightly hairy; lvs. long-petioled (except the uppermost), cordate-ovate, blunt, round-toothed; fls. 1 in. long, ascending in the clusters, the upper lip strongly arched or hooded, the tube 2-3 times longer than the calyx, hairy within. Eu.—Flowers usually purple-red, but sometimes varying to white (when it is known as *L. album*, but the *L. album* of botanists is a different plant, having pointed but sharp-toothed lvs.). The lvs. are usually whitish blotched along the midrib (var. *variegatum*), and in this form it is common about old gardens, trailing in the waste places. The plant is also run wild. *L. purpureum* of the botanists is annual.

ericeóphalum, Benth. Stem much branched, glabrous; lower lvs. long-stalked, puberulent, small, orbicular, somewhat incise-crenate; floral lvs. larger, deeply toothed, sessile or nearly so; calyx villous; corolla 3-4 times longer than the calyx, straight, purple. Taurus.—Said by some to be annual.

Galeóbdolon, Crantz, of Europe, with yellow fls. and sometimes with yellowish foliage, is cult. in the Old World, but it has not appeared in the Amer. trade.

L. H. B.

LAMPROCÓCCUS. See *Echmea*.

LANDRETH, DAVID, founder of the oldest seed-house in America, was born in 1752 at Haggerston, Northumberland county, England. He came to America late in the eighteenth century, making Philadelphia his home, and establishing there, in 1784, a nursery and seed business. Its location, on what was then known as High street, is now covered by the building 1210 and 1212 Market street. The raising of trees and production of seeds were conducted on land near by, particularly on a tract at Twelfth and Filbert streets. This locality proving too contracted for the purpose, the nursery and seed grounds were removed in 1789 to the "Neck," then considered far out of town, the place chosen being not far distant from the site of the present arsenal.

The subject of the present sketch, the younger David Landreth (Plate X), was born in Philadelphia in 1802. When of suitable age he entered actively into his father's business, which had considerably extended in Philadelphia, while a branch house had been opened in Charleston, S. C. The young man's early duty was that of manager of this Charleston branch. Of the Charleston business, it will suffice here to say that it continued till the era of the civil war, when it came to a sudden end by the act of the Confederate States District Court, which confiscated the real estate and merchandise alike, on April 22, 1862.

The younger David Landreth, in 1828, succeeded his father as proprietor of the well-established and thriving business in Philadelphia, a business which was to remain highly prosperous for half a century afterwards under his fostering care. His time, however, was not wholly occupied with the details of business, but was turned at an early age towards the literature of husbandry and to enterprises of public interest. Among the latter may be mentioned the Philadelphia Horticultural Society, of which, in 1827, he was one of the founders and a vice-president, and in 1828 was elected corresponding secretary, which office he held for seven

years. At a subsequent date he was made president of the Philadelphia Society for the Promotion of Agriculture, and vice-president of the United States Agricultural Society, and became an active member of many other organizations.

His literary labors included the publication of the "Illustrated Floral Magazine," started in 1832, and an advanced work for that period. At a later date he wrote much upon husbandry, his graceful style as a writer and his technical knowledge of the subject making his views of much value in the progress of the industry. He edited an American edition of George W. Johnson's "A Dictionary of Modern Gardening," a volume of 635 pages, published at Philadelphia in 1847.

In 1847 the Landreth nursery was removed to Bloomsdale, where Mr. Landreth established what is believed to be the most complete seed-farm in the United States, and where he planted an arboretum which perhaps stands unequalled in this country in the development of its trees. He was an early breeder of the Channel Island cattle, then styled Alderneys, and was among the earliest manufacturers of mowing and reaping machinery. In 1872-73 he experimented in steam-plowing with a Scotch engine, and in the following year with an American engine. Subsequently, steam-digging and steam-chopping were experimented with at Bloomsdale, and many improvements produced in the machine shop of that model farm.

David Landreth lived until 1880 in the enjoyment and care of the business which had been so much developed in his hands, and which had reached almost its hundredth year. The firm is now one of the thirty centenary firms in the United States. During a long life he had served his country in connection with agriculture, a pursuit which he dignified by the wide respect he had gained as an old-school country gentleman, and his reputation as an able and learned agriculturist. In early life he had lived amid the plantations of the Landreth nursery, one of the show places of Philadelphia—the site now marked by the Landreth School—and his virtues and character were those of one brought up in intimate contact with nature.

BURNET LANDRETH.

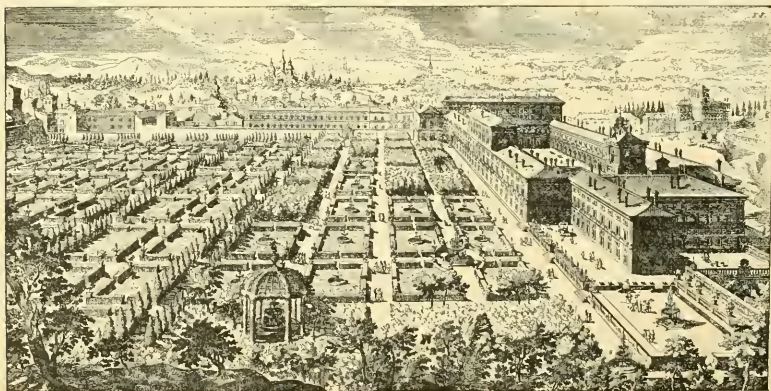
LANDSCAPE GARDENING. "Gardening may be divided into three species:—kitchen gardening—parterre-gardening—and landscape, or picturesque gardening; which latter is the subject intended in the following pages—it consists in pleasing the imagination by scenes of grandeur, beauty, or variety. Convenience merely has no share here; any farther than as it pleases the imagination." These are the opening lines of "Unconcocted Thoughts on Gardening," by the poet William

Shenstone, 1764. These sentences gave the world the term Landscape Gardening, to embody the growing desire to make grounds like nature. Milton, Addison, Pope, and the Dutch painters, expressed the awakening to the charms of the external world and hastened the day of freedom and naturalness. These and others had protested, directly or indirectly, against the artificialisms of living, as Bacon, also, in the following sentence, had protested: "As for the making of Knots or Figures, with divers Colored Earths, they be but toys, you may see as good sights many times in Tarts. * * * * *

I do not like Images cut out in Juniper, or other garden-stuff; they are for Children."

One does not know what Shenstone's protest meant until he knows the style of gardening which had been and still was in vogue. Gardens were fantastic constructions, elaborate with designs and formalities, cramped with geometrical details. A Roman garden (Fig. 1227) was well enough in its place, but there are other conditions and other ideals. Only rarely can such gardens as these find the proper setting. If effective, they must be dominated or supported by architecture. In the freer atmosphere of the country, they are evidently artificial; they are conceits. The reader will catch the feeling of the formal gardens of a later time by looking at Fig. 1228, which is a reduction from one of Batty Langley's designs in his "New Principles of Gardening," 1728. Langley seems to have been the extreme of geometricalians. In fact, Part I of his book on gardening treats "Of Geometry." Yet his plates suited the taste of the time. The particular plan which is shown in Fig. 1228 he describes as follows: "The House opens to the North upon the Park A, to the East upon the Court B, to the South upon the Parterre of Grass and Water C; and Lastly to the West upon the circular Basin D, from which leads a pleasant Avenue ZX. The Mount F, is raised with the Earth that came out of the Canal EE, and its slope H is planted with Hedges of different Ever-Greens, that rising behind one another of different Colours, have a very good Effect, being view'd from M. I, I, are contracted Walks leading up the Mount." The ideas of the time are further reflected in Fig. 1229, which is a reproduction, on a smaller scale, of one of Langley's pictures of artificial ruins. It is one of his "views of the Ruins of Buildings, after the old Roman manner, to terminate such Walks that end in disagreeable Objects; which Ruins may either be painted upon Canvas, or actually built in that manner with Brick, and covered with Plastering in Imitation of Stone."

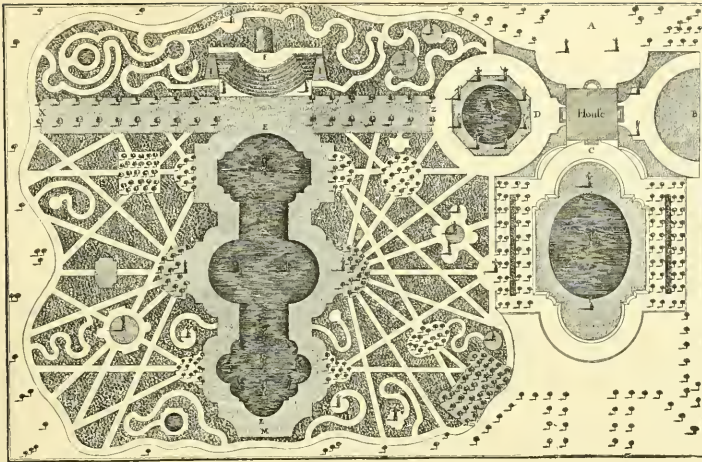
The awakening love of nature and of the spontaneous life, as expressed in writings and paintings, soon found expression also in gardens. In verse, Pope gave rules



1227. Gardens of the Pope, on the Quirinal, Rome. From Falda's "Li Giardini di Roma."



The "open center" in a winter landscape. Cat-tails in the foreground.



1228. One of Langley's "Designs for gardens that lye irregularly to the Grand House." 1728.

for the laying out of a spontaneous garden. The accompanying plan of Shenstone's garden, the Leasowes (Fig. 1230), and the picture of a glimpse therein (Fig. 1231), show how far his conceptions were removed from those of Langley, howsoever much they may fall short of the ideals of the present day. A full description has been left us of the Leasowes. Here is a glimpse: "Passing through a small gate at the bottom of the fine swelling lawn that surrounds the house, you enter upon a winding path, with a piece of water on your right. The path and water, over-shadowed with trees that grow upon the slopes of this narrow dingle, render the scene at once cool, gloomy, solemn, and sequestered; and forms so striking a contrast to the lively scene you have just left, that you seem all on a sudden landed in a subterraneous kind of region. Winding forward down the valley, you pass beside a small root-house, where on a tablet are these lines:

'Here in cool grot, and mossy cell,
We rural fays and faeries dwell;
Tho' rarely seen by mortal eye,
When the pale moon, ascending high,
Darts thro' your limes her quivering beams,
We frisk it near these crystal streams.'

The garden-art of the old time was largely a corollary of architecture. The garden-art of the present time, particularly amongst English-speaking peoples, exists for its own sake. Yet, one cannot say that the old-time garden-art is unlovely, or that it contradicts the canons of good taste. The two belong to different categories of aesthetic feeling, and the mere fact that both of them use plant-subjects does not make them comparable. Garden-art, like painting or music or literature, develops along racial or national lines. The Latins and their descendants have liked the formal and conventional gardens; and since these gardens express the personal and national emotions, they need no apology, notwithstanding the fact they are condemned by many landscape gardeners.

A different type of endeavor is that which attempts to interpret nature in the making of landscapes. The ideal landscape garden, like the ideal landscape painting, expresses or emphasizes some single thought or feeling. Its expression may be gay, bold, retired, quiet, florid; but if it is natural, its expression will conform to the place and the purpose, and the expressions are not matters of rule. It should be a picture, not a collection of

interesting objects. Mere planting and grading do not make a landscape garden; in fact they often spoil it. It is not enough to plant; the plants must be in the right place. A yard or a lawn with bushes or flowerbeds scattered over it may be interesting as a mere garden, but it is not a landscape garden. The Italian gardens were hardly landscape gardens. A real landscape garden has open breadth, space, atmosphere. It usually has an open center with mass-planted sides, and vistas to the outside. Incidentally, it may be ornamented; yet many persons even confound ornamental gardening with Landscape Gardening; it would be as proper to confound house-painting with architecture. Figs. 1227 and 1232 show the contrasts of a mere garden and a landscape garden. Compare Plates XIV and XV.

It will be seen from the above that the term Landscape Gardening precisely expresses the art of making a garden or tame area which shall be a landscape or picture. Yet, amongst the profession, the term landscape architecture is preferred. This term borrows the dignity of architecture, and is useful in a professional way. The writer much prefers the term Landscape Gardening; but it is apparent that the term landscape architecture is growing in favor with the profession, and there is little use in debating over a mere term. Properly speaking, the terms Landscape Gardening and landscape architecture are not synonymous, although in practice they are so used. It is not every place which is adapted to the making of a landscape picture. Formal gardens are often more to be desired than natural ones. They may conform to the principles of art, but it is the art of formal gardens, not of natural gardens. Too often have formal gardens been judged from the viewpoint of the natural or landscape garden, and hence confusion has arisen. There is now a slow but wholesome reaction against the too exclusive use of the true landscape garden. In practice, however, one cannot separate the two, so that one practitioner is, or should be, both landscape gardener and landscape architect. So it comes that the term landscape architecture stands for the whole art of laying out grounds. The term is therefore broader than its etymology would suggest: the word "architect" should be taken in its general sense of *craftsman* or *planner*, rather than in its specific one of *builder*. It is the nature-like landscape garden, rather than the formal garden, which the writer has in mind in the advice which is given in this article. The

character of the formal garden is dominated so completely by the nature of the architecture and the site, that condensed general remarks are of little purpose.

Landscape Gardening has undergone many fluctuations of taste within the century. Such changes are to



1229 An improvised ruin. 1728.

be expected as long as the human race makes progress. The constantly increasing wealth of plants modifies the spirit of the work. It is no longer worth while to follow any school or cult. Every style has its use and place. In small city or suburban places, a formal or formalized treatment of the ground plan may be desirable. In larger and freer places, the spirit of the fields may be given fuller expression. The fundamental thing to consider is the fact that there must be a general theory or plan before there is any grading and planting,—these latter things are only means to an end. Yet many persons who would be called landscape gardeners conceive that to plant a place is the whole of the problem. The working out of the details of the plan is to Landscape Gardening what building is to architecture, or what pen-work and grammar are to literature. It is the industrial or constructional part of the work. It is what has been called Landscape Horticulture (Bailey "Garden and Forest," p. 158). It has to do with all the details of kinds of plants, the care of them, the making of lawns, and similar problems. The American writings on Landscape Gardening are mostly writings on landscape horticulture and kinds of plants. Of indigenous American books, only two (Downing and Waugh) can be said to give a dominant share of their space to the principles of Landscape Gardening as a fine-art conception.

The first American practicing landscape gardener of note was André Parmentier, who came to this country from Belgium about 1824 and established a nursery on ground which is now in the heart of Brooklyn. He was a man of great taste and skill, and Andrew J. Downing considered his "labors and example as having effected, directly, far more for Landscape Gardening in America than those of any other individual whatever." He laid out many places, even as far away as the southern states on the south and Montreal on the north. The first American book on Landscape Gardening sprung full-fledged and complete from the pen of A. J. Downing in 1841, without having undergone the tedious evolution of preliminary and imperfect editions which characterize so many horticultural and kindred writings. It

was immediately popular, and it has probably exerted a greater influence on American horticulture than any other single volume. It remains to this day without a superior and almost without a competitor. Downing was also the second prominent practicing landscape gardener, although his untimely death left the country with no completed works of his genius. His best known pieces are the grounds of the Smithsonian Institution and Lafayette Square, Washington, but it is doubtful if the subsequent treatment which the former demesne has received is such as would have pleased the designer. A. J. Downing's pomological work was continued by his painstaking brother Charles; but the artistic work dropped at his death, and Henry Winthrop Sargent, who edited the sixth edition of the "Landscape Gardening," in 1859, declared that "there has been no one since Mr. Downing's death who has exactly filled the niche he occupied in the public estimation." The third genius of American Landscape Gardening, and the one who has carried the art to its highest points of excellence, is Frederick Law Olmsted, who as a young man was inspired by Downing, and who became a landscape gardener when he was placed in charge of the improvements of Central Park, New York city, about 1856. For more than twenty-five years, Mr. Olmsted has given his talents wholly to this delightful art, and more than any other American, has moulded and crystallized public taste respecting the appreciation of Landscape Gardening. A leading spirit in the construction of this great park was Calvert Vaux, who, with Olmsted, was joint author of the original plan. Vaux was also associated with A. J. Downing. He died in 1895. He was an excellent artist. The initiation of Central Park as a pleasure ground inaugurated the modern park systems of the country, and created what the Earl of Meath has recently designated the "veritable rage for park making" which has "seized the American public." See the article on *Parks*, Vol. III.

Within recent years, the number of practitioners of Landscape Gardening has greatly increased. The art is becoming established in popular estimation. Tastes may change, but the changes will affect only the minor applications of Landscape Gardening. The desire for artistic treatment of grounds is ineradicable. Three national societies are conservators of the Landscape



1230. Plan of the Leasowes, the seat of Shenstone. The residence is near the center.

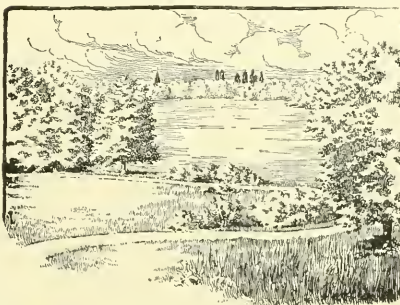
Gardening and rural art of the country : American Park and Out-Door Art Association ; American Society of Landscape Architects ; Association of American Cemetery Superintendents.

The one point in which America excels other countries

in landscape art is in the rural and garden cemetery. The first distinct movement towards a rural cemetery was made in 1825 by Jacob Bigelow, of Boston, whose work was soon taken up by the Massachusetts Horticultural Society. As a result of the agitation by this admirable organization, Mt. Auburn Cemetery, at Cambridge, was established and incorporated in 1831. The consummation of this enterprise gave to the world a cemetery which should be distinct from church-yards, removed from the city, and softened by the gracious touch of nature; and thereby, also, the young Massachusetts Horticultural Society set an example to all similar organizations and achieved for itself enduring fame. The work of Repton and London had not then enlivened and broadened the conceptions of Landscape Gardening, and Mt. Auburn, whilst an excellent work of its kind, is not a landscape garden cemetery. The modern art of garden cemetery making—in which, as in the park, the continuous expanse of greensward is the fundamental conception of the fabric—originated with Adolph Strauch, who, in 1854, became superintendent of Spring Grove cemetery, Umeinath. Strauch was a Prussian, born in 1822, and died in 1883. His work at Spring Grove cemetery has justly given him lasting fame, and his book describing the place must be consulted by any one who traces the evolution of the garden cemetery. The Board of Directors of the cemetery said, at the time of his death, that "he had filled the measure of his ambition by the consent of his profession, which ranked him as the equal of Repton and Pückler-Muskau as a master of art in landscape creation, which had been finally proved by him to be possible to be successfully applied in adorning and making attractive the last resting places of humanity." At the present time, about a hundred burial places in various parts of North America can be said to be landscape-garden cemeteries. See the article on *Landscape Cemeteries*, following.

The successful practice of Landscape Gardening depends, first, on an artistic temperament and an inherent love of nature; second, on an intimate knowledge of plants; and third, on familiarity with various arts and handicrafts, as the making of roads, grading, draining, enriching the land, and the like. Landscape Gardening must be sharply distinguished from gardening: the former is the making of pictures with plants; the latter is the growing of plants without reference to the picture. In one, the interest centers in art; in the other it centers in plants. Since Landscape Gardening is primarily a matter of taste, it is impossible that it be

tinguish sharply between the fundamentals and the incidentals,—those things which are to give the character or tone to the place, and those which are embellishments or ornaments. Keep one or more spaces open. Plant the sides or boundaries with masses. Use single or individual plants only to emphasize or to heighten an effect, not to



1232. Outline of an open center and mass-planted sides.

Suggestion from Englischer Garten, Munich.

give it character: they are incidentals. Ornament should be an incident. Foliage is a fundamental. Greensward is the canvas on which the picture is spread. Plants are more useful for the positions they occupy than for their kinds. Walks and drives are no part of a landscape picture: they are a necessity, but they may be made to conform to the spirit of the picture. The place for walks and drives is where they are needed; otherwise they have no use or purpose. It is the part of a good landscape gardener to make his grounds conform to the buildings: it should equally be the part of an architect to make his buildings conform to the landscape. Make views to desirable objects in the outlying landscape or the offscape. Obstruct the views to undesirable parts. Aim for a good prospect from every window in a residence, including the kitchen. Shear the trees and bushes when hedges, curiosities, and formal gardens are wanted: let them assume their natural forms when a landscape garden is wanted (Figs. 1237, 1238). Place no tree or plant until you are sure that it will mean something.

The best results in the planning of any place are to be expected when one employs a competent landscape gardener. Avoid the man who places great stress on flower beds and "designs." Yet one can do much by himself, and be the happier for the effort. Books will help. Some of the current American books on Landscape Gardening and related topics are the following: Downing's "Landscape Gardening;" Kemp's "How to Lay Out a Garden;" Parson's "Landscape Gardening" and "How to Plan the Home Grounds;" Long's "Ornamental Gardening for Americans;" Waugh's "Landscape Gardening;" Maynard's "Landscape Gardening as Applied to Home Decoration;" Davis' "Ornamental Shrubs;" Van Rensselaer's "Art Out of Doors;" Bailey's "Garden-Making." See *Borders, Herbs, Lawns, Parks, Shrubs*.

L. H. B.

Landscape Cemeteries (Plate XVII).—The cemeteries of the present day have come into existence from a desire to have burials made at a distance from centers of population, and among beautiful surroundings. They are often called "rural cemeteries." The first one in the United States to merit this name was Mt. Auburn, near Boston, Mass., founded in 1831. Since then the idea of having burial places park-like in their character has been spreading until they contain to-day some of the most beautiful landscapes developed by the hand of man. The wish to have in the cemetery all the beauty of trees, shrubs, lawns and flowers has gradually led to the abolition of fences, coping and other lot enclosures, and a reduction in the number of monuments and the size of headstones. There are many who now believe



1231. Glimpse in Shenstone's Leasowes.

dominated by rules. However, a few general precepts and suggestions may be useful, and these are given in the following paragraph (see Figs. 1232-1238).

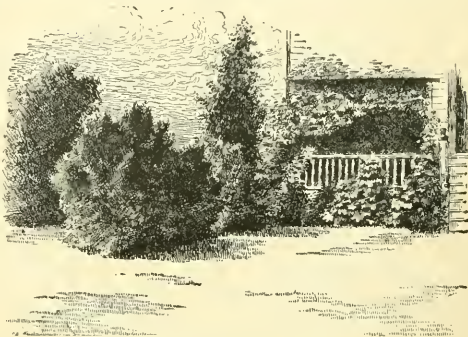
The motive of a true landscape garden, as already explained, is to make a picture. The picture should have a landscape or nature-like effect. The place should be one thing: it should emphasize some thought or feeling. It should have one central or emphatic object. Avoid scattered effects. Bunch or mass the planting. Dis-

that the last resting place should be surrounded by the quietness and beauty of these features of nature's handiwork without distracting stonework or artificial objects. There are others who say that "the cemetery should be a cemetery," meaning by this expression that it should resemble somewhat closely the old churchyard or graveyard, with its multitude of crowded stones, inscribed with the names and good qualities of all buried within its walls.

All agree that the cemetery should be so situated and maintained as to menace in no way the healthfulness of surrounding neighborhoods. The ideal location is one where the ground is somewhat undulating and thoroughly drained by having a porous subsoil, while the surface soil is sufficiently rich and deep to support a good growth of vegetation. In some instances, as at Forest Hills, Boston, Mass., and at Woodlawn, New York, it has been necessary to blast and remove rock and then fill in the space with earth. In other cases, the natural soil has been so poor that it has been necessary to cover it with rich earth hauled from a long distance. In still other cases, it has been found necessary to select a clay soil because there was no other, or to make ground by excavating lakes, using the material excavated to raise the surrounding land, or to bury above ground in structures erected for the purpose, as at New Orleans.

When a site is chosen, it is usually subdivided into sections and lots, which must be made accessible by the construction of drives and walks. The drive should pass within 150 or 200 feet of every place available for burial. The width of the drive should vary according to the size of the cemetery and the probable amount of driving. If the area is very small, say not over four or five acres, it may be unnecessary to have any drive. In a little larger area, a grass drive 8 feet wide might suffice; in one still larger, a driveway 16 feet; and, finally, a cemetery designed to accommodate large populations should have good macadamized roadways 24 or 32 feet in width. Walks should generally be left in grass which forms part of a continuous lawn, such being better in appearance and more easily maintained than those made of gravel. The location of the drives will determine the shape and size of the sections. The plans should be made after a careful study of the ground in question, the drives being placed so that they will have easy grades, command good views, and be as few as possible without being more than 300 or 400 feet apart. When the ground is irregular in shape, or has steep slopes, or

contains streams or lakes or valuable trees, these conditions may make it necessary to construct more drives than would otherwise be desirable. They can generally be staked out on the ground by eye with a better effect than if drawn first in an office by the use of some geo-



1234. A flank planting, leaving the center free.

metrical curve. They should nearly always be curved to produce the most pleasing result, a curved driveway being interesting because: (1) when the margins are properly planted certain portions of the ground are always hidden; (2) they insure varied effects of light and shade; (3) they make the average distance from the cemetery entrance to the lots shorter than if one follows straight lines and turns right angles.

An open tract, to begin with, is in many ways preferable to one that is thickly wooded, but groups of trees or single specimens that have broadened out in a natural way would be very valuable, since they would help to take away the naked, forbidding appearance of land newly planted with young trees. On a vacant area, it is usually advisable to plant some large trees for the sake of immediate effect. These can be grouped about the entrance, a fork in the drives, the top of a hill, the margin of a lake, or other distinguishing position. The objection to a piece of land covered with thick woods is that the necessary thinning to get sufficient open space will leave tall, spindling trees, unused to exposure.

These, while not very attractive in themselves, are very likely to die and are liable to be blown down. If there are thick woods in the land chosen, the trees selected to remain should be those that are healthiest and have the lowest branches. Some of the trees removed might be cut off at the ground, when the sprouts springing from the stump will form beautiful bush-like specimens.

The necessary buildings will vary with the size of the cemetery, but they should always be modest in appearance and suitably embellished with shrubbery and vines. The office would naturally be placed near the entrance to avoid unnecessary walking, but it should not be placed immediately on the highway or public street. The large arch frequently built over the gateway is usually too pretentious in appearance and not in keeping with the character of the grounds. A natural archway of living trees would be better. The chapel, if any, should be built well within the grounds to give it greater seclusion and quietness.



1233. A free and open center.



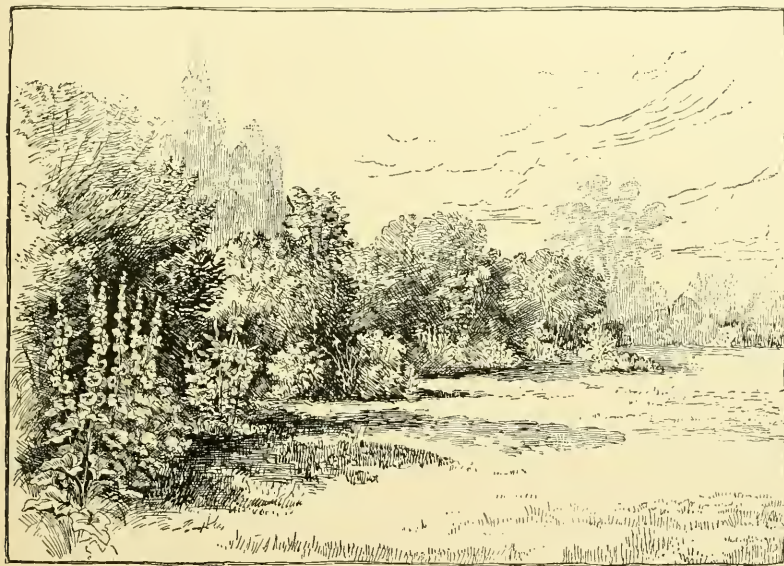
Plate XVII. A walk and vista in a Landscape Cemetery.—Graceland Cemetery, Chicago

Whether there should be greenhouses or not cannot be discussed here on account of the limits of this article. It may simply be said that with the greater variety of flowering trees and shrubs which we have to choose from, as well as the thousands of hardy, flowering, herbaceous plants, most beautiful effects can be produced without the expense, the continual labor and the bare beds more than half the year, which would follow the construction of greenhouses. Usually the selection for planting of material found growing in the adjacent country will help to produce satisfactory results with little expenditure of money and time. To prevent intrusion, a fence along the boundary of the cemetery is necessary, but this can be a simple inexpensive wire fence, serving in places as a support for vines, and in places being hidden by a belt of trees and shrubbery. No one would now make the cemetery dreary by confining the planting to spruces

a meeting of the Association of American Cemetery Superintendents, held at Boston, in 1890, the following rules were recommended by a unanimous vote of those in attendance:

Rule 1: (This should be a general rule, stating the authority and conditions on which lots are sold and the restrictions on transfers. The rule, of course, would have to be varied according to conditions existing in each cemetery.)

Rule 2: The Trustees desire to leave the improvements of lots, as far as possible, to the taste of the owners; but, in justice to all, they reserve the right, given them by law, to exclude or remove from any lot any headstone, monument or other structure, tree, plant or other object whatever which may conflict with the regulations, or which they shall consider injurious to the general appearance of the grounds; but no trees



1235. A structural foliage mass, with rugged sky line and irregular ground plan, and embellished with flowers on the margin.

and weeping willows. On the contrary, every effort is made to secure bright, cheerful effects by the selection of all kinds of flowering, happy-looking plants. The modern cemetery becomes in fact a sort of arboretum. It includes some evergreens which are most suitably grouped along the boundary belt, and which should contain all kinds of hardy pines, as well as the more stiff and formal spruces. The planting of Norway spruces has in many places been overdone. The development of attractive landscapes in cemeteries is of so much importance that Mr. Strauch, who was the greatest cemetery designer that we have had, used to call the present method "the landscape lawn plan."

A good landscape in the cemetery is usually the result of years of growth. It must first be carefully designed, and then receive care and attention from some one familiar and in sympathy with the scheme adopted. To insure such attention, and to protect the interest of all lot-owners, as well as to maintain the dignity and character of a city of the dead, rules have been adopted by all leading cemeteries. These rules are the result of study and experience on the part of many men. At

growing within any lot shall be removed or trimmed without the consent of the Trustees.

Rule 3: Lot-owners may have planting or other work done on their lots at their expense, upon application to the Superintendent. No workmen other than employees of the cemetery will be admitted to the cemetery except for the purpose of setting stone-work.

Rule 4: No iron- or wire-work, and no seats or vases will be allowed on lots, excepting by permission of the Trustees, and when any article made of iron begins to rust, the same shall be removed from the cemetery.

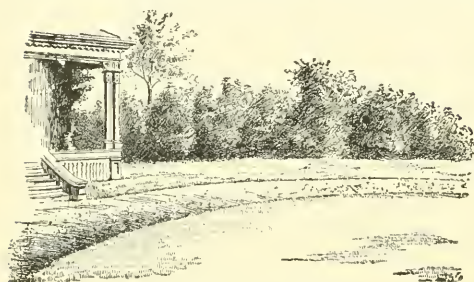
Rule 5: The Trustees desire to encourage the planting of trees and shrubbery, but, in order to protect the rights of all and to secure the best general results, they require that such planting shall be done only in accordance with the directions of the Superintendent of the cemetery.

Rule 6: No coping, nor any kind of enclosure, will be permitted. The boundaries of lots will be marked by corner-stones, which will be set by the cemetery, at the expense of the lot-owner, with the centers upon the lines bounding the lot. Corner-stones must not project above the ground and must not be altered nor removed.

Rule 7: No lots shall be filled above the established grade.

Rule 8: All interments in lots shall be restricted to the members of the family or relations of the lot-owner.

Rule 9: No disinterment will be allowed without the



1236. A good planting on the boundary.

Against this background, flowers would look well.

permission of the Trustees, of the lot-owner, and of the next of kin of the deceased.

Rule 10: Mounds over graves should be kept low, not exceeding four inches in height; and stone or other enclosures around graves will not be allowed.

Rule 11: Foundations for all monuments, headstones, etc., shall be built by the cemetery at the expense of the lot-owner, and fifteen days' notice must be given for the building of foundations. The cost of the same must be paid in advance.

Rule 12: Every foundation must be at least as wide and as long as the base stone resting upon it, and must not project above the surface of the ground. All foundations must extend as low as the bottom of the grave.

Rule 13: Only one monument will be permitted on a family burial lot.

Rule 14: (This should be a rule limiting the height of headstones, and the lower this limit is made the better. Even with the lawn is considered best.)

Rule 15: All stone- and marble-works, monuments and headstones must be accepted by the Superintendent as being in conformity with the foregoing rules before being taken into the cemetery.

Rule 16: No monument, headstone or coping, and no portion of any vault above ground, shall be constructed of other material than cut stone or real bronze. No artificial material will be permitted.

Rule 17: The Trustees wish, as far as possible, to discourage the building of vaults, believing, with the best landscape gardeners of the day, that they are generally injurious to the appearance of the grounds, and, unless constructed with great care, are apt to leak and are liable to rapid decay, and in the course of time to become unsightly ruins. Therefore, no vaults will be permitted to be built unless the designs for the same are exceptionally good, and the construction is solid and thorough. The designs must be submitted to the Trustees, and will not be approved unless the structure would, in their judgment, be an architectural ornament to the cemetery.

Rule 18: Material for stone or marble work will not be allowed to remain in the cemetery longer than shall be strictly necessary, and refuse or other unused material must be removed as soon as the work is completed. In case of neglect such removal will be made by the cemetery at the expense of the lot-owner and contractor, who shall be severally responsible. No material of any kind will be received at the cemetery after 12 o'clock m. on Saturdays.

Rule 19: The Trustees shall have the right to make exceptions from the foregoing rules in favor of designs which they consider exceptionally artistic and ornamental, and such exceptions shall not be construed as a rescission of any rule.

Rule 20: It shall be the duty and right of the Trustees from time to time to lay out and alter such avenues and walks, and to make such rules and regulations for the government of the grounds as they may deem requisite and proper and calculated to secure and promote the general object of the cemetery.

Rule 21: The Superintendent is directed to enforce the above regulations, and to exclude from the cemetery any person wilfully violating the same.

Cemeteries should be established upon a basis to enable those in authority to take uniform care of the grounds for all time. The prices charged for lots should be high enough to enable a fund to be set aside that will yield an annual income sufficient to pay all necessary general expenses. In laying out a new cemetery, those in charge should seek the best advice available. Such advice should be based on a thorough knowledge of Landscape Gardening and the special needs of burial grounds. Much information can be obtained by visiting Spring Grove, at Cincinnati, Ohio, generally recognized

as the pioneer of park-like cemeteries, and perhaps the best example in the world. Oakwoods Cemetery, at Troy, N. Y.; Swan Point Cemetery, at Providence, R. I., and Forest Hills, at Boston, Mass., are some of the prominent examples of the system now in vogue. Grace-land Cemetery, at Chicago, Ill., although much smaller in area than those already mentioned, contains some good landscape effects. There are many other cemeteries in the vicinity of the large cities of the United States which can be commended on account of the good taste displayed in them. There are others, like Mt. Auburn of Boston, Greenwood of Brooklyn and Laurel Hill of Philadelphia, which, while containing many beautiful trees and expensive monuments, include also many fences, railings, copings and hedges that serve as examples of what to avoid rather than to imitate.

Our leading cemeteries should keep pace with the best thought of the times, with the best theories of religion, science and economics. They should be, as the name implies, sleeping places—places of rest and freedom from intrusion. It seems natural that people should



1237. An artistic group-planting alongside a walk.

select for such a place the very best production of landscape-art, a place where spreading lawns give a cheerful warmth and sunlight; where pleasing vistas show distant clouds or the setting sun; where branching trees give grateful shade, furnish pleasing objects to look at, and places for the birds to come each year and sing

again their welcome songs; where blossoming shrubs delight the eye, perfume the air, and make attractive resting places. Such places may seem to exist more for the living than for the dead, but the living are the ones that need them. If it seems natural to select a most beautiful park, a real picture, we might say, for a sleeping place, it seems strange to put into this picture obelisk after obelisk, stone posts and slabs of all shapes



1238. A group which has been spoiled by the pruning shears.

and sizes, and stone tombs within whose walls their owners hope to have their dead bodies preserved forever. The history of sepulture shows the futility of trying to preserve one's body or one's name with the help of stone. A man can only hand his name down to posterity by his own work, and even if his body should be preserved as long as were those of the ancient Egyptians, it might finally be used only to propel a locomotive or a steamboat. These facts should be recognized in the modern cemetery. The ground should assist in changing the body back into organic forms or to receive the ashes, if the quicker process of cremation is adopted. The scenery should solace those that are bereft.

It is repugnant to our best feelings to use the same land over and over again, as is done in many cities in Europe and, to some extent, in the United States. A cemetery is frequently spoken of as the last resting place, and it serves mankind best when it is so in fact, since in that case, after it has served its purpose of purification, it becomes a park, a breathing place for the people of the city, whose growth is likely to crowd the vicinity with houses. The memory of past generations will certainly be sweeter if it is associated with trees, than if it is connected with tombs, catacombs and pyramids. The problem presented to cemetery associations is, therefore, how to secure the most pleasing combinations of growing plants, including trees, shrubs, flowers and grass; the most satisfactory views; the most harmonious and restful park, for the cemetery is really a memorial park.

Those seeking information on this subject will find it in the histories of the various cemeteries and in encyclopedias. The development of the landscape idea in connection with cemeteries is given in some of the reports of those institutions, that of Spring Grove for the year 1869 being especially valuable. The reports of the Association of American Cemetery Superintendents contain many papers of interest. The volumes of the "Modern Cemetery," afterwards the "Park and Cemetery," the only periodical devoted to the interests of burial places, contain articles relating to all phases of the subject. All books relating in any way to Landscape Gardening are of value in cemetery work, since they treat of all its natural features.

O. C. SIMONDS.

LANTANA (old name, once applied to a *Viburnum*), *Verbenacea*. Perhaps a half hundred species of herbs or shrubs, sometimes half-climbing, with opposite rough dentate leaves, and spikes or cymes of small verbenalike flowers. They are natives of the tropical and subtropical parts of Asia, Africa and America. Fls. small, gamopetalous, the calyx very small, the corolla somewhat irregularly 4-5 parted, the corolla tube slender; stamens 4, didynamous; ovary 2-loculed, becoming a fleshy or dryish drupe with 2 nutlets. The bracts subtending the head often imitate an involucre. *Verbena* differs in having akene-like nutlets and long-tubular 5-toothed calyx.

Lantanas have been long in cultivation, and it is difficult to refer the garden forms to botanical species. The species themselves are confusing. Most of the garden kinds are of the *L. Camara* type. There are several *Camara*-like species which probably have hybridized to produce these forms; but Voss, the latest garden monographer, regards these species as only forms of *L. Camara* (preferring, however, to use the name *L. aculeata*). Accepting *L. Camara* in Voss's sense, the garden Lantanas may be said to be derived from that species; and this view is adopted below. Monogr. by J. C. Schauer, DC. Prodr. xi. 594-609.

L. H. B.

The Lantana has been improved in its usefulness as a bedding plant of late years, largely through the efforts of French hybridizers. The older varieties were mostly rather tall and lanky, later in coming into bloom, and dropped their flowers badly after rain storms, but were showy in warm and dry weather. The new varieties are dwarf, spreading and bushy in habit, early and free-flowering, and the heads or umbels of bloom average much larger, with florets in proportion; nor do they drop off from the plants as the old varieties did in bad weather. These newer kinds are not as well known as they should be. They are very desirable for any situation where sun-loving bedding plants are used, in groups or borders, window-boxes, baskets and vases. The Lantana is not particular as to soil, and flourishes provided the exposure is sunny and the soil well supplied with moisture, at least until a fair growth has been made. When well established it does not seem to mind drought, and continue bright and attractive in the hottest weather. It should not be transplanted out in the open before danger of frost is over. If the old plants are wanted for propagation, cut them back and transfer to pots early in September, and when they start into new growth the soft wood will furnish cuttings that root easily. Keep young stock in a warm position through the winter months, and repot in April.

Save the old plants, after Jack Frost has nipped their freshness late in the fall, prune severely back, remove them indoors, giving them a temperature anywhere above 40°, and with a little attention and fresh soil, every plant will be a perfect specimen, covered with bloom in May. Gardeners train them into fine standards, as prim and shapely as need be. Among the French varieties the most representative are Argus, orange with yellow center; Tethys, canary yellow; A. Claveau, silvery rose with yellow center. These are very dwarf spreading growers, about 8 in. high. Amiel is semi-dwarf, orange-red with yellow center, bright and showy; Protée belongs to the same class, rose color, yellow-shaded center; Delicatissima is a trailing or creeping sort, with slender stems, small leaves and dainty flowers of pink and lavender; La Pluie d'Or, golden yellow, is a standard variety among the older kinds.

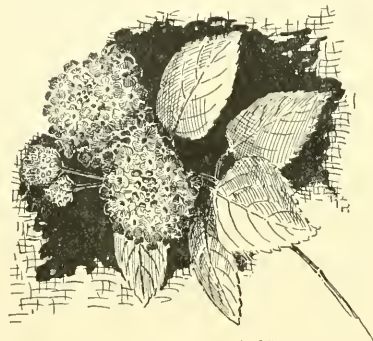
GROVE P. RAWSON.

A. Plant often spiny; fruit juicy.

Camara, Linn. (*L. aculeata*, Linn.). Fig. 1239. Small shrub, 1-4 ft. high, hairy, sometimes with short, hooked prickles; lvs. rather thick, rugose, scabrous above but pubescent beneath, ovate or cordate-ovate, mostly short-acuminate, crenate-dentate, the petioles short; clusters of fls. on strong axillary peduncles which may or may not exceed the lvs.; fls. in a dense, nearly flat-topped head, usually opening yellow or pink but changing to orange or scarlet, the bracts narrow and not conspicuous. Trop. Amer., extending north to Texas and S. Ga. B.M. 96. L.B.C. 12:1171 (as *L. scabrida*, Ait.).—In the wild, the plant may grow 10 ft. high, and it is usually prickly (hence the name *L. aculeata* of Linnæus). The cultivated plant is less prickly or even unarméd. The plant has a strong smell, but the ease with which it can be made to produce an almost continuous supply of bloom renders it a popular greenhouse and bedding subject. Color of fls. varies on different plants. Of late years the Lantanas have been neglected by florists, but improved varieties are now bringing it into favor again.

Var. *nivea* (*L. nivea*, Vent.). Fls. white, the outer ones becoming bluish; heads rounder. B.M. 1946.

Var. *mutabilis* (*L. nivea*, var. *mutabilis*, Hook.). Remarkable for the change of color in the nearly globular heads: in little more than a day the fls. may change from white through yellowish, lilac, rose and blue. The outer fls. open white and run through yellowish, rose and lilac; the inner ones open yellowish. B.M. 3110. R.H. 1852:461.



1239. *Lantana Camara* ($\times \frac{1}{2}$).

Var. *mista* (*L. mista*, Linn. Not spelled *mixta* by Linnaeus, although it is so spelled by later authors). Outer fls. opening yellowish and becoming saffron and brick-red; inner fls. yellow, changing to orange.

Var. *crœcea* (*L. crœcea*, Jacq.). Fls. opening sulfur-yellow and changing to saffron. R.H. 1852:461.

Var. *sanguinea* (*L. sanguinea*, Medic.). Fls. opening saffron-yellow, changing to bright red.

purpûrea, Hornem. Erect; branches 4-angled and somewhat hairy, with few recurved spines; lvs. ovate, narrowed into a petiole, acuminate, serrate-crenate, rugose; fls. purple, very pretty, in hemispherical-umbellate heads, the bracts short and lance-subulate. S. Amer.—Int. by Franceschi, 1900. A form of *L. Camara*!

AA. *Plant never spiny; fruit thin-fleshed, usually not juicy.*

trifolia, Linn. (*L. annua*, Linn.). Half-shrubby, hairy; lvs. ovate-lanceolate or elliptic-oblong, pointed, crenate-dentate, in 3's or 4's; heads becoming ovoid or oblong, the involucre not conspicuous; fls. rose-lilac varying to white, with yellow throat; fr. rather pulpy, showing well amongst the bracts. Trop. Amer. B.M. 1449.—The name *L. annua* seems to have been applied to young plants, on the impression that they were annuals. The picture of *L. annua* in B.M. 1022 is quite as likely to be a form of *L. Camara*. Little known in cult.

Sellowiana, Link and Otto (*L. delicatissima*, Hort.). WEeping or TRAILING LANTANA. Twiggy, slender plant with lopping or trailing pubescent branches; lvs. small, ovate, tapering below, close-toothed; fls. small, in long-stalked small heads, rosy lilac, the outer bracts or scales of the involucre broad-ovate and hairy and half or less as long as the slender pubescent corolla tube. S. Amer. B.M. 2981. B. 3:115. R.H. 1852:461.—A very profuse bloomer in both winter and summer, and most desirable for pot or basket culture. Should be better known. Verbena-like. The plant seems to be an escape in Fla.

involverata, Linn. Low, much-branched bush, with obscurely 4-angled gray branches, and blunt, ovate, small, crenate-dentate lvs.; fls. small, nearly or quite equalled by the ovate involucre bracts. Trop. Amer., reaching N. to S. Fla. and S. Tex.—Said to be occasionally cult. indoors for the light lilac or white fls.

L. H. B.

LAPAGÉRIA (the Empress Josephine, *née* Tascher de La Pagerie). *Litôceæ*. CHILEAN BELLFLOWER. A single species of noble, half-hardy evergreen climber, allied to the smilaxes. Lvs. alternate, lance-ovate or cordate-lanceolate, 3-5-nerved, acuminate; fls. large and showy, bell-shaped, hanging singly from the upper axils or somewhat racemose at the end of the vine, about 3 in. long; stamens 6, borne on the torus or slightly attached to the base of the inner segments, shorter than the perianth; ovary sessile and 1-loculed, with 3 parietal placentae, ripening into a 3-angled, oblong, fleshy, indehiscent, berry-like beaked fruit, and bearing nearly globular seeds imbedded in the pulp. **L. rosea**, Ruiz & Pavon, is the only species. Fig. 1240. It has rose-colored or rose-erimson fls., with lighter spots. Chile. B.M. 4447. F.S. 5:491; 20:2059-60. R.H. 1850:101. Gt. 46:1445; 47, p. 101. G.C. III. 20:657 (fruits); 25:45. Gu. 34, p. 321; 48, p. 475; 49:1056; 55, p. 57. Gng. 5:356. Mn. 7:191. Var. **albiflora**, Hook. (var. *alba*, Hort.), has white or whitish fls. B.M. 4892. R.H. 1852:441. F.S. 20:2059-60. (tn. 41, p. 53; 49:1056 and p. 175; 54, p. 277. A.G. 13:745 (poor). Gng. 2:187; 5:356. A double-fl. form of the white variety is shown in G.C. II. 17:177. The species is variable in vigor, floriferousness, size, color and substance of bloom, and there are a number of named horticultural subvarieties. Lapagerias are tall-twining plants, suitable for rafters or walls in cool-houses, or for culture in the open in the milder parts of the country. They are usually propagated from layers, but stronger plants usually are obtained from seeds, although varieties may not come true. The first live plants were introduced into England in 1847. Lapageria should be seen more frequently in America. Franceschi says that in California the plant prefers shady places "where the atmosphere will never become too dry."

Lapageria rosea and *Philesia borifolia* have been hybridized by Veitch, producing a plant known as *Philesia Veitchii*, Mast. (G.C. 1872:358). *Philesia* afforded the pollen. It is not in the American trade, but is a most interesting plant hybrid. For an anatomical study of it, bearing on problems of hybridity, see J. M. Macfarlane, Trans. Roy. Soc. Edinburgh, 37, pt. 1, p. 207 (1892).

L. H. B.

It is by no means an easy task to grow Lapagerias. They do best planted out into a cool greenhouse, where only the morning sun strikes them. If the border or bed in the greenhouse is on a naturally sandy or gravelly subsoil, so that the natural drainage is perfect, it is an ideal place for these plants. They like a deep bed of sand or gravel underneath their roots, where abundance



1240. *Lapageria rosea* ($\times \frac{1}{2}$).

of water can be applied during the spring and summer months and where the drainage is perfect. Light peaty loam is best, and after plants are fully established they like plenty of liquid fertilizing. The soil, in all cases,

must be open and sandy. They should be trained against a wall, facing either the east or north. Abundant syringing, temperature not to exceed 50° to 60° at night, and even as low as 45° at night in winter, plenty of air,—these are requisites. In winter they require but little water except spraying when the temperature warrants it. Where no such sandy strata or subsoil exists it must be provided, but care must be taken that they are not crowded into an obscure corner where the soil will not dry out, as otherwise it will sour and the plants will not do well. The roots must not be put too deep, as the plant is a shallow rooter. If no sand-bed can be had it is best to have the young plants in shallow pans, and, breaking the bottom, set them into such a prepared bed, sinking the pans until the roots go out into the prepared bed. In their native homes Lapagerias grow where plenty of water falls during their growing season and where they are semi-dormant the rest of the year. They flower from the well-ripened and matured wood of a strong growth. Propagation is effected by means of layers or from seeds. H. A. SIEBRECHT.

LAPEIROUSIA. Preferably spelled *Lapeyroussia*.

LAPEIROUSIA (Jean François Galoup de Lapeyrouse, distinguished French naval officer, born 1741). *Iridaceae*. About 32 species of African bulbs, something like *Freesias*, but with blue or red fls., which are produced in summer instead of spring. They can be grown outdoors in the North with some winter covering, and are said to be quite hardy south of Washington, D. C., if planted deep. By American dealers they are still listed under the name of *Anomatheca*, which Baker has reduced to one of the 3 subgenera of *Lapeyroussia*, characterized by having several lvs. forming a 2-ranked basal rosette, accompanied by a long, branched stem. *Lapeyroussia* is further distinguished from *Freesia* by having a more slender perianth-tube, with the stamens inserted at the throat instead of below; also by the ovules being more regularly superposed instead of crowded together. The species of *Lapeyroussia* have an egg-shaped or globose corn about ½ in. thick, and matted with tunics; lvs. linear or sword-shaped; inflorescence various, often a loose, 1-sided, more or less zigzag spike, as in *Freesia*; fls. variously colored, 1-2 in. across; perianth tube long or short; segments spreading, 3 larger than the other 3. Monographed by Baker in his "Hand book of the Iridaceae," and also in the African floras.

These plants will probably never have anything like the degree of popularity enjoyed by *Freesias*, because of their later season of bloom and lack of fragrance. Probably the most popular kind is *L. cruenta*, which grows 6-10 in. high, blooming in summer and fall. In a sheltered and in light, porous soil it generally succeeds in the North without any protection, but the bulbs are safer in very severe winters under a covering of litter or straw. The bulbs increase rapidly, and should be divided every few years before they become too crowded.

A. Color of fls. chiefly blue or violet.

corymbosa, Ker. (*Anomatheca corymbosa*, Hort. A. Blane). This belongs to the subgenus *Ovieda*, having usually 1-2 basal lvs., while the next 3 species belong to the subgenus *Anomatheca*, having more numerous lvs. *L. corymbosa* has 1 basal leaf which is spreading, sword-shaped, 4-6 in. long; inflorescence a dense flat-topped cluster of as many as 15 fls. each about 1 in. across, with practically regular segments, blue, with a star-shaped white figure near the throat, outlined in black after the fashion of *Quedlinburg* Phlox. B.M. 595. J.H. III. 32:379.

AA. Color of fls. red, with 3 darker spots at the base of the 3 smaller segments.

B. Size of fls. 2 in. across.

grandiflora, Baker. (*A. grandiflora*, Baker). Lvs. 1 ft. or more long; fls. bright red; stamens as long as the segments; the 3 style branches each 2-ent. B.M. 6924. —A newer species than *cruenta*, and perhaps destined to greater favor. Corm globose (ovoid in the others here described).

BB. Size of fls. 1 in. across.

c. Segments bright carmine.

cruenta, Benth. (*A. cruenta*, Lindl.). Lvs. ½-1 ft. long; stamens less than half as long as the segments; the 3 style branches unent. B.R. 16:1369. L.B.C. 19:1857. P.M. 1:163. J.H. III. 31:397.

cc. Segments pale red or rose.

júncea, Poir. (*A. júncea*, Ker.). Lvs. strap-shaped, (linear in the 2 preceding species), 6-8 in. long; stamens half as long as the segments. —Less known in cult. than the others. J. B. KELLER and W. M.

LAPPA. See *Arctium*.

LARCHE. See *Larix*.

LARDIZABALA (after the Spanish naturalist Lardizabal y Uribe). *Berberidaceae*. Six species of S. American shrubby climbers, mostly Chilean, one of which is cult. outdoors in S. Calif. and the warmer parts of Europe. It is something like the well known hardy vine *Akebia quinata*, having similar, odd-looking, dark-colored fls., but the leaflets are in 2's instead of 5's. The leaves may be once, twice or thrice ternate, and they are dark green, glossy, and here and there have 1 or 2 almost spiny teeth.

There are 4 genera of the Barberry family containing shrubby climbers that are cult. Of these *Akebia* is the best. *Akebia* and *Holboellia* have free stamens; *Lardizabala* and *Stauntonia* have monadelphous stamens. In all of these the showy parts are the 6 sepals, the 6 petals being much smaller in *Lardizabala* and absent in *Stauntonia*. *Lardizabala* is further distinguished from *Stauntonia* by having once- to thrice-ternate foliage and oblong berries, while *Stauntonia* has digitate foliage with 3-7 leaflets.

biternata, Ruiz & Pav. Lvs. generally once ternate, particularly in the flowering branches: flts. rather leathery, evergreen, ovate, dark green above, paler and netted-veined beneath; staminate fls. in a dense drooping spike, containing as many as 15 fls. each about 1 in. across, with ovate dark purplish chocolate colored sepals and small lanceolate white petals. (Chile. P.M. 4561. Gr. 28, p. 489.—Grows about 12 ft. high against walls in warmer parts of England. The fruit is said to be sold in the Chilean markets and cordage is made of the fiber. W. M.—

LÁRIX (ancient Latin name). *Coniferae*. **LARCHE**. **TAMARACK**. Ornamental deciduous coniferous trees of pyramidal habit, with the lvs. linear and clustered except on young shoots, where they are spirally arranged, and with the pistillate fls. often very conspicuous by their bright purple color; cones erect, globose to oblong, rarely more than 2 in. long. They are all hardy North except the Himalayan *L. Griffithii*, and are often planted as park trees, chiefly for the light green foliage and the regular conical, or in some vars. pendulous, habit. The most beautiful is probably *L. leptolepis*, with the foliage turning bright yellow in fall, while the others assume only a pale yellow color. They are also very valuable forest trees, especially for the northern and mountainous regions; no forest tree goes farther north than the Larch, reaching in N. America 67° and in Siberia 72° of latitude. The wood is hard, heavy and very durable, and much used for construction, that of *L. occidentalis* being considered the best of all American conifers. From the European Larch turpentine is obtained. The bark contains tannin, and an extract is used for tanning leather. The Larch grows in almost any kind of soil, including clay and limestone, and prefers a somewhat moist, but well-drained soil and an open situation; the American Larch grows well even in swamps. Unfortunately several insects and fungi prey on the Larch, and sometimes do considerable damage, especially the leaf-eating larvae of some moths. Prop. usually by seeds sown in spring, and the young seedlings shaded; vars. are grafted on seedlings, mostly on those of *L. decidua* (*Europaea*), either outdoors by whip- or cleft-grafting or in the greenhouse by veneer-grafting; they may also be increased by cuttings of nearly ripened wood under glass or by layers, but this method is rarely

practiced. Nine species in the colder regions of the northern hemisphere. Staminate fls. small, globose to oblong, solitary, consisting of numerous short-stalked, spirally arranged anthers; pistillate fls. larger, consisting of several or numerous scales, with 2 naked ovules at the base, each scale borne in the axil of a much longer bract; cone with woody, 2-seeded scales, persistent on the axis; seeds with large, thin wings, ripening the first year.

ALFRED REHDER.

The European Larch is an upright, conical grower, and one of our best lawn trees. In the spring, when it is covered with its new growth of soft, feathery, light green foliage, it is a very striking and beautiful object. As it begins growth at a low temperature, it is the first of our trees to be covered with new foliage. Again in the autumn it is very beautiful, as its needles turn a golden color before falling, for this tree, unlike most of the conifers, is deciduous after the first year. In the middle West and along the coast in Massachusetts, it is planted for timber, shelter belts and wind-breaks. Unlike its American relative, *L. Americana*, or Tamarack, this tree grows on high ground and does well on a great variety of soils. It does not do well on low, submerged ground, the home of *L. Americana*. The Larch is known in Europe as one of the most durable woods. It does not ignite easily, neither does it splinter, and the wood was in great demand for these reasons for battle-ships before the ironclads displaced the wooden ships.

The Larch stands transplanting well, but this must be done very early in the spring, before new growth begins. The seed is sown in beds of finely prepared soil, about the middle of May, and either raked in or covered very lightly by hand, not to exceed one-eighth of an inch. It is usually sown in beds 4 feet wide. As soon as it germinates it is shaded with lath frames, raised about 10 inches above the bed. The first year it makes a growth of from 2 to 4 inches, and holds its foliage the first winter. A slight covering of hay or straw should be lightly shaken over the seedlings as soon as winter sets in, to prevent the seedlings being thrown out by continual freezing and thawing. The frames are put on again to hold the snow. During the following summer the frames should be removed entirely. At two years old they will be from 6 to 20 inches in height, and can then be moved to nursery rows or planted out permanently in the forest. The seeds should be sown thicker than other conifer seed, as seldom over 60 per cent germinate. Sometimes they make very little upward growth the first and second years after transplanting, seemingly putting all their strength into the side shoots in order to spread out and shade the ground over their roots, a custom followed by all the conifers on hot, sandy soil. This being finally accomplished, they will make a rapid upward growth.

THOS. H. DOUGLAS.

A. Bracts longer than the scales; scales numerous, stiff, spreading or recurved after maturity.

occidentalis, Nutt. Tall tree, to 150 ft., with dark-colored bark, becoming bright cinnamon-red on older trunks, and with short, horizontal branches, forming a narrow pyramidal head; branchlets pubescent when young; lvs. rigid, sharply pointed, triangular, keeled beneath, 1-1½ in. long, pale green; cone oblong, 1-1½ in. long; scales orbicular, almost entire, tomentose beneath. Brit. Col. to Mont and Ore. S.S. 12:594. G.F. 9:497. Gt. 20:685, figs. 8-10. G.C. H. 25:652. B.H. 22:8, figs. 3-5.

AA. Bracts shorter than scales.

B. Lvs. with 2 white lines beneath; scales numerous, reflexed at the apex.

leptolepis, Murr. (*L. Kämpferi*, Sarg., not Gord.). Tree, to 80 ft., with horizontal branches, forming a pyramidal head; branchlet yellowish or reddish brown, glabrous and glossy; spurs short and globular; lvs. rather broad, obtuse, soft, ½-1½ in., light or bluish green; cones ovate-oblong, ½-1½ in. long, with emarginate, roundish ovate scales. Jap. G.C. H. 19:88. Gt.

20:685, fig. 5. B.H. 22:8, fig. 2.—The handsomest of the Larches as a lawn tree. Var. *minor*, Murr. (var. *Murrayana*, Maxim., *L. Japonica*, Murr., not Carr.). Dwarfier form with smaller cones. Gt. 20:685, fig. 2. B. H. 22:9, fig. 4.

BB. Lvs. without white lines, very narrow; scales erect-spreading, straight or slightly incurved at the apex.

decidua, Mill. (*L. Europæa*, DC.). EUROPEAN LARCH. Fig. 1241. Tree, to 100 ft., with pyramidal, later often irregular, head; bark dark grayish brown; branchlets slender, glabrous, yellowish; lvs. compressed, triangular, soft and obtuse, bright green, ¾-1¼ in. long; pistillate fls. purplish; cones 3-1½ in. long, with many all orbicular scales, usually finely tomentose on the back. N. and M. En. Gt. 20:684, fig. 3. B.H. 22:7, fig. 1. Var. *pendula*, Loud. With pendulous branches;

1241. *Larix decidua* (×½).Commonly known as *L. Europæa*.

sometimes confounded with the American Larch. Gt. 20:684, fig. 11. B.H. 22:8, fig. 1. Gn. 35, p. 245 and 39, p. 84.

Americana, Michx. (*L. microcarpa*, Desf., *L. pénéula*, Salisb., *L. taricina*, Koch). TAMARACK. HACKMATAK. Tree, to 60 ft., with horizontal branches, forming a narrow pyramidal head, sometimes broad and open on older trees; bark reddish brown; branchlets slender, glabrous, often bloomy; lvs. like those of the former, but of light bluish green; cones small, oval or almost globular, ½-¾ in. long; scales few to 20, almost orbicular and entire, glabrous. Canada, south to Pa., west to Ill. and Manitoba. S.S. 12:593. Em. 106. Gt. 20:684, fig. 7-8. B.H. 22:10, fig. 2-3.

L. Dahurica, Turcz. Similar to *L. Americana*. Tree, to 70 ft., sometimes prominent; cone usually with more than 20 scales, more spreading at maturity. Amurland, Sachalin. Gt. 20:684, figs. 9-10. B.H. 22:9, figs. 5-6.—*L. Chinensis*, Beissn. Tree, with glabrous branchlets; lvs. with 2 white lines beneath; cones similar to those of *L. occidentalis*, China.—*L. Griffithii*, Hook. f. & Thoms. Pyramidal tree, to 60 ft., with spreading and pendulous branches; lvs. soft, obtuse; cones 2-3 in. long, oblong, with exerted and reflexed bracts. Himal. F.S. 12:1267-68. P.H. 1868, p. 371. Gt. 20:685, figs. 1-4. B.H. 22:10, figs. 4-7. G.C. H. 25:719, 26:463.—*L. Kämpferi*, Gord.=*Ecuadoriarix Kämpferi*,—*L. Kämpferi*, Sarg.=*L. leptolepis*,—*L. Kurilensis*, Mayr (L. Dahurica Japonica, Maxim.). Allied to *L. leptolepis*, to 70 ft.; young branchlets deep bluish red, pubescent; lvs. rigid; bracts as long or somewhat shorter than scales. N. Jap.—*L. Lyallii*, Parl. Allied to *L. occidentalis*, but less high; young branchlets tomentose; lvs. quadrangular; young cones deep purple, the scales with fringed margin. Brit. Col. to Wash. S.S. 12:595. G.C. H. 25:683; III. 23:357. Gt. 20:685, figs. 11-13. B.H. 22:9, figs. 1-3.—*L. Sibirica*, Ledeb. (L. European Sibirica and var. Rossica, Regel). Allied to *L. decidua*. Pyramidal tree, to 90 ft., with ascending branches; lvs. longer; pistillate fls. usually green, sometimes brown; cones larger with fewer but larger scales. Siberia. Gt. 20:684, figs. 1-2. B.H. 22:7, figs. 2-3.

ALFRED REHDER.

LARKSPUR. Species of *Delphinium*.LASIAGRÖSTIS. See *Stipa*.LASIANDRA. See *Tibouchina*.

LASTHENIA (name of a woman who was a pupil of Plato). *Compositae*. Low, slender annuals with numerous inch-wide yellow flowers in early summer.

glabrata, Lindl. (*L. Californica*, Lindl. *Homalogyne glabrata*, Bartl.). The plant cult. under this name is likely to be *Bueria gracilis*, which see. Height 1 ft.; lvs. much longer than in *B. gracilis*, strongly keeled, not hairy, or rarely pubescent; involucre enlarged below the flower. Calif. B.M. 3730. B.R. 21:1780 & 1823.

LASTREA (C. J. L. Delastre, Austrian botanist). A name commonly used in England for species of Dryopteris. Also spelled *Lastrea*. On the basis of priority it has no claim to recognition, as it was established by Bory in 1824, while we have *Nephrodium*, 1803; *Aspidium*, 1801; *Tectaria*, 1800; *Polystichum*, 1799, and *Dryopteris*, 1763.

The following additional species of Dryopteris (Vol. 1, p. 508) are in the American trade under the name *Lastrea* (the combinations are for Dryopteris, not *Lastrea*):

A. *Lowest pinnae reduced to auricles; texture thin.*

sancta, Kuntze. Lvs. 6-9 in. long, 1-2 in. wide on short slender stems; lower pinnae very much reduced; under surface glandular. West Indies.

palustris, Kuntze. Lvs. 2-3 ft. long, 8-12 in. wide, on long straw-colored stems; lower pinnae reduced, the upper $\frac{3}{4}$ in. wide, cut down to the rachis into linear-oblong lobes. Brazil.

montana, Kuntze. Lvs. 1 $\frac{1}{2}$ -2 ft. long, 6-8 in. wide; lower pinnae greatly reduced to mere auricles; upper pinnae 1 in. wide, cut into close blunt lobes. Eu., western N. America. A variety *crispato-gracile* is also cult.

AA. *Lower pinnae scarcely reduced; texture firm.*

rigida, Kuntze. Stipes stout, densely scaly; lvs. 1-1 $\frac{1}{2}$ ft. long, 4-6 in. wide, oblong lanceolate, the lower pinnae not reduced; segments with mucronate teeth. Eu. Var. *arguta* in Calif.

lepida, Moore. Lvs. 1 $\frac{1}{2}$ ft. long, 6-7 in. wide, ovate, bipinnatifid or bipinnate, the lower 4 or 5 pairs slightly smaller; indusia hairy. Of greenhouse origin, native country unknown.

Other species cultivated under the name *Lastrea*, as *L. aristata* and *L. Richardi*, belong to the genus *Polystichum*, which see.

L. M. UNDERWOOD.

LATANIA (East Indian name). *Palmaeae*. Three species of fan palms from the Mascarene Islands. *L. Borbonica* is one of the dozen commonest trade names among palms, but the seeds offered under this name are said to be almost invariably those of *Livistona Chinensis*. *Latania Borbonica* of the botanists is properly *Latania Commersonii*, which has 3-seeded fruits, while those of *Livistona Chinensis* are 1-seeded. *Latanias* are tall, spineless palms, with solitary robust annular trunks; lvs. ample, terminal, long-petioled, suborbicular, palmately flabelliform, pinnately multifid; segments smooth or spiny on the margins; rachis short; petiole 3-sided, concave above; ligule conchoidal; sheath short; spadices many feet long, compressed at the base and branches, sheathed with incomplete sheaths; staminate-fl. branches cylindrical, digitately arranged at the ends of the branches, very densely clothed with imbricated bracts; pistillate portion somewhat twisted, few-fl., sheathed with very broad dentate bracts; staminate fls. half-exserted beyond the bracts, the perianth smooth and shining; pistillate fls. larger; drupe globose, obovoid or pear-shaped, yellow. Allied genera are discriminated under *Hyphene*.

A. *Lvs. glaucous.*

Loddigesii, Mart. (*L. glaucophylla*, Hort.). Lvs. 3-5 ft. long, very glaucous, primary veins slightly tomentose beneath, tinged with red, especially in young plants; segments 2 ft. long, less than 3 in. wide, unequally acuminate, the edges spiny in young plants; petioles 3-4 $\frac{1}{2}$ ft. (or more) long, tomentose, entire in the mature, spiny in the young plant; drupe pear-shaped, 3-angled, 2 $\frac{1}{2}$ in. long, 1 $\frac{1}{4}$ in. thick. Mauritius.

AA. *Lvs. not glaucous.*

B. *Petiole densely tomentose, with an orange margin.*

Verschaaffeltii, Lemaire (*L. aërea*, Duncan). Lvs. pale green, 4 $\frac{1}{2}$ -5 ft. long, the segments 2 $\frac{1}{2}$ ft. long, above 2 in. wide, acuminate, the entire margins and veins slightly tomentose beneath; petioles 8 ft. densely tomentose, with entire orange margins, spiny in young plants; drupe slightly 3-angled, 2 in. long, 1 $\frac{1}{2}$ in. wide. Isl. Rodriguez. 1. II. 6: 229.

BB. *Petiole red, slightly tomentose.*

Commersonii, Gmel. (*L. rubra*, Jacq. *L. Borbonica*, Lam., not Hort.). Lvs. 5-5 $\frac{1}{2}$ ft. long, dark green above, paler beneath; segments lanceolate, acuminate, 2 ft. long, 3 $\frac{1}{4}$ -3 $\frac{1}{2}$ in. wide, their margins entire, spiny in young plants, veins and margins tinged with red; petiole 4-6 ft., slightly tomentose, the margins smooth, spiny in young plants; drupe globose, 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ in. in diam. Mauritius. Not A. F. 4:567 and 7:127; A. G. 13:144; 15:389 and 19:557; V. 9:199, all of which are *Livistona Chinensis*.

JARED G. SMITH.

Latanias are essentially warmhouse palms and require moderate shading through the greater portion of the year, and also an abundance of water. A well-drained and rather light compost is most suitable for them, and if the soil at the time of repotting is of the same temperature as the house in which the plants are grown, there will be less risk of a check to the delicate rootlets. *L. Commersonii* is a particularly striking palm, the leaf-stems being quite long, smooth, and colored bright crimson, as are also the ribs of its fan-like leaves, this coloring being especially bright on the young foliage. *L. Loddigesii* is the strongest grower of the genus, the leafstalks reaching a length of about 8 ft., usually chocolate-colored and quite glaucous, the leaves thick and leathery and their ribs reddish while young, though never developing such bright tints as those of the preceding species. *L. Verschaaffeltii* is also very attractive, though possibly a little more delicate than the other two, its leafstalks being long and rather slender, and orange-yellow in color, the ribs of the leaflets also yellow and the leaves themselves of a light shade of green.

L. crecta and *L. variegata* are trade names, the former being advertised by Saul, 1893; the latter by Pitcher & Mandl, 1895. Any specimens in cult. will probably be found to be varieties of some of the above.

W. H. TAPLIN.

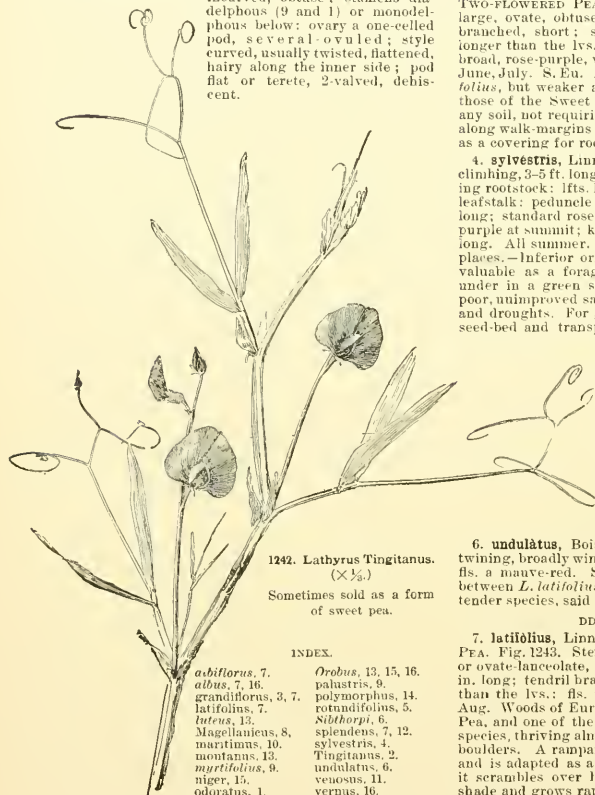
LATHYRUS (name used by Theophrastus for some leguminous plant). *Leguminosae*. A genus of about 100 species, occurring in the northern hemisphere and in South America, consisting of annual and perennial, climbing and upright herbs with pinnate lvs., half-sagittate stipules and showy, papilionaceous flowers.

The genus is best known by the Sweet Pea. Most other forms are perennial, although some of these are cultivated as annuals. All are free-growing plants, so independent in their ways that they require a place to grow by themselves, apart from other plants of like habit or size. Hence they are to be grown alone, on trellises or against walls, or allowed to form a wild tangle among strong shrubs. The chief value of the annuals is for cut-flowers, though their part in the garden is not to be ignored. As a temporary screen in summer for shutting out unsightly objects, they are valuable, or for quickly covering trellises or rough places otherwise unsightly.

The perennials are of comparatively easy cultivation, succeeding in any garden soil. The annuals are more exacting in their requirements, demanding a moderately rich garden soil, abundant moisture, coolness and depth for their roots, and open sunlight. All are grown from seed, sown very early in the open to secure the required coolness for the roots. The perennials are propagated, in addition, by division, special varieties being increased by cuttings in the fall, after the flowering season, or in spring, from old plants stored in the greenhouse. The roots of perennials are long and fleshy, and, when once established, continue for years without attention.

Orobis niger and *vernus* are common garden names, but Bentham & Hooker make *Orobis* a subgenus of

Lathyrus, characterized in part by the lack of tendrils. (See, also, *Orobus*.) Lathyrus has lvs. equally pinnate, ending in a tendril or in a point; lfts. 2 or several; stipules leafy, large and prominent, half-sagittate; fls. solitary or racemose, on long axillary peduncles; calyx oblique-campanulate, 5-parted, the upper teeth often shorter; corolla dark blue, violet, rose, white or yellow, or a union of these, the standard large, broadly obovate or rounded, notched, with a short claw, the wings falcate-obovate or oblong, the keel shorter than the wings, incurved, obtuse; stamens diadelphous (9 and 1) or monadelphous below; ovary a one-celled pod, several ovuled; style curved, usually twisted, flattened, hairy along the inner side; pod flat or terete, 2-valved, dehiscent.



1242. *Lathyrus Tingitanus*.
($\times \frac{3}{8}$.)

Sometimes sold as a form
of sweet pea.

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A. *Habit climbing; lvs. tendril-bearing. (Lathyrus.)*

B. *Annuals; leaflets one pair.*

1. *odoratus* Linn. SWEET PEA. Stem rough-hairy, winged; fls. oval or oblong, mucronulate; stipules lanceolate, peduncle 2-4 fld., much longer than the lvs.; fls. in shades of blue, red, yellow and white, fragrant, the shield large and showy, expanded, sometimes "hooded;" pod 1-2 in. Summer, Sicily. B.M. 60.—For culture and varieties, see *Tanger Pea*.

2. *Tingitanus*, Linn. SANGIER SCARLET PEA. Fig. 1242. Sts. spreading, winged, glabrous, 3 ft. long; lfts. linear-lanceolate, obtuse, mucronulate; stipules lanceolate; peduncle 2-fld., longer than the lvs.; fls. 1 in. long,

dark red-purple; shield large, purple, wings and keel bright red; pod 4-5 in. long. June, July. W. Mediterranean region. B.M. 100.—An earlier annual than the Sweet Pea, and because of its vigor should be kept away from it or it will run it out.

BB. *Perennials.*

C. *Lvs. with 1 pair of leaflets.*

D. *Stipules narrow.*

3. *grandiflorus*, Sibth. and Sm. EVERLASTING PEA. TWO-FLOERED PEA. Stem winged, 4-6 ft. long; lfts. large, ovate, obtuse, mucronulate, undulate; tendrils branched, short; stipules small; peduncles 2-3-fld., longer than the lvs.; shield large, obovate, notched, broad, rose-purple, wings dark purple; pod linear, 3 in. June, July. S. Eu. B.M. 1938.—Larger vine than *L. latifolius*, but weaker and less rampant. Fls. as large as those of the Sweet Pea. Free-flowering, succeeding in any soil, not requiring much light. Adapted to banks, along walk-margins in woods, among straggling shrubs, and as a covering for rocks.

4. *syvestris*, Linn. FLAT PEA. Stem straggling or climbing, 3-5 ft. long, stout, winged, glabrous, with creeping rootstock; lfts. linear-lanceolate, thick, with winged leafstalk; peduncle 3-6-fld., equalling the lvs.; fls. 3 in. long; standard rose, with green spot on its back; wings purple at summit; keel greenish; pod lanceolate, 2-3 in. long. All summer. All Europe, in thickets and rocky places.—Inferior ornamentally to other perennials, but valuable as a forage plant for cattle and for plowing under in a green state as a fertilizer. Grows well on poor, unimproved sandy soil, and is unaffected by frosts and droughts. For garden culture, it may be sown in a seed-bed and transplanted when of suitable size. Its seeds in the wild state are said to be to some degree unhealthful, but in the cultivated form this quality has been bred out.

5. *rotundifolius*, Willd. PERSIAN EVERLASTING PEA. LOW-GROWING, winged species; lfts. ovate; stipules toothed; peduncles many-fld.; longer than the lvs.; fls. large, rose-pink. June, Russia and the East. B.M. 6522.—A species of easy culture, requiring a cool, shady and sheltered position. Adapted to stony banks.

6. *undulatus*, Boiss. (*L. Sibthorpi*, Baker). Stems twining, broadly winged; lfts. oblong; peduncle 5-6-fld.; fls. a mauve-red. S.B.F.G. 333.—A form intermediate between *L. latifolius* and *L. rotundifolius*. A somewhat tender species, said to be 6 weeks earlier than any other.

DD. *Stipules broad.*

7. *latifolius*, Linn. EVERLASTING PEA. PERENNIAL PEA. Fig. 1243. Stem winged, 4-8 ft.; lfts. ovate-elliptic or ovate-lanceolate, somewhat glaucous, mucronate, 2-3 in. long; tendril branching; peduncle many-fld., longer than the lvs.; fls. rose, large; pod fls. 4-5 in. long. Aug. Woods of Europe.—This is the common Perennial Pea, and one of the hardiest and most easily cultivated species, thriving almost anywhere, even among flags and boulders. A rampant grower, it is a good trellis plant, and is adapted as a cover to wild, rough places, where it scrambles over bushes and stones. It succeeds in shade and grows rapidly, but, like all species of Lathyrus, it is impatient of removal, owing to the size and length of its roots. Has no place in the border. Its varieties are not clearly defined. Var. *albus*, Hort., the white form, is adapted to the same uses as the type, and is, besides, valuable to florists wanting white flowers in midsummer. Var. *splendens*, Hort., dark purple and red, is said to be the best form of the type, but does not come true from seed. There is a striped form, also. Other trade names are vars. *albiflorus* and *grandiflorus*.

8. *Magellanicus*, Lam. LORD ANSON'S BLUE. Stem 3-5 ft. long, smooth, angled, somewhat branched; lfts. ovate or oblong-linear; tendrils branched; stipules cordate-sagittate, broad; peduncles long, 2-4-fld.; fls. dark purple-blue. June, July. Straits of Magellan. S.B.F.G. II. 344.—A strong-growing, woody, almost evergreen

species covered with a bluish bloom. Since it is a maritime plant, salt is said to assist its growth. It is sometimes regarded as an annual. Var. *albus*, Hort., "LORD ANSON'S WHITE," is the white form.

CC. *Lvs.* with more than 1 pair of leaflets.

9. *palustris*, Linn. MARSH PEA. WING-STEMMED WILD PEA. Stem slender, 1-3 ft. long, glabrous or somewhat pubescent, often winged, rather erect; fls. 2-4 pairs, oblong-lanceolate, acute, 1-2 in. long; tendrils branched; stipules small, lanceolate; peduncles 2-8 fld., scarcely longer than the lvs.; fls. purplish, $\frac{1}{2}$ in. long; pod 2 in. long. Summer. Northern N. America and N. Europe, in moist places.—A good bog plant. Var. *myrtifolius*, Gray (*L. myrtifolius*, Muhl.). MYRTLE-LEAVED MARSH PEA. Has smaller, obtuse lvs., broader and larger stipules, the fls. pale purple. July, Aug. Banks of rivers, northern North America to N. C.

10. *maritimus*, Bigel. SEA OR SEASIDE PEA. BEACH PEA. Stem stout, 1-2 ft. long, angled, decumbent; fls. 3-6 pairs, ovate-oblong, thick, glaucous, nearly blue, 1-2 in. long; stipules leaf-like, broadly ovate and cordate-hastate; peduncles 6-10 fld., a little shorter than the lvs.; fls. purple; wings and keel paler, $\frac{3}{4}$ in. long; pod $1\frac{1}{2}$ in. long, hairy. May-Aug. Gravelly seacoasts throughout the northern hemisphere.—A spreading plant with creeping rootstock and of rapid growth, very tenacious of life. A good plant in rock gardens and in gravelly soil.

11. *venosus*, Muhl. SNOWY WILD PEA. Stem stout, 2-3 ft. long, finely pubescent, strongly 4-angled; fls. 4-6 pairs, oblong-ovate, obtuse, often pubescent below, 2 in. long; stipules narrow, short; peduncle crowded, 8-16 fld., rather shorter than the lvs.; fls. purple, 6-8 lines long; pod smooth. June, July. Shady places and along streams, Canada to Ga. S.B.F.G. II, 37.

12. *splendens*, Kellogg. PRIDE OF CALIFORNIA. Stem subshrubby, slender, more or less soft-pubescent; fls. 4-6, ovate-oblong to linear, $\frac{3}{8}$ -1 in. long, acute; stipules narrow; peduncle 6-12 fld.; fls. pale rose or violet, large. Dry hills of coast ranges, Calif. Gn. 52:1133.—A greenhouse plant 1 ft. long or more, becoming 8-10 ft. at home, where it dies down during the summer. Elsewhere it adapts itself to climate but is not hardy in N. United States. Sometimes confused with a variety of *L. latifolius*.

1243.

Lathyrus latifolius.
($\times \frac{1}{2}$)



AA. Habit not climbing; lvs. not tendrill-bearing.
(*Orobanch.*)

B. Fls. yellow.

13. *montanus*, Bernh. (*Orobanch. luteus*, Linn. *L. luteus*, Baker). Stem simple, angled, smooth; fls. 5-8 pairs, large, elliptic-lanceolate, pointed, glaucous below; peduncles many fld., a little shorter than the lvs.; fls. large, orange-yellow. June, July. Forests of the Alps.

S.B.F.G. II, 115.—A shade-enduring species with fls. in erect, spike-like clusters and adapted to borders and rockeries.

BB. *Fls.* not yellow.

14. *polymorphus*, Nutt. PRAIRIE VETCHLING. Stem rather stout, usually low, glabrous or finely pubescent, erect, a little woody at the base; fls. 3-6 pairs, scattered, narrowly oblong, acute, thick, 1-2 in. long; stipules narrowly acuminate; peduncle 2-6 fld., a little longer than the lvs.; fls. purple, large. March-July. Grassy, alluvial plains, Colo. to New Mex. and Ariz.

15. *niger*, Bernh. (*Orobanch. niger*, Linn.). BLACK PEA. BLACK BITTER VETCH. Stem erect or ascending, branched, angled, 1-2 ft. long; fls. 6-8 pairs, elliptical or ovate, $\frac{1}{2}$ -1 in. long, light green, turning black when drying; stipules narrow, small; peduncles 6-8 fld., longer than the lvs.; fls. purple, small. June, July. Mountainous and rocky districts, Middle Europe. B.M. 2261.—Slender species, with short rootstock, succeeding in the shade.

16. *vernus*, Bernh. (*Orobanch. vernus*, Linn.). SPRING BITTER VETCH. Stem simple, somewhat pubescent, 1-2 ft. long; fls. 2-3 pairs, ovate-acuminate, light green; stipules entire; peduncles 5-7 fld., shorter than the lvs.; fls. blue violet; keel shaded with green, nodding. May, June. Hills and woods, S. and central Europe. B.M. 521.—The most popular *Orobanch.* compact, tufted plant, growing quickly in sun or a little shade; best in deep, sandy loam, in a sheltered position; hardy. Var. *albus*, a white form, is rare.

L. galifornicus and *L. Helveticus* are names in the American trade, but cannot be placed botanically.—*L. tuberosus*, Linn., has been imported by an American amateur. It differs from all described above by having tubers. It is a native of the northern parts of the Old World, and bears red flowers, which are generally fewer and smaller than those of *L. sylvestris*.

A. PHELPS WYMAN.

LAUREL. Properly *Laurus nobilis*, but other broad-leaved evergreens have taken the name. In America, the Kalmias are known as Laurels. The Cherry Laurel is *Prunus Lauro-cerasus*, and in America *P. Caroliniana*. Portugal Laurel, is *P. Lusitana*. Ground Laurel is *Epigaea*.

LAURESTINUS. Popular name of *Viburnum Tinus*.

LAUROCERASUS. Consult *Prunus*.

LAURUS nobilis (*Laurus* is the ancient name) is the Sweet Bay tree of the florists, the most universal of all evergreen tub-plants. It is native to the Mediterranean region, sometimes attaining a height of 40 to 60 ft., but rarely assuming a true tree-like form. As a cultivated subject, it is grown as a small standard tree, with a close-sheared top. The plant endures abuse and neglect, the head can be trimmed to almost any shape, and the growth may be kept within small limits year after year. F.R. 1:669 (Fig. 1244). It is, therefore, the most popular of plants for decoration of open-air or exposed restaurants, esplanades, architectural appendances, and the like. Although much used in America, it is still more popular in Europe. Of the European dealers one may order plants with heads trained to pyramids, cones, globes, and the like, and with bodies long or short. The plant will endure considerable frost. It is grown in the open in England: "The Sweet Bay bush in the farmer's or cottage garden comes with its story from the streams of Greece, where it seeks moisture in a thirsty land along with the wild Olive and the Arbutus. And this Sweet Bay is the Laurel of the poets, of the first and greatest of all poet and artist nations of the earth—the Laurel sacred to Apollo, and used in many ways in his worship, as we may see on coins, and in many other things that remain to us of the great peoples of the past" (Gn. 47, pp. 301, 307). Although so universally used, there are few important horticultural varieties,—the variegated-leaved and crisped-leaved forms being the best known. Prop. by cuttings, and sometimes by seeds.

Laurus gives name to the family *Lauraceae*, which includes *Cinnamomum*, *Camphora*, *Persea*, *Sassafras*, *Benzoïn*, and other genera. Many species have been re-

ferred to Laurus, but with the exception of two, these species are now placed in other genera. These two true Lauruses are *L. nobilis*, Linn. (the subject of this sketch), and *L. Canariensis*, Webb & Berth., of the Canary Islands. The fls. are dioecious or perfect, small and inconspicuous, in small, axillary umbels; perianth with a short tube and a 4-parted limb; stamens 8-12 or more, and staminodia often present; ovary sunk in the receptacle, the style short; fr. a small berry.

The Sweet Bay (*L. nobilis*) has stiff, dull green, entire, alternate lvs. lanceolate or lance-oblong in shape; yellowish fls. in early spring; succulent, purple, cherry-



1244. *Laurus nobilis* in tubs.

like fruits. The lvs. are sometimes used in cookery and the making of confections, because of their pleasant aromatic flavor. The wreaths with which the heroes of antiquity were crowned were made of Laurel leaves.

Laurus Benzoin of trade catalogues is *Benzoin odoriferum*. *L. Sassafras* is the Sassafras tree. *L. Camphora* is the Camphor tree (see *Camphora* and *Cinnamomum*).

L. H. B.

It is estimated that several hundred thousand Bay Trees are sold every year in Europe and America. They are mostly imported from Belgium and Holland, where they are cult. as follows: Cuttings 3-4 inches long from well-ripened wood are put in sharp sand, either under bell glasses or in glass cases. Bottom heat is not essential. After the cuttings have rooted, they are potted in small pots, in fairly rich sandy loam, with good drainage, and can then be put in a hotbed, with some gentle bottom heat, where they will at once make a good strong growth. After this they are, as a rule, planted in nursery rows, in rich sandy soil, with perfect drainage. They will make a strong shoot 3 to 5 feet in length in one season. These shoots are tied up to stakes. At the end of the growing season and long before the cold weather sets in, these young plants, together with their stakes, are taken up and put into their winter quarters, which, as a rule, is a well-lighted and ventilated shed—an ordinary barn-like shed, sometimes built several feet into the ground and provided with sky-lights and ventilators. These plants are set in close rows and watered once or twice a week, according to the weather. Little or no fire heat is used in these sheds unless the weather gets extremely cold. The temperature is kept just above freezing. In the spring they are taken out and either potted and plunged in nursery rows, or planted out, as before. Plenty of water, rich peaty soil and the congenial moist atmosphere near the seacoast induces them to make a fast and luxuriant growth. Thus they are cultivated continually until the plants have been trained into the desired form, and as soon as they have attained enough of this form to show their character, which usually is from 5 to 6 years after propagation, they are planted in properly proportioned hardwood tubs and are then ready for the market, or to

be further cultivated, perhaps for a good many years, until they grow into large specimens. The trees are cut back and trimmed into shape once a year, after the new growth is well matured.

The peaty muck soil in which they are grown abroad is very deceptive to Americans, and many fine trees have been ruined by not understanding its nature. Its dark color always makes it look moist. Sometimes when the soil looks moist enough the trees are really dying from drought.

In retubbing trees there is danger of using for filling material a soil that is too heavy. The water then runs into the new soil, leaving the old soil dry. If the trouble is not detected soon the trees may be spoiled. The only thing to do in such cases is to comb out the old ball and cut back to live roots. The tree can then be planted in the open to gain a new set of roots, after which the top can be cut back to live wood. The tree may thus be eventually brought into a good shape again.

As a rule, Bay Trees are not good house plants. They do not like the dry heat of a dwelling. They can, however, stand considerable heat if they have plenty of fresh air and plenty of water. In spring and early summer, when they are making and flushing their growth, they can stand any quantity of liquid manure or of strong manure mulching, for they are great feeders. Many people erroneously suppose that this tree affords the bay rum of commerce. The cured leaves of the Sweet Bay are used in putting up packages of rice, and impart a rich and agreeable aroma. H. A. SIEBRECHT.

LAVÁNDULA (Latin, *lavare*, to wash; referring to the use of Lavender in the bath). *Labiate*. This genus includes the Lavender (*L. vera*), an ancient garden favorite because of its pleasant odor. The genus contains about 20 species, scattered from the Mediterranean region to India; perennial herbs, subshrubs or shrubs; lvs. commonly crowded at the base, pinnatifid or dissected: whorls 2-10-fl., crowded into long-peduncled cylindrical spikes, which are unbranched or branched from the base: fls. blue or violet; calyx tubular, 13-15-ribbed, 5-toothed; corolla lobes nearly equal, or the posterior lip 2-cut, the anterior 3-cut; stamens 4, didynamous, declined, included in the tube; style shortly 2-cut at the apex. In the North, winter protection should be provided for Lavender. The plant grows naturally in dry and hilly wastes. J. B. Keller advises a light, open soil.

A. Spike loose: upper floral lvs. fertile, shorter than the calyx.

B. Lvs. not densely woolly.

vera, DC. LAVENDER. Subshrub, 1-3 ft. high: lvs. oblong-linear or lanceolate, entire; younger ones often clustered in the axils, white-tomentose, revolute at the margins; older ones greener, 1-1½ in. long; spikes interrupted; whorls 6-10-fl. Summer.

Spica, Cav. Dwarfier than the true Lavender, whiter, the lvs. more crowded at the base of the branches, spike denser and shorter. The floral lvs. are lanceolate or linear (rhomboid-ovate acuminate in *L. vera*), and the bracts are linear-ovate-shaped, shorter than the calyx, while in *L. vera* the bracts are almost absent.

BB. Lvs. densely woolly.

lanata, Boiss. Differs also from the preceding in having much longer and less crowded spikes. Woolson says it grows 1-2 ft. high and needs winter protection at Passaic, N. J.

AA. Spike dense: upper floral lvs. sterile, comose.

B. Lvs. entire.

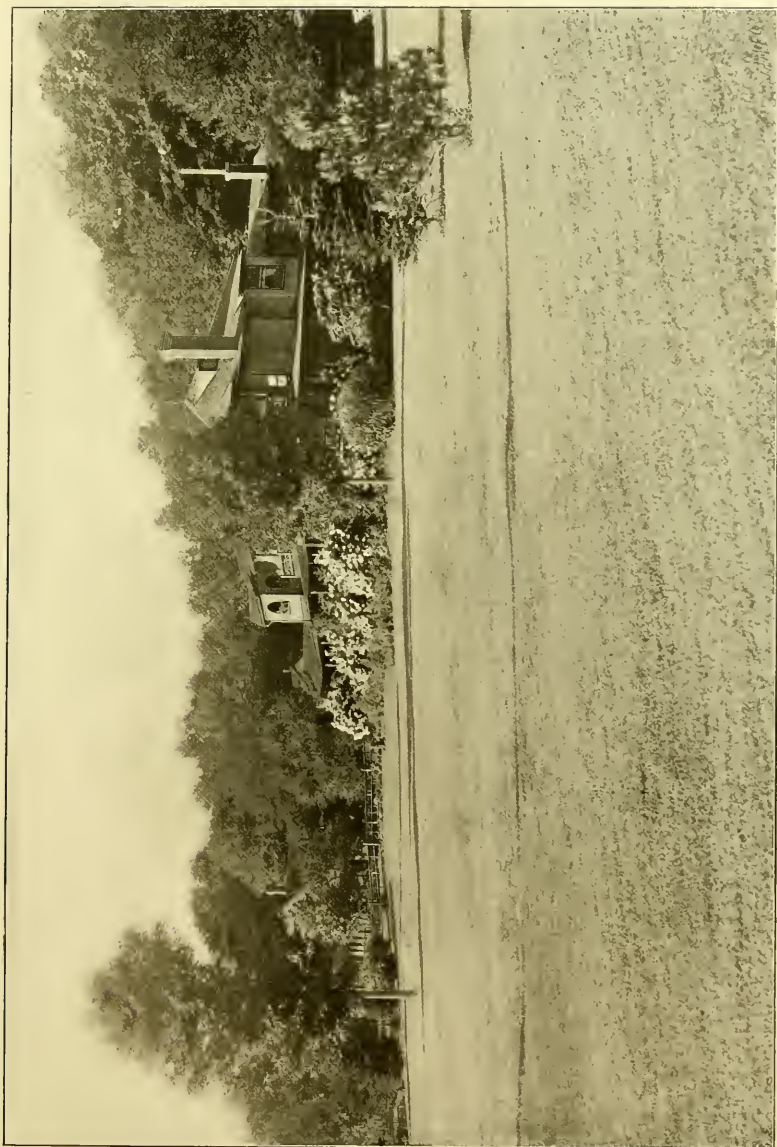
Stoechas, Linn. Shrub, 2-3 ft. high: lvs. tomentose, about ½ in. long: spikes short-peduncled, densely comose: fls. dark purple. Cult. only in S. Calif.

BB. Lvs. obtusely pinnate-dentate.

dentata, Linn. Lvs. pubescent: spikes long-peduncled: fls. deep purple. Mediterranean region. B.M. 400.—Int. 1900 by Franceschi.

W. M.

Lavender (*L. vera*, DC.), a labiate shrub, 2-3, sometimes 6 ft. tall, with green or glaucous lvs. and flowers in cylindrical, terminal spikes, of a blue tint



The free and open lawn, with enclosed boundaries

named from them, is a native of Persia, the Canaries, and the Mediterranean region, covering vast tracts of dry land in Spain, Italy and southern France, cultivated largely in the last-named country and in the counties of Surrey and Hertfordshire, England.

In the eastern United States it is grown in hut few gardens, but in California, where climatic and soil conditions seem favorable, it is more commonly planted, though not upon a commercial scale. The dry soil of that state and the light limestone soil of the Black Belt of Alabama and adjacent states seem to be most inviting to this industry.

The generic name is derived from the ancient use of its flowers and leaves in bath perfumery. The flowers long retain their strong, fragrant odor after drying, and upon distillation yield a lemon-yellow, very fluid oil of aromatic, bitterish, burning taste. Though this is officially credited with stimulant and tonic properties, it is seldom administered in the pure state. Its chief uses are in the manufacture of perfumery, aromatic vinegar and lavender water, an alcoholic solution of the oil and other odorous substances. For these purposes, English oil has long commanded the highest price, but recently the French product has been claimed superior. Though all parts of the plant are aromatic, and both leaves and flower-stems are used in oil manufacture, oil obtained in the first half hour of distillation from flowers alone is much superior to the later distillate and also to the oil obtained from a mixture of flowers and stems. These grades, and also the highly valued product of very dry seasons, are always sold separately.

Lavender is best propagated by cuttings of one season's growth taken with a heel of older wood, in late autumn or early spring. When set 3-4 in. asunder in rather moist soil and shaded, they strike more readily and produce more symmetrical plants than older wood. Seed does not propagate desired varieties, and division is not advised, since plants so obtained are more susceptible to disease than those made from young-wood cuttings. After danger of frost, the 1-year-old plants are set 4 ft. asunder in rows 6 ft. apart, running north and south. Closer planting and the hedge-method yield a smaller quantity of bloom. Dry, light, calcareous, even stony soils upon sites where sun and air are unimpeded by trees, etc., favor this plant. Upon such fewer are injured by frost, and the oil is of superior quality. In moist soil so much water enters the plant as to enfeeble it, and upon rich lands yield and quality both suffer. Light fertilizing with stable manure or ashes turned under in autumn, and spring harrowing, are advised. During the first year in the field the plants should be clipped to prevent flowering and to encourage stockiness. Vigorous plants so treated may grow to a height and a diameter of 5 ft., and when 2-4 years old produce secondary bloom spikes after the general harvest, which usually occurs in early August. Plantations should be destroyed when 4-6 years old and the land rested with other crops before setting to Lavender again. Cutting in clear weather, in early blossom, before the dew is off and at once distilling give best results; but no delay should occur. Cutting in wet weather, in the heat of the day, holding blossoms long before distilling and exposing them to the sun after cutting result in serious losses. One pound of flowers yields from $\frac{1}{2}$ -1 draehm of oil, and an acre from 10-25 pounds. The annual output of the stills of Grasse, France, is from 80,000 to 100,000 kilograms.

"Oil of spike," obtained from a broad-leaved, much whiter and smaller species (*L. Spica*), is less fragrant than true Lavender oil, being analogous to oil of turpentine, with which it is often adulterated. It suggests the odor of rancid cocoanut oil. Officially, it is credited with carminative and stimulant properties, and has been found useful in nervous languor and headache. It is used by artists in the manufacture of varnishes, by porcelain painters, and to a small extent in perfumery, mainly as an adulterant. From 20,000 to 25,000 kilogrammes are annually produced at Grasse.

M. G. KAINS.

LAVATERA (two Lavater brothers, physicians and naturalists at Zurich, friends of Tournefort). *Mutavæer*. About 18 species of widely scattered herbs, shrubs and

trees, tomentose or hairy: lvs. angled or lobed: fls. sometimes 2-4 in. across, variously colored, rarely yellow, solitary in the axils or borne in terminal racemes; column of stamens divided at the summit into an indefinite number of filaments; petals 5.

The genus has 5 near allies of garden value, which are all distinguishable by their bractlets. In *Lavatera* and *Althæa* they are grown together at the base; in *Malva* and *Callirrhoe* they are free all the way, sometimes absent in *Callirrhoe*; *Sidalcea* has none at all. *Lavatera* is further distinguished from *Althæa* by having 3-6 bractlets (*Althæa* having 6-9), and the axis of the fruit surpassing the carpels, which is not the case in *Althæa*. These plants are of the easiest culture, the first species being the commonest, and all prop. by seeds. There seem to be no double forms. They are far less popular than *Hollyhocks*.

A. Annual, herbaceous.

trímétris, Linn. Height 3-6 ft.: lvs. nearly glabrous, upper ones angled: fls. rosy, 4 in. across: receptacle or axis of the fr. expanded at the apex into a disk, enclosing the ovary. Mediterranean region. Var. *Alba* has white fls. Gn. 24, p. 89; 51, p. 212 and 53:1154. B.M. 109.

AA. Biennial or perennial, shrubby or tree-like.

B. Foliage variegated.

arborea, Linn. Biennial, woody at the base, with annual flowering branches, forming a shrub 3-5 ft. high or less: lvs. 5-9-lobed, softly downy on both sides, rarely nearly glabrous: fls. pale purple-red, about 2 in. across: receptacle small, marked with little pits, not exerted. Cult. only in the form of var. *variegata*, which has mottled lvs. Gn. 23, p. 114. V. 8:99.

BB. Foliage not variegated.

C. Fls. 1-4 in the axils, pedicelled.

assurgenti-flora, Kellogg. Presumably perennial, shrubby, 6-15 ft. high: lvs. glabrous or sparingly stellate-pubescent, 5-7-lobed, 3-6 in. wide: fls. purple; petals 1-1 $\frac{1}{2}$ in. long, with long, narrow, glabrous claws, and a pair of dense, hairy tufts at the base: axis of the fr. low-conical, about as long as the carpels. *Anæpæa* Island. Cult. in Calif.—Franceschi says it makes a large, round-headed shrub, with large red fls., and is one of the best plants to stand saline winds. See *Wind-breaks*.

CC. Fls. solitary, sessile.

Óbia, Linn. Perennial, shrubby, about 6 ft. high: hairs of the stem pilose, somewhat clustered, distant: lvs. softly tomentose, lower ones 5-lobed, upper 3-lobed, highest oblong, scarcely divided: fls. reddish purple. S. Eu.—Not advertised in America, but commonly cult. in England, where it occasionally sows itself. W. M.

LAVENDER. See *Lavandula*.

LAVENDER COTTON is *Santolina Chamæcaryparissus*.

LAVIA, of one nursery catalogue, is a typographical error for *Layia*.

LAWN. For most people the word Lawn bears a vague meaning, compounded of their recollection of grass-covered spaces dotted over with trees and shrubs, and of broad areas covered simply with closely-mown turf. Both are correct impressions; but the more important feature is that a Lawn shall be an open area of grass space (Figs. 1245, 1246). Many exceptions or additions to this definition may, however, be admitted. A great white oak, for instance, rugged and picturesque against the evening sky, needs only to be seen to furnish an ample excuse for its retention on any Lawn. But this would be a happy chance, not affecting the principles which should govern the construction of a Lawn on an open area.

It may readily appear that the Lawn will, as originally designed, prove too sunny or too strongly wind-swept over its extended expanse; but the remedy for this will be found to lie not so much in planting single trees or detached groups of trees over the uncovered area, as in extending limbs, points, promontories and peninsulas of trees, or trees and shrubs, directly out from the main



1245. An open area of grass space.

body of bordering plantations which will usually frame the Lawn and the different pictures that will appear in any properly unified scheme of landscape gardening. The art of the designer will display itself in determining the relative sizes of the Lawns and these enclosing or framing plantations. A careful eye must, of course, be given to the individuality of the Lawn itself, which should never be allowed to merge into the neighboring plantations. A like principle applies to all kinds of art—it is fundamental and vital in its character. The reader may fancy that its application would tend to limit the beauty of landscape gardening by eliminating certain features of natural beauty, such as trees, shrubs and beds of flowers, but, if he will look at an open Lawn with discerning and sympathetic eyes, he will find that the "moving cloud-shadows, waving grass, rich patches of dark and light green, studded with the starry radiance of the humble flora of the grass, and the hundred incidents of blazing or subdued color and form that appear on the surface of an open meadow," need no added beauty of tree or shrub to perfect their nearly unapproachable loveliness. So important does the writer consider the essential and peculiar beauty of the Lawn as distinguished from that of any other part of the home domain, that he always feels inclined to term it the true focus of the picture, the central point of interest in any landscape gardening design.

This being the case, it behoves us always to literally leave no stone unturned or clod of earth untilled and unfertilized in order to obtain a satisfactory open Lawn. Did the reader ever really see such an one? Let him answer frankly to himself whether he has or has not seen a Lawn which showed no traces of twitch grass and other early weeds in July, nor any summer grass and later weeds in August and September,—above all, a Lawn which would stand a protracted drought without artificial watering. Very likely he will think it is impossible to make such a Lawn under the conditions of soil and climate which each and all of us are likely to believe specially characteristic of the spot of ground on which we live. Perhaps, on the other hand, he will declare that he has seen such a Lawn in some remote place, but if we question him, ten chances to one we shall find that his observation of this exceptional Lawn is limited—that he has not wintered and summered near it, or seen it during its periods of "storm and stress." The writer knows one place where such a Lawn can be seen, and he refers to it, not because it is properly a Lawn, for it lacks the requisite framing plantations; but it is perfect in the first essential of a good Lawn—it is a piece of perfect Lawn grass. A brief description will show how this standard of excellence was reached. The Lawn consists of small patches of grass turf on a private farm in Manchester, Conn. Each patch was worked and turned over with various ingeniously contrived hoes, forks and rakes until the last lurking weed was removed that could be found by dint of skill and untiring patience. The soil was that of an old garden, and naturally good. It was tilled in the most thorough manner and not fertilized at all, for fear new weeds be introduced. Then, in this mellow and receptive medium, were set cuttings or joints of the hardiest and most luxuriant varieties of grasses

which had been discovered by months and even years of keen and intelligent search in the old meadows of both the Old and the New World from Austria to Australia. The result is an elastic firmness, an endurance, depth and richness of the turf which suggests to the tread the deep pile of some Eastern carpet woven in a hand-loom.

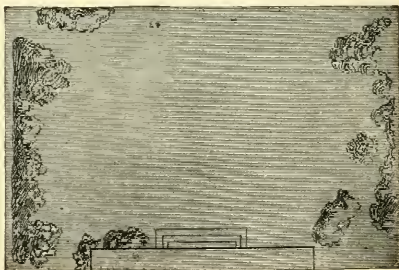
But all can not attain this standard on their Lawns. For those who do not look higher than the ordinary standard—and even this is none too often desired, or even understood, by the general public—the following directions for Lawn making may be given:

1. The Lawn should be carefully graded, either convex, level or concave, in such comparatively long, snave and graceful lines as will accord with the peculiar conformation of the ground (Fig. 1247).

2. Plow, harrow or spade, and fork the soil of the Lawn to a depth of two feet, if possible, and keep removing the stones and burning the gathered rubbish for several weeks, or as long as you can persuade yourself to do it, or pay any one else to do it, with the full assurance that no matter how much you do, you will not be likely to destroy all the weeds and win the very best possible results.

3. Enrich the soil by a covering of still richer mold. Next to this in efficiency are bone dust, superphosphate of lime, nitrate of soda, and nitrogenous manures like ground flesh and bone mixed in proportions suited to the special soil, which may vary materially in a distance of a few hundred yards. The usual proportions are one ton to the acre of ordinary artificial fertilizers, such as superphosphate of lime and bone dust, or 15 to 25 of well-rotted stable manure. If artificial fertilizers are not available, then take cow manure, sheep manure, or last of all, because it is the most productive of weeds, ordinary stable manure. These natural manures are, after all the best, save for their weed-bearing qualities. They will need composting with several times their bulk of good soil and evenly spreading and harrowing or raking in throughout the surface of the Lawn.

4. For turfing, the cleanest grass seed that can be obtained at any price will be found the best in the end.



1246. Ground plan of a nature-like garden. To show relative importance of lawn and planting.

The bulk of this seed should be Kentucky blue-grass or June-grass (*Poa pratensis*) mixed with red-top or herd's-grass (*Agrostis alba*, var. *vulgaris*), or *Agrostis canina*, the Rhode Island bent-grass. The advantage of using several kinds of grass is that the first-comers hold possession of the ground against incursions of weeds until the stronger but slower-growing Kentucky blue-grass

gets complete root-hold, when, in the struggle for life, the earlier growths of grass, being weaker, go to the wall and are crowded out of existence. How fine this blue-grass may become under favorable conditions it will be needless to point out to those who have seen the grass meadows of Kentucky.

5. On a quiet day the seed should be sown evenly over the Lawn surface—a task which can be well done only by much skill and experience. The ground will then need careful raking with a fine-toothed iron rake,

or *Capriola*), a plant of trailing and stoloniferous habit. Although it is known throughout the southern states under the name of Bermuda, it is, however, a native grass of Bengal and other sections of India, and found, also, in Corea. In Bengal it is known as "Doob grass," and there highly prized for its vigorous growth of a soft, dark hue, and thriving where scarcely any other kind will. This grass has become widely disseminated throughout the South, where it has received both the harshest possible reputation as a nuisance when allowed to take a foothold in uncultivated fields and gardens, as well as unstinted praise from those who have learned its great value as a pasture, hay or Lawn grass.

When required for Lawns, the roots should be cut in short lengths,—passing them through a hay cutter is the most expeditious. Let the ground be well and deeply plowed or dug, well manured, and after sowing the pieces of grass roots they must be either raked or harrowed in, then the surface made perfectly level by rolling; or, where the area is limited, the roots may be planted 6 inches apart. Plant at any time during February or March, or in the fall if preferred. If during the spring the soil should become very dry, an occasional watering, where this is practicable, should be attended to until the grass is well established. Neither excessive heat or cold will kill the roots if left undisturbed, but plowing up during warm weather will soon rid the ground of the roots if this is desired. As the new growth attains a few inches in height, use the Lawn mower every week or ten days during moist weather, but even during dry weather the grass must be kept occasionally clipped to prevent flowering. If the growth is not vigorous, apply a top-dressing of bone meal. In the fall a coat of well-rotted stable manure should be given; this may be raked off early in the spring, previously running a sharp-toothed harrow over the Lawn, and finally rolling it well. In this way a permanent and good Lawn may be secured with very little additional expense. Any soil, unless naturally very wet, will suit Bermuda grass.

Paspalum distichum, or "Joint grass," is native of the southern states, and usually found in moist or low grounds. It can be utilized in soils which are too wet to suit the Bermuda, but at best makes an indifferent Lawn, as it is of low-creeping and not sufficiently dense habit.

Stenotaphrum dimidiatum, known on the coast and Florida as "Goose grass" (St. Augustine grass), is an erect-growing perennial plant, with flat or channelled leaves. It is found in pine-barren swamps and ponds from Florida to North Carolina, and being well adapted to the sandy soils of the coast, even those which are commonly termed salt-water lands, it is therefore valuable for such localities. As for the Bermuda, the soil should be well fertilized and prepared. The rootlets are planted in rows a few inches apart. As the growth begins, repeated clippings are required. While it makes a coarse sod, still its bright green color and adaptability to soils where few other grasses of low growth are possible, makes it a valuable plant for Lawns.

Many Lawns are injured by allowing other grasses to take a foothold. *Sporobolus Indictus*, or "Smut grass," was originally introduced from the West Indies. It soon forms large tufts, with tall, wiry stems, whose panicles are usually covered with a black fungus growth. *Aristida purpurascens*, or "Broom Sedge," will soon deface a Lawn if left undisturbed. Both should be eradicated as soon as they appear.

P. J. BERCKMANS.

LAWSONIA (after Dr. Lawson, who published in 1769, at London, an account of his botanical journey in Carolina). *Lythæceæ*. This genus includes a tropical shrub, cult. in Europe under glass for ornament and outdoors in the tropics throughout the world. Its fragrant white fls. produce the henna or alhenna of the Arabs (Cyprus of the ancients), which is used in Egypt and elsewhere by women to color their nails, and by men to dye their beards. In America it seems to be cult. only in S. Calif. and S. Fla.

Lawsonia is a genus with perhaps only one species, a



1247. An easy grade for a steep lawn.

and rolling with an iron roller, the heavier the better. In very dry and windy weather it is hardly worth while to sow grass seed.

6. As soon as the grass has grown 3 or 4 inches, cut it first with a scythe and afterwards with the Lawn mower, in order to secure a good, thick-set turf. Every spring, and oftener if wet weather prevails, a compacting with the iron roller will serve a good purpose. Fertilizing on the top of the Lawn in the winter is always in order, provided the remainders of rubbish from the stable manure that may be used be removed early in spring before the grass starts.

7. The last and perhaps the most important care to be given the Lawn in the process of its establishment is the weeding of the first summer. The next is the weeding of the second summer—and the third is the weeding at any time it may need it, no matter how many years may have elapsed since its construction. The onion patch and the flower garden need no more weeding than the Lawn, if for no other reason than because the use and beauty of either onion patch or flower garden can never, combined, equal those of the home Lawn. In it, skill and patience and the love of beauty find abundant reward.

SAMUEL PARSONS, JR.

LAWNS FOR THE SOUTH.—The scarcity of handsome Lawns throughout the South often leads to the impression that the cause is from a lack of proper grasses possessing sufficient resisting power to withstand the long, warm summers. This idea is, unfortunately, widely entertained, and, as a consequence, one of the most pleasing features of landscape gardening is lost. The principal cause which has led to this opinion is from the endeavor, in the formation of Lawns, to use the many kinds of grass seeds which are so successful in the northern states and which are unsuited for southern soils and climate, unless in a few exceptional localities.

Sown during the fall months in properly prepared land, a very good stand can be had during winter and early summer, but unless there is sufficient moisture, either from copious rains or liberal irrigation, most of those otherwise excellent grasses fail and die out during a protracted drought. Lawns of an extensive area, when formed with northern and European grasses, are therefore unadvisable South, but where the extent is limited, the soil deeply dug, well fertilized and artificial irrigation available, then a very satisfactory result may be expected. Several Lawn grass mixtures are recommended, but the best that has come under our observation is the formula known in Philadelphia as "Evergreen Lawn Mixture."

There are, however, several native and exotic grasses, which not only resist the long summer heat, but, if properly treated, afford most excellent Lawn-making material. First of all is the Bermuda grass (*Cynodon*

glabrous shrub, with branches spiny or not. Important generic characters are: calyx 4-parted; petals 4; stamens 8; capsule globose, 4-celled, rupturing irregularly.

alba, Lam. HENNA PLANT. Lvs. opposite, oval-lanceolate, entire, short-stalked. Fls. panicled. Native to India, the Orient, N. Afr. Naturalized in West Indies.

LAYERING. Figs. 1248-1253. Layering is the process by which a part of a plant stem is made to produce roots while still attached to and nourished by the parent plant, so that it may be able to maintain an independent growth. The tendency, under favorable conditions, to produce roots from the cambium zone of some part of the stem is manifested by many plants, especially in the tropics. It may be noticed in the species of *Ficus* cultivated in the greenhouse, in *Epigea* and *Rhus Toxicodendron* in the woods, in tomato vines in the garden, in grape canes lying on the ground, and frequently in young apple trees when the trunk becomes covered with earth to an unusual depth. With most such plants, rooting by detached parts is easily accomplished, and this being more convenient, layering is generally practiced only with those plants which do not root readily from cuttings.

The mode of root-production is essentially the same in either case. The right conditions as to moisture, temperature, food supply, etc., seem to stimulate the formation of one or more growing points in the cambium zone. The multiplying cells force their way through the bark, and if favorable soil contact is secured, supporting roots are soon developed. The same results may come, sometimes more readily, from or near a callus formed in the effort to heal a cut surface. It is when the food supply is deficient or the cell action is so slow that the detached part would perish before supporting roots could be established, that rooting while the parts are still attached to and nourished by the parent plant need be employed.

The different methods of Layering are simply matters of detail adapted to the varying natures of the plants to be dealt with. Usually branches are selected of rather young wood, which can easily be brought under the soil and which, when rooted, can be removed without damage to the old plant. The most favorable season is generally the spring or time of most rapid cell growth.



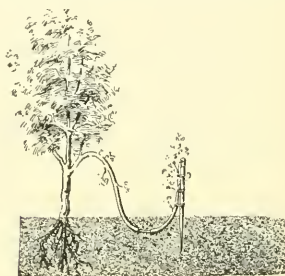
1248. A layer notched at the bottom.

The methods of Layering may be represented in the following diagram:

METHODS OF LAYERING		
TREES AND SHRUBS	Bowed branch— Bark ruptured. Bark ringed. Tongue cut. Tip layered.	
	Mound- or stool-layer.	
	Potted or aerial layer.	
	VINES AND CANES	Simple layer.
		Trench layer.
Serpentine layer.		

As shown in Fig. 1248, a suitable branch is bent to the ground and held in place by a forked pin, so that it por-

tion of it is covered with 2 or 3 inches of rich earth, the end being bent to an upright position and fastened to a stake. The bend and consequent rupture of the bark may be all that is needed to obstruct the movement of food-material and cause the development of roots at this



1249. A layer ringed or girdled at the bottom.

point. If not, a tongue may be cut not deeper than one-third of the thickness of the branch from below upwards and near a bud or node. In Fig. 1249 a layered branch is shown with a ring of bark removed, a good practice with thick, hard-barked species.

For many low-branched shrubs, mound- or stool-layers are prepared (Fig. 1250), as follows: In the spring, head the bush back to a series of stubs, which will produce a large number of vigorous young shoots. By midsummer, in some cases, or the following spring, a mound of earth is thrown around the old stool and the base of the new shoots, and from these latter abundant rooting is secured, so that by the following autumn or spring they may be separated and set in nursery rows.

When a branch cannot be brought to the ground, sometimes the earth is brought to the branch by clasping the halves of a broken or specially made pot around a tongued or girdled branch and filling in earth and sphagnum moss to retain the moisture; or the moss may be held in place by a cone of strong paper (Fig. 1251). It may be necessary to support the pot with a light stand of stakes. Where a moist atmosphere is retained, as in a conservatory, merely a ball of sphagnum bound around the branch with twine will serve an equally good purpose with less trouble. This kind of propagation is known as air-layering, Chinese layering or circumposition.

In the case of vines, a cane may be laid horizontally in a shallow trench, covering a few inches to induce rooting, and leaving a node or two exposed for growth, and so on to the end, as shown by Fig. 1252. After young shoots are well started from the uncovered buds, the



1250. Mound- or Stool-Layering.

earth may be filled in to the level of the dotted line.

In Fig. 1253 is shown what is often called the serpentine layer, in which the cane is bent, portions being covered and the intervals left above the ground. It is said that by this means the tendency of the sap to flow to the extremity and there make the strongest growth, is overcome, and even rooting secured the whole length of the cane. This method is often used with quick-growing vines like Clematis and Wistaria, from which it is possible to secure a succession of layers from the annual growth during spring and early summer.

All of the foregoing operations will be found more readily successful in the more moist situations; more successful in the nearly saturated atmosphere of the southern states, for instance, than in the comparatively dry conditions of the prairie states. S. C. MASON.

LAYIA (Thomas Lay, naturalist in the Beechey voyage). *Compositae*. About 13 species of California annuals, with yellow or white fls. in spring or early summer. Lvs. chiefly alternate, all entire or some, particularly the lower, with about 2 pairs of linear side lobes above the middle of the leaf. For general culture they are probably inferior to *Madia elegans*, which has a similar habit and is distinguished by the blood-colored spot at the base of the rays. The fls. in *Layia* are about 1-1½ in. across, and the rays are distinctly 3-toothed. The species described below are diffuse, much-branched and about a foot high. It is probable that for best results they should be started early indoors, and transplanted outdoors in May. Easy to grow.

A. Rays entirely white.

glandulosa, Hook. Hispid, sometimes glandular: lvs. 1-1½ in. long, 2-3 lines broad, linear, the upper ones all entire: rays 8-13. B.M. 6856.—Not cult., but desirable.

AA. Rays yellow, sometimes tipped white

B. Plants hairy.

elegans, Torr. & Gray. All the upper lvs. entire: rays 10-12, yellow, rarely white-tipped: pappus white or whit-



1251. Air-Layering.

ish, its copious villous hairs much shorter than the awn-shaped bristles, which are long plumose below the middle. This and the next have a few small, scattered, stalked glands which are wanting from the last two. Gn. 31, p. 463.—Procureable from western collectors. Perhaps the best of the genus.

platyglossa, Gray. Some of the upper lvs. pinnatifid: rays light yellow, commonly white-tipped: pappus of stout, awn-like bristles which are upwardly scabrous. B.M. 3719.—Cult. in En.

BB. Plants not hairy or at most minutely pubescent.

calliglossa, Gray. Akenes villous-pubescent or partly glabrate: pappus of 10-18 very unequal and rigid awl-shaped awns. B. R. 22:1850 (erroneously as *Oxyura chrysanthemoides*).

chrysanthemoides, Gray (*Oxyura chrysanthemoides*, DC.). Akenes wholly glabrous, broader: pappus none. Not B. R. 22:1850, which is the above. According to Thorburn this is a hardy annual trailer with white fls., blooming in summer and autumn.

LEAD PLANT is *Amorpha canescens*.

LEADWORT. *Plumbago*.

LEATHER FLOWER. *Clematis Viorna*, L. Jacket. *Eucalyptus punctata*, L. Leaf. *Chamaedaphne* L. Wood. *Dirca palustris*; also *Cyrilla*.



1252. A horizontal multiple layer.

LEBIDIÉRÓPSIS (Greek; resembling *Lebidiera*, a genus now included in *Cleistanthus*). *Euphorbiaceae*. This genus includes a small tree with very hard wood, and of unknown value, introduced from a botanical garden of northern India by Reasoner Bros., Omeo, Fla. *Lebidieropsis* was reduced by Bentham and Hooker to the rank of a subgenus of *Cleistanthus*, but in the Flora of British India Hooker says that *Lebidieropsis* should probably be restored, the seeds being globose, while in *Cleistanthus* they are always oblong. The seeds also differ in structure. Generic characters of *Cleistanthus* are: trees or shrubs: lvs. alternate, 2-ranked, entire: fls. small or minute, in axillary clusters and spikes, monœcious; calyx 5-cleft or 4-6-cleft; petals as many, minute; stamens 5; filaments united in a column in the center of the disk; ovary 3-celled.

orbicularis, Muell., Arg. Lvs. 1½-4 in. long, 1¼-3 in. wide, leathery, broadly obovate or elliptic, tip rounded or retuse, glaucous beneath, nerves 5-8 pairs: fls. silky, 3-6 in a cluster; petals fleshy, narrow: seeds 2 lines thick, chestnut-brown, with scanty albumen. Hooker does not recognize the 3 varieties distinguished by Muell. on the shape and hairiness of the lvs.

LEDUM (*ledon*, ancient Greek name of *Cistus*). *Ericaceae*. LARBAROR TEA. Ornamental low evergreen shrubs with alternate, entire, short-petioled lvs., slightly fragrant when bruised, and with handsome white fls. in terminal umbels, appearing in early summer. They are all hardy North, and well adapted for borders of evergreen shrubberies or for planting in swampy situations. They thrive as well in sunny as in partly shaded situations, and prefer a moist, sandy and peaty soil. Transplanting is easy, if the plants are moved with a sufficient ball of earth. Prop. by seeds sown in spring in sandy



1253. Serpentine Layering.

peat and treated like those of *Azalea* and *Rhododendron*, the young plants growing but slowly; increased also by layers and division. Three species in the arctic and cold regions of the northern hemisphere, all found

in N. America. Allied to *Rhododendron*, but corolla polypetalous. Fls. rather small, $\frac{1}{2}$ – $\frac{3}{4}$ in. across, long-pedicelled, in terminal, umbel-like racemes; calyx lobes and petals 5, spreading; stamens 5–10; capsule nodding, 5-celled, separating from the base into 5 valves, with many minute seeds. The lvs. contain a volatile oil, with narcotic properties. The lvs. of *L. latifolium* are said to have been used during the war of independence as a substitute for tea, hence the name "Labrador Tea."

palustre, Linn. **WILD ROSEMARY**. One to 2 ft. high; lvs. linear or linear-oblong, revolute at the margin, dark green and somewhat rugose above, densely ferruginous-tomentose beneath like the young branches, $\frac{1}{2}$ – $\frac{1\frac{1}{2}}$ in. long; stamens 10; capsule ovate. May–June, N. hemisphere, in N. America from Newfoundland to Alaska. L. B. C. 6:560. Var. *dilatatum*, Gray. Lvs. broader; capsule more oblong. N.W. coast of N. Amer., Japan. Var. *decumbens*, Ait. With procreant stems and shorter usually oval lvs.

latifolium, Ait. (*L. Groenlandicum*, Oeder). One to 3 ft., similar to the former, but lvs. broader, oblong or linear-oblong, 1–2 in. long, tomentum beneath often whitish at first; stamens 5–7; capsule oblong, May, June. Canada to Brit. Col., south to Pa. and Wis. L. B. C. 6:534 and 11:1049 (as *L. canadense*). J. H. III. 31:20 (as *L. palustre*). Gn. 34, p. 31.

L. buxifolium, Berg. = *Leophyllum buxifolium*. — *L. glandulosum*, Nutt. Shrub, to 6 ft.; lvs. oblong or oval, glabrous, glaucous and glandular beneath; stamens 10. July, Aug. B. C. to Calif. B. M. 7610.

ALFRED REHDER.

LEEA (James Lee, Scotch nurseryman, 1715–1795).

Leeacea. About 20 species of tropical, oriental small trees or shrubs, some of which are cult. as young plants in warm conservatories for their colored foliage and stately habit. Lvs. alternate, 1–3 times pinnate; lfts. entire or serrate; tendrils none; fls. small or large, red, yellow or green, in cymes; calyx 5-toothed; petals 5, connate at the base and with the tube of stamens; ovary 3–6-celled; cells 1-ovuled; fr. a berry. By Bentham and Hooker this genus was placed in the order Apellideae, which others call Vitaceae. Vitis differs in having the climbing habit, ovary 2-celled; cells 2-ovuled. The first species mentioned seems to be valued particularly for its fls.; the others are foliage plants which are presumably distinct horticulturally, but 2 of them may not be good botanical species, and cannot be distinguished without a knowledge of the flowers.

Leenas are tropical house plants. *L. anabilis* has beautiful, silvery, vine-like foliage. It makes a handsome plant for pillar-posts, and does exceedingly well planted out; but it should be given a season of rest during winter time by a partial drying out, when it will lose most, if not all, its foliage. This practice should be followed in any case. It may also be grown as a trained specimen in pots. Peaty soil is often recommended, but good light loam, with plenty of drainage, does equally well.

A. *Foliage green.*

coccinea, Planch. Lvs. 3-pinnate; lfts. 5 on each main division of the leaf, oblong-lanceolate, dentate, margin recurved; fls. 60 or more in a trichotomous, flat-topped cluster about 3 in. across, scarlet in bud, the 5 spreading lobes of the corolla pink above; stamens yellow, exerted, each fl. about $\frac{1}{2}$ in. across. Burma. B. M. 5299. — It begins to flower when only a foot high, but the main stalk of the clusters is only an inch or so long. Adv. by John Saul, 1893.

AA. *Foliage colored or variegated.*

B. *Lvs. marked bright red; veins white.*

Micholitzii, Hort. Introduced by Sander & Co., 1899, from Guinea, but not distinguished in their description from *L. anabilis*, var. *splendens*, which is probably still cult. in Eu.

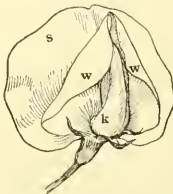
anabilis, Hort. Veitch Lvs. pinnate; lfts. 5 or 7, lanceolate, acuminate, serrate, upper surface velvety, deep bronzy green, with a broad white stripe; veins white at the bases; young lvs. pale pinkish brown. G. C. II. 17:493. Gn. 21, p. 352. Var. *splendens*, Lindl., is marked with bright red and has a red stem. I. H. 31:5184.

BB. *Lvs. flushed bronze; veins rosy.*

sambucina, Willd. (*L. Rührsidna*, Hort. Sander). Lvs. pinnate; lfts. $\frac{6}{8}$ in. long, $\frac{2}{3}$ in. wide, oblong, cordate at the base, acuminate, coarsely crenate. India, Malaya, Philippines, trop. Australia. A very variable species. The above synonymy is the judgment of M. T. Masters in G. C. III. 23:245. F. E. 10:554. A. F. 13:1284. Gng. 6:278.

T. D. HATFIELD and W. M.

LEEK (*Allium Porrum*), a flat-leaved, biennial, hardy biennial, is probably a native of the Mediterranean region, where, particularly in Egypt, it has been used for culinary and medicinal purposes since pre-historic time. All parts of the plant possess an offensive, pungent odor and acrid taste due to an essential oil characteristic of its close relative, the onion. In medicine, the bulb, like the onion, is used as a renal stimulant. The blanched stems and leaves are much employed in continental cookery as a flavoring for soups, stews, etc., boiled and served like asparagus, and in the raw state. Except in the larger cities and among our foreign population, the leek is little used in America. The seed should be sown in a well-prepared, light, deep, rich, moist loam in a nursery bed or coldframe. The site should be open, the subsoil dry. When six or eight weeks old, or about 5 inches tall, the young plants should be set 9 inches asunder, in drills 3 to 6 inches deep and 18 inches apart. Shortening both roots and stems is often advised. As the plants grow, the soil should be drawn loosely round the stems and lower leaves to insure blanching. When blanched leeks are not desired, the plants may be cultivated like onions;



1254. A papilionaceous flower—Sweet Pea. Showing the banner, standard or vexillum at s; the wings at w; the keel at k.

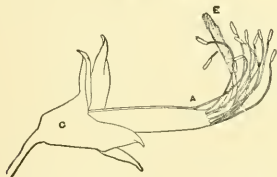
indeed, except for earthing up, the cultural methods employed for these two crops are identical. Leeks are marketed in bunches like young onions and, for winter use, are stored like celery. As a second crop to follow early cabbage, spinach, etc., they are in general favor with market-gardeners. In soups and stews the rank odor disappears, leaving a mild and agreeable flavor.

M. G. KAINS.

Leek, though of the onion family, and also a biennial, is differently treated and used. The object in its cultivation is to develop the leaves in such a manner that they become numerous; the flower-stem does not appear before the second year, hence the necessity of growing it to full size the first year.

Sow the seed in March in a seed-bed (with slight bottom beat), in drills 2 or 3 inches apart; when large enough, thin out to stand 1 inch apart in the row, as they may attain the thickness of a fair-sized straw. In May or early June the seedlings are transplanted in the open ground; they are then cut half-way down and should also be set deep, so they will begin blanching when they attain a fair size. The soil best suited is a rich, moist, light loam; prior to the transplanting it should be well prepared with well-rotted stable manure, if possible. The plants are generally set in drills 12 to 15 inches apart, and 6 to 9 inches apart in the drills. They should be well cultivated, and when growing freely should be earthed up slightly with the hand cultivator or hand-hoe. Some of the successful gardeners still cultivate them on the celery-trenching system; by this means they can be watered more thoroughly and

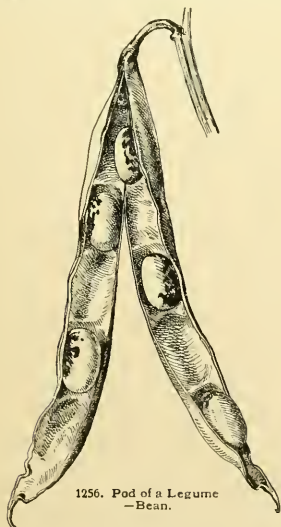
will attain a much larger size; also can be conveniently left in the trench with slight protection, and taken therefrom for winter use. Care must be taken not to cover too early, as they decay easily, beginning at the end of



1255. Essential organs of a Sweet Pea flower. Calyx at C; tenth stamen at A; stigma at E.

the foliage; this destroys their appearance. The hardier kinds are used for this purpose and will blanch yellow down to the so-called stem, which is white to the root. Leeks planted out in May are ready for use in September; the sowings can be made earlier and later to suit the time of maturing, and can be sown in August and September in coldframes and wintered over with slight protection, then transplanted to the open ground in April. The varieties best known to American gardeners are London Flag, Large Musselburgh or Scotch Flag, Giant Carentan, and Large Rouen. J. OTTO THILOW.

LEGUMES. The popular name given to a vast and important family of plants, of which pea, bean, clover, vetch, etc., are common representatives. The order is generally known as the pulse family, or *Leguminosae*. It contains nearly 450 genera, comprising over 7,000 species, and in economic importance ranks second only to the grasses (*Gramineae*). The species of this family are distri-

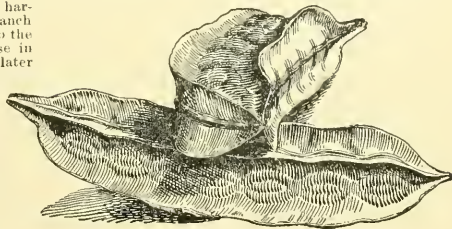


1256. Pod of a Legume
—Bean.

buted over the entire earth. By far the greater number are herbs and half-shrubby plants, but in the warmer regions of the earth they attain the dimensions of for-

est trees. Numerous species are widely cultivated as agricultural crops. Among these, beans and peas are important food-plants, while clover, vetches, peas, melilot, alfalfa, lucerne, cow-peas, etc., are valuable forage crops, cover-crops, and green manures. Many of the exotic species are of commercial importance. The arboreal forms furnish structural timber and cabinet woods. Many also furnish dye-stuffs, rubber, balsams, oils, etc., and some are cultivated for ornamental purposes.

In respect to the character of the flowers, the family is divided into three subfamilies. In the large subdivision to which the ornamental species of *Mimosa* and *Aecia* belong, the flowers are small and regular and often clustered in spherical or oblong heads. The stamens are free or united into a tube and much exerted. In the second subfamily the flowers are usually irregular, with the upper petal folded inside of the others in the bud. The coffee-tree, honey locust, and the large genus *Cassia* belong in this subdivision. Most of the native species of



1257. A 4-sided leguminous pod—*Daubentonia*.

Legumes, and all those cultivated as farm crops, belong to the vast subfamily *Papilionaceae*. In these the flower is of the papilionaceous type, or pea type (Fig. 1254). The upper larger petal, called the banner, *sc*, is exterior and folded over the others in the bud. The two lateral ones, situated below the banner, are the wings, *ac*, *ec*, while the lower pair, which are sometimes united, form the keel, *k*. The keel encloses the stamens and pistil, the latter being often bent at right angles to the ovary, or coiled. The stamens are either free or they form a tubular sheath surrounding the ovary. Often the upper one alone is free, leaving a slit along the upper side of the sheath (Fig. 1255). These flowers are often dependent on insects for pollination, a fact which is of great importance in raising clover seed.

The fruit of the Leguminosae is a pod or Legume, as in the bean (Fig. 1256). As a rule, the pods are one-loculed, and have the seeds arranged in rows. In some tribes they become several-celled by partitions which arise between the seeds. These pods become constricted at the partitions, and at maturity separate into short joints (see Fig. 694, Vol. 1). The valves of the pods are generally papery or leathery, and open at maturity, often by a sudden snapping of the valves, which scatters the seeds. In other tribes, however, the pods are indehiscent, or do not split at maturity (Fig. 1257).

The roots of Legumes have numerous small tubercles scattered throughout the root-systems. Fig. 1258. These are caused by and infested with minute organisms, to which the name bacteroids has been applied. The bacteroids are always present, and probably multiply to some extent in soils where Legumes have been grown. They are very minute bodies, which are either rod-like in form or branched in the form of a Y or a T. The infection of the plants has been observed to take place through the root-hairs. Within the plant the bacteroids assume a new and peculiar form. They grow out into a branched and flexuous thread, which is enlarged and nodulose at places. At the point of infection the root-cells are stimulated to growth, producing the nodules characteristic of Legumes. The threads permeate the entire tubercle. The old threads finally disorganize, and it is believed that their protein substances are absorbed by the host.

It has been shown, first in 1886 by experiments conducted by Hellriegel and Wilfarth and later by numerous other investigators, that when Legumes are grown in sterilized sand, which contains no trace of nitrogen, they soon die of nitrogen-hunger, and no tubercles are formed on their roots. If, however, a very small quantity of soil extract or of bacteroids, grown from root-tubercles, is added to the sand, the plants assume new vigor and grow to maturity. Tubercles are formed on the roots, and the plants are found to contain more nitrogen than was present in the seed. By such experiments it is shown that Legumes can acquire free nitrogen through the agency of the bacteroids. The physiological process by which this is done is still obscure.

Some species of Legumes can be innoculated by bacteroids from other species, but others seem to be dependent upon their own specific organism. The organisms are spread in the soil only by mechanical agencies, such as working the soil, moving water, wind, etc. If the soil is rich in nitrogen, leguminous plants can develop, like all others, without the aid of tubercles.

Recently pure cultures of bacteroids have been offered in the market as Nitragin, to be used for the purpose of inoculating soils deficient in micro-organisms. Although several experimenters claim success with this substance, its practical application to agriculture remains yet to be demonstrated. The substance sold as Alinit, and said to enable grasses to acquire free nitrogen, is merely a pure culture of a very common bacterium present in all decaying matter.

HEINRICH HASSELBRING.

LEIOPHYLLUM (From *leios*, smooth and *phyllon*; referring to the smooth foliage). Syn., *Dendrium*, *Ammyrsine*, *Ericaceae*. SAND MYRTLE. Evergreen hardy densely branched shrub, sometimes procumbent, with small, glabrous, opposite or alternate crowded lvs. and white or light pink small fls. in terminal many-fl. umbels, appearing profusely late in spring. It resembles in appearance somewhat the Dwarf Box, and is well adapted for borders of evergreen shrubberies and also for rockeries. It thrives best in a peaty or very sandy, loamy soil and as well in a sunny as in a partly shaded position. Prop. by seeds sown in pans and placed in a cool frame or by layers put down in fall. One species in E. N. Amer. from N. J. to Fla. Allied to *Ledum*. Lvs. entire; fls. in terminal, umbelliform corymbs; sepals and petals 5; stamens 10; fr. a 2-5-celled dehiscent many-seeded capsule.

buxifolium, Ell. (*Ledum buxifolium*, Berg.). Dense, leafy bush, to 3 ft. high; lvs. short petioled, thick, oval or obovate, about $\frac{1}{2}$ in. long; fls. white, pinkish outside, about one-fifth in. across, on slender pedicels; petals elliptic, almost twice as long as sepals. April-June. Pine barrens and mountains, N. J. to Fla. B.M. 6752. Gn. 42, p. 559. G.W.F.A. 49. B.R. 7:531 (as *Ammyrsine*). L.B.C. 1:52 (as *Ledum*). Var. **prostratum**, Gray. Forming dense depressed tufts; lvs. usually oval, and deep green. High mountains of Carolina.

ALFRED REIDER.

LÉMNA (Greek, *limne*; a large pool of standing water). *Lemnaceae*. DUCKWEED. DUCKSMEAT. Duckweeds are common upon stagnant pools, often covering the water with a blanket of green. They are easily gathered for schoolroom and home aquaria, and may be procured from specialists in aquatics and native plants. Ducks and carp eat these plants greedily. One of the common Duckweeds is shown 6 times its natural size in Fig. 1259. Duckweeds are small floating plants, without any distinct stems, a whole

plant commonly consisting of one leaf and one unbranched root which has no vascular tissue. These lvs. are called fronds by the botanist largely because lvs. do not ordinarily emit roots. The plants grow separately, or cohere by their edges in 2's or 3's, and multiply by similar fronds, which grow out of the edges of the old ones something like buds. The flowers are minute and appear on the edge of the frond. They consist of a pistil and generally 2 stamens which are inclosed in a sheath, which the botanists have determined is a spathe by reason of the place where it is borne and by homology with related plants. *L. minor* is said to flower more frequently than any other northern species. Details of its flower are shown in Fig. 1260, where there seem to be 4 anthers, but there are only 2, each bearing 2 locules. Some botanists consider the 2 stamens as 2 fls. and the pistil a third flower. Duckweeds are perennial plants. In the autumn they fall to the bottom of the ditch or pond, but rise again in the spring, and increase in size. The allied genus *Wolffia* contains the smallest flowering plants in the vegetable kingdom. There are about 11 species of Duckweeds, widely scattered. *L. polyrrhiza* is commonly known in American botanies as *Spirodella polyrrhiza*, but *Spirodella* is considered by Bentham and Hooker a subgenus of *Lemna*. The common Duckweed occasionally infests the small lily ponds (artificial ones), where it is a pest. The simple remedy is to flush the pond and see that common goldfish or carp are in sufficient numbers to clear off the remainder.

A. Veins 7-11; roots several.

polyrrhiza, Linn. (*Spirodella polyrrhiza*, Schleid.). Also spelled *polyrrhiza*. Fronds broadly ovate or orbicular, attaining 3 or 4 lines diam. B.B. 1:365.

AA. Veins 1-5; root solitary.

B. Fronds oblong, 6 lines long, 3 lines wide.

trisulca, Linn. Fronds much thinner than in the next, narrow and minutely toothed at one end, thicker and task-like at the other, usually with 2 young ones growing from opposite sides near the base. B.B. 1:366. V. 3:200.

BB. Fronds broadly ovate or orbicular, 2 lines long.

minor, Linn. Figs. 1259-60. Fronds usually cohering in 3's or 4's, rather thick, not minutely toothed. B.B. 1:366. V. 3:200.

WM. TRICKER and W. M.

LEMON culture in Florida was assuming an important share of horticultural work previous to the cold winter of 1894-5, but since then attention has been more largely given to hardier fruits. The growing of Lemon trees is beginning again in lower Florida, in sections free from killing frosts, and although soil conditions are rather unfavorable to the cultivation of citrus trees, owing to the rocky or poor character of the ground, there is evidence of interest and some practical results from the experimental plantations. There remained after the killing freezes some isolated orchards of Lemons in southern Florida, which have since entirely recovered and have borne full crops of fruit for two or three years.

The pecuniary reward to a careful Lemon grower is large, provided he has suitable soil and a situation removed from killing frosts, and although profits from other citrus fruits may be temporarily larger, Lemons are constantly in demand, and the reward is correspondingly certain. Orchards are usually set with budded trees, about 20 by 25 feet apart. The young trees after setting are advantageously mulched with grass or other



1258. Nodules on the roots of a young plant of garden pea. Natural size.

litter, which holds moisture for the unestablished roots, and gradually rots, affording humus. The stocks used are sour orange and rough Lemon principally, but other stock may be used, and the Lemon may also be raised from cuttings in the same manner that citrons are grown. The remarks as to the use of *Citrus trifoliata* as a stock for lines will apply also in this case (see *Line*).

The cultivation is the same as for orange trees: shallow plowing early in spring, followed by thorough harrowing once or twice each month until the summer rainy season has well set in. After this time the grass which naturally springs up is allowed to grow at will until autumn, when it is mowed for convenience in picking fruit and getting about the orchard. Many growers perceive advantage in raising soil-enriching plants in the orchard and so, instead of allowing native grasses to grow, sow seeds of various forage plants, as beggar-weed (see *Desmodium*), cow-peas, velvet beans, etc., part of which growth is harvested for hay, the rest left to add fertility to the soil, and is later plowed under. In

late autumn most growers apply fertilizer, usually composed of sulfate of potash, sulfate of ammonia and bone-black, which is broadcasted at the rate of 800 to 1,500 pounds per acre. This fertilizer is not wasted by the action of the sun, and is either left on the surface to be washed in by rain or is mixed in the soil by harrow or turning-plow. Fertilizing is also done in the early summer, and occasionally a third application is made before ripening of the fruit, but the rule is, two applications per year of about the same amount each.

E. N. REASONER.



1259. Duckweeds,
Lemna minor.



1260. Floral details
of *Lemna minor*.
aa, stamens; b, pistil.

LEMON IN CALIFORNIA.—Though Lemons have been grown in California for half a century, it is only during the last decade that the culture has risen to considerable commercial importance. This fact is shown by the latest statistical data, which indicates about a quarter of a million bearing trees and about a million non-bearing trees as comprising the aggregate of Lemon planting in this state. The early product consisted of seedlings which were of excessive size, with juice of low acid content and rind of marked bitterness. The closest attention of Lemon-growers was given about twenty years ago, and for some time afterwards, to the testing of the best seedlings and the varieties brought from the Mediterranean region, to secure acceptable size, thinness of rind and freedom from bitterness, with high percentage of citric acid in the juice. The result was that a few such varieties were found and they were demonstrated to be equal in these characteristics to the imported fruit from Sicily. Then, for the first time, California growers were able to compete with the imported fruit, and the planting of Lemons began upon a large scale. The local markets were first supplied, overland shipments were undertaken, and the fruit was found to be

acceptable east of the Rocky mountains and the undertaking to displace the Mediterranean fruit at all points in the United States began. This effort was greatly advanced by the protective tariff, which counterbalanced the advantages which foreign producers had previously enjoyed in cheaper labor and in less cost of transportation. Shipments of about 1,200 car-loads of Lemons a year to the eastern markets show the success which California growers have attained in competition with the imported fruit.

Local adaptations of climatic and soil conditions to the growth of the Lemon have required long and close study and experimentation. The Lemon is less hardy than the orange, and will suffer seriously with degrees of frost which the orange will endure. Almost frostless situations are, therefore, most promising. The Lemon will reach perfection in a region where the summer heat may be slightly less than required to develop satisfactory sweetness in the orange. These desiderata of very light frost and somewhat lower summer temperature are found to coincide in places most open to ocean influences in southern California. Roughly speaking then, the Lemon region is on or near the coast and the orange region in interior valleys. Differentiation in planting these two fruits has proceeded along these lines quite largely, though it is still true that in certain places most excellent Lemons are grown at interior points and most excellent oranges near the coast. The orange has proved to be, however, rather more easily grown and prepared for market than the Lemon, and on the whole, more profitable, perhaps; so that these facts are to be properly included when an effort is made to account for the disposition of those owning Lemon orchards in the interior to work them over to the orange.

A light warm loam is best suited to the growth of the Lemon, while the orange root seems to be adapted to a range of heavier soils. This was of more moment when the practice was to grow the Lemon on its own roots, either from cuttings or by budding on seedling Lemon stock. But the production of a Lemon tree of less riotous growth and fruit of less average size and, with a healthier and more satisfactory tree, was found to be attained by using the orange seedling as a stock for the Lemon tree, and this is the universal practice at the present time. Propagation is by the ordinary process of budding on a seedling root two or three years old. Distances of planting in the orchard differ somewhat according to the judgment of growers, but about 100 trees to the acre is the average.

Pruning the Lemon has been a vexed problem with the growers for years. The tree is naturally of rangy growth, running out long leaders which afterwards assume a pendent form and are tossed about in the wind, to the detriment of both tree and fruit, which is apt to come at the ends of the long, pliant shoots. Thus an unpruned Lemon orchard becomes almost impenetrable for necessary orchard work. This is in marked contrast to the growth of the orange, which is more compact and symmetrical, and needs but slight regulation after a good form is secured in the young tree and. Regular shortening-in of the branches of the Lemon is therefore necessary, followed by thinning of the new shoots, so that the tree shall not make too many bearing twigs and become too dense in the center. In that way the fruit can be kept within easy reach, and the branches stiff and strong to carry it.

Ample irrigation and frequent cultivation to prevent evaporation afterwards are essential to thrift and bearing of the Lemon in California. Neglected trees lose their leaves and prematurely ripen fruit lacking in juice.

Scores of varieties have enjoyed fleeting popularity in California and now not more than six are largely grown; viz., Villa Franca, Lisbon, Eureka, Genoa, Messina and Bonnie Brae. Of these, the first three constitute probably four-fifths of the crop.

The preparation of the Lemon for marketing has been a matter of discussion and experiment for years. The bulk of the crop ripens in the winter; the time to sell Lemons is in the summer. The Lemon ripened on the tree has very poor keeping quality. Both for meeting the market demand and to secure a fruit which will endure shipping, Lemons need storage for a considerable

time. Proper storage, or curing, as it is generally called, results in thinning and toughening the rind so that it has a pliable character, a silky finish and is not easily bruised in handling. Very costly curing houses have sometimes been found defective in not readily disposing of the products of evaporation from the fresh fruit. At present, simpler constructions, consisting in thoroughly ventilated inner apartments for the fruit, with outer walls and double roof to protect the interior against wide temperature changes in the outer air, are giving very satisfactory results. The fruit needs freedom from extremes of temperature, abundant ventilation and yet no intrusion of wind or air currents and the absence of light. When these are secured, the fruit ripens slowly, assumes a beautiful, characteristic color and is then good for long keeping or distant shipment. It is essential to secure uniform size, and this is done by picking without regard to ripeness as soon as a fruit reaches a certain size. The result is that the fruit is picked before any sign of coloring appears. The standard is $2\frac{1}{4}$ inches in diameter, as measured with an iron ring which the picker carries. The diameter decreases one-eighth of an inch during curing. Late-ripening fruit, for quick sale, may be allowed to get a little larger, but no fruit should be above 2 $\frac{1}{2}$ inches in diameter. All fruit must be cut and not plucked from the trees, and until the final packing for shipment, should be handled in shallow trays or boxes, piled with air spaces between them so that the air may circulate and remove the exhalations. E. J. WICKSON.

LEMON VERBENA is *Lippia*.

LEMON VINE is *Pereskia*.

LEMÓNIA. See *Ravenia*.

LENS (ancient Latin name of the Lentil). *Leguminosae*. This genus includes the Lentil, *Lens esculenta*, one of the oldest and still one of the most important food-plants for man, especially in the warmer parts of the Old World and the Orient. It is a much-branched tufted annual 1- $\frac{1}{2}$ feet high. The leaves have numerous leaflets and end in a tendril. The flowers are small, white or pale blue, axillary and borne in pairs. The pods are short and broad, very flat, and contain 2 flat seeds which are rounded in outline and convex on both sides. The lens of the astronomer and physicist was named because it was shaped like one of these seeds. Some varieties have gray seeds, others red. Esau sold his birthright to Jacob for a mess of red pottage made of Lentils. Lentils are used chiefly for soups and stews. They are a coarser and cheaper food than fresh peas and beans, and about as palatable as split peas. Lentils rank amongst the most nutritious of all vegetables, as they contain about 26 per cent caseine, 35 per cent of starch and only 14 per cent of water. Lentils are also of the easiest culture, but the seeds are often destroyed by weevil. The seed is generally sown in drills in March. The heaviest crops are produced on rather dry, sandy soils. The plants need no special care between seedtime and harvest. The seeds keep better in the pods than after being threshed out. Some of the varieties are the Puy Green, Small Winter and Small March. The genus Lens is placed by Bentham & Hooker between the vetch and sweet pea, (*Vicia* and *Lathyrus*). In Lens and *Vicia* the wings of the flower adhere to the keel, while in *Lathyrus* they are free or only slightly adherent. Lens has 2 ovals; *Vicia* usually many.

LENTIL. See *Lens*.

LEONÓTIS (Greek, *lion's ear*, which the flowers are supposed to resemble, *Labiata*, LION'S EAR. LION'S TAIL. This includes a tender shrub, with scarlet-orange, gaping fls., cult. outdoors in S. Fla. and S. Calif. As a bedding plant it is little grown north of Washington, D. C., and it is far outclassed in popularity by the Scarlet Sage, which gives an equally vivid mass of red in the northern autumn. The Lion's Ear differs from the Scarlet Sage in having conspicuously hairy, almost plush-like fls. These are 2 in. long, as many as 18 in a whorl, and 3 or 4 whorls open successively on

each branch. The fls. are oddly gaping, the upper lip very long and uncut, the lower very short and 3-cut. In the North, cuttings should be started in early spring, the young plants transplanted to the open in May and thereafter frequently pinched to make an asymmetrical instead of a straggling bush, and if the plants do not flower before frost, they can be cut back, lifted and brought into a cool greenhouse to flower in November or December. A southern enthusiast says that they are as easy to cultivate as a geranium.

Franceschi writes that the plant seldom seeds in S. California, and must be propagated from cuttings, which, if taken from hardened wood, do not root as readily as many other labiates. The plants are much improved by cutting back every year or so.

Leonotis has about a dozen species, chiefly south African. Herbs or shrubs: lvs. dentate, the floral ones alike or narrower and more sessile; fls. scarlet or yellow; calyx tubular, 10-nerved, obliquely 8-toothed; stamens 4, didynamous.

Leonurus, R. Br. Shrubby, 3-6 ft. high: lvs. 2 in long, oblong-lanceolate, obtuse, coarsely serrate, narrowed at the base, slightly tomentose beneath; floral ones like the rest; corollas no more than three as long as the calyx. S. Afr. B.M. 478 (as *Phlomis Leonurus*). R. H. 1857, p. 548. Gn. 53, p. 460. G.C. II. 19-186.

W. M.

LEONTICE (Greek, *lion's foot*; referring to the shape of the leaf). *Berberidaceae*. LION'S LEAF. About 7 species of hardy herbaceous perennials, chiefly Asian, of low growth and distinct appearance. Three kinds are advertised by the Dutch bulb growers, but perhaps one of them belongs to *Bongardia*. Leontice is distinguished from the highly interesting and rare group mentioned under *Epidemium* by having 6-8 sepals (which are the showy parts), and 6 petals reduced to small nectaries. Like *Bongardia*, it has 6 stamens and a bladder capsule. These plants have a turnip-shaped corn about 2 in. thick, and bear yellow fls. in early spring. *Bongardia* has only one species, which is described in the supplementary list of the present article.

A. *Lvs. twice ternately cut*.

Leontopetalum, Linn. *Lvs. ovate or obovate*, rarely subcorlate; panicle large, dense, leafy. Italy and the Orient.—Root used in the Holyland against epilepsy.

AA. *Lvs. digitately cut*.

B. *Raceme dense, conical*.

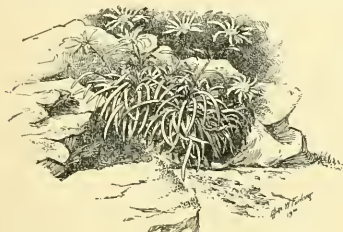
Álberti, Regel. Stems several, stout, each giving off 2 subradical lvs. which are undeveloped at flowering time: lvs. finally on stalks 4-5 in. long, digitately 5-parted; lfts. pale green, glaucous, elliptic; nerves prominent and parallel beneath; scape 6-8 in. high, robust; raceme as many as 18-fl.; fls. nearly 1 in. across, ochre-yellow, streaked reddish brown on back; petals shorter than the stamens. Turkestan. B. M. 6900. Gt. 1881:1657.

BB. *Raceme loose, oblong*.

Altaica, Pall. According to Index Kewensis, this is a synonym of *Bongardia Rawolfii*, but the following description, taken from the plant figured as *L. Altaica*, in B. M. 3245, is very distinct from that figured as *Bongardia Rawolfii* in B. M. 6244. Lvs. not from the root, digitately cut, only one leaf on each flower-stem, the leaf having 3 primary divisions, each of which is petioled and has 5 lfts., 2 of which are smaller than the rest; lfts. elliptical; inflorescence a raceme, bearing large, more or less roundish leafy bracts; fls. mostly erect, having 6 showy, oblong, not overlapping, entire parts supposed to be sepals, the petals small, yellow, erect, shorter than the anthers.

Bongardia Rawolfii, C. A. Mey. Lvs. all from the root, pinnate; lfts. 3-8 pairs, or some of the lfts. in whorls of 3-4, wedge-shaped, 3-rid, with a conspicuous triangular crimson mark at the base of each; inflorescence a panicle, bearing minute, linear bracts; fls. drooping, having 6 showy, wedge-shaped, erenate parts, 3 of which should possibly be considered petals, and the other 3 inner sepals, since there are 3 small, greenish lobes outside which are like an ordinary calyx, and should, perhaps, be called the outer calyx. B.M. 6244. F.C. 3:98. B. 1:50. W. M.

LEONTOPIDIUM (Greek, *lion's foot*). *Compositae*. The Edelweiss is perhaps the one flower most sought by tourists in the Alps. It is an emblem of purity, and the name means "noble white." It is a low plant, 4-12 in. high, densely covered with a whitish wool, the attractive



1261. Edelweiss—*Leontopodium alpinum* ($\times \frac{1}{4}$).

portion being the flat, star-like cluster of woolly floral leaves surrounding the true fls., which are small, inconspicuous and yellow. The general impression seems to be that Edelweiss cannot be cult. in America. In 1900, however, it is being extensively advertised as a pot-plant, and it has long been cult. in rock gardens. J. B. Keller writes, "It can be grown to perfection in elevated position of the rocky, in rather light soil and with full exposure to sun. It also succeeds in an ordinary hardy border where the plants can be kept moderately dry in winter." Dreer advises that the seed be sown early in spring in shallow pans of sandy soil and leaf-mold and kept cool and moist. E. J. Canning sows seeds of Edelweiss in 4-in. pots in the greenhouse in Feb., pricking off as soon as large enough to handle, and finally transferring them to the rock garden, where they flower well the second year; but after that they are inclined to die out.

To establish a colony of Edelweiss an English writer (Gn. 52, p. 146) advises that a few stray seedlings be firmly planted in a narrow chink of rock so placed that a deep fissure of gritty or sandy loam may be assured for the roots to ramble in. Plants in pots may be grown and flowered when the collar is tightly wedged between some pieces of stone or old mortar. The plant is best propagated by seeds, as division is not always successful.

Leontopodium has about 6 widely scattered species of perennial herbs, all tufted and woolly, with ascending or erect stems which are unbranched except at the very top; stem-lvs. alternate, entire; heads small, crowded into dense cymes surrounded by a sort of leafy involucre. Edelweiss is still catalogued as a *Gnaphalium*, but in that genus the style is 2-cut, while in *Leontopodium* it is uncut. *Leontopodium* is more nearly allied to our common weed, the "Pearly Everlasting" (*Anaphalis margaritacea*), which lacks the dense cluster of star-like floral leaves, but in the opinion of the writer has as much beauty as the Edelweiss.

alpinum, Cass. (*Gnaphalium Leontopodium*, Linn.). Fig. 1261. Lvs. lanceolate, floral ones oblong; fl. heads 7-9 in a cluster; involucre scales woolly at base, blackish at apex. B.M. 1958. Gn. 29, p. 529 and 52, p. 146.

LEOPARD'S BANE. *Doronicum*.

LEOPARD FLOWER is *Belamanda*.

LEPACHYS (Greek, *a thick scale*; probably referring to the thickened upper part of the bracts of the receptacle). *Compositae*. This includes a fine prairie wildflower, *L. columnaris*, for which, unfortunately, there is no common name. It grows 2-3 ft. high, has elegantly cut foliage, and bears fls. something like a Brown-eyed Susan, but the disk is finally cylindrical and more than an inch high, with 6 or 7 oval, reflexed rays hanging from the base. In a fine specimen these rays are $1\frac{1}{2}$ in. long and nearly 1 in. broad. There are

5 inches or more of naked wiry stem between foliage and flower. Typically, the rays are yellow, but perhaps the most attractive form is var. *pulcherrima*, which has a large brown or brown purple area toward the base of each ray. Like the majority of our native western fls. that are cult. in the eastern states, the plants have reached our gardens from European cultivators. Meehan says it is perfectly hardy in our northern borders, but the English do not regard it as entirely safe without some winter protection. Moreover, it is one of the easiest herbaceous perennials to raise from seed, flowering the first year, and it is chiefly treated in the Old World as an annual bedding plant, the seeds being known to the trade as *Obeliscaria pulcherrima*. For bedding, the seeds are sown in early spring in a hotbed, the seedlings pricked off into boxes, hardened off, and finally transplanted to the open, only slight care being necessary to obtain compact bushes about 2 ft. high. Under such circumstances the plants flower from June to September, and the season may be prolonged by a sowing in the open. This plant deserves trial in our northern borders, where seed can probably be thinly sown in the open, where the plants are to stand, with a fair chance of autumnal bloom the same year. The fls. last well in water and should be cut with long stems to get the benefit of the delicately-cut foliage. *Lepachys* contains 4 species of herbs, all American, 3 perennial. Lvs. alternate, pinnately divided or parted; disks at first grayish, their corollas yellowish, becoming tawny; chaffy bracts commonly marked with an intermarginal purple line or spot, containing volatile oil or resin. Monographed in Gray's "Synoptical Flora." For generic distinctions, see *Rudbeckia*.

A. Rays oval, scarcely as long as the disk at its longest.

columnaris, Torr. & Gray. Fig. 1262. Branching from the base, 1-2 ft. high in the wild, often 3 ft. in cult.; stem-lvs. with 5-9 divisions, which are oblong to



1262. *Lepachys columnaris* ($\times 1-5$).

linear in outline and sometimes 2-3-cleft; fls. solitary, terminating the branches; rays yellow; style-tips short, obtuse. Prairies. B.M. 1601. Mn. 1:65. G.W.F.A. 8.

Var. *pulcherrima*, Torr. & Gray (*Obeliscaria pulcherrima*, DC.), differs only in having the rays partly

or wholly brown-purple. The plants in the trade are mostly margined with yellow or have about half of each color. Gn. 51:1104. R.H. 1854:421. Var. *totus-purpureus*, Hort. D. M. Andrews, is "a variety with dark orange-brown rays, almost black."

AA. Rays oblong-lanceolate, very much longer than the disk.

pinnata, Torr. & Gray. Slender, 3-5 ft. high: lvs. with 3-7 lfts., which are lanceolate, sparsely serrate, sometimes lobed, the uppermost run together: rays yellow, often 2 in. or more long. Western N. Y. to La., south to La. B.M. 2310. J. H. COWEN.

LEPIDIDIUM (from Greek for *little scale*; alluding to the small flat pods). *Cruciferae*. CRESS. PEPPERGRASS. Perhaps 100 species of small herbs (sometimes under-shrubs) in many parts of the world, with very small white fls. There are about 20 native species, mostly western, and several introduced weedy species. The foliage and pods have an aromatic peppery flavor. The foliage of some species is used as salad, and the pods are sometimes fed to tame birds (whence the name "Canary grass"). There are no species of much ornamental value.

sativum, Linn. GARDEN CRESS. Annual, 1-2 ft., glaucous when in flower and fruit, glabrous: fls. small and inconspicuous, in an elongating raceme: pods nearly circular, bifid at the apex, winged; lvs. exceedingly various, but usually the radical ones pinnately divided and subdivided, the central cauline ones 2-3-cleft nearly to the base and the segments entire or toothed, the uppermost simple and entire. W. Asia, but widely disseminated as a cult. plant, and sparingly run wild in the northern part of the U. S. and Canada.—Under cultivation the foliage varies immensely. The curled sorts have lvs. as finely cut as curled parsley. On Australian Cress, which is a golden-lyd. form, there are sometimes on the same plant broad spatulate, ragged-edged lvs., cut lvs., and simple linear lvs. For culture, see *Cress*.

Other Lepididms are sometimes eaten, but are not in the trade and are of little importance. One of these is the common *L. Fritacium*, Linn., wild in the U. S. and known as Pepper-grass. Others are the Chilean *L. Chilense*, Kunze, and the Oceanic *L. piscidum*, Forst. f. L. H. B.

LEPTACTINA (Greek, *graceful rays*; referring to the star-like aspect of the flower). Also written *Leptactinia*. *Rubiaceae*. This includes a shrub from western tropical Africa which should rank among the finest tall bothose shrubs in cultivation that have large white flowers. The fls. have a slender tube, 4 in. long, and 5 narrow spreading lobes, each $\frac{5}{8}$ in. long and recurved for one-third of their length. As many as 4 fls. are borne at the top of each branch, in the axils of the highest pair of lvs. The plant might be compared to a giant-flowered, loose-clustered *Ixora*. It is not yet advertised in America, but seems worthy of a trial in some of our best conservatories.

The genus contains 6 species, all tropical African shrubs, important generic characters being the large calyx lobes, very long corolla tube, 5 included stamens, style branches free or connate, large, lax stipules, and clustered inflorescence.

Manni, Hook. Branching shrub, 6 ft. high: lvs. $\frac{5}{8}$ in. long, $\frac{2}{3}$ in. wide and larger in proportion, oval, wavy-margined, obtuse, with globose green bodies between the insertions of the lvs., which are stipules: calyx tube 3 lines long, lobes 1 in. or more long, leafy; corolla silky within, lobes lanceolate; stamens 5, included: style hairy above, 2-branched. B.M. 7367.

LEPTOSIPHON. Now referred to *Gilia*.

LEPTOSPÉRMUM (Greek, *slender seed*). *Myrtaceae*. This genus includes some Australian shrubs, which are cult. outdoors in S. Calif., and under glass in the North only by a few persons who are expert in the culture of heaths and other hard-wood Cape and Australian plants. They have great numbers of small white, yellowish or pinkish fls. about $\frac{1}{2}$ in. across, with 5 petals, which are roundish and clawed. Franceschi reports that they

stand drought well in California. The genus has about 20 species, chiefly Australian, and has not been monographed since 1866, in vol. 3 of *Flora Australiensis*. Shrubs or small trees: lvs. small, rigid, entire, alternate, nerveless or 1-3-nerved: fls. white, sessile, solitary or 2-3 at the ends of short branchlets or in the axils of the lvs.: fls. usually white; stamens numerous. The young shoots are often silky.

Leptospermum ballatum (see *L. scoparium* below) is an exceptionally good pot-plant for those who can grow heaths. It is better than *L. levigatum*. Cuttings taken from well-ripened wood in the fall or from young growth in summer root freely under the treatment given *Erica*. For a potting, use two parts leaf-mold and one of sand. Plunge the pots outside during the summer in the full sunlight. The plants make a straggling growth, unless trimmed into shape. By fall they will be covered with buds, but it is impossible to force them into bloom for Christmas. Keep the plants in a cool house with *Eriogon* or *Azalea* until the latter part of February or March, and then give them a little more heat, say 55° to 60°. The plants will soon be a mass of white flowers. *L. ballatum* does not grow rapidly, but, like *Epaeris*, as it grows older it makes fine specimens. It has tough foliage, stands much hard usage, and when in bloom attracts plant-buyers. It deserves greater popularity.

A. Ovary usually 10-celled.

levigatum, F. Muell. Tall shrub, attaining 20-30 ft., glabrous and somewhat glaucous: lvs. varying from obovate-oblong to oblong-cuneate or narrow-oblong, obtuse, mostly 6-9 lines long, but sometimes 12 or more; 3-nerved: calyx glabrous: capsule slightly protruding above the calyx tube. B.M. 1304 (as *Fabricia levigata*). G.C. II. 25:816; III. 9:45.

AA. Ovary usually 5-celled.

B. Calyx tube glabrous.

C. Lvs. flat or with recurved margins, obtuse or scarcely pointed (except in the large variety).

flavescens, Smith. Lvs. varying from narrow-oblong or linear-lanceolate to broadly oblong or even obovate, usually less than 6 lines long, attaining 9 lines in the largest forms. Var. *commune*, Benth and Muell. Lvs. narrow, 6-9 lines long; fls. middle-sized. B.M. 2685. Var. *obovatum*, F. Muell. Lvs. broadly obovate to obovate-oblong, under 6 lines long. Cult. in Europe under glass. Var. *grandiflorum*, Benth. & Muell. Lvs. rather larger: fls. larger than in any other variety. L.B.C. 6:514.

CC. Lvs. flat or concave, sharp-pointed, narrow or small.

scoparium, Forst. Attaining 10-12 ft.: lvs. ovate to linear-lanceolate or linear, mostly under 6 lines long. Otherwise, almost exactly as in *flavescens*. B.M. 3419. *L. juniperinum*, a narrow-leaved form, is considered synonymous by the botanists, but is kept distinct in the trade, as also is *L. ballatum*, Hort., which is perhaps the only *Leptospermum* cult. in the North. J.H. III. 30:435. *L. scoparium*, var. *grandiflorum*, Hort., Gn. 51:1120, is one of the most desirable forms. It is said to be of relatively easy culture, with compact habit, the branches spreading in all directions.—Excellent plants for the amateur, but very slow-growing.

BB. Calyx tube more or less densely clothed with silky or woolly hairs.

lanigerum, Smith. Lvs. varying from obovate-oblong to elliptic or narrow-oblong, normally 6 lines long. A form with lvs. narrower, 6-12 lines long, and large fls., is pictured in B.M. 1810. L.B.C. 8:701. I.H. 32:570. G.C. II. 12:427. Gn. 19:266, and 27, p. 145.—Extremely variable. Long cult. abroad, but not adv. in America.

H. D. DARLINGTON and W. M.

LEPTOSYNE (Greek, *slenderness*). *Compositae*. This includes some yellow-fld. composites, with much-divided foliage like *Cosmos*. They are 7 species of herbs and subshrubs, all from California except *L. Arizonae*. They are the representatives of *Croceopsis* on the western side of the continent, but have mostly pistillate rays and always a ring on the tube of the disk-

fls. In the North these plants are mostly treated as half-hardy annuals. None of them has anything like the popularity of either *Cosmos* or *Calliopsis elegans*. The commonest species is *L. maritima*, but *L. Stillmanni* promises to outrank it, though it is not yet advertised in America. *L. Stillmanni* is said to bear fls. $1\frac{1}{2}$ in. across, for 5 or 6 weeks. Its seed germinates quickly and can be sown outdoors. Sandy soil and a sunny position is advised. It is said to bloom in four to five weeks after sowing. *L. maritima* should be started indoors, transplanted in May, and can be brought into flower by July. Two distinct plants are passing in the trade as *L. maritima*, one of which is *L. calliopsidea*, and is considered an inferior plant by some. The seeds of the two plants are easily distinguished. Genus monographed 1886, in Gray's "Synoptical Flora."

A. Rays obovate.

B. Seeds having long, soft, villous hairs.

calliopsidea, Gray (*Agarista calliopsidea*, DC. *Co-reopsis calliopsidea*, Bol.). This is the plant figured in R.H. 1873:330, erroneously as *L. maritima*. Annual 1-2 ft. high; fls. 3 in. across; rays fewer, shorter and broader than in *L. maritima*, $1\frac{1}{4}$ in. long, $\frac{3}{4}$ -1 in. wide.

BB. Seeds having short, rigid bristles.

Douglasii, DC. Annual, 9-12 in. high; lvs. 1-3-times parted; ring of the disk-fls. distinctly bearded. Int. by Orenst, 1891.

BBB. Seeds not hairy.

Stillmanni, Gray. Stoutier than *L. Douglasii*; ring of the disk-fls. hairless. Gn. 52, p. 461. G.C. III. 22:333. R.B. 23, p. 275. Gt. 46, p. 612. S.H. 2:44. Int. 1898, by Benary.

AA. Rays oblong.

B. Stems low, from a thick base.

maritima, Gray. Perennial; lvs. 2-pinnate; fls. $3\frac{1}{2}$ in. across, borne at the ends of branches on peduncles 9-12 in. long; rays 16-20, $1\frac{1}{2}$ in. long; disk 1 in. across; seeds not hairy. B.M. 6241. Gn. 49:1061. Not R.H. 1873:330, which is really *L. calliopsidea*.—Makes a good bog plant.

BB. Stems 2-8 ft. high, 1-5 in. thick.

gigantea, Kellogg. Differs in being leafy at the top only, the others being leafy at the base; lvs. 2-3-pinnate; fls. smaller than in *L. maritima*, borne on short corymbose peduncles; disk $\frac{1}{2}$ in. across; seeds not hairy. Cult. in S. Calif. Gt. 44, p. 592.—Franceschi says the fls. are sweet-scented. W.M.

LEPTOTÆNIA dissecta and **multifida** were advertised in 1881 by Edward Gillett, of Southwick, Mass., for Californian collectors, but it is doubtful if any plants of these species are cult. in gardens. They are presumably inferior in height and hardness to *Ferula*. For descriptions, see Coulter and Rose's Revision of North American Umbelliferæ, 1888.

LEPTOTES. See *Tetramiera*.

LESPEDEZA (D. Lespedeza was a Spanish governor of Florida, who aided the botanist Michaux). *Leguminosæ*. Bush Clover. Between 30 and 40 perennial herbs and shrubs in N. Amer., Asia and Australia, with small (often inconspicuous), pea-shaped fls. in racemes or heads; lvs. pinnately 3-foliolate or rarely 1-foliolate, the lfts. entire and wanting stipels; calyx lobes nearly equal, sometimes subulate; anthers usually 9 and 1; pod short and 1-seeded (and in this differing from *Desmodium*, which has jointed pods). In some of the Lespedeas there are two kinds of fls.,—petal-bearing and mostly sterile, apetalous and mostly fertile. There are a number of native Lespedeas, some of which are offered by dealers in native plants, but they are not very showy and are most in place in native borders and in amateur collections. Two or three of the oriental species are now becoming popular. *L. striata* is the Japan Clover of the South, and is a valuable forage and green-manure plant. *L. bicolor* is a low shrub, with small violet-purple fls., hardy in New England, but little known in cult. The most important ornamental members of the

genus thus far introduced are *L. Sieboldi* and *L. Japonica*, which are hardy herbs sending up many strong, wiry shoots each year, and blooming profusely in September and October. Their late bloom is very desirable. All Lespedeas are of the easiest culture wherever hardy. Usually increased by division of the clumps. *L. Sieboldi* is readily propagated by greenwood cuttings under glass. Monogr. by Maximowicz in Act. Hort. Petrop. ii. (1873).

A. Occidental or native Lespedeas; of upright or erect habit, not showy; stipules and flower-bracts minute, subulate.

These species are not in general commerce, but are offered by dealers in native plants. They thrive in light, dry soils. Because of the grayish or brownish color of the foliage, they are sometimes useful in landscape-gardening work. Hardy, and of easiest culture. Perennial.

B. Fls. whitish or yellowish, all complete.

hirta, Ell. Erect, 2-4 ft. tall, silky-pubescent; petioles shorter than the lvs.; lfts. nearly orbicular; fls. in oblong or cylindrical heads which are on peduncles which usually exceed the lvs. Dry soils, New England to Fla. and W. Mn. 6:181.

capitata, Michx. Much like the last, but lfts. narrow-oblong or oval, and the fl.-heads dense and short-peduncled. Range of the above.

BB. Fls. purple or violet, or some of them opetalous.

c. Peduncles slender.

violæca, Pers. Two to 3 ft., only slightly pubescent; lfts. oval or elliptic; fls. small, in a loose cluster which is on a stalk usually longer than the lvs. Range of above.

Nuttallii, Darl. Two to 3 ft., hairy-pubescent; lfts. oval, oblong or nearly orbicular; fl.-clusters dense or even capitate, the stalk mostly exceeding the lvs. Range of above.

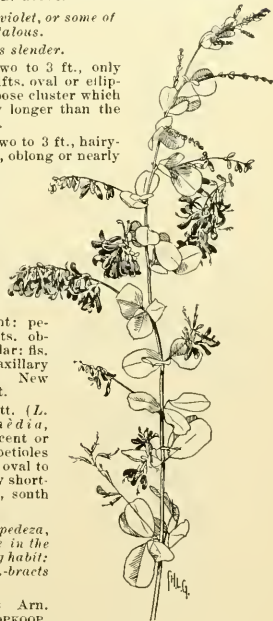
cc. Peduncles nearly or quite wanting.

Stuevei, Nutt. Mostly unbranched, 2-4 ft., velvety-pubescent; petioles very short; lfts. oblong to nearly orbicular; fls. in nearly sessile, axillary clusters or heads. New York, south and west.

frutescens, Britt. (*L. Stuevei*, var. *intermedia*, Wats.). Less pubescent or almost glabrous; petioles mostly longer; lfts. oval to elliptic; clusters very short-stalked. New Eng., south and west.

AA. Oriental Lespedeza, grown for forage in the South; of trailing habit; stipules and fl.-bracts conspicuous.

striata, Hook. & Arn. JAPAN CLOVER. HOOPKOPF. Annual, somewhat pubescent, decumbent or erect, slender; lvs. small and very numerous, the lfts. oblong or obovate, and the petioles very short; fls. small, pink or purple, in axillary clusters. China and Japan.—Said to have been introduced accidentally into S. Car. in 1849, but probably in the country much before that time. It is now extensively naturalized south of the Ohio river, growing on nearly all kinds of land. On light lands it makes dense mats,



1263. *Lespedeza bicolor*. (X $\frac{1}{2}$.)

lant on heavy lands grows 18-24 in. high. It is a good pasture- and hay-plant, and is useful for plowing under as a green manure. It thrives on land which is indifferently prepared. For hay, seed is sown early in spring, at the rate of $\frac{1}{2}$ bushel per acre. It often yields 2 tons of hay to the acre. For pasturage in the South, it is sometimes sown with oats in the fall.

AAA. *Oriental Lespedeza*, grown as ornamental plants for the fls.: erect; stipules and fl.-bracts small; perennials.

bicolor, Turcz. Fig. 1263. Shrub, with slender branches, becoming 6-10 ft. tall, slender and graceful, glabrous; lvs. on thin wiry stalks, mostly longer than the glabrous blades; flts. oval to round-obovate, rounded at the apex, the terminal one 1-2 in. long; fls. small, purple, in simple or compound racemes, which surpass the lvs.; pod $\frac{1}{4}$ in. long, somewhat pubescent. Japan. —Hardy as far north as Boston, blooming in July and seeding freely. A good slender shrub for adding variety to the border. A white-fl. variety is advertised.

Sieboldi, Miq. (*Desmodium penduliflorum*, Oudem. *L. racemosa*, Dipp. *L. formosa*, Koelne). Fig. 1264. Herb, throwing up strong, wiry shoots each year from the crown; stems angled, reddish or brown, hairy (at least above); lvs. dull above and light-colored and hairy beneath, the petiole usually somewhat shorter than the blade; flts. elliptic-oblong-pointed; fls. twice larger than in the last (nearly $\frac{1}{2}$ in. long), rose-purple, drooping in very numerous long racemes, which at the top of the plant are panicled; pod nearly or quite $\frac{1}{2}$ in. long, pubescent. Japan. G. F. 5:115. Gng. 1:23. R. H. 1873:210. J. H. 111, 30: 15. G. C. 11, 20: 749. F. S. 18: 1888. R. M. 6602 and Mu. 7, p. 69 (as *L. bicolor*). —Blooms in September, and hardy in central New England. A very desirable late-blooming plant, making a large specimen with age. Does not often seed in the North.



1264. *Lespedeza Sieboldi*. ($\times \frac{1}{6}$)

the last, and seems to seed more freely in the North. Perhaps a botanical variety of *L. Sieboldi*, but distinct for horticultural purposes.

Other Japanese and Chinese *Lespedeza*s may be expected to appear in the trade. See Franchet, R. H. 1890, pp. 225-227, for an account of *W. China* ornamental species, with picture of *L. Delavayi*.

L. H. B.

LETTSOMIA is a genus of the *Convolvulus* family. About 26 species of tropical oriental climbers. An unknown species was advertised from S. Florida in 1889 and is still procurable. Reasoner and others think well of it.

LETTUCE (see *Laetuca*) is the most popular of salad vegetables, Plate XVIII. It is a quick-growing annual, delighting in cool atmosphere and open, loose soil. As an outdoor crop, it thrives best in spring. Special care is needed to grow it in the hot summers of America, although heat-resisting varieties have been developed. Of late years, the forcing of Lettuce under glass has come to be a large industry. The most serious trouble in forcing Lettuce is the rot, due to a species of botrytis. The leaves become soft and fall, leaving only the core of the plant erect (Fig. 1265). This trouble may be prevented by growing in loose soil, by keeping the surface of the

soil and the plant as dry as possible, and by avoiding a too warm and too moist atmosphere. Sub-irrigation (see *Irrigation*) is to be advised for Lettuce forcing. Of varieties, there are two general types,—the cabbage or heading sorts (Fig. 1266), and the loose sorts (Fig.



1265. Lettuce plant collapsed with the rot.

1267). The latter are more used because more easily grown, but the former are considered to be the finer.

In 1885, Goff reduced the kinds of Lettuce to 87 varieties (4th Rep. N. Y. Exp. Sta.), throwing them into three general groups: (1) leaves uprightish or but slightly oblong, spreading rather than round; (2) leaves oblong, tending to grow upright; (3) leaves pinnately lobed. These categories were divided into subtribes on minor leaf-characters. In 1889 (*Annals Hort.*) 119 names of Lettuces were catalogued by North American seedsmen. Lettuce has been in cultivation for over 2,000 years.

L. H. B.

LETTUCE OUT-OF-DOORS.—While Lettuce seems never more enjoyable than when it comes from the greenhouse during the colder parts of the year, yet it is acceptable for salad purposes and is in good demand the entire year. In open ground, at the North, we may have it in all its perfection from June until snow dies again in the fall. Usually it is much less of a knack, however, to have it in the earlier part of the season and up to August, than in the torrid weather of August and early fall. For early market we start the plants in the greenhouse during February, and prick them out in flats or sunken thumb-pots filled with rich, fibrous loam, and after thoroughly hardening them by exposure for a week or more in a coldframe, we take the plants up, with a chunk of soil, and plant them out in very rich, well-prepared loam outdoors, just as soon as the weather will permit. Tennisball and its various strains and selections, Boston Market, etc., are good for this purpose. The rows may be made a foot apart, and the plants set 6 or 8 inches apart in the rows. We want neat solid heads, even if not as large or heavy as some of the heads we can easily produce later on from summer varieties, and we wish to get them as early in the season as possible in order to be able to put them on the market when prices are still high. Light applications of nitrate of soda, either broadcast over the patch at the time of setting the plants, or along the rows very soon after, seldom fail to assist in hastening early growth and to increase the size of the heads. This is a "trick of



1266. Heading Lettuce.

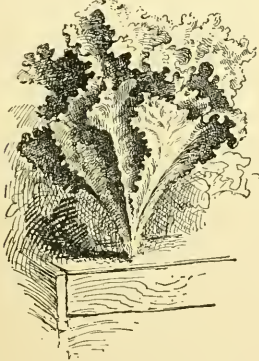
the trade" well worth practicing. The free use of the wheel-hoe keeps the soil loose and the crop free from weeds, and also hastens it to early market condition.

At the time of setting the first plants in open ground, we also sow a patch with the garden drill, using seed



Plate XVIII. Lettuce, showing the heading and loose-leaved types

sparingly and covering it lightly, say one-half inch deep, although in good soil the seed will come up readily even if placed an inch or so below the level of the surface. The varieties catalogued by seedsmen as suitable for summer culture are almost endless, and most of them are good enough. Among the standard sorts we have the Hanson, Deacon, Simpson, Salamander, Stubborn Seeder, several Butter Lettuces, etc. Because of our hot, dry seasons, the Cos Lettuces are less popular in this country than in Europe. The heads should be tied up and blanched, for the best results. The plants of drill-sown Lettuces should be thinned early. For home use we leave them at first only a few inches apart, so that they have just room enough to form little heads. Every other plant may then be taken out and used for the home table. These little heads are delicious. The remaining heads are left to attain full size and are then used for the table or for market. If grown for market only, the plants are thinned to stand not less than 5 or 6 inches apart from the start. In due time every other plant can be taken up for market, while the ones remaining have a chance to grow to largest size afterward. From early spring until along in August we sow a few rows of these summer Lettuces every two weeks or so, and thus try to provide a continuous supply of good heads. The demand may drop off for a few days, or even weeks, but it is sure to revive. If we can



1267. Curling, or Grand Rapids Lettuce.

manage to have good Lettuce late in the fall it will sell good going for customers.

Sometimes we may wish to raise seed of a sort that suits our purposes. All we have to do is to leave some of the plants in the rows, until the larger part of the seeds on a plant have matured. The plant is then cut off near the ground and exposed on a sheet to sun and air to dry. The seeds are then to be thrashed out and cleaned.

T. GREINER.

LETTUCE FOR THE VILLAGE GARDEN AND CITY YARD.—The value of Lettuce for the table depends largely upon its being fresh. A very small area may be made to produce an abundant supply for an ordinary-sized family. The plant is quite healthy and hardy, when young enduring a considerable frost without injury. It has few insect enemies and the requisites for its successful culture are few and easily understood. On this account it can be grown with greater satisfaction and profit on a village lot, or even in a city back yard, than can most of our garden vegetables. To produce it of the best quality under these conditions, as early in the spring as the ground is at all dry and the grass begins to start, a bit of ground should be well dressed with fine manure, putting on from one-half a bushel to one bushel to the square yard, and then well spading up, working in the manure and making the bed as fine and smooth as possible. Make a mark about one inch deep, drop in the seed at the

rate of from 25 to 50 seeds to the foot, and cover with from one-fourth to one-half an inch of fine soil pressed down with the hoe or hand. From two feet to two yards of such row for each member of the family should furnish an abundance for the time that the product of a single planting is usable, and if more than one row is planted they should be about two feet apart. In from 15 to 20 days the young plants should be thinned out leaving 8 to 10 to the foot, and at the same time a second row, to give a succession, should be planted. About 20 days later the first row should be re-thinned, leaving plants from 6 to 12 inches apart according to the size of the variety, and a third row planted. A fourth planting may be made, but Lettuce planted as late as the time of the ripening of strawberries is not likely to do very well unless protected from the sun and heat. A supply of fine fall Lettuce may be secured if, in August or early September, we re-manure and spade the ground which was occupied by the first crop, and make a trench some 6 or 8 inches deep and fill this with water. When this has soaked away, refill, and repeat this from one to six times, according to the dryness of the soil. Fill this trench with fine, moist, not wet soil, in which make a mark and sow the seed as in the spring. Cover the row with a foot-wide board, and about three days later put some bricks under so as to hold the board about two inches above the soil. As soon as the plants are well up turn the bricks so as to hold the board about four inches up, and take it off altogether about five o'clock in the afternoon, leaving it off until eight or nine in the morning. On cloudy days give more exposure, as the plants develop until the shade is entirely dispensed with. Some of the finest Lettuce the writer has ever seen was grown in a city yard by this method. W. W. TRACY.

LETTUCE FORCING.—This vegetable is one of the principal money crops of the market-gardener in winter. It is grown in hotbeds and hotheouses. The old way is to raise it in hotbeds, but since the experiments of growing in houses have been so successful it is grown mostly in them.

For the first early crop to be grown in beds or houses, the seed is sown in the seedhouse about August 20, in the latitude of Boston. By this means, the Lettuce will be brought into market the latter part of October or the first of November, after the frost has spoiled the outdoor crop; and thus it often brings very good prices. The sowing is made in a bed in the house prepared for the purpose with sterilized soil, so that there will be no fear of a rusty root or mildew on the plants. The soil should be 10 inches deep, well moistened and beat up very fine, with no manure or fertilizer. For every ounce of seed, prepare a space 6 feet square, raking off the bed as smooth as possible. Sow the seed and then sprinkle the bed with water. Then sift on one-fourth of an inch of either sterilized or clean subsoil, preferably the latter. In about four days the plantlets will appear. Three weeks from sowing, the plants will be ready for transplanting. This should be done at the proper time, that is, before the plants become too large. Prepare the soil the same as for the seed-bed. If 3 inches of the sterilized soil, or some new soil that no Lettuce has been grown in, can be had, it will be sufficient. Transplant the Lettuce 4 inches apart in sufficient quantity to set out the prepared space. In three or four weeks these plants will be large enough to again transplant into the bed or house intended for them. Sterilizing is done in a box 5 x 4 feet and 3 feet deep, with several punctured steam pipes in the bottom. The soil should be heated to 200°.

In preparing the bed for the last transplanting, the soil should be well wet before working and then let stand until the water has all drained off, which will be in about twenty-four hours. Now put in stable manure, worked fine with the first beat out of it, which is secured by piling and overhauling twice a week for two or three weeks before using. Apply this prepared manure about 3 inches deep and dig into the soil to a depth of 12 to 15 inches. Rake off and mark with the marker 8 inches apart. If the soil is new no sterilization is needed, but if old would prefer about 2 inches of the top sterilized. This is done to prevent the mildew and disease that often comes from old, worn-out soil.

If the bed is properly prepared it will need no water-

ing. If the plants are large, they may need to be sprinkled immediately after setting the last time. No more water is required until they begin to mature. Many think that the crop requires constant watering, but that is wrong, because the roots will not go down if the top is kept constantly wet, and a better crop will be obtained if not watered until it begins to mature or to head.

The kind of Lettuce intended in the above remarks is the head variety, called in many sections the Boston Lettuce. This crop should be ready to begin to pull in six or seven weeks from time of last transplanting. According to the previous statements, it has taken thirteen weeks from seed to produce a crop. This is starting in September or October. Earlier than this the time will be one or two weeks less. It is customary to pull over the bed once and take out the best ones, and then give the remainder a good wetting. In about one week those left will be fit to pull clean. After the first transplanting to 4 inches, it is the surest way to smoke the house three nights in succession, once the second week and once the third week. This is done to keep the plants free from disease or from the green-fly or leuse. If it is desired to follow with a second crop of Lettuce on the same bed, the plants must be ready for the second crop when the first is taken off, and thus lose no time of the house. In hotbeds much the same course is pursued as in the house; sometimes one will succeed better than the other. For midwinter the houses are the better, and for late spring the beds.

The best way of heating the beds is by the use of hot stable manure placed in the bottom of the bed, and about 8 inches of loam on top. Ten inches of manure, hot, will hold for two crops of Lettuce. The first crop will need a little special fertilizer. The second crop will require about 3 inches of stable manure prepared as for the houses. The beds are prepared in the fall and covered with coarse manure or hay until wanted. The beds, after setting, are covered with straw mats or shutters at night when the temperature is below freezing, and ventilated by day when it is above 60°.

The heat is supplied to the houses by steam and the temperature controlled by ventilation. The proper temperature for the growing crop is 40° at night and 70° by day. For continuous crops through the season, sow every week enough seed to give the plants required. One ounce should produce 5,000 plants. This sowing is continued until February 1, which is the time to sow the seed for the crop to be set out in the field. These plants are grown in hotbeds and hardened off before they are set out; that is, they are transplanted from seed-bed to 4 inches apart in hotbeds, and are then taken up and transplanted to the field. This is a very different variety of Lettuce. It will not head in the houses, while the variety grown in the houses will not grow in the field.

A great improvement has been made in the varieties of Lettuce. The variety grown twenty years ago called White Seed Tennisball was a very fine Lettuce and would pack 6 dozen to the barrel-box or 10 dozen to the barrel, but the improved variety of to-day will fill 3 dozen to the barrel-box and 5 to 6 dozen to the barrel. The new variety is called the New Hot-house Lettuce, and will grow in beds just as well as in the house.

Experiments made with the electric light have been very successful. It not only hastens the time of growing, but also improves the size and quality of the head. The writer estimates that the light increases the size and quality 10 per cent and hastens the time of growth 15 per cent. This is by the use of arc lights over the houses by night. This could not be practiced on hotbeds, because they are covered by night. Between the first of November and the first of March the days are very short and the nights very long, so that the electric light increases the length of the day, and when applied it has the same effect as the longer days of spring have upon the growth of crops.

The Lettuce, when prepared for market, is pulled, then washed, and for the Boston market is put in boxes of 3 dozen each and sold at wholesale by the box. The smaller heads are packed 4 dozen in each box and are usually sold per box for about one-half the 3-dozen size. When packing for other markets, as New York, Philadelphia, Washington or Chicago, it is packed in cases that will hold a barrel. These cases have a partition in

the center, so that the Lettuce when packed will not all fall to one end should the cases be roughly handled. The expense of sending a case from Boston to New York is 25 cts., to Philadelphia 50 cts., and to Chicago 75 cts.

The crop from the South has affected our sales very much in the midwinter, but the climate seems to have changed in that locality so that it is in our favor, for of late years they have cold weather there two or three times each season, thus giving us the market. Our Lettuce is far superior to theirs and of a different variety. They have named theirs the Big Boston. It will be seen that the name of Boston is very popular in the Lettuce market. This inferior Lettuce coming from the South is packed in baskets.

There is a disease of Lettuce called by some a "burn," but this is a misnomer. It is a disease coming more from a diseased root or a cold soil, because it develops most when there is but very little sun, and least when there is most sun; and if the plant is examined there will be found a diseased root. Here the benefit of the new or sterilized soil is very apparent. The use of sterilized soil is of much more benefit than the electric light, because if the plant is diseased no light will cure it and no crop can be successful with diseased plants. Preparing the soil by wetting thoroughly before transplanting is one of the great secrets in successful growing of Lettuce, and heating the water to a high temperature is also very beneficial. It lessens disease.

The price at which Lettuce can be grown at a profit is a question very difficult to answer, but by the figures made by some of the members of the Boston Market-Gardeners' Association it was decided that for midwinter crop the Lettuce must be sold at 50 cts. per dozen to return any profit to the grower. W. W. RAWSON.

LEUCADÉNDRON (Greek, white tree). *Proteaea*.

This genus includes the celebrated Silver Tree of the Cape of Good Hope (see Fig. 1268), which has a striking and unique habit. Its lvs. are densely covered with white silky hairs. This tree grows wild only on Table Mountain. In the first quarter of the century it was considered of great importance for firewood. It is said to grow poorly away from the Cape, except in S. Calif., where it generally does well outdoors. It is also rarely cult. in the East in tubs, being protected in a cool greenhouse during winter and placed on the lawn in summer. The Silver Tree attains 30 ft. at the Cape. The trees are practically male and female, the fls. being dioecious, by abortion. The female tree is cult., being prop. by seeds imported from the Cape. The young seedlings are very difficult to raise. There is no monograph of this genus since Meisner's in DC. Prod. Vol. 14, 1856, but the genus will be reviewed in a forthcoming volume of Flora Capensis.



1268. Silver tree, *Leucadendron argenteum*.

argenteum, R.Br. Fig. 1268. Branches densely leafy; lvs. sessile, 3-6 in. long, $\frac{1}{2}$ -1 in. wide, callous and blackish at the apex, lanceolate, acute, silvery white and silky; involucres spreading, longer than the globose head of fls.; nut ventricose, turbid, wingless, the whole style and calyx persisting with it, obovate. B.R. 12:979. V. 5:282, 283.

LEUCÆNA (probably from Greek, *leukos*, white; referring to the fls.). *Leguminosæ*. This includes a tree known in S. Fla. as the White Popinac, a rapid grower, with acaecia-like foliage and whitish fls. It is also cult. in S. Calif. The genus has about 9 species, found in

Mexico, Guatemala, Peru, and Pacific islands, but *L. glauca* is found in the tropics of both worlds. It grows wild in the West Indies and in western Texas. The trees and shrubs of this genus have the habit of *Aecia*, but belong to the *Mimosia* tribe, which is characterized by stamens 10 or less. Generic characters are: calyx 5-dentate; stamens 10, not glandular; pod broadly linear, stalked, flat-compressed, chartaceous, 2-valved; seeds compressed. *Acaia trichodes* is *L. trichodes*, Benth., but it is not in the trade.

glauca, Benth. (*Aecia frondosa*, Willd.). 1. *glauca*, Moench). Spineless; branches and petioles powdery; pinnae 4-8-paired; lfts. 10-20-paired, oblong linear, glaucous below; pod 5-6 in. long.

LEUCHTEBERGIA (after Prince Leuchtenberg). *Cactaceae*. AGAVE CACTUS. Stems in use forming a trunk 2 in. or more in diam., by the shedding of the lower tubercles; tubercles triangular-acuminate, spreading, 2-4 in.



1269. *Leuchteobergia principis* ($\times \frac{1}{2}$).
(Adapted from Botanical Magazine.)

long, $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, with twisted papery spines; fls. funnel-form, widely expanded, borne near the apex of young tubercles; fr. gray, ovate-elliptical, 1 in. long, covered with scales and crowned by the persistent flower; seeds dark brown, minutely tuberculate. Only 1 species, closely related to *Echinocactus*, but of remarkably different form. The plant is readily grown in the manner of *Echinocactus* and *Mamillaria*.

principis, Hook. & Fisch. Fig. 1269. Radial spines 6-8, the central one usually solitary, longer, sometimes 8 in. long; fls. yellow. B.M. 4393. A.G. 11: 464.

KATHARINE BRANDEGEE.

LEUCOCRINUM (Greek, *white lily*). *Liliaceae*. SAND LILY of Colorado. A hardy bulbous plant growing a few inches high, with narrow foliage and clusters of pure white, fragrant fls. borne just above the ground in early spring. The fls. are funnel-shaped, having a slender tube 2-4 in. long, the greater portion of which is below the surface of the soil, and 6 lobes, each $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. They are borne in clusters of 4-many fls., and maintain a succession for several weeks. They should be desirable

for edging walks and bulb beds. They have a deep-seated rhizome and fleshy roots. The bulbs are procurable from Colorado and California, either as collected or nursery-grown stock. The genus has only one species. It belongs to an anomalous group, characterized by almost total lack of stem and fls. solitary or clustered among the radical lvs. From the other members of this group it is distinguished by the lvs. not 2-ranked, and an indefinite number of ovules in each locule. Perianth segments narrowly lanceolate, persistent; stamens 6; style persistent, slightly 3-lobed.

montanum, Nutt. SAND LILY of Colorado. Lvs. 8-12 or more, flat, rather thick, 4-8 in. long, 1-3 lines wide; pedicels $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. J. H. COVEN.

LEUCOJUM (name explained below). Also written *Leucolum*. *Amaryllidaceae*. SNOWFLAKE. The Snowflakes are hardy bulbous plants growing a foot or less high and bearing dainty, nodding, 6-parted fls., which are white, tipped with green, yellow, or a tinge of red. They are less popular than Snowdrops (*Galanthus*), to which they are closely related, and have larger fls., with all the segments of equal size. There are 8 species, natives of Europe and the Mediterranean region, 4 of which are cult. Perianth-tube none; segments ovate or oblong. Baker, Handbook of the Amaryllidaceae, 1888. The name *Leucojum* was given by Linnaeus, but he did not explain the application. The old Greek name, *Leucoion*, was given by Theophrastus to a plant now supposed to be a crucifer, like some stock or wallflower. *Leucoion* is from *leukos*, shining, white, and *ion*, violet. Snowflakes appear about the same time as white violets, and sometimes have a delicate odor, resembling that of the violet, but the form of the fls. is very different. For culture, see *Bulbs*.

A. *Blooming in March.*

vernum, Linn. SPRING SNOWFLAKE. Bulb globose, $\frac{3}{4}$ -1 in. in diameter; lvs. strap-shaped, finally 6-9 in. long, 4-6 lines wide; scape $\frac{1}{2}$ -1 ft. long, usually 1-fl.; perianth segments white, tipped green; seeds with a pale, membranous coat and conspicuous strophiole. Central En., France to Bosnia and Tyrol. B.M. 46. G.C. 11: 399; 21: 341; 23: 341. P.G. 5: 47. Gm. 25: 325 and 29, p. 607. V. 8: 69. Var. *Carpaticum*, Herb., has perianth segments tipped yellow. B.M. 1963. J.H. 111, 32: 169. G.M. 39: 105. A choice form, usually bearing 2-4 fls.

AA. *Blooming in April and May.*

aestivum, Linn. SUMMER SNOWFLAKE. Bulb ovoid, 1-1 $\frac{1}{2}$ in. in diameter; lvs. strap-shaped, 1-1 $\frac{1}{2}$ ft. long; scape 1 ft. long, 4-8 fl.; perianth segments white, tipped green; seeds with a black, hard-shelled coat and no strophiole. Blooms end of April and beginning of May. Central and S. Eu. Mn. 9: 45. P.G. 1: 7. V. 3: 342 and 8: 70.

pulchellum, Salisb., differs from *L. aestivum* by its smaller fls. and capsule, narrower lvs. and fls. a fortnight earlier. Sardinia and Balearic Isles.

AAA. *Blooming in autumn.*

autumnale, Linn. (*Leis autumnalis*, Salisb.). AUTUMN SNOWFLAKE. Bulb globose, $\frac{1}{2}$ in. in diameter; lvs. thread-like, usually produced after the fls.; scape very slender, 3-9 in. long, 1-3 fl.; perianth segments white, tinged with red; stamens half as long as segments. Portugal and Morocco to Ionian Islands. B.M. 960.—Not satisfactory everywhere.

roseum, Martin. Bulb globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. in diam.; peduncle shorter and usually 1-fl.; perianth segments $\frac{1}{2}$ in. long, rose-red, oblanceolate; stamens $\frac{1}{2}$ in. long. Corsica.—Usually difficult to grow, and little known horticulturally.

J. N. GERARD and W. M.

LEUCOPHYLLUM (Greek, *white leaf*). *Scrophulariaceae*. This includes a rare shrub from southern Texas, the leaves of which are covered beneath with silvery white wool. It has showy violet-purple, bell-shaped fls. an inch across, borne in spring. In cultivation it flowered for the first time in 1890, at Augusta, Ga., with P. J. Berckmans. It is now cult. in S. Fla., and deserves cultivation everywhere in the South. According to C. S. Sargent, "There is no shrub of the desert portions of

of the valley of the lower Rio Grande more generally distributed, and certainly there is not one of them which more delights the traveler in the early spring months, when the large, violet-purple flowers of this plant heighten the effect of its brilliant silvery foliage." (G. F. 3: 488.)

Leucophyllum has only 2 species. Lvs. all alternate, ovate or obovate; calyx 5-ent; corolla tube broad and short; lobes 5, rounded; stamens 4, didynamous, included, fixed at the base of the corolla; ovary 2-celled; ovules numerous; capsule 2-valved; seeds oblong.

TEXANUM. Benth. Loose-growing, straggling shrub, 4 or 5 ft. high in the wild, 8-10 ft. high in cult. Lvs. $\frac{1}{2}$ -1 in. long, obovate; fls. axillary, slightly hairy within. G. F. 3: 489.

LEUCOSTEGIA (Greek, *white roof*; alluding to the indusia). *Polygodaceae*. A small genus of Indian ferns allied to *Davallia*, with a small, narrow, thin indusium attached by its base, with the apex and sides free. The leaves are mostly tri-quadripinnate. For cult., see *Davallia*.

pàrvula, Wallich. Root-stocks wide-creeping, scaly; lvs. nervally sessile, deltoid, less than 1 in. long, half as wide, usually tripinnate. Singapore and Borneo.

L. M. UNDERWOOD.

LEUCOTHÖE (Greek mythological name; daughter of Nereus). *Eriaceae*. Including *Agarista*. Ornamental low evergreen shrubs, with alternate, short-petioled, usually serrate lvs. and with white, rarely pink or scarlet, usually nodding fls., in terminal or axillary racemes, appearing mostly in spring. The S. American species, which are very rare in cultivation, though they surpass the other in beauty of the fls., are hardly only South, while the other species can be grown as far north as Mass. and western N. Y., the evergreen ones in sheltered positions or with slight protection during the winter. They are very handsome for borders of shrubberies or as undergrowth in open woods. They thrive best in somewhat moist, peaty or sandy soil, and prefer shaded or partly shaded situations, but also grow in full sun if the soil is not too dry. Prop. usually by seeds sown in peaty, sandy soil in pans or boxes in spring, and treated like those of *Azalea* or *Rhododendron*; also by layers or division; the evergreen species grow from cuttings under glass in late summer, but root rather slowly. About 35 species in N. and S. America, Madag., Himal. and Japan, formerly often united with *Andromeda*. Lvs. evergreen or deciduous; fls. in axillary or terminal racemes; calyx 5-parted, imbricate; corolla ovate or cylindrical; stamens 10; anthers obtuse or 2-pointed at the apex; capsule separating into 5 valves; seeds minute, irregular. Most of the allied genera differ by the valvate calyx, and *Chamaedaphne* by the valves of the capsule separating into 2 layers, the inner one 10-valved.

A. Lvs. evergreen; racemes axillary, sometimes clustered, shorter than the lvs.

B. Racemes dense, sessile, many-fl'd.; pith of branches solid.

axillaris, Don (*Andromeda axillaris*, Lam.). Shrub, to 5 ft., with spreading and usually recurving branches, puberulous when young; lvs. with short pubescent petioles, oval to oblong-lanceolate, shortly acuminate, serrulate toward the apex, glossy above, pale and sparsely pubescent beneath when young, 2-4 in. long; racemes 1-2 in. long; sepals broadly ovate; corolla white, usually greenish in bud, $\frac{1}{2}$ in. long. April, May. Va. to Fla. and Ala. - Var. *longifolia*, Pursh. Lvs. linear-lanceolate. B. M. 2357.

Catesbei, Gray. To 6 ft., similar to the former, with glabrous, slender and more arching branches; lvs. longer-petioled, ovate-lanceolate to lanceolate, ciliate appressed-serrate, glossy above, usually light green beneath, glabrous, 3-7 in. long; racemes larger; sepals narrower; corolla over $\frac{1}{2}$ in. long, white, usually reddish in bud. April, May. Va. to Ga. E. M. 1955. L. B. C. 14: 1320. - This species is handsomer than the former, and also somewhat hardier; lvs. and fl.-buds assume a beautiful purple hue, late in fall which is retained through the winter.

BB. Racemes peduncled, with rather few, slender-petioled fls.; pith laminate.

acuminata, Don (*L. populifolia*, Dipp. *Andromeda acuminata*, Ait.). Shrub, to 12 ft., with spreading branches; lvs. short-petioled, ovate-lanceolate, acuminate, entire or obscurely serrulate, glabrous, 2-4 in. long; pedicels as long as corolla; calyx very short; corolla cylindrical, over $\frac{1}{2}$ in. long. June. S. C. to Fla.

AA. Lvs. deciduous; racemes mostly terminal, secund, longer than the lvs. (*Subgenus Embolrys*.)

racemosa, Gray (*Andromeda racemosa*, Linn. *L. spicata*, Don. *Lyonia racemosa*, Don). Shrub, to 10 ft., with mostly erect branches; lvs. oblong to ovate, acute, serrulate, pubescent beneath, at least on the veins, 1-3 in. long; racemes erect, 2-4 in. long; corolla cylindrical, $\frac{1}{2}$ in. long. April-June. Mass. to Fla. and La. Em. 423.

recurva, Gray. Similar to the last, but lower and more spreading; lvs. elliptic-ovate to elliptic-lanceolate, acuminate; racemes spreading and recurved; capsule depressed and strongly lobed. April-June. Va. to Ala. G. F. 9: 225. - It grows in drier situations, but otherwise it is not superior to the former; the foliage of both assumes a splendid scarlet color in fall.

L. Davisii, Torr. Evergreen shrub, to 5 ft.; lvs. oblong, obtuse, crenately serrulate; racemes slender, many-fl'd., clustered in terminal panicles. May, June. Calif. B. M. 6247. - *L. Grayana*, Maxim. Half-evergreen; lvs. large, broadly oval, appressed-pilose; racemes terminal, slender; fls. rather small. June. Japan. - *L. nerifolia* DC. (*Agarista nerifolia*, Don). Evergreen, glabrous shrub, with ovate-oblong, acuminate lvs. and bright scarlet fls. in erect, slender racemes at the end of the branches. Brazil. B. M. 4593. - *L. pulchra*, DC. (*Agarista pulchra*, Don). Evergreen shrub, 2 ft. or more high, glabrous; lvs. ovate, mucronate, about 1 in. long; fls. white, in spreading, peduncled, slender racemes, much longer than the lvs. Caracas. B. M. 6314. - *L. populifolia*, Dipp. = *L. acuminata*, in main list.

ALFRED REHDER.

Leucothoe Catesbei is one of our most ornamental and popular hardy broad-leaved shrubby evergreens. It is used for massing in connection with *Rhododendrons*, *Kalmias*, etc., serving as a foil for these taller varieties. The shiny dark green leaves are borne with regularity on a recurved stem often 2-3 ft. long, and sometimes coloring brilliant bronze and carlet shades in autumn when exposed to the direct rays of the sun. *Leucothoe* sprays are largely used by florists in making up designs and in connection with *Galax* leaves, usually, however, in the more informal pieces. They were introduced to the trade about 1890. The fragrant flowers are in the leaf axils, borne along the stem in early spring, and are usually conspicuous, considering the fact that the leaves are persistent. It is this graceful evergreen spray effect, with the good color and dense habit, that makes *Leucothoe* so desirable as a plant for massing, and also the fact, perhaps, that it is fairly easy to transplant. Seeds are produced freely, and can be sown in sphagnum moss and sand under glass, as *Rhododendrons* and *Azaleas* are grown, pricked off in flats and planted outdoors in early spring, when the plants are a few inches high. *Leucothoe* is also propagated by division, underground runners and cuttings, the latter being plunged in sand on the bench and given moderate bottom heat. It is usually collected, however, in its native habitat, in small plants, transplanted to nursery rows and grown for several seasons. HARLAN P. KELSEY.

LEVERWOOD. *Ostrya Virginica*.

LEVISTICUM (a modification of a name given by Dioscorides to some umbelliferous plant). *Umbelliferae*. **LOVAGE** is a plant grown for its aromatic seeds, which are used in confectionary. The leaf-stalks were formerly blanched and eaten like celery. It is a tall, hardy perennial herb, with large, 2-3 times divided radical lvs. The plant may be propagated by seed sown as soon as ripe, but when plants are already established root-division is less troublesome and risky. Division may be made in the autumn, but better in the spring. The divided plants and the seedlings, when 2 or 3 in. tall, should be set in checks 3 ft. apart in deep, rich soil. When well established the plants remain profitable for many years, demanding but little attention. The genus

has only one species, and is distinguished by having the bracts of its involucre grown together.

officinale, Koch. **LOVAGE**. Tall; lvs. dark green, shining; segments wedged shaped at the base, cut to ward the apex; fls. yellow; seeds 3-ribbed, hollow and boat-shaped on one side, convex on the other. S. Ea.

LEWISIA (after Meriwether Lewis, of the famous Lewis and Clark expedition across the continent to the Pacific in 1804). **Portulacaecae**. The **BITTER-ROOT**, *L. rediviva*, is an odd and interesting plant. It has a thick-branched root; lvs. like a Portulaca, fleshy and linear, and handsome fls. borne 3 or 4 in. above ground. The fls. are 1-2 in. across, rosy, varying to white, red or purplish, with 8-14 petals. The plant has been thoroughly tested in the East, and is desirable for rockeries, needing perfect drainage, a sunny position and careful watering while in flower. One of those perennials that should be planted in groups for best effect, and also as a precaution to prevent loss by oversight in eases weeding during flowerless period.

The starchy root is dug by the Indians in spring, and eaten. The bark is ordinarily very bitter, but at flowering time it is said to slip off easily, and the root when boiled has little of the bitter taste. The roots from which the plant was described showed signs of life after being in the herbarium for several years. Pursh planted them, and they grew for a year. This event suggested the name *rediviva*. The fine fls. figured in B.M. 5395 came from a root which had been immersed in boiling water in order to make an herbarium specimen. The root is called spatulum or spatium by the Indians. The Lewis and Clark expedition was planned in the house of Bernard M' Mahon, an early American horticulturist. (See *M' Mahon*). A full account of this plant is given by Pailleux and Bois in *Le Potager d'un Curieux*; also in R. H. 1892, p. 298. Generic characters are: sepals 5-8, persistent; stamens numerous; style 6-8-parted; capsule circumscissile. The genus has 2 species.

rediviva, Pursh. Fls. June-Aug. Wash. and Calif. to Nev. B.M. 5395. R.H. 1892, p. 298. V. 2:306. Mn. 2, p. 85. J. WOODWARD MANNING and W. M.

LIATRIS (a name of unknown derivation). **Compositae**. **BLAZING STAR**. **BUTTON SNAKEROOT**. A genus of hardy perennials, confined to eastern and southern N. America. Fifteen or more species have been recognized, all of which are best adapted to the wild-flower border. The most showy are *L. elegans* and *L. pycnostachya*. All produce their flowers in wand-like spikes or racemes, the petaloid coloring of the involucre bracts often adding to the effect of the usually bright rose-red or purple flowers. Their flowers are produced in late summer and autumn. They multiply by offsets from their cork-like base, or may be grown from seed, which should be sown in autumn. They will grow and produce flowers in poorer soil than most garden plants, but thrive best in good, rich garden soil, and require no special care. When grouped in masses they give best results.

AA. Bracts of involucre obtuse.

B. Heads hemispherical, $\frac{1}{2}$ -1 in. broad, 15-45-flowered, and peduncled.

scariosa, Willd. Stem stout, 1-5 ft. high; lower lvs. spatulate or oblong-lanceolate, 4-6 in. long, $\frac{1}{2}$ in. wide; upper narrowly lanceolate; heads large, numerous, in a relatively loose spike; involucre bracts often tinged with purple; fls. purple; pappus bristles minutely barbellate. Throughout the U. S. and Can., east of the Rocky Mts. B.M. 1709. B.R. 7:590 and 20:1651. G. C. H. 14:593. D. 271. P.M. 5:27 (as *L. borealis*).—Next to *L. elegans* and *pycnostachya*, perhaps the most desirable species for ornamental purposes.

BB. Heads oblong, 3-4 lines broad, 5-15-flowered.

c. Bracts not punctate.

d. Heads sessile.

spicata, Willd. Stem stout, rather tall, 2-5 ft., and very leafy; lvs. all linear, the lower larger and broader than the upper, which are gradually reduced to the linear-subulate bracts of the spike; heads 8-13-fl., $\frac{1}{2}$ in. long, closely sessile, and forming a dense spike

from 6-12 in. long; involucre bracts rounded obtuse, with usually purplish margins. In the Atlantic and Gulf states, from Mass. to La. B.M. 1411.

Var. *montana*, Gray (*L. pinnata*, Lodd.). Fig. 1270. Lower, 10-20 in. high; lvs. broader, the lower ones $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, and obtuse at apex; spike proportionately short and heads larger. Va. and N. Car., in the mountains. L.B.C. 2:147.

DD. Heads distinctly pedicelled.

E. Lvs. oblong-lanceolate, relatively short.

gracilis, Pursh (*L. paucifloracutosa*, Nutt. *L. lanceolata*, Bertol). Stem slender, 1-3 ft. high; lower lvs. oblong-lanceolate, upon distinct petioles, upper reduced to small linear bracts; heads in a loose raceme, 3-5-fl.; bracts of the involucre few and rather loose. Georgia, Ala. and Fla.

EE. Lvs. attenuate-linear, the radical 8-12 in. long.

tenuifolia, Nutt. (*L. lavigata*, Nutt.). Stem slender, 2-4 ft. high; lvs. without distinction of blade and petiole, only a line or two wide; heads in a strict raceme, a foot or more long, about 5-fl.; pappus strongly barbellate. N. Car. to Fla.

cc. Bracts punctate; heads peduncled.

graminifolia, Pursh. Stem comparatively slender, 2-3 ft. high; lvs. ciliate toward the base, with scattered hispid hairs; spike less dense, often becoming racemose; head $\frac{1}{2}$ in. long; bracts of involucre punctate, rounded at the apex. Atlantic states, Va. to Fla.

AA. Bracts of involucre acute or mucronate.

B. Heads 15-60-fl., cylindrical or turbinate.

c. Bracts with lanceolate, spreading, rigid tips.

squarrosa, Willd. Stem stout, 6-20 in. high; lvs. linear and rigid, the lower elongated and grass-like; spike variable in length, bearing few to many heads, the larger heads 1 in. long; involucre bracts lanceolate, rigid, and usually bearing pointed tips, squarrose. Eastern U. S., as far west as Neb. and Tex. B.R. 11: 948 is var. *intermedia* of this species.

cc. Bracts with closely appressed, mucronate tips.

cylindracea, Michx. Stem 1 ft. high; lvs. and spike as in last species; heads few, 16-20-fl.; bracts of involucre abruptly mucronate. Upper Can. to Minn. and Mo.

BB. Heads 3-6-fl., oblong or narrowly campanulate.

c. Inner bracts much longer than the fls.

elegans, Willd. Stem 2-3 ft.; lvs. linear, the upper soon reflexed; spike dense and wand-like, 3-20 in. long; heads $\frac{1}{2}$ in. long; inner involucre bracts prolonged into spreading, petaloid appendages, which surpass the flowers and pappus. Va., to Fla. and Tex. B.R. 4:267.

cc. Inner bracts not longer than the fls.

d. Pappus bristles very plumose; bracts appressed. *punctata*, Hook. Stem stout, 10-30 in. high; lvs. and involucre bracts punctate and rigid; spike long and



1270. *Liatris spicata*, var. *montana* ($\times \frac{1}{2}$).

wand-like, dense and leafy; heads 4-6-fld., $\frac{3}{4}$ in. long; bracts of involucre oblong, rather abruptly cuspidate, eiliate on its margins; pappus plumose. Saskatchewan and Minn. to Tex. and Mex.

DD. *Pappus bristles merely barbellate.*

E. *Involucral bracts spreading.*

pycnostachya, Michx. Stem stout, 3-5 ft. high; lvs. crowded throughout, the lower lanceolate, the upper narrowly linear; spike densely flowered, 5-18 in. long; heads about $\frac{1}{2}$ in. long, all sessile; involucre with squarrose tips acute, purplish; pappus copious, minutely barbellate. Ill. and Ia., to Ark. and Tex. R.H. 1883:324. Gn. 55:1217.—One of the choicest and holdest species.

EE. *Involucral bracts appressed.*

Chapmanii, Torr. & Gray. Stem a foot or two high, strict and rigid; lvs. short, the lower oblong-linear, the upper small and awl-shaped; spike densely flowered, often 1 ft. long; heads about 3-fld.; fls. large for the size of the head; pappus grayish, the bristles minutely barbellate, about $\frac{1}{2}$ in. long. Fla. W.W. ROWLEE.

LIBÉRTIA (Marie A. Libert, a Belgian woman, who wrote on Liverworts, about 1820). *Tridivèr*. This includes some tender bulbous white-fld. plants procurable from Dutch dealers, but for northern gardens inferior to our common hardy Blue-eyed Mary (*Tradescantia Virginica*). The fls. appear to be 3-petaled, the showy parts being the inner segments of the perianth. The fls. are about 1 in. across, and numerous in large clumps of certain species. Rhizome short; lvs. linear, equitant; perianth without any tube above the ovary; segments obovate, the 3 outer usually shorter, firmer and less showy than the inner, more or less green or brown; stamens inserted at the base of the segments; filaments free or connate toward the base; ovules many, superposed; capsule small, leathery, loculicidally 3-valved; seeds 3-cornered.

The genus has 8 species, found in Australia, New Zealand, Tasmania and Chile. All are white-fld. except *L. corulescens*, which is blue. Botanically it is nearest to *Diplazium*, but in the latter the inner segments are shorter than the outer ones and connivent. *Libertia* belongs in the same subtribe with our blue-eyed grass (*Sisyrinchium*), but in the latter case all the perianth segments are about equal in size. Baker, Handbook of the Iridaceae, 1892.

A. *Clusters lax; pedicels longer than the bracts.*

B. *Lvs. 3-6 in. long, entirely green.*

pulchella, Spreng. Lvs. not rigid; stem $\frac{1}{2}$ -1 ft. long; inflorescence of 1 or few clusters, which are 2-3-fld. N. Australia, Tasmania, New Zealand.

BB. *Lvs. 1 ft. or more long, with a broad pale midrib.*

ixioides, Spreng. Stem 1-2 ft. long; inflorescence an ample panicle with numerous peduncled, 2-6-fld umbels. New Zealand.

AA. *Clusters dense; pedicels shorter than the bracts.*

formosa, Grab. Lvs. rigid, 1- $\frac{1}{2}$ ft. long; stem 2-3 ft. long; inflorescence of many sessile umbels. Chile. B.M. 3294. B.R. 19:1630. Gn. 45, p. 192 (fine habit sketch) and 40, p. 441

W. M.

LIBOCÉDRUS (*Libas*, drop, tear, and *Cedrus*; alluding to the resinous character of the trees). *Coniferæ*-Syn., *Hedydèra*. INCENSE CEDAR. Ornamental, tall evergreen trees of pyramidal habit, with frond-like arranged, mostly flattened branchlets, small, scale-like, opposite lvs., and rather small, ovate or oblong cones. None of the species is quite hardy North, but *L. decurrens* thrives in the vicinity of the city of New York, and even in sheltered places in E. Mass. It is a valuable park tree, forming a symmetrical, narrow pyramid, with bright green foliage. It is also an important timber tree, the wood being light, soft, close and straight-grained, is very durable in the soil, and is used for fencing, for shingles, for the interior finish of houses, and also for ship and boat building. The other species are hardy only South, and, though very ornamental trees, they are hardly cultivated in this country; they are all important timber trees in their native countries. The Incense

Cedars thrive best in a well-drained soil, and prefer open situations; they are liable to lose their lower branches rather early. Prop. by seeds sown in spring; also by cuttings under glass in late summer or fall, which root rather slowly; sometimes grafted on *Thuja* and *Chamaecyparis*. Eight species in W., N. and S. America, Australia and S.W. China. Allied to *Thuja*. Branchlets flattened, rarely quadrangular, frond-like in arrangement; lvs. scale-like, with decurrent base, with or without glands; fls. monoecious or dioecious, terminal, similar to those of *Thuja*; cones oblong to ovate, with 4, rarely 6, woody scales, the lower pair sterile, small and short, the second one much larger and fertile, each scale bearing two long-winged seeds, the third pair, if present, connate into a woody septum.

decurrens, Torr. (*Thuja Craigiana*, Murr. *T. gigantea*, Carr., not Nutt.). WHITE CEDAR. Tree, to 100 ft., with erect or spreading, short branches, forming a rather narrow, feathery head; bark bright cinnamon-red; branchlets much flattened, bright green on both sides; lvs. oblong-ovate, adnate, with long decurrent base, fine at the apex and acuminate, glandular on the back; cones oblong, $\frac{3}{4}$ -1 in. long, light reddish brown; scales mucronate below the apex, a third connate pair separating the 2 fertile ones. Orege. to Calif. and W. Nev. S.S. 10:534. F.S. 9, p. 199. Gn. 29, pp. 266, 267.—In cult. the young trees are conspicuous by their bright and deep green foliage, while the trees in their native localities are mostly of a light yellowish green. Var. *compacta*, Hort. Dwarf compact form of globose habit. Var. *glauca*, Hort. With glaucous foliage.

L. Chilensis, Endl. Tree, to 60 ft., with compact, pyramidal head; branchlets much compressed; lvs. glaucous green, small, erect-spreading, obtuse, with a silvery line beneath; cones ovate oblong, $\frac{1}{2}$ in. long. Chile. P.F.G. 1, p. 47. G.C. 1850, p. 439. R.H. 1867, p. 410. Gn. 30, p. 552.—*L. Doniana*, Endl. (*L. planosa*, Sarg.). Tree, to 100 ft., with dense, pyramidal head, similar to the former, but lvs. larger, more closely set and more spreading, without any silvery line beneath; scales of the cone with a large curved spine on the back. New Zealand. N. 2:261. This species is the most tender of this genus.—*tetragona*, Endl. (*L. cupressoides*, Sarg.). Tree, to 100 ft., with compact, pyramidal head, sometimes shrubby; branchlets almost tetragonal; lvs. ovate or ovate-lanceolate, with slightly spreading and acute apex; cones ovate, scales with a large, curved spine on the back. Chile to Patag. G.C. 1850, p. 439. Gn. 30, p. 552.

ALFRED REHDER.

LIBONIA floribunda and **Pearsohiensis**. See *Jacobinia*.

LICUALA (Molucca name). *Palmæacæ*. Low, shrubby fan palms; stems solitary or in groups; lobes of the lvs. long, wedge-shaped, plicate, truncate and variously lobed or split, deeply and irregularly divided; rachis very short; ligule short; sheaths fibrous; fls. large. Species 36 or more, from trop. Asia to trop. Australia. Allied genera in cult. are *Brabea*, *Serenoa*, *Erythra*, *Fritchardia*, *Livistona*, *Trachycarpus*, *Rhapiz*. From these *Licuala* is distinguished by the carpels of the ovary 3-angled, slightly coherent; style single, filiform; albumen equable; embryo dorsal.

A. *Lvs. with lobes more or less grown together; lobes very broad.*

B. *Marginal teeth very large, the upper edges bent under.*

Rumphii, Blume. Petiole spiny below; segments 12-15, the inner ones 2 ft. long and 1 ft. wide at the apex, the lateral ones 16 in. long and 4 in. wide, oblique; marginal teeth broadly ovate, obtuse, shortly bifid. Celebes. Cult. in S. Fla.

BB. *Marginal teeth with upper edges not bent under.*

grândis, H. Wendl. (*Pritchardia grândis*, Bull.). Erect palm, the stems clothed above with dead sheaths; lvs. very many, erect-spreading; petiole 3 ft., slender, glabrous, with stout, short, straight or curved spines along the margins below the middle; blade orbicular or semi-orbicular, very closely plicate, wedge-shaped or truncate at the base, concave, the margins with many short lobes which are obtusely 2-fid; ligule thick, short, acute, broadly ovate. New Britain. H. 28:412 and 41, p. 82. G.C. II, 1:415. B.M. 6704. A.F. 7:1145. F.E. 7:982. S.H. 1:344.

AA. *Lvs. digitately divided; lobes narrow.*

B. *Lobes less than 12.*

Jeanencyei, Sander. A dwarf, rapidly growing palm: *lvs. deep shining green; lobes blunt, 5 to 8.* New Guinea. *Gen.* 55, p. 71. *F.E.I.* 11:291. *G.M.* 41:341.

BB. *Lobes 12 or more.*

C. *Petioles without spines in the upper part.*

élegans, Blume. Stems thick as a man's body, 4 ft. high, prominently scarred; petioles 3-4½ ft. long, the margins with brown hooked spines to just above the middle; *lvs.* orbicular; lobes very graceful, the linear-lanceolate lateral ones gradually decreasing to 11 in., obliquely truncate, with acute teeth, the middle lobes 16 in. long, truncate, with broader obliquely ovate obtuse teeth, lobes with only 2 or 3 folds. Sumatra.



127. *Licuala peltata.*

CC. *Petioles spiny throughout.*

D. *Lvs. ascending.*

peltata, Roxb. *Fig.* 1271. *Lvs.* 3-5 ft. diam., orbicular; lobes very variable in length and width, many-toothed at the apex, the teeth ½-2 in.; petiole stout, 3-4 ft. long. The lobes of the *lvs.* droop very gracefully. *G.C.* 1872:1657. India. — *Adv.* 1895, by Pitchee & Manda. *Fig.* 1271 is redrawn from Martius.

DD. *Lvs. horizontally spreading.*

spinosa, Wurm. (*L. hórrida*, Blume). *Lvs.* 3 ft. or more in diam., orbicular-reniform; inner lobes 18-22 in. long, 4½-5 in. wide at the apex, 10-11-toothed; outer lobes 15 in. long, 1½-2 in. wide, 4-6-toothed; teeth rather large, triangular-ovate, bifid; petioles obtusely 3-angled, 4-5 ft. long, with brownish hooked spines. Java, Moluccas.

JARED G. SMITH.

Licualas are very handsome warmhouse palms of moderate growth, several species of which have been grown to some extent commercially. They delight in a tropical temperature and abundant moisture, and should also be shaded from strong sunshine in order to produce foliage of the deep, rich shade of green that is common to this genus.

The most attractive species is *L. grandis*, which has been until recent years a costly species owing to its comparative rarity in cultivation. It is probably within ten years that the first consignment of seeds of this species was received in America.

The large fan-shaped leaves of the Licualas are somewhat tender and easily injured, which makes them of less value for house decoration, but as exhibition plants

there are few palms more striking than *L. grandis*, and *L. elegans*. *L. spinosa* and *L. peltata* are also well worth cultivation, though objection is sometimes found to the strong hooked spurs with which their leafstalks are armed.

W. H. TAPLIN.

LIGULARIA. All referred to *Senecio*.

LIGUSTICUM (Latin, referring to the ancient province of Liguria, where a plant was gathered which was something like this and used in medicine.) *Umbellifera*. This includes a native hardy herbaceous plant suitable for naturalizing with aquatics and bog plants. It has a bold habit, grows 2-6 ft. high and has terately decomposed foliage. Offered by dealers in native plants. The genus has about 20 species scattered in the northern hemisphere. They have large aromatic roots, mostly no involucre, involucre of narrow bractlets and white fls. in large, many-rayed umbels. Consult our manuals or Coulter and Rose's "Revision of North American Umbellifera," 1888.

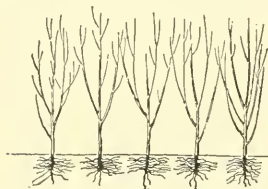
actaeifolium, Michx. Stem stout, branched above; *lvs.* 3-4-ternate; *lfts.* 2-5 in. long, coarsely serrate, broadly oblong; umbel 10-20-rayed; fruiting rays 1-2 in. long. July, Aug. Rich ground, S. Pa. to Gulf of Mex. B.B. 2:519. — *Int.* by H. P. Kelsey. W. M.

LIGUSTRUM (ancient Latin name). *Oléaceae*. Including *l'isidiana*. **PRIVET**. **PRIM.** Ornamental shrubs or trees with deciduous or evergreen opposite, entire *lvs.*, white or whitish, mostly fragrant fls. in terminal panicles, and decorative, usually black berries, often remaining on the branches through the whole winter. Some deciduous species, as *L. vulgare*, *l'ibata*, *ciliatum* and *Amurensis*, are hardy North, while others, like *L. ovalifolium*, *Senense* and *Quihoui*, can not be considered quite hardy north of Long Island. The evergreen species are only half hardy or tender, but *L. Japonicum* may be grown as far north as Philadelphia. They are all very valuable for shrubberies, with their clean, dark green foliage, which is rarely attacked by insects and keeps its green color mostly unchanged until late in fall, though *L. ciliatum* sheds the *lvs.* rather early and *L. l'ibata* and sometimes *L. ovalifolium* assume a pretty purplish hue; in mild winters some of the deciduous species hold part of their foliage until almost spring. *L. vulgare*, *ovalifolium* and others stand dust and smoke well and are valuable for planting in cities. *L. ovalifolium* is one of the best shrubs for seaside planting, growing well in the very spray of the salt water (known as California Privet). Some are handsome in bloom, especially *L. Sinense*, *l'ibata*, *Japonicum*, *lucidum* and most of the other evergreen species; all are conspicuous in autumn and winter from the black berries, or in some vars. of *L. vulgare*, whitish, greenish or yellowish. *L. vulgare*, *ovalifolium* and also *L. Amurensis* are well adapted for ornamental hedges. The Privets grow in almost any kind of soil, and even in rather dry situations and under the shade and drip of trees. Prop. by seeds sown in fall or stratified, sometimes not germinating until the second year; usually increased by cuttings of hardwood or by greenwood cuttings in summer under glass; vars. are sometimes grafted on *L. vulgare* or *L. ovalifolium*. About 35 species, chiefly in E. Asia and Himalayas, distributed south to Australia, one in Europe and N. Africa: from allied genera distinguished by the terminal inflorescence and from Syringa by the berry-like fr. *Lvs.* short-petioled, stipulate; fls. perfect, small; calyx campanulate, obscurely 4-toothed; corolla funnel-shaped, with mostly rather short tube and with 4 spreading lobes; stamens 2; fr. a 1-3-seeded berry-like drupe.

ALFRED REHDER.

CALIFORNIA PRIVET FOR HEDGES. — *First method* — Cuttings 8-14 inches of 1-year wood are made in fall or winter, preferably the former, as they are occasionally damaged by the winter, even as far south as Alabama. These are tied in bundles and buried during winter. In the spring they are stuck in rows 2-6 inches by 2-3½ feet, and kept cultivated. They are sold at 1 year, when 1-2½ feet high, or at 2 years, when 2-4 feet high. If not sold at 2 years the plants are sometimes cut back to 3 inches to sprout again. They are dug by spade or tree-digger. These closely grown plants will make a hedge,

as shown in Fig. 1272, especially if dug with spade and given short roots. If 3-year plants, not cut back, are used, the base is open, as the old wood at the lower part of the plant has had its side branches weakened or killed by crowding and they do not readily branch out. Plants



1272. Common method of making Privet hedge.
(Scale $\frac{1}{2}$ in. to ft.)

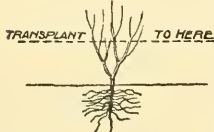
grown by this method are frequently planted in a double row.

Second method.—Cuttings of 5-6 inches of stout, 1-year wood, are made in November. The cuttings are made short so that the roots will not be cut off by the tree-digger. The leaves are stripped off, and the cuttings tied in small bundles, as large bundles mold. These are buried, tops up, over winter. In the spring, before growth starts, they are planted in rich, mellow land 4 inches apart, with rows 8 inches apart. To plant, a back furrow is plowed in the center of the block, the top raked off, a line stretched and pegged down. The cuttings can then be inserted nearly full length. The trampling of the row settles the soil enough to expose the top buds. With a one-horse plow the bottom of the furrow is loosened where the planters have packed the soil, and new furrows are made around the strip planted. The cuttings are tilled during summer with a wheel-hoe or hand-plow. To make wide plants, the tips of the shoots are pinched when they are about 3 inches long. This is repeated at intervals of about three weeks during the summer. Nitrate of soda may be used to hasten growth. This method produces a plant as shown in Fig. 1273.

The plants may be dug in the fall and heeled-in, to prevent possible winter-killing. They are then sorted into grades and planted in the spring $1\frac{1}{2}$ -2 feet apart in rows 3-4 feet apart against the land side of a deep furrow, and a little soil kicked over the roots. The filling is completed with a one-horse plow. Before filling, fine manure may be spread near the plants.

The plants should be straightened up and trampled firm. When finished, they should have the lower branches covered and the lower end of the cutting not below the level of the tree-digger. The pinching-back process may be continued, or the tips may be cut with a sickle during the early part of the season, especially on plants of the smaller grade. To get more roots on the branches the plants may be hilled-up. They are cultivated with a one-horse cultivator or a two-horse riding cultivator. At two years these will make plants $2\frac{1}{2}$ -3 $\frac{1}{2}$ feet high and $1\frac{1}{2}$ -2 feet wide at the base.

Dig with a tree-digger that operates on one or both sides. The plants may be set 12-15 inches apart, 4-6 inches deeper than before, and produce a hedge as shown in Fig. 1274. A smaller number of plants is required than when plants grown by the first method are used.



1273. California Privet from short cuttings, transplanted deep.
(Scale $\frac{1}{2}$ in. to ft.)

As there are numerous vigorous buds near the ground, the growth is very dense at the base. After planting, the tops may be cut off to an even height.

Various forms of hedge are used, as shown in Fig.

1275. No. a is used on Long Island; b is used at Newport. At Newport, by repeated clipping, the leaves become very small and the growth dense, resembling a wall. Nos. d and e frequently result from using narrow plants and allowing them to grow at the top.

Third method.—At Biltmore Nursery, North Carolina, the Privet cuttings are run through a stalk cutter and the pieces sown in a furrow.

HENRY HICKS.

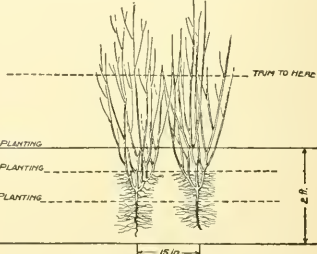
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A. *Corolla with the tube 2 or 3 times longer than the limb.*

B. *Lvs. linear-lanceolate or linear, evergreen.*

1. *Massalongianum*, Vis. (*L. longifolium*, *angustifolium*, *myrtifolium*, *rosmarinifolium* and *spicatum*, Hort.). Erect shrub, to 3 ft., with warty and pilose branchlets: lvs. tapering at both ends, glabrous, $1\frac{1}{2}$ -3 in. long; panicles much branched, many-fl., with rather small pedicelled fls., $2\frac{1}{2}$ -3 $\frac{1}{2}$ in. long. July, Aug. Himal. G.C. II. 16:149.—Graceful half-hardy shrub.



1274. The Privet hedge at final transplanting.
(Scale $\frac{1}{2}$ in. to ft.)

BB. *Lvs. oblong to ovate or oval.*

C. *Young branchlets and inflorescence pubescent: lvs. deciduous.*

2. *ciliatum*, Blume (*L. Ibota*, Sieb. & Zucc. *L. Ibota*, var. *ciliatum*, Dipp. *L. medium*, Hort., not Franch. & Sav.). Shrub, to 6 ft., with erect and spreading branches: lvs. rhombic-ovate or ovate-lanceolate, acute at both ends, appressed pubescent near the margin and finely ciliate and pubescent on the midrib beneath, 1-2 in. long; panicles small, erect, about 1 in. long; fls. almost sessile; calyx glabrous; fr. shining. June. Japan.—This is one of the least decorative species; it has been introduced under the erroneous denomination of *L. medium*, which is sometimes misspelled *L. media*.

3. *Ibota*, Sieb. (*L. obtusifolium*, Sieb. & Zucc.). Fig. 1276. Shrub, to 10 ft., with spreading and curving branches: lvs. elliptic to oblong-ovate, acute or obtuse, usually only pubescent on the midrib beneath, 1-2 in. long; panicles nodding, small, 1-1 $\frac{1}{2}$ in. long, numerous along the branches on short branchlets: fls. short-pedicelled; calyx pubescent; fr. with slight bloom. June, July. Japan, China. G.F. 6:425. M.D.G. 1899:218.—Graceful shrub, hardy North. Var. *Regelianum*, Rehder (*L. Regelianum*, Hort.). Low, dense shrub with almost horizontally spreading branches and oblong or obovate, usually more pubescent lvs.

4. *Amurénse*, Carr. (*L. Iboia*, var. *Amurénse*, Hort.). Shrub, to 15 ft., with upright branches; lvs. oval or oblong, usually obtuse, somewhat glossy above, glabrous except the midrib beneath. 1-2½ in. long; panicles erect rather than many-fl. 1-2½ in. long; fls. short-pediceled; calyx glabrous or slightly pubescent near the base. June, July. Japan, China. R.H. 1861, p. 352.—Similar in habit to the following and almost half-evergreen.

cc. *Young parts glabrous; lvs. half-evergreen.*

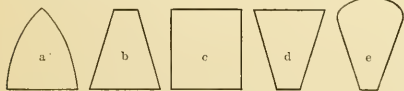
5. *ovatifolium*, Hassk. (*L. Cutifolium*, Hort. *L. Japonicum*, Hort., not Thunb., and probably *L. médium*, Franc. & Sav.). CALIFORNIA PRIVET. Shrub of upright habit, to 15 ft., quite glabrous; lvs. cuneate at the base, elliptic-ovate or elliptic-oblong, acute, dark green and glossy above, yellowish green beneath, 1½-2½ in. long; panicles erect, many-fl., rather compact, to 3 in. long; fls. almost sessile. July, Japan.—A very handsome shrub, but of somewhat stiff habit; well adapted and much used for hedges (see Mn. 6, p. 9). Var. *aureo-marginatum*, Hort. Lvs. edged yellow. Var. *variegatum*, Hort. (var. *robustum variegatum*, Hort.). Lvs. variegated with yellow. Var. *tricolor*, Hort. Lvs. variegated with yellowish and white, pinkish when young (Mn. 2, p. 42).

aa. *Corolla with the tube as long as the limb or shorter.*

b. *Young growths glabrous; lvs. evergreen.*

6. *Japonicum*, Thunb. (*L. glabrum*, Hort. *L. Kletterbaum*, Vis. *L. Klettermanni*, Schrad., *spicatum* and *serotinum*, Hort.). Bushy shrub, to 10 ft.; lvs. reddish-ovate to ovate-oblong, acute or obtusish, with reddish margin and midrib, veins beneath not distinctly marked, 2-3½ in. long; panicles broad, rather loose, to 4½ in. long; tube usually somewhat longer than calyx. July, Aug. Japan.—Very handsome evergreen shrub, but in colder climates often losing the lvs. in fall; often confounded with the following, and also with the former.

7. *laevidum*, Ait. (*L. Japonicum macrophyllum*, *L. magnifolium*, *L. Sinense latifolium robustum* and *L. spicatum*, Hort.). Large shrub or tree, to 20 ft., with somewhat spreading branches, similar to the former; lvs. larger, ovate to ovate-lanceolate, acute or acuminate, distinctly veined beneath, 3-5 in. long; panicles less loose, with almost sessile fls.; tube about as long as calyx. July, Aug. Japan, China. B.M. 2565; 2921 (as *L. Nepalese glabrum*). G.C. II. 10:753.—Larger leaved than the former, but more tender. It yields the white wax, an exudation of the branches, caused by an insect, *Coccus P-lah*; therefore cult. in China. Var. *Alivoni*, Arb. Kew. (*L. Japonicum*, var. *Alivoni*, André). Lvs. ovate-lanceolate, to 8 in. long, acuminate, sometimes with yellowish variegation when young. Var. *aureo-marginatum*, Hort. (*L. exelsum arboreum*, Hort.). Lvs. margined yellow. Var. *tricolor*, Arb. Kew. (*L. Japonicum tricolor*, Hort.). Lvs. with yellowish variegation, pink when young.



1275. Conventional forms of California Privet hedges.

8. *coriaceum*, Carr. (*L. laevidum*, var. *coriaceum*, Deene.). Dwarf, dense shrub, with short, rigid branches, to 6 ft., very leafy; lvs. orbicular or orbicular-ovate, convex, dark green and shining above, 1½-2½ in. long; panicle compact, 2-4 in. long, with sessile fls. July. Cult. in Japan, not known wild. B.M. 7519. R.H. 1874, p. 418; 1888, p. 440. F. 1876, p. 65.

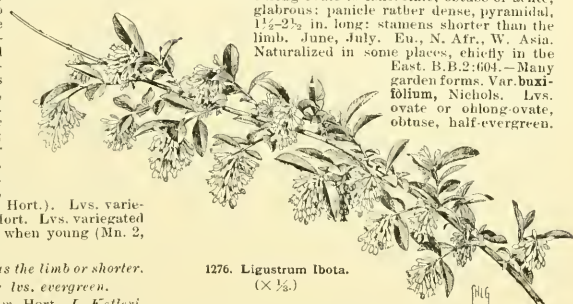
bb. *Young branchlets and inflorescence pubescent or puberulous.*

c. *Lvs. evergreen, 2-5 in. long.*

9. *Nepalense*, Wall. (*L. spicatum*, Don). Evergreen shrub or tree, with pubescent branchlets; lvs. oblong or oblong-ovate, acuminate, pubescent beneath, 2-5 in. long; panicles rather large and broad, interspersed with petioled bracts. July, Aug. Himal.

cc. *Lvs. deciduous or half-evergreen, 1-2½ in. long.*

10. *vulgare*, Linn. COMMON PRIVET or PRIM. Shrub, to 15 ft.; branchlets and panicles puberulous; lvs. oblong-ovate to lanceolate, obtuse or acute, glabrous; panicle rather dense, pyramidal, 1½-2½ in. long; stamens shorter than the limb. June, July. Eu., N. Afr., W. Asia. Naturalized in some places, chiefly in the East, B.B. 2:664.—Many garden forms. Var. *busiifolium*, Nichols. Lvs. ovate or oblong-ovate, obtuse, half-evergreen.



Var. *glabrum albo-marginatum*, Hort. Lvs. bluish green, with narrow white margin. Var. *italicum*, Kirchn. (*L. italicum*, Mill. *L. sempervirens*, Pierl.). Lvs. linear-lanceolate, almost evergreen. Var. *pendulum*, Hort., with pendulous branches. There are also vars. with fruits of different colors, as var. *chlorocarpum*, Loud., with greenish, var. *leucocarpum*, Loud., with whitish, and var. *xanthocarpum*, Loud., with yellowish fruits. Of the variegated forms, var. *aureum*, Hort., with yellow foliage, and var. *variegatum*, Hort., with the lvs. blotched yellow, are the most important.

11. *Sinense*, Lour. (*L. Fortunei*, Hort.). Shrub, to 8 ft., with slender spreading branches; branchlets pubescent; lvs. oval to ovate-lanceolate, pubescent along the midrib beneath, at least when young; panicles pubescent, loose, to 4 in. long, with distinctly petioled fls. China, Corea. Two forms can be distinguished. Var. *villosum*, Rehd. (*L. villosum*, May). Lvs. oval to ovate-lanceolate, obtuse or acute, pubescent beneath, especially along the midrib; panicle narrow. G.C. 1858, p. 621. Var. *Stauntoni*, Rehd. (*L. Stauntoni*, DC.). Less high and more spreading; lvs. oval to ovate, obtuse or emarginate, pubescent on midrib beneath, panicle broader and more loose. G.C. II. 10:365. G.F. 3:213.

12. *Quihoui*, Carr. Shrub, to 6 ft., with spreading branches; branchlets and panicles finely pubescent; lvs. elliptic-oblong or narrow-oblong, obtuse, glabrous, somewhat coriaceous, 1-2 in. long; fls. almost sessile, in small clusters, forming at ends of the branches long, paniced spikes. June-Aug. China. G.C. II. 18, p. 277.

L. brachystachyum, Deene. Closely allied to *L. Quihoui*, but of upright habit, with larger lvs. and shorter, more compact panicles.—*L. compactum*, Hook. f. & Thoms. (*L. laevidum*, longifolium, lineare and Simonii, Hort.). Evergreen shrub, quite glabrous; lvs. lanceolate, to 6 in.; panicle large, compact; tube short. Himalayas.—*L. insulare*, Deene. (*L. Stauntoni*, Hort., not DC.). Shrub, to 6 ft., allied to *L. vulgare*; lvs. elliptic-ovate to linear-lanceolate, yellowish green, often pendulous, 2-3 in.; panicles rather large. Origin uncertain.—*P. Leginense*, Hort. = *Syringa*. Pekinensis.—*L. strygnolophyllum*, Hemsf. Evergreen shrub or small tree, almost glabrous; lvs. orbicular or obovate, ½-1 in.; panicle rather loose. China.—*L. Walkeri*, Deene. Allied to *L. Nepalense*; lvs. ovate to lanceolate, glabrous, to 3 in.; panicle large, to 6 in. Ceylon, Noellcherries. G.C. III. 24:282. G.M. 41:683.

ALFRED REHDER.

LILAC. See *Syringa*.

LILIUM (ancient Latin name). *Lilideae*. LILX. The Lilies have always been looked upon as amongst the noblest of garden plants. Their conspicuous flowers, striking colors, and their stately forms appeal strongly to the eye and to the imagination as well. They are among those good "old-fashioned" plants which frequently and justly come newly into vogue. Lilies are less understood and less discriminatingly appreciated than almost any other plants of prominence. The Tiger Lily is a favorite and old-fashioned flower, to be found in many of the most homely and unpretending gardens. Now and then one finds a good group of the Madonna Lily, very rarely a cluster of the beautiful little Coral Lily, and sometimes the landscape gardeners furnish free-handed clients with masses of the Gold-banded Lily in the shrubby borders. The Easter Lily is largely forced by the florists, as are also certain varieties of the Speciosum group. But aside from these, no Lilies can at present be classed as real favorites of the American public, while dozens of magnificent kinds are practically unknown.

In the opinion of the writer, the three best Lilies for everybody to grow are *L. tigrinum*, var. *splendens*; *L. speciosum*, var. *rubrum*; and *L. tenuifolium*. To these the following species may be added as well worthy of general culture, at least in the eastern states (the order given is approximately that of the writer's preference): *L. elegans* (many varieties, all good), *auratum*, *concolor* and its var. *parvicornis* (the Coridon Lily), *Brownii*, *Henryi*, *Chalcedoniense*, *testaceum*, *candidum*, *maculatum*, *puberulum*, *Japonicum* var. *roseum*, *longiflorum*, *pinnatifidum*. The connoisseur should not be without *L. Maximowiczii*, *Canadense*, *Paryii*, *Nepalense*, *monadelphum*, *pardalinum*, *superbum*, *Washingtonianum*, *Gragi*, *Wallichianum*, *Philadelphicum*, *Columbianum*, *Neilgherrense*. All these will succeed fairly well, and many of them are of the easiest possible culture.

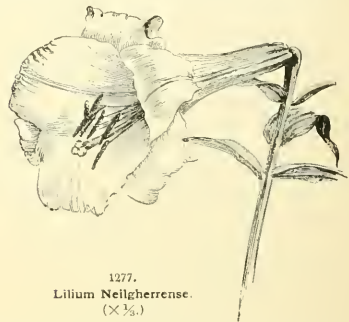
Lilies are ornamentally useful principally for their flowers. Their foliage is seldom of a character to assist in any scheme of garden decoration. Certain species bear flowers in such quantity and of such pronounced colors that they make very effective masses. Such strokes of color can best be worked into the garden picture at carefully chosen points in the borders, especially where the rich sunlight of early morning or late afternoon takes its rest. For fine mass effects of this kind the divers varieties of *L. elegans*, particularly var. *fulgens*, are excellent. *L. tigrinum*, var. *splendens* and *L. tenuifolium* are also striking; while other sorts which mass well, but are of more modest colors, are *L. speciosum*, *auratum*, *Chalcedoniense*, *concolor*, and *Brownii*. Lilies of many sorts are highly arceveable when scattered—not massed—somewhat freely through shrubby borders, or with large hardy perennials. Almost any Lily is satisfactory when so placed, but the varieties must not be mixed, and there should be enough plants to avoid a feeling of thinness and isolation.

Lilies are native to the north temperate zone. The majority of our best garden Lilies, such as *L. tigrinum*, *auratum*, *speciosum*, and the new *Henryi*, come from western Asia, whereas none of the American species is especially successful in our gardens. Throughout Japan, eastern and southern China and Burma, and the adjacent islands, are found dozens of the most gorgeous species.

The genus *Lilium* is the type of the order Liliaceae, a family crowded with plants of garden value. The family has over 2,000 well known species, and of the 187 genera probably half are in cultivation. There are many monographs of the genus *Lilium* in rare and costly works and in various languages. The latest and most sumptuous one is "A Monograph of the Genus *Lilium*," by Elwes, published in 1880, with magnificent colored plates. It is referred to below by the abbreviation El. Unfortunately, there is no recent book on Lilies in the English language which combines the horticultural and botanical points of view. The latest botanical review of the whole genus will be found in the "Botanical Gazette" 27:235 (1899), to which the student is referred for fuller descriptions than those given below. F. A. WAUGH.

CULTURE.—In the growing of a large collection of Lilies in the open air, the best results can be obtained only

with a variety of soils and conditions. Heavy soils are not suited to many of the Lily tribe. A few species, like *L. superbum*, *Canadense* and *tigrinum*, may do well in heavy soil, but a light soil with sand and gravel intermixed, one from which any excess of moisture runs off, is much better for a large collection. Drainage is of great importance. The slope of a hill, if not too steep, affords a chance for varied degrees of drainage; the



upper portions are suited to such as prefer the driest ground, as *L. Philadelphicum*, *concolor* and *Washingtonianum*, while at the bottom, if the drainage be good, *L. auratum*, *testaceum*, *candidum* and others would thrive. No general rule for the culture could be given for all. A slate ridge seems to be well suited to some Lilies. *L. concolor*, *Philadelphicum*, *Gragi*, the varieties of *elegans*, *Washingtonianum*, *puberulum*, *Columbianum*, *Maximowiczii* and others seem to like such soils, and with deep planting will stand more drought than in lighter soils.

Lilies like some shelter from severe winds as well as midday sun. They do finely among Rhododendrons. The point is not so much to shade the stems and foliage as to keep the ground over the bulbs cool and moist. An open frame is an admirable place for planting Lilies, with 3-4 in. of peat or leaf-mold over the bed, which keeps them cool. Peat is very beneficial also when mixed with the soil about the roots.

The scales of Lily bulbs shrink by exposure to air, and in this way the bulb is weakened. Bulbs with shrunken or flabby outside scales are less valuable than with firm and plump ones. They may be kept in damp soil, boxed tightly for some time, but many of the store bulbs have lost much of their vitality by the time they reach the purchaser. It is not rare for such bulbs to fail to grow until the second season. *L. monadelphum*, *maculatum* and *Brownii* frequently do not appear above ground until the second season, if their scales have been dried to any considerable degree.

Among the kinds which seem to do well in any ordinary light soils, and which, as a rule, may be grown with least effort, are *L. auratum*, *Chalcedoniense*, *candidum*, *elegans* and its common varieties, *testaceum*, *maculatum*, *Henryi*, *tigrinum*, *Martagon*, *Maximowiczii*, *longiflorum*, *monadelphum*, and the varieties of *speciosum*. *L. superbum* and *Canadense* are also easily grown and do well with considerable shade. *L. Philippense*, *Catesbri* and *Neilgherrense* are not suited to outdoor culture in the North. *L. Nepalense* and *sulphureum* may be grown in Vermont with fairly good results, but should not be allowed to freeze during winter. All Lilies are better if their bulbs are not frozen. Most of them will stand some frost at a good depth, but frost seems to weaken them and Lily diseases attack the weaker plants first.

The Lily blight or disease, which seems to affect Lilies in much the same way that the potato rust does the potato, is more damaging to some species than to others. Those from the Pacific coast seem to be more subject to



The Washington, or Shasta Lily (*Lilium Washingtonianum*)

this disease than the Japan species. The disease is common in our wild Lilies and is sometimes found on them in their natural habitat. In cultivation the disease often ruins flowers, foliage and the stalks of *L. Canadense* without seeming to affect the bulbs. It is common on *L. candidum*, and we now seldom find bulbs entirely free from it. The Bordeaux mixture has been found beneficial in fighting the Lily disease, but the best results are attained by using it as a preventive, applying it to the foliage before any blight appears.

In planting new bulbs, it is well to use ground that has not had Lilies for some years. All stalks and foliage affected by blight should be removed and burned, and blighted bulbs and scales, especially such as are worthless from decay, should be burned, as these may help to propagate the disease.

As a rule, Lilies like a rich soil, but it seems to be the general opinion of all who have had experience in growing them that manures (particularly fresh manures) should not be allowed to come in contact with the bulbs. Many advocate the application of all manures as a mulch, letting the rains carry down their fertilizing ingredients. When the enrichment is not allowed to come in contact with the bulbs, but is placed within the reach of the extended roots from the bulb, well composted manures seem not injurious. Lilies, as a rule, do better when set at considerable depth. They seem to resist drought better, and the bulbs are no doubt kept cooler in hot weather. Most Lilies throw out many roots along their stems between the top of the bulb and the surface of the soil, and deep setting is rather necessary to this root-growth. Deep spading should go with deep setting, and it is not too much to say that the ground should be spaded twice as deep as the bulbs are placed. Sphagnum moss has been found beneficial to some species. Among such are *L. auratum* and *candidum*. Two or three inches of the fresh moss may be placed under the bulbs. It has been used with success under others, and is especially good for *L. testaceum*.

Lilies are propagated by seed, from scales and from offsets. With one or two exceptions, the production of bulbs from seed is a very tedious process. Several species seldom, if ever, produce seed in this country. Among these may be mentioned *L. candidum*, *speciosum*, *testaceum*, *maculatum*, *Bronnii*, *tigrinum*, *Chalcedonicum*, and some varieties of *elegans*. Some species, such as *L. auratum*, seldom germinate until the second summer after planting. *L. tenuifolium* is, however, an exception to most species, for not only does the seed germinate the first year, but it is not rare for some of the bulbs to bloom the second summer.

In growing Lilies from scales, it is a good plan to remove outside scales from strong bulbs when quite ripe or in early spring, and plant these scales where they will be kept moist and warm. They generally change into bulblets the first season and make a fairly good growth by the second autumn. If well cared for they are large enough to sell by autumn of the third season. *Lilium tigrinum*, *bulbiferum* and *sulphureum* have bulblets in the axils of their leaves, which, if gathered as soon as mature, may be planted, and with good care usually bloom the third or fourth year. In many other kinds offsets form along the stems beneath the surface and down to the bulb, which, when planted out, make good bulbs in about 3 years.

Lilium longiflorum, *Maximowiczii*, especially the red variety, and most of the varieties of *elegans*, have a large number of offsets along their stems under the surface of the ground. The number is larger in seasons when plenty of rain comes during their growth than in dry seasons. *L. candidum* is set with best results as soon as the foliage begins to turn in August; and it is at this same season that its scales should be planted for propagation. When good, healthy scales of this species are planted out early, they usually change the same autumn into bulbs, and most of them will send up leaves before winter.

F. H. HORSFORD.

LILIES IN CANADA.—Some of the species generally recommended for garden culture as hardy do not stand at Ottawa. Those that have failed are *L. candidum* (of late years from disease), *Kramerii*, *cordifolium*, *speciosum*, *Kratzeri*, *Canadense*, *Harrisii*, *auratum*, and vars. *pictum*, *platyphyllum*, *hyemale*, *Willii*. Those

that have held their own, but have not increased, are *L. Maximowiczii*, *pompiliatum*, *Pyrenicatum*, *elegans semi-pleno* and *elegans incomparabile*. Those that have increased and been perfectly hardy are *L. longiflorum*, *Bronnii*, *speciosum*, *Batemanianum*, *Wallacei*, *maculatum*, *Dobynsianum*, *elegans* and vars. *Bellevuei* and others. *L. tigrinum*, *tigrinum*, var. *Fortunei* and *flore-pleno*, *L. speciosum* vars. *album*, *roseum*, *vulgarum* and *Melpomene*, *L. Martagon*, *superbum*, *pardalinum*, *testaceum*, *pompiliatum*. Those starred (*) are the most satisfactory. It would be well to warn growers that in the average garden *L. auratum*, in all its varieties, will not last more than 2 or 3 years without renewing. Some of the more expensive varieties flower only once.

An important characteristic of Lilies is perfume, a point in which they differ very much. It is very strong in *L. candidum*, *longiflorum* and the *auratum*s, and the atmosphere is full of the delicious odor on a quiet evening. It is fainter in *L. testaceum*, and rank in *L. croceum* and related species, and a positive stench in *L. pompiliatum*—almost unendurable in the garden and unbearable in the house. Beautiful as *L. pompiliatum* is in color and habit, the odor outweighs these good points, and makes it undesirable and not to be recommended.

R. B. WHYTE.

THE EASTER LILY.—In North America a tall and large-flowered form of *Lilium longiflorum*, and one that can be readily forced in a relatively high temperature, has come to be known as the Easter Lily. This variety was introduced from Bermuda. About 1875, a Philadelphia woman, in returning from Bermuda, brought with her two Lilies in bloom and presented them to a local florist. The bulbs were increased to one hundred in the next three or four years, when the plants were seen by W. K. Harris, an enterprising Philadelphia florist. The earliness of blooming and prolificacy of the bulbs were striking features, and led to their purchase by Mr. Harris. In 1882, the Lily was introduced under the name *Lilium Harrisii*. It had been exhibited previously in New York and Philadelphia, where its early flowering brought it into prominent notice. While the Lily was being increased prior to its introduction, other florists who had seen it were gathering bulbs in Bermuda and



1278. *Lilium Japonicum* ($\times \frac{1}{2}$).

endeavoring to secure a stock. In 1882, it was also introduced by a Philadelphia florist under a long Latin name, and later by a New York florist as the Bermuda Easter Lily. Practically all of the names except *Lilium Harrisii* have been discarded. To botanists it is known as *L. longiflorum*, var. *erimium*. The distinguishing trait of *L. Harrisii*—and this gives it its emphatic commercial value—is its power to stand a high temperature, allowing it to be forced into bloom

throughout the winter. A second favorable feature is the production of an unusually large number of flowers from each bulb, and a third, the large size of the flowers. It is practically impossible to obtain uniform and good stock of the true variety from Bermuda at the present time.

The propagation and general management are not unlike that given other bulbs of its class. It is multi-



1279. *Liliium Philadelphicum* ($\times \frac{1}{2}$).

plied by offsets, in which the variety is prolific, a bulb sometimes producing as many as fifty. When first introduced, the stock was increased from the bulb scales, and from cuttings of the stem before the plant had bloomed.

The Easter Lily is not difficult to grow under glass, if one has strong and healthy bulbs. The perplexity in its culture, of which one sometimes hears so much, is due to the fact that bloom is usually wanted at definite seasons, as New Year's, Easter, Decoration Day. Now, the time at which any bulbous plant will bloom depends to an important extent on the age, size, freshness and degree of maturity of a given bulb. Each bulb is to a great degree a law unto itself. This explains why it is so difficult to secure uniform bloom at a definite time. The dates of potting and shifting which give satisfactory results one season may give unsatisfactory results the following season. What the gardener does, therefore, is to start his bulbs early, and then retard or force them by varying the temperature, as the crop and occasion may demand. He grows them in pots, so that he may shift them from house to house.

In common with all hardy or spring-blooming bulbs, Easter Lily bulbs should be kept cool until roots have formed, when they may be brought into heat for flowering. Secure the bulbs as early as possible. Place your order in early summer. You will do well if they are received in early September. Keep them moist; if they become dry and shrivelled, much of their vigor is lost. There are three leading commercial grades, measured by the average circumference in inches of the bulbs,—the 5-7's, 7-9's, 9-11's. The 7-9 is usually the most ser-

vicable and economical grade for the commercial florist. It is best to put them into small pots (usually 4 in.) to form roots, and to transfer them, when growth has begun, to the pots in which they are to bloom. Handling them at first in small pots saves labor, economizes room, and may give stockier plants. By growing them in pots, the plants may be shifted from cool to warm parts of the house, thereby insuring greater uniformity of season; and all diseased plants are readily detected and easily discarded.

In September or October, then, the bulbs are firmly potted. If the soil is rather heavy, set the bulb on a cushion of sand (see Fig. 290, p. 192). The top of the bulb should be about level with the surface of the soil. The best earth is one which is light and rather fibrous, devoid of clay. A good potting soil (see *Potting*) will answer. The 5-7 and 7-9 sizes may be put in 4- or 4½-inch pots, and the 9-11 in 5-inch. Plunge them in a frame in the open, covering with sifted coal ashes or excelsior; or put them in a cool cellar. Here they may remain (in New York) until the 10th or 15th of December. Protect them from very severe weather and from beating rains. By early December they should have made good balls of roots, and a little top growth. Bring them in, and shift into 6-inch or 7-inch pots, one bulb in each. For decoration, 3 to 5 small bulbs may be put in 8- to 10-inch pots, choosing bulbs of equal strength in order that the bloom may be simultaneous. None of them will need transferring again. For early results for cut-flowers, it is customary to put the 5-7 bulbs at first into 5-inch pots and to put them at once on the benches, keeping them rather cool for a time. Flowers may then be secured for the holidays.

Keep them cool. A carnation temperature suits them well until they begin to bloom, when a higher temperature is desirable. Start with a night temperature of 45° to 50°, increasing to 60°. If the flowers begin to open too soon, remove to a cooler house which is partially shaded, where they may be retarded as much as two weeks. If they are too late, give more heat. The electric light run at night will hasten the bloom perceptibly. Rarely can more than 80 or 90 per cent of a crop be made to bloom simultaneously. Following are the dates of a crop which was forced for Easter (at Cornell):

October 9. Bulbs received and potted, and plunged in frames.

December 11. Brought into house.

December 12. Shifted to permanent pots, and plunged in a bed in a house having night temperature of 50°.

February 5. First buds seen; some of the pots transferred to a warm-house (temperature for tomatoes).

March 20. Plants in bloom in warm-house.

April 15. Easter. Plants in full bloom in cool-house.

Give Easter Lilies plenty of light. Keep down the aphids by fumigating with nicotine vapor once a week. If the bugs get a start, give them a little very weak tobacco water. Stake the plants when about 2 feet high. A good plant from a 7-9 bulb should have 3 to 5 flowers open at once, and 1-3 buds. After flowering, the bulbs are practically worthless. They may be planted in the border and may give a few flowers that season; and if well protected they may give some satisfaction for several seasons. If the bulbs are to be planted in the border, ripen them up in the pots by gradually withholding water. In rare cases they have been forced again the second winter, but the attempt is not to be advised except for experiment.

All the above remarks are intended for the true Easter or Harrisii Lily. Lately *L. longiflorum* itself has come into use for greenhouse work. It is usually more uniform, of lower growth, and a neater plant. It does not force so well, however, and is usually difficult to get for an early Easter. It should be in prime for Decoration Day. Some of these *Longiflorum* come from Bermuda and others from Japan. The Bermuda-grown Lilies are less reliable than formerly. It is probable that Cuba and the southern parts of the U. S. will grow the stock in time.

L. H. B.

The genus *Lilium* is distinguished by having flowers with the perianth of 6 distinct segments, deciduous, clawed, the claws usually distinctly grooved; stamens

6, equal, slightly adhering to the ovary below; anthers attached near the middle, dehiscant along the edges; style clavate, more or less curved; ovary sessile or nearly so, 3-celled, with many horizontal ovules. Succulent herbaceous plants, with scaly bulbs and leafy, upright stems; lvs. scattered or whorled; fls. showy, solitary, umbellate or racemose.

Subgenus I. **EULIRION**. Perianth funnel-shaped, with oblanolate segments, which are recurved only at the tip; lvs. linear or lanceolate, sessile or nearly so.

Subgenus II. **ISOLIRION**. Fls. usually single or umbellate; perianth erect, spreading; segments recurved only in the extended flower, but not revolute; stamens diverging from the straight style.

Subgenus III. **ARCHILIRION**. Perianth broadly funnel-form at the base; segments finally broadly spreading or twisted, revolute, usually prominently papillose within; stamens diverging from curved style.

Subgenus IV. **MAKTAGON**. Fls. strongly nodding, with perianth segments very revolute; stamens diverging; style curved.

Subgenus V. **PSEUDOMAKTAGON**. Inflorescence usually paniculate, with fls. tending to be erect or only slightly nodding; perianth funnel-form; segments slightly recurved at the tip, or finally recurved from the middle. American species.

Subgenus VI. **CARDIOCRINUM**. Lvs. stalked, cordate-ovate; perianth funnel-shaped, usually more or less irregular; segments oblanolate, recurved only at the apex.

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SUBGENUS I. EULIRION.

- A. Tube scarcely widened from base to middle.
- B. Lvs. linear, 1-nerved.
- C. Height 2 ft. or less 1. Philippense
- CC. Height 3 ft. or over.
- D. Fls. white; anthers yellow 2. Wallichianum
- DD. Fls. purplish or yellowish; anthers brown 3. sulphureum
- BB. Lvs. lanceolate, 3-nerved or more.
- C. With creeping subterranean stem 4. Neilgherrense
- CC. Stem usually erect from the bulb 5. longiflorum

AA. Tube widening gradually from base to neck.

B. Lvs. narrow-lanceolate, 1-nerved, not whorled.

C. Fls. white or pink 6. Japonicum

CC. Fls. purplish, especially outside 7. Brownii

BB. Lvs. broad lanceolate, 3-7-nerved, not whorled.

C. Fls. in spike, usually white 8. candidum

CC. Fls. few or solitary, yellowish or purplish 9. Nepalense

CCC. Fls. few or several, pink. 10. rubellum

BBB. Lvs. in whorls.

C. Fls. clear lemon-yellow. 11. Parryi

CC. Fls. whitish or pinkish or spotted 12. Washingtonianum

1. **Philippense**, Baker. Bulb perennial, ovoid; stem 1½-2 ft. high, slender, erect; lvs. 30-40, scattered; fls. solitary, horizontal, white, tinged with green toward the base outside, 5-6 in. long, trumpet-shaped. Philippine Islands. El. 3. Gn. 50:1097 (fine). B.M. 6250 (good). I.H. 41:16.—Little known in cult., but a promising species.

2. **Wallichianum**, Schult. f. Bulb large, long; stem 4-6 ft. high, stiff; lvs. 50-60, scattered, sessile, 3-5-nerved; fls. usually solitary, sometimes 2-3, horizontal or nearly so, white, slightly tinged with green, fragrant. Central Himalayas. El. 4. B.M. 4561. Gn. 10:44.—Somewhat difficult to grow, and on that account not popular; but a noble species well worth the pains of the amateur. Suitable for growing in shrubbery borders.

3. **sulphureum**, Baker. Bulb large, globose; stem erect, 4-8 ft. high; lvs. numerous, scattered, linear; fls. usually 2-3, pendent on long peduncles, fragrant, sulfur-yellow, tinged with red outside, 4-7 in. long. Burma. B.M. 7257. Gn. 54. p. 259 (as *L. ochroleucum*). R.H. 1895:541.—This is new to the trade, but promises to be a favorite with the amateurs.

4. **Neilgherrense**, Wight. Fig. 1277. Bulb globose; stem 1-2 ft. high, creeping at the base; lvs. 30-40, crowded, 3-5-nerved; fls. 1-3, ascending, white, fragrant, 5-6 in. long. India. El. 6. F.S. 22:266-67. Gn. 27:488. B.M. 6332. F.M. 1876:237.—A beautiful Lily, too little known in America. Difficult of cultivation.



1280. *Lilium elegans* (×¼). No. 17.

5. **longiflorum**, Thunb. Bulb globose; stem 1-3 ft. high, erect; lvs. 20-40, scattered; fls. often solitary, sometimes 2-3 or more, nearly horizontal, fragrant, waxy white. Temperate regions of Japan, China and Formosa.

El. 7. A.F. 11:1311; 12:1104. B.R. 7:560. L.B.C. 10:985. A.G. 19:709. Gn. 48, p. 386.—One of the best-known Lilies in cult. It has been used extensively for forcing, but for this purpose it is now generally superseded by the following variety:

Var. *eximium*, Nichol. (*L. eximium*, Court. *L. Hdrissi*, Carr.). BERMODA or EASTER LILY. Usually bears more and larger flowers than *L. longiflorum*, on more leafy stems. A.G. 18:297. A.F. 12:143. Gn. 30:556; 43, p. 165; 45, p. 215; 46, p. 73; 47, p. 172; 49, p. 481 and 52, p. 217. F.R. 1:679. G.C. III. 22:91. R.H. 1883:211.



1281. *Lilium tigrinum*.
($\times 1.5$.) No. 19.

Vars. *Takesima*, *Wilsoni* and *Liu Kiu* are offered. They are not sufficiently different from the type for ordinary cultivation.

6. *Japonicum*, Tsub. Fig. 1278. Bulb globose; stem 1-3 ft. high; lvs. 12-20, scattered, lanceolate, 5-7 nerved; fls. often solitary, sometimes 2-3, white on the inside, more or less tinged with pink or purple on the outside, fragrant, 3-5 in. long. Japan. El. 14. B.M. 1591. L.B.C. 5:438.—A fine, graceful species, much grown in gardens. There are several varieties, of which (excepting *roseum* below) *Alexandrae* and *Colchesteri* are the best. G.C. III. 14:243.

Var. *roseum*, Hort. (*L. Krameri*, Hort.). More slender and graceful than *L. Japonicum*, with beautiful pale rose-colored fls. B.M. 6058. F.M. 1874:105. F. 1874:13. F.S. 20:2061.—One of the most attractive flowers in the genus.

7. *Bröwnii*, Poit. (*L. Japonicum*, var. *Brownii* of many writers). Differs from *L. Japonicum* in having a more robust, vigorous habit, with leafy stalk and large fls., which are white inside and deep rich vinous purple outside. El. 8. Gn. 29:540 (as *L. Japonicum*); 38, p. 173; 47, p. 97. F.S. 21:2248, 2193 (as *L. Japonicum Colchesterii*). Gng. 4:193.—A favorite in gardens, and deserving of general culture. Specially recommended to beginners. Var. *leucanthemum* is offered. Gn. 47:1000.

8. *candidum*, Linn. MADONNA LILY. Bulb ovoid, large; stem lvs. scattered, sessile, acute, bract-like above; stem 2-4 in. high, erect, stiff; fls. 6-25 in a raceme, 3½-5 in. long and wide, pure white, fragrant. Southern Eu. El. 9. Gng. 6:369. G.C. III. 21:161. Gn. 45, p. 281; 53, p. 188; 56, p. 255.—One of the most orna-



1282. *Lilium Henryi*.
($\times \frac{1}{4}$.) No. 20.

mental species, and an old favorite, though considerably subject to disease. The following varieties are offered: fl. pl., maculatum, pleno-monstrosum, speciosum, spatatum, striatum.

9. *Nepalense*, D. Don. Stem 1-2 ft. high, stiff; lvs. scattered, lanceolate or linear, 5-7-nerved; fls. few or solitary, nodding, slightly fragrant, yellowish white, more or less tinged with purple, often with small scattered dots inside. Himalayas. El. 5. A.G. 13:249 (poor). Gn. 35:684. B.M. 7043. R.B. 22:3.—A magnificent Lily, suitable for the collector.

10. *rubellum*, Baker. Bulb globose; stem slender, bearing about 20 obscurely petioled bright green lvs., which are 5-7-nerved; fls. pink, unspotted, about 3 in. long and broad. Japan. Gn. 54:1197. G.C. III. 23:321 and 335. G.M. 41:477. A.G. 20:31.—Recently introduced to English and American gardens, and very favorably received. Promising. Said to force well.

11. *Párryi*, Wats. Bulb small, with jointed scales; lvs. linear-oblancoate, usually scattered; fls. horizontal, pale yellow, about 4 in. long, with spreading, recurved tips. San Bernardino county, Calif. El. 12. Gn. 18:264 (not typical); 49, p. 410. B.M. 6650. I.H. 33:595. G.C. III. 18:209 (habit not correctly shown).—Not uncommon in cult., and probably the finest yellow Lily of easy growth.

12. *Washingtonianum*, Kellogg. Bulb oblique, somewhat rhizomatous; stem 2-5 ft. high; lvs. in several whorls of 5-12 each, or sometimes a few scattered; fls. few, or sometimes as many as 20, on ascending pedicels, white, tinged with pink or red and dotted with purple, fragrant. Calif. El. 10. Gn. 20:310; 27, p. 344. J.H. III. 33:113.—One of the best Californian species for eastern gardens.

Var. *purpureum*, Mast. (*L. rubescens*, Wats.). Smaller and more slender, with smaller, more pinkish fls. and perianth segments less acute.



1283. *Lilium auratum*.
($\times \frac{1}{4}$.) No. 21.

El. 11. F.S. 19:1975. Gn. 20:310.—A striking variety which should perhaps be regarded as a separate species.

SUBGENUS II. ISOLIRION.

- A. *Lvs. more or less whorled*. 13. *Philadelphicum*
 AA. *Lvs. not whorled*.
 B. *Style shorter than ovary*. 14. *concolor*
 BB. *Style longer than ovary*.
 C. *Pl. papillose inside*.
 D. *Stem frequently bulbiferous*. 15. *bulbiferum*

DD. *Stem not bulbiferous*...16. *croceum*
 CC. *Fl. smooth inside, or*
nearly so.

D. *Lvs. broad lanceolate,*
crowded.....17. *elegans*
 DD. *Lvs. linear, scattered*...18. *Catesbaei*

13. *Philadelphicum*, Linn. Fig. 1279. Bulb annual, rhizomatous, small, with few thick, brittle scales: stem 1-3 ft. high, slender; lvs. 10-40, thin, glabrous, more or less whorled; fls. 1-4, terminal or umbellate, bright red, marked with scattered darker spots toward the center. From Canada to N. C. and west to the Rocky Mts. El. 17. B.R. 7:594. L.B.C. 10:976. B.M. 872 (as *Peunylvanicum*) and 579. G.W.F. A. 6.—*L. montanum*, Nelson, seems to be a western form, with broader lvs. *L. Masseyi* is a southern form, with narrower perianth segments. This is the most characteristic and widely distributed of our native Lilies. A charming wild flower. In fact, it is so acceptable simply as a wild flower that it has seldom been cultivated, though it takes readily to the garden. It is a very variable species. Some, at least, of the *L. Davuricum*, or *L. Dahuricum*, in the nursery trade belongs with *L. Philadelphicum*.

14. *concolor*, Salisb. Bulb perennial, ovoid, small; stem slender, 1 ft. or more high; lvs. 20-30, scattered, lanceolate, obscurely 7-nerved; fls. 1-3, erect, 1-2 in. long, spreading, bright scarlet, unspotted. China. El. 18. B.M. 1165.—One of the best for garden cult.; thrifty and easy to grow. Of graceful, upright habit and good for cutting.

Var. *Sinicum*, Hook. Taller, with larger bulb; fls. more numerous; perianth segments a little wider, bright scarlet with black spots. Southern Siberia. B. M. 6905. L.B.C. 17:1628 (as *L. Buschianum*).

Var. *pulchellum*, Baker. A slender yellow-fl. var., perhaps belonging with the next.



1286. *Lilium Martagon* ($\times \frac{1}{4}$).
 No. 25.

Var. *parthenelon*, Baker (*L. cordium*). A fine yellow-fl. var. One of the very best for cultivation.

15. *bulbiferum*, Linn. Bulb ovoid, perennial; stem 2-4 ft. high; lvs. scattered, the upper ones often bearing bulbils in the axils; fls. 1 to many, umbellate or somewhat racemose, on short, stout pedicels; perianth $1\frac{1}{2}$ -2 in. long, erect, spreading, bright red or dark orange, usually with some dull spots, papillose toward the center. Cent. Eu. El. 23. B.M. 36.

—This is one of the oldest in cult., and has run into many horticultural varieties, few of which, however, are known in this country. The only one named in American trade catalogues is *aurantiacum*. In Europe the species seems to be more commonly cultivated.

16. *croceum*, Choix. Bulb perennial, globose; stem 2-4 ft. high, vigorous; lvs. numerous, crowded, linear or lanceolate, 3-5-nerved, not having bulbils in the axils; pedicels ascending, white-cobwebby; fls. solitary, or 10-15, in an umbellate raceme, erect, funnelform, $2\frac{1}{2}$ -3

in. long, bright orange, conspicuously lamellar-papillose inside. Switzerland, France, northern Italy. Much cult., especially in Eu. El. 22. L.B.C. 8:784 (poor).—Closely related to *L. bulbiferum*, with which it is often confused. It seems to be confounded with *L. elegans*, also, at times. It is distinguished from the former by having stems devoid of bulbils, and from the latter by having the flower more distinctly papillose inside.



1285. *Lilium puberulum* ($\times \frac{1}{2}$). No. 24

17. *elegans*, Thunb. (*L. umbellatum*, Hort., not Pursh. *L. Dahuricum*, in part. *L. Thunbergianum*, Schultes, and many other synonyms). Fig. 1280. Bulb perennial, ovoid; stem 1-2 ft. high, stiff, erect, slightly cobwebby, or sometimes nearly glabrous; lvs. 20-30, scattered or crowded, 5-7-nerved; fls. 1-5, spreading, usually self-colored in some brilliant shade of yellow, orange or red. Japan. Sundry varieties are illustrated as follows: El. 19 and 20. Gn. 47, p. 415. F. 1868:121. F. S. 16:1627 (as *L. Thunbergianum*). Gn. 38:778. P. M. 6:127 (as *L. aurantiacum*). I. H. 12:459 (as *L. formosum*).

—Probably the most useful hardy species for general garden use. Very variable, with many striking varieties. Following are the best:

Var. *fulgens*, Baker (*L. Bdtmannia*, Wallace. *L. fulgens*, Morren. *L. sanguineum*, Hort.). A fine orange or salmon-red var., with perianth segments rather narrower than the type. One of the finest Lilies for color-massing. Thrifty and clean in the garden. Var. *atrosanguineum*, Bak. & Dyer. Very deep dark red. I. H. 14:503 f (as *L. hematocroium*). Var. *altitacum*, Bak. & Dyer (var. *Armeniacum*, var. *citrinum*, etc.). More or less clear yellow. F.S. 22:2319. Var. *bicolor*, Moore. Yellow at the center and reddish outwards. Var. *plenum*, Waugh. More or less double. F. 1871, p. 83. Var. *Wallacei*, Waugh (*L. Wallacei*). Small, dwarf, usually 1-fl., pale red; segments rather acute. There are dozens of other horticultural varieties, among which the best are Alice Wilson, Best Red, Incomparable, Van Houtte. These varieties are rather more distinct than in most species of Lilies.

18. *Catesbaei*, Walt. Bulb like that of *L. Philadelphicum*: stem 1-2 ft. high, slender, erect; lvs. 20-30, scattered, lanceolate; fls. usually solitary, erect, bright orange red, spotted; segments lanceolate, with long-attenuate tips. N. Car. to Fla. and west to Ky. El. 25. B.M. 259 (good). L.B.C. 9:807. R.H. 1868:431 (poor).—

A pretty plant, but not successful in cult., at least not in the northern states.

SUBGENUS III. ARCHLILION.

- A. *Lvs. sessile*.....19. **tigrinum**
 AA. *Lvs. short petiolate*.....
 B. *Fls. dull reddish*.....20. **Henryi**
 BB. *Fls. white, yellowish, or pinkish*.....
 C. *Fls. open funnelform, on rather short, straight pedicels*.....21. **auratum**
 CC. *Fls. on long, twisted pedicels; segments twisted revolute*.....22. **speciosum**

19. **tigrinum**, Andr. **TIGER LILY**. Fig. 1281. Bulb perennial, globose; stem 2-5 ft. high, somewhat whitish cobwebby; lvs. scattered, rich green, 5-7-nerved, the upper ones shorter and bearing bulbels in their axils; fls. 3-10, or sometimes more, in a wide raceme, nodding, bright red, thickly spotted with large purplish spots; perianth segments twisted, revolute. Japan and China.



1237. *Lilium maculatum* ($\times 1\frac{1}{2}$). No. 26.



1238. *Lilium superbum* ($\times \frac{1}{2}$). No. 27.



1239. *Lilium pardalinum* ($\times \frac{1}{4}$). No. 28.

El. 38. B.M. 1237. F. 1873:13.—A thoroughly old-fashioned and remarkably useful plant. It lives and thrives from year to year in the open border, where it should be planted in masses.

Var. **spléndens**, Leicht. A fine variety of more robust habit, with longer-flowering spikes. Gn. 27:480 and p. 152. F.S. 19:1931 (too dark colored). This is to be highly recommended. In most gardens it should be substituted for the ordinary Tiger Lily.

Var. **plenescens**, Waugh. An odd double var. R.H. 1873:10 (good). F. 1871:25. F.S. 19:1995. Other vars. are **Fortunei** and **Lishmanni**.

20. **Henryi**, Baker. Fig. 1282. Bulb globose; stem 2-6 ft. high; lvs. lanceolate below, more ovate above; inflorescence a lax corymb of 4-8 fls., bracteate at the base; fl. dark reddish yellow, marked with a few irregularly scattered brown spots. Ichang, western China. Gn. 40:830 (fine); 55, p. 233 (fine). G.C. 111. 8:380. B.M. 7177 (too light-colored).—Recently introduced to cult., and unquestionably one of the best Lilies known for general garden culture. The price of the bulbs still keeps many persons from planting it, and many others from massing it in large quantities, as it should be used for the best effect. It propagates so freely and proves so hardy that it will undoubtedly soon become cheaper, and find its way into common use. In habit and general ap-

pearance, it stands midway between *L. tigrinum* and *L. speciosum*. Its free and easy unconventionality of habit will endear it to the heart of the artist flower-lover. In this respect, it surpasses even *L. speciosum*.

21. **auratum**, Lindl. **GOLD-BANDED LILY**, JAPAN LILY. Fig. 1283. Bulb perennial, globose; stem 2-4 ft. high; lvs. 20-30, scattered, 5-nerved; fls. in a short raceme, with bracteolate pedicels, spreading; segments much reflexed and somewhat twisted, white, more or less marked with bands of yellow and spots of purple, strongly papillose. Japan. In sundry varieties illustrated as follows: Gn. 15:183; 16:212; 39, p. 455; 50, p. 148. R.B. 21:25. F.M. 1871:514. R.H. 1875:10; 1867:371. El. 15. B.M. 5338. A.G. 20:525. A.F. 7:43. Gng. 2:167; 4:53. G.C. 111. 25:303.—Several garden varieties have been described with botanical names, though none seems to be equal to the distinction. Trade varieties are:

imperiale, **macranthum**, **pictum**, **platyphyllum**, **rubro-vittatum**, **rubrum**, **speciosum**, **virginale**, **virginale album**, **Wittel**. The gold-banded Lily is a favorite in American gardens, where it is used in large quantities. It appears to best advantage massed and scattered amongst moderately tall-growing shrubs. It is of comparatively easy culture, but

does not live and thrive indefinitely, as *L. speciosum*, *Henryi* and *tigrinum* do.

22. **speciosum**, Thunb. (*L. lancifolium*, Hort.). Fig. 1284. Bulb perennial, globose; stem 2-4 ft. high, stiff; lvs. 12-20, scattered, very short-petiolate, oblong-lanceolate, 5-7-nerved; fls. 3-10, racemose, on divaricate, bracteate pedicels, white, more or less suffused with pink and dotted with red, strongly papillose toward the center; perianth segments much revolute. El. 13. B.M. 3785. Gn. 25:425; 33, p. 289; 45:947 and p. 90 (fine); 45, p. 91; 47, p. 19. R.H. 1843:492. B.R. 23:2000. This is probably the best species of all for general cult. It is thrifty and hardy, especially var. **rubrum**. The habit of the plant and flower is delightfully free and informal. The white and the red varieties are both grown extensively by the florists, and cut for sale. It has been extensively imported from Japan. There are numerous trade names current, most of which do not stand for important varieties. The ones of greatest concern are **Mel-pomene** and **Kretzeri**. The Lily known as "Opal" is a form of this species.

Var. **rubrum**, Hort., is a fine, extra strong growing sort, with darker pinkish red fls., and is the best for garden culture. Gn. 36:726.

Var. **album**, Hort. (*L. praecox*, Hort.), is white or nearly so and less thrifty. P.M. 8:127.

SUBGENUS IV. MARTAGON.

- A. *Foliage mostly whorled.*
 B. *Lvs. in small whorls of less than 8 or partly scattered.*.....23. **Columbianum**
 BB. *Lvs. nearly all in large whorls of 8 or more.*
 C. *Bulb large, horizontally elongated*.....24. **puberulum**
 CC. *Bulb small, globose.*
 DD. *Fls. purplish or whitish.*.....25. **Martagon**
 DD. *Fls. yellow, spotted.*.....26. **maculatum**
 DDD. *Fls. mostly reddish or dark orange.*
 E. *Color reddish or yellowish, dull black-spotted*.....27. **superbum**
 EE. *Color orange-yellow, with distinct round dark spots*.....28. **pardalinum**
 AA. *Foliage not whorled.*
 B. *Form of lvs. lanceolate; nerves many*.....29. **monadelphum**
 BB. *Form of lvs. linear; nerves one or few.*
 C. *Lvs. crowded.*
 D. *Perianth segments rather broad.*
 E. *Fls. red or yellow*.....30. **Maximowiczii**
 EE. *Fls. creamy white*.....31. **testaceum**
 DD. *Perianth segments narrow.*
 E. *Fls. whitish outside*.....32. **pomponium**
 EE. *Fls. red outside*.....33. **Chalcedonium**
 CC. *Lvs. scattered*.....34. **tenuifolium**

23. **Columbianum**, Hort. (*L. Nèyi*, Nutt. *L. parviflorum*, Holz.). Bulb perennial, ovoid, small; stem 1½-3 ft. high, slender; lvs. few, mostly in whorls of 4 or 5, the upper ones frequently scattered, oblanceolate, acute; fls. 2-3 or more, umbellate, on slender nodding pedicels; perianth 1½-2 in. long, bright orange, thickly spotted with small purplish dots; segments lanceolate, reflexed. Ore., Wash. El. 31. F.M. 1874:136, as *L. parviflorum* (not characteristic).—Not uncommon in garden collections, where it succeeds as well as any of the Pacific coast species. It is so slender of stem, sparse of foliage and small of flower, as grown in eastern gardens, that it does not give any mass effect. It looks best mixed in the border with hardy perennials.

24. **puberulum**, Duchr. (*L. Californicum*, Hort., not Domb. *L. Humboldtii*, Roez. & Leicht. *L. Bloomerianum*, Kell.). Fig. 1285. Bulb large, thick; stem 3-5 ft. high; lvs. in 4-6 large whorls of 10-15 lvs. each; fls. 6-10 or more, in a large panicle, on nodding, divaricate pedicels, bright orange-red, thickly marked with dark spots; segments strongly reflexed. Calif. El. 32. F.S. 19:1973, Gn. 20:314 and p. 568.—A noble, dignified, commanding plant, and one which ought to be cult. oftener. Rather formal in appearance.

25. **Martagon**, Linn. (*L. Dalmatium*, Vis.). TURK'S CAP LILY. Fig. 1286. Bulb perennial, ovoid; stem 2½-5 ft. high; lvs. in 2-4 whorls of 3-9 each, sometimes a few scattered, sessile, with 7-11 nerves; fls. 3-20, in a long, loose, bracteate raceme, nodding, fragrant, varying in color from purple to dirty white, spotted or unspotted; segments lanceolate, strongly revolute. El. 33. Gn. 23:371; 38, p. 393; 44:927 (as *L. Dalhousoni*). B.M. 872 and 1634. F.M. 1874:136. F.S. 20:2127 (as *Martagon Dalmatium*).—Much cult. in Europe, less in America. It has many horticultural varieties, but the only one in our catalogues is **album**. The plant is vigorous, upright and thrifty, with good foliage, but the fls. are small, dull-colored and not showy, as compared with our more popular kinds.

26. **maculatum**, Thunb. (*L. Hansoni*, Liecht.). Fig. 1287. Bulb perennial, globose, compact; stem 3-4 ft. high; lvs. oblanceolate, acute, frequently in a single whorl of 8-12, or some scattered, sometimes several whorls; fls. 4-12, in a loose raceme, on erect, spreading pedicels, bright orange, conspicuously spotted with purple on the lower half. Japan. El. 34. E.M. 6126 (good). Gn. 29, p. 287. R.H. 1883, p. 296.—One of the thriftiest

and hardiest species known. It is a trifle high-priced for general planting, but is worthy a place in every garden. It is one of the most formal and dignified of Lilies.

27. **superbum**, Linn. AMERICAN TURK'S CAP LILY. Fig. 1288. Bulb large, globose; stem 3-6 ft., tall, erect; lvs. often in whorls, sometimes more or less scattered, 3-5-nerved; fls. 6-12, or even more, paniculate, bright reddish orange, conspicuously spotted; perianth segments lanceolate, acute. Canada to Georgia and west to the Mississippi river. El. 26. B.M. 936 (good). L.B.C. 4:335 (as *L. autumnale*). Gn. 30, p. 8 (fine); 30:551 (fine); 38:781. Mn. 8:1 (fine).—Frequently cult. Useful in borders.

Var. **Carolinianum**, Chapm. (*L. Carolinianum*, Michx.). Smaller, more slender, with fewer fls. and broader lvs. A southern variety, in dry woods, Va. to Fla., and west to La.

28. **pardalinum**, Kellogg (*L. Californicum*, Donh.). Fig. 1289. Bulb short, rhizomatous; stem 2-3 ft. high; lvs. mostly near the middle of the stem, in 3-4 whorls of 9-12 lvs. each, with a few scattered; fls. 3-10, loose corymbose, on long, nodding pedicels, bright red with orange toward the center, strikingly marked with large purplish brown spots; perianth segments strongly revolute, somewhat papillose. Calif. El. 28 and 29. F.M. 1872:33 (as *L. Washingtonianum*). Gn. 20:312 and p. 526.—A magnificent garden flower, not commonly grown, though adapted to general cult. Var. **angustifolium**, Kellogg, has narrow, scattered lvs. Var. **Warei**, Hort., has yellow fls. Gn. 29:547.

29. **monadelphum**, Bieb. (*L. Scovitzianum*, Fisch. & Lall. *L. Colchicum*, Hort.). Bulb perennial, ovoid; stem 2-5 ft. high; lvs. 30-50, scattered, linear-lanceolate or oblanceolate, many-nerved; fls. 2-12, sometimes 20-30, in a raceme, nodding, bracteate, fragrant, yellow, with a few small spots, and tinged at the base and tip with



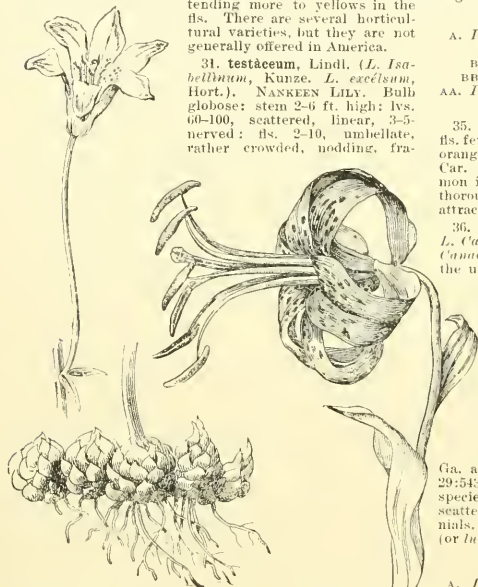
1290. *Liliium pomponium* ($\times \frac{1}{2}$). No. 32.

purple. Persia. El. 36 and 37. B.M. 1405. Gn. 9:9 (as *L. Scovitzianum*); 39:796. G.C. III. 16:129.—A pretty species, but not much grown in this country. Var. **Lédebouri**, Baker. Dwarfier than the species, with narrower linear lvs. Caucasus.

30. *Maximowiczii*, Regel (*L. Leichtlinii*, Hook. *L. Pseudo-tigrinum*, Carr.). Bulb globose; stem 2-3 ft. high, slender, decumbent at base; lvs. 30-40, scattered, linear, 3-nerved; fls. few, in a loose corymb, on spreading pedicels, bright lemon-yellow, light orange or red, thickly dotted with dark purple and tinged with purple on the outside; segments strongly revolute. Japan. El. 39 and 40. B.M. 5673. L.H. 15:540. R.H. 1867:410. F.S. 17:1736, yellow variety. Gn. 21:331, yellow variety; 42 p. 193 (not typical).—A fine garden plant having much the same habit and cultural qualities as *L. tigrinum*, but

tending more to yellows in the fls. There are several horticultural varieties, but they are not generally offered in America.

31. *testaceum*, Lindl. (*L. Isabelinum*, Kuhn. *L. excelsum*, Hort.). NANKEN LILY. Bulb globose; stem 2-6 ft. high; lvs. 60-100, scattered, linear, 3-5-nerved; fls. 2-10, umbellate, rather crowded, nodding, fragrant.



1291. *Lillium parvum*. Nat. size. No. 36.

1292. *Lillium Canadense*. An old flower. ($\times \frac{1}{2}$).

grant, creamy yellow, with sometimes a few minute reddish dots. El. 44. B.R. 3:11 (too highly colored). P.M. 10:221.—Not known in the wild state, and generally said to be a hybrid between *L. candidum* and *Chalcodonicum*. If this is a true hybrid it is the only one known in cult. A fine, stately plant, with unusually attractive flowers.

32. *pomponium*, Linn. (*L. rubrum*, Lam.). Fig. 1290. Bulb ovoid, with several lanceolate scales; stem 2-3 ft. high, thick, stiff; lvs. 100 or more, scattered, narrow-linear; fls. 2-15, racemose, nodding, often bracteolate, cinnabar-red, thickly spotted and papillose within, fragrant. N. Italy and S. France. G.C. III. 8:51. Gn. 20:307 (fine). El. 45.—Adapted to the hardy border, where it shows well in masses or scattered. An excellent Lily for garden planting, especially the yellow var. *aurant.* Hort.

Var. *Pyrenæicum*, Baker (*L. Pyrenæicum*, Gouan). A more robust plant, with wider lvs. distinctly 3-nerved; ds. larger, yellow. Pyrenees. El. 46.

33. *Chalcodonicum*, Linn. Bulb ovoid; stem 3-4 ft. high, stiff; lvs. 100 or more, crowded, 3-5-nerved, with the edges and veins below distinctly papillose; fls. few in a raceme, nodding, bright red, unspotted, or sometimes with minute dots, rarely yellow. Greece. El. 43. F.S. 21:2160. B.M. 30.—An excellent garden plant, and

destined to become more popular in America. Here belongs *L. Heidebrechi*.

34. *tenuifolium*, Fisch. SIBERIAN CORAL LILY. Bulb small, globose; stem 1-2 ft. high, slender; lvs. 20-50, scattered, very narrow-linear, with revolute margins; fls. 1-20, racemose, nodding, rich scarlet, self-colored; segments much revolute. Siberia. El. 42. B.M. 3140. L.B.C. 4:358, as *L. pumilum* (poor).—A deserving favorite. Very easily pro. either from seeds or bud scales. Fine for massing. Especially suitable for beginners.

SUBGENUS V. PSEUDOMARTAGON.

- A. Perianth narrow; segments only slightly spreading at the tip.
 B. Fls. dull reddish brown 35. *Grayi*
 BB. Fls. bright reddish brown 36. *parvum*
 AA. Perianth spreading; segments rotate spreading or slightly recurved 37. *Canadense*

35. *Grayi*, Wats. Lvs. lanceolate, in whorls of 4-8; fls. few or solitary, $1\frac{1}{2}$ -2 in. long, dull reddish brown or orange, covered inside with purplish spots. Va. and N. Car. G.F. 1:19. B.M. 7234.—Becoming somewhat common in gardens. Closely allied to *L. Canadense*, but thoroughly distinct as a garden plant. Not showy, but attractive to the amateur. Of easy cult.

36. *parvum*, Kellogg (*L. Canadense*, var. *Wälkeri*. *L. Canadense*, var. *parvum*). Fig. 1291. Bulb of *L. Canadense*; stem 1-2 ft. high; lvs. partly whorled, or the upper ones scattered; fls. few or many, upright or nearly so, bright reddish orange, thickly dotted. Sierra Nevada, Calif. El. 30. B.M. 6146. F.S. 21:2192. J.H. III. 31:113 (poor).—A pretty and interesting species, but not sufficiently showy in cult. to suit the average gardener. Var. *floræ pleno* is offered.

37. *Canadense*, Linn. Fig. 1292. Bulb annual, rhizomatous; stem 1-4 ft. high, slender, erect; lvs. oblanceolate, acute, 5-7-nerved, usually mostly in whorls; fls. 1 to several, usually somewhat umbellate, 2-3 in. long, in various shades of yellow, orange and red, with numerous dark spots. Eastern N. A., from New Brunswick to Ga. and west to the Mississippi river. El. 27. Gn. 29:543 (good); 34, p. 182. B.M. 858 (poor).—A good species for garden use. Excellent for massing or for scattering in borders of shrubbery or of hardy perennials. Variable. Var. *rubrum* has red fls. Var. *flavum* (or *leucom*) has yellow fls. B.M. 800.

SUBGENUS VI. CARDIOCRINUM.

- A. Lower lvs. tinged with red 38. *cordifolium*
 AA. Lower lvs. clear green 39. *giganteum*

38. *cordifolium*, Thunb. Bulb perennial, globose; stem 3-4 ft. high; lvs. at the base cordate, long-petiole, tinged with red; stem-lvs. cordate-ovate, short-petiole; fls. 3-10 in a short raceme; perianth narrow, funnelform, 3-5 in. long, white, with large, violet-brown patches on the lower half of the outer segments. Japan. El. 1. G.C. III. 8:41. B.M. 6337.—Sometimes found in collections, but difficult of cult., particularly in this country.

39. *giganteum*, Wallich. Bulb globose; stem 4-10 ft. high; radical lvs. green; stem lvs. 12-20, scattered, ovate, acute, deeply cordate at base, reticulate veined, petiole; fls. 12-20 in a raceme, slightly nodding, white, tinged with purple inside and green outside, fragrant, 4-5 in. long. Himalayas. El. 2. G.F. 6:376. B.M. 4673. F. 1874, p. 79 (poor). R.H. 1861, p. 310. I.H. 1, p. 11. G.C. III. 8:47 (good); 16:754. Gn. 8, p. 564 (c. p.); 34, p. 269 (good); 52, p. 226; 54, p. 186 (doubtful).—Found only in large collections. Very difficult of cult.

L. avenacense, Fisch. One-2 ft. high; lvs. few, scattered or somewhat whorled; fls. few, nodding, small, revolute, bright reddish yellow, with a few blue dots. Gu. 24, p. 85. Japan, Kamchatka and vicinity.—*L. Bakerianum*, Coll. & Hemsl. An Indian species not yet in cult. Belongs in subgenus *Isobrium*.—*L. Bolanderi*, Watson. Bulb ovate; stem 6 in. to 3 ft. high; fls. 2, horizontal or slightly nodding, dingy purple or dark brownish red, dark spotted, about 1 in. long. Calif. Rare. A fine curiosity for the collector but not a gardener's plant.—*L. callistum* Sieb. & Zucc. Bulb small, perennial; stem 1-3 ft. high; 30-40, scattered, linear, 3-5-nerved; fls. 2-12 in a narrow raceme, on

short nodding pedicels, bright scarlet. Japan and Loo-Choo Islands.—*L. Carniolicum*, Berni. Bulb ovoid; stem 2-3 ft.; lvs. 30-40, scattered, many-nerved, with ciliate margins; fls. racemose, nodding, 2 in. long, orange or red. Europe. Rare in cult. *El. 45.—L. Clatpouense*, Hort.—*L. primuminum*—*L. Parvifid.* Panch. Known only in herbolarium.—*L. Delavayi*, Franchet. A Chinese species recently discovered, and not yet offered for sale. Fls. wine red, somewhat the form of *L. longidorum*.—*L. Fargesii*, Franchet. Small, long, yellow fls. Subgenus Martagon. Recently from China, and not yet in the trade.—*L. formosense*, Franchet. A species recently discovered in China, resembling *L. bulbiferum* and elegant, but having white fls. Not introduced.—*L. Lankouense*, Franchet. Newly discovered in Yun-nan, China. Not introduced. Subgenus Martagon.—*L. Lovii*, Baker. A new Burmese species, having 2-3 white fls. somewhat resembling *L. candidum*. Not yet introduced. B.M. 7223. G.C. III. 45:953. G.C. III. 11:121.—*L. maritimum*, Kellogg. Bulb small, conical; stem low; lvs. usually scattered, narrow, often obtuse; fls. solitary or few, horizontally, 1-2 in. long, deep reddish orange, spotted. Calif.—*L. medeoloides*, Gray. Stem slender, 1-2 ft.; lvs. several, whorled, whorled, sometimes bright orange-red with a few spots. Japan, Korea. Rare or unknown in cult.—*L. mirabile*, Franchet. A new species of the subgenus *Cardiocrinum* recently found in Su-Teluen, China. Not introduced.—*L. myriophyllum*, Franchet. Recently discovered in China. Said to be a "mild" species, recalling *L. Wallichianum*. Not yet in the trade.—*L. nitidum*, Hort. Bulb oblong, subrhizomatous, with crowded appressed lanceolate scales; stem 18-24 in. high; lvs. lanceolate, scattered and in whorls; fls. 10-20, bright yellow with many red-brown spots. Not in American gardens.—*L. occidentale*, Parry. Bulb rhizomatous; stems 2-4 ft.; lvs. scattered below, but in whorls at the middle of the stem, lanceolate, acute; fls. few to 15, orange-red, with crimson tips and black spots. Calif.—*L. uchraceum*, Franchet. Chinese, recently discovered, not introduced.—*L. ornatum*, Baker. One 1½ ft. tall; lvs. 20-30, scattered, lanceolate-linear; fl. wide funnel-shaped, or nearly rotund, purplish, tinged with green beneath, somewhat dotted inside. Western Himalayas. Not in cult. *El. 5.—L. papilliferum*, Franchet. A recently named species from Yun-nan, China. Not in the trade. Fls. dirty red. Belongs with *L. speciosum*, etc.—*L. polyphyllum*, D. Don. Three-4 ft. high; lvs. 40-60, scattered; fls. 4-10, in a loose raceme, on nodding pedicels, yellow, with purplish spots. Himalayas. I.H. 32:565.—*L. primuminum*, Baker. A new species from Burma, with pale yellow fls., somewhat resembling *L. Nepalense*. B.M. 7227. G.C. III. 11:121. Bulb like *L. umbrianum*; stem 5-6 ft. high; lvs. lanceolate, mostly in whorls; fls. few to 10, horizontal, orange-red, thickly dotted, fragrant. Washington and British Columbia.—*L. Sutchuense*, Franchet. A new Lily of the tenaifolium style, with 1-3 reddish orange flowers spotted with black. Recently discovered in Su-Teluen, China, not introduced. B.M. 7315.—*L. Tansuense*, Franchet. A recently discovered species of the subgenus Martagon. Fls. white or whitish. China. Not in commerce.—*L. Yunnanense*, Franchet. A white-fl. species, somewhat resembling *L. Japonicum* recently discovered in China. Not yet in the trade. F. A. WAUGH.

LILAC. See *Syringa*.

LILY, in the narrowest sense, is restricted to the genus *Lilium*, but the popular names given below also include plants outside the family Liliaceae. Many of them belong to the Anaryllis family. African Blue *L.*, *Agapanthus umbellatus*. African Corn *L.*, *Lilia*. Amazon *L.*, *Eucharis Amazonica*. American Turk's Cap *L.*, *Lilium superbum*. Atamasco *L.*, *Zephyranthes Atamasco*. Barbadoes *L.*, *Hippeastrum equestris*. Belladonna *L.*, *Amaryllis Belladonna*. Bengal *L.*, *Crinum longifolium*. Bermuda *L.*, *Lilium Harrisii*. Black *L.*, *Fritillaria Camtschatcensis*. Blackberry *L.*, *Belamanda Chinensis*. Bourbon *L.*, *Lilium candidum*. Brisbane *L.*, *Eurycleris sylvestris*. Calla *L.*, *Richardia Filiflora*. Cape *L.*, *Crinum Capense*. Checkered *L.*, *Fritillaria Meleagris*. Climbing *L.*, *Gloriosa* and *Litonia*. Common White *L.*, *Lilium candidum*. Day *L.*, the blue and white ones are *Funkias*; the yellow and orange ones *Hemerocallis*. Easter *L.*, *Lilium Harrisii*. Fairy *L.*, *Zephyranthes rosea*. Faya *L.*, *Ombocaulis aculeata*. Golden-banded *L.*, *Lilium auratum*. Golden-rayed *L.*, *Lilium auratum*. Gnerney *L.*, *Nerine Sarpisensis*. Jacobean *L.*, *Sprekelia formosissima*. Kaffir *L.*, *Schizostylis coccinea*. Mariposa *L.*, *Calochortus*. Martagon *L.*, *Lilium Martagon*. Orange *L.*, *Lilium croceum*. Peruvian Swamp *L.*, *Zephyranthes candida*. Plantain *L.*, *Funkia*. Pond *L.*, *Nuphar advena*. Sacred *L.* of China, *Narcissus Tuzetta*, var. *orientalis*. Spider *L.*, *St. Bernard's L.*, *Athericum Liliago*. St. Bruno's *L.*, *Paradisa Liliustrum*. St. James' *L.*, *Sprekelia formosissima*. St. Joseph's *L.*, *Lilium candidum*. Tiger *L.*,

Lilium tigrinum. Turban *L.*, *Lilium pomponium*. Turk's Cap *L.*, *Lilium Martagon*. Water *L.*, *Nymphaea*. White *L.*, *Lilium candidum*.

LILY-OF-THE-INCAS. *Astrameria Pelagrina*. See, also, *Hymenocallis* (Ismepe).

LILY-OF-THE-PALACE. *Hippeastrum autium*.

LILY-OF-THE-VALLEY. *Convallaria majalis*.

LIMATODES (probably from the Greek for meadow, referring to the habitat of the plants). *Oreohidiceae*. Similar to *Calanthe*, but the spurred labellum is not adnate to the column but closely wrapped around it. In Phajus, and in *Calanthe* also, the lvs. are not articulated to the stem and therefore wither on the plant instead of falling.

After resting season of Limatodes is over, say from February to May, shake off the old potting material. If plants are large, divide them and pot them moderately tight. For the American climate, chop finely some good, turfy loam well mixed with old rotten cow manure and a little leaf mold and sharp sand and place in a shaded house, temperature 70° to 90°. Do not water till roots are well out, and sparingly till leaves are well started. After that and during flower-sheath growth, they will enjoy profuse waterings and spraying—water with weak liquid at intervals of 10 days or so, and every plant will be a marvel of beauty.

rosea, Lindl. (*Calanthe rosea*, Benth.). Pseudobulbs 4-8 in. long, pyriform or fusiiform, grooved; lvs. 2-8 in. long, elliptic-lanceolate, acuminate, plicate; scape from the base of the pseudobulb, 12-18 in. long, slender, bearing a many-fl. villous raceme; fls. large, rosy, 1½ in. across; sepals ovate-lanceolate; petals oblong, acute; lip 1½ in. long, with a large obovate-oblong midlobe; base yellow, edged with scarlet. Jan. Burma. B.M. 5312.—A hybrid of this species and *Calanthe vestita*, Lindl., is common in cultivation under the name *Calanthe Veitchii*, Lindl., which see. John Saul said *L. rosea* bore fls. as large as those of *Calanthe Veitchii*, and more brilliant in color.

HEINRICH HASSELBERG and WM. MATHEWS.

LIME. The use of Lime in agriculture antedates the Christian era. In modern times it has been an indispensable adjunct to potassic, phosphatic and nitrogenous manures in restoring and maintaining the fertility of immense areas of soil derived from sandstone, granite, mica schist and certain shales and slate. Without its use the wonderful transformation of Limousin in France, the sandy regions of Germany, and particularly the reclamation of the sour peat (Hoeh-moor) soils of northern Germany would have been difficult or impossible. Even limestone soils sometimes become so lacking in Lime near the surface that they stand in great need of its application.

The necessity of Lime as a direct food for the higher orders of plants has been indisputably demonstrated. Its physiological role is of the greatest significance. It serves also as an indirect food by transforming or setting free other soil ingredients which plants require. (1) It aids in transforming the nitrogen of organic matter and ammonium salts into nitric acid, which, in combination with potash, soda, Lime and magnesia, furnishes most plants the major portion of their nitrogen. (2) It appears probable that liming favors symbiosis and the consequent assimilation of atmospheric nitrogen in the case of clovers, alfalfa and certain other legumes, while it may have an opposite effect upon others, among which may be mentioned serradella and lupines. (3) Lime attacks certain more or less inert combinations of potash and of phosphoric acid which exist in soils, thereby rendering their manurial constituents more readily assimilable.

Noxious iron compounds in soils are so acted upon by Lime as to overcome their poisonous tendency. The presence of carbonate of lime in soils prevents the formation of sour humus and consequent injury to a large class of agricultural plants. Liming makes clays more friable and sandy soils more compact, thus im-

proving the texture of each. By the flocculation of the fine particles of the former, water drains off more readily, and the danger of serious washing is thus diminished. Soluble phosphates are less liable to be lost or changed into unassimilable forms in soils containing Lime. Large quantities of Lime should not be employed upon sandy soils in a single application. The repeated use of highly magnesian Lime is fraught with danger, though, applied occasionally in the place of ordinary Lime, it may prove beneficial. The use of Lime, whether in wood ashes or from other sources, increases the tendency to alkalinity of the soil, and hence makes it more favorable to the development of potato scab, provided the fungus which causes the disease is already in the soil, or is introduced into it upon the "seed" tubers. The disease which develops upon turnips and certain other plants, known as "club foot" or "club root," is less noted to a marked degree by the use of Lime upon the soil.

Lime is usually applied to land at rates ranging from half a ton to two and one-half tons per acre, and at intervals of from four to six years. It should be thoroughly worked into the surface soil after plowing. Upon sandy soils it is applied with the greatest safety after composting with organic matter.

The value of Lime in preparing composts has long been known. Mixed in layers with loam, weeds, manure, coarse stable manure and other vegetable or animal matter, it forms in a few months, if kept moist, an excellent material for the use of gardeners. If worked over a few times at intervals, the operation is materially hastened. The introduction of a little common salt or of muriate of potash facilitates the process by virtue of the formation of carbonates of soda or of potash. In order to prevent loss of ammonia, compost heaps are usually kept covered with moist earth with which gypsum or land plaster may often be advantageously mixed.

The influence of Lime on plant-growth is often astounding. Lettuce, spinach, beets, onions, muskmelons, asparagus, clovers, timothy, Kentucky blue grass and poppies are almost failures upon very acid soil until liming is practiced. Watermelons, lupines, serradella, cranberries, rhododendrons, azaleas, the Norway spruce and other plants might be cited that are known to be injured or ruined by considerable applications of Lime. Their natural home is upon a sour soil. The Early Richmond cherry, though helped somewhat by liming, succeeds upon very acid soil, while the Black Tartarian fails under similar circumstances. The Delaware grape is more in need of Lime than the Concord. Blackcap raspberries do not seem to be helped by liming, even upon very acid soil, though the Cuthbert, a red raspberry, responds to the treatment in a marked manner. The quince is more in need of Lime upon acid soils than the pear, apple or peach. The American Linden and American elm are thankful for Lime upon acid soils, while the white birch shows utter indifference to it. The success of the beech upon the limestone soils of Europe indicates its natural home. Chestnut trees are said not to thrive well on limestone soils. Gooseberries and currants are moderately helped by liming on very acid soils. Strawberry-berries exhibit this characteristic only in a slight degree.

Rhode Island owes its reputation as the home of Rhode Island bent to the fact that this grass can persist upon soil where many other grasses fail, and hence it has won in the struggle for existence. Had the soil been well supplied with Lime it is not probable that such would have been the case. Upon very acid soils, there is little fear that the poppy would ever become a pernicious weed, as is the case in many of the wheat fields of Europe. Such soils are, however, the natural home of common sorrel. The conditions favorable to the poppy are also favorable to wheat. Barley fails upon very sour soils. Oats succeed except upon extremely acid soil, though even soils of that character produce good crops of rye and Indian corn.

He who will use Lime intelligently must study carefully the peculiarities of his soil, and of the plants that are to be grown.

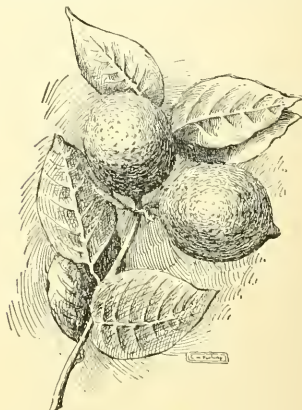
H. J. WHEELER.

LIME (FRUIT) of literature is mostly *Citrus Limetta* of Bisso, or Sweet Lime, which is now regarded as a form of *C. Medica*. The Sour or West Indian Lime (dis-

cussed below) is a much sourer fruit and is *Citrus Medica*, var. *acida* (see p. 325, Vol. 1), Fig. 1293.

The Sour Lime is a useful member of the orange tribe, valuable for its acid fruits, which are prized above lemons in tropical countries for making cooling drinks and for cookery. Limes are also largely used in the manufacture of citric acid. The tree is low, much branched and very thorny, thriving on poorer, rockier soil, and in closer proximity to salt water than other members of the citrus tribe. In orchard planting the trees are set about 15 x 25 feet apart, and cultivation given them the same as for lemon and orange trees.

The variety most commonly grown is a small-fruited, very prolific sort, ordinarily grown from seed and called "West Indian." The fruits of this sort are shipped from



1293. Sour Lime—*Citrus Medica*, var. *acida* ($\times \frac{1}{2}$).

lower Florida and the West Indies to Atlantic coast cities in quantity during summer and autumn. There are several good varieties beside the common "West Indian," all of which are propagated by budding or grafting on strong stocks of various kinds, but especially upon rough lemon and sour orange. Among the best known and valuable may be named Tahiti, which has large, smooth fruits almost the size of lemons and Sour Rangpur, the "Mandarin Lime," in shape and character of fruit much like the China Mandarin, but with intensely acid juice. There are a number of sorts from India being experimented with in Florida, but which are not as yet well tested. The Lime, in almost all varieties, is more tender as regards cold than even the lemon, not being able to withstand sharp frosts without damage. The Sour Rangpur (from India) is an exception, and has proved to be almost as hardy as the sweet orange tree, and has fruited freely in the upper orange belt of Florida. Doubtless by budding or grafting Limes on the *Citrus trifoliolata* as a stock, the trees will be able to stand more severe frosts than when worked on more tender roots.

E. N. REASONER.

The Lime is but little grown in California. In early days it was freely planted, largely in hedge form around orange groves. Its susceptibility to injuries from low temperatures, which did not harm the orange and lemon, caused its abandonment in our chief citrus fruit regions, and no effort was made to restore the acreage in frostless localities, because the supply from Mexican regions keeps local prices so low as to offer no profit to California growers. At present the Lime has no commercial standing as a California fruit, though several varieties are grown in a few places for home use.

E. J. WICKSON.

LIMNANTHEMUM (Greek, *marsh flower*). Including *Vallisneria*, *Gentianaceae*. FLOATING HEART. About 20 species of aquatic plants, widely scattered in tropical and temperate regions. They have 5-petaled white or yellow fls., borne in spring and summer. Floating or creeping: lvs. ovate or orbiculate, heart-shaped at the base, rarely peltate, with a closed sinus, entire or slightly wavy; peduncles with 1, 2 or many fls.; corolla wheel-shaped, deeply 5-cut; lobes fringed or not; stamens 5, fixed at the base of the corolla. Distinguished from *Menyanthes* by having the capsule 4-valved instead of irregularly 2-valved. Four hardy kinds are procurable from dealers in aquatics and native plants.

*Limnanthemum*s are most useful ornamental aquatic plants, and are represented in cultivation by but four species. *L. lucuosum*—Floating Heart—is the hardiest of American species; its mottled, variegated leaves, about 2 in. broad, are very attractive, regardless of its dainty, white, miniature flowers. It is best grown under natural conditions, in pools and still water, and in water about 2 ft. deep. It may also be grown in tubs, as a surface covering, with a few tall plants in the center. *L. trachyspermum*, commonly known as the Fairy Water-Lily, is a much stronger grower; lvs. deep green, and, when grown in natural ponds, attain large proportions, 4-6 in. broad, and bears innumerable flowers, more like flakes of snow. It is also valuable for tub culture, similar to the preceding variety. *L. Indicum*, commonly called Water Snowflake, is undoubtedly the most interesting and attractive of any, and deserving of most general cultivation. The leaves are of a light green color, heart-shaped, and it produces flowers in greater abundance, which are much larger and covered completely with hirsute glands. These, like the other varieties, are produced in clusters on the petioles, near the surface, and, although they are of but one day's duration, they are produced in such quantities that there is never any lack of these delicate flowers all through the season. In tub culture, this variety (or species) will soon crowd itself over the edge of an ordinary tub, and, although the leaves no longer float on the surface, it does not affect the growth or the prolificness of its flowering. When grown in tubs, the latter should be filled two-thirds with moderately rich, loamy soil, covered with sand, and filled and kept filled with water. All three species, when strong enough to produce flowering leaves or petioles, produce new shoots, as each cluster of flowers apparently terminates with a bud and produces leaves; these, when strong, produce flower buds and leaf buds again, and thus soon reproduce themselves. *L. trachyspermum* produces a cluster of fleshy roots, with a bud from single leaves in fall, which are plentiful in Florida in the season. These are excellent for distribution, and can be sent safely a great distance. The petioles are very brittle and easily snap off, but the floating leaf soon emits roots at the broken end as well as where the flower buds are located; thus it is very free and prolific. These are very desirable aquatic plants.

The fourth species, *L.* (or *Vallisneria*) *nymphoides*, is a rampant, woody plant, although its mottled foliage is beautiful and the flower is much larger than those of the above plants. Its habit of growth is also different; it produces runners, and rambles over an immense space; it also produces seed in great quantity, which, when ripe, floats on the surface for a short time, then sinks to the bottom; it is best confined to the limits of a tub, where it grows freely and produces its large yellow flowers in profusion. It is hard to eradicate when once established, as it is perfectly hardy.

A. Color of fls. yellow.

B. Fls. accompanied by clusters of tubers.

lacuosum, Griseb. Stems sometimes 10 ft. long; lvs. purplish beneath, 1-2 in. long; fls. 3-6 lines across; segments ovate, acute; seeds smooth. July, Aug. Ponds, Nova Scotia to Fla. and La., west to Minn. B.B. 2: 622.

BB. Fls. not accompanied by clusters of tubers.

nymphoides, Hoffmg. and Link. (Also written *L. nymphoides*.) Lvs. 2 in. broad; fls. 1 in. across or more; segments obovate, short-fringed. May-July.

Eu., Asia; naturalized in District of Columbia. B. B. 2: 623. Gn. 24, p. 335.—Simulates *Limnocharis Humboldtii* in habit.

AA. Color of fls. white.

B. Seeds rough.

trachyspermum, Gray. Stoutest and larger than *L. lucuosum*: lvs. cordate orbicular, thick, entire or repand, 2-6 in. long, spongy; tubers thick: fls. 6-10 lines broad. Apr.-July. N. J. to Fla. and Tex. B. B. 2: 623. —"Fairy Water Lily" is a nursery catalogue name.

BB. Seeds smooth.

Indicum, Thw. WATER SNOWFLAKE. Fls. white, yellow towards the base within; segments fimbriated, densely papillose, without a longitudinal fold down the middle. Tropics. Not B. M. 658, which is a yellow-fl. species.

WM. TRICKER and W. M.

LIMNANTHES (Greek, *marsh flower*). *Geraniaceae*. Two or 3 species of American annuals growing near the water. Low, diffuse, rather fleshy; lvs. pinnate; fls. white, yellow or rosy, solitary on axillary peduncles, 1 in. across; fls. regular, the parts in 5's; sepals valvate in the bud; glands alternating with the petals; stamens 10; carpels distinct, at first fleshy, at length hard and wrinkled, indehiscent, separating from the short axis; ovule solitary.

Douglassi, R. Br. Lvs. pinnate; lfts. sharply lobed or parted; lobes linear; petals oblong-spatulate, notched at apex, more or less yellow, white toward the tip; fr. smooth or slightly corrugated. Calif. B. M. 3554. B. R. 20: 1673.

LIMNOBIUM (*living in pools*, from the Greek). Including *Trianea*, *Hydrocharidaceae*. Three or four American aquatic herbs, one of which is in the Amer. trade. Stemless plants, spreading by means of runners, the large leaves floating. Monocious, the fls. arising from spathe borne on the rootstock, the pistillate single from a spathe and the staminate 2-4 from a spathe, all with 6 white segments or petals, the inner ones being very narrow; stamens in a column, bearing anthers at unequal heights; ovary with several (6-9) locules and as many stigmas, ripening into a many-seeded berry.

Bosci, Rich. (*L. Spöngia*, Steud.). AMERICAN FROG-BIT (the European Frog's-bit is *Hydrocharis*). A neat floating plant, with purplish, hanging, hairy roots and long-stemmed, cordate or ovate lvs. 1-2 in. long and purplish beneath. Lake Ontario, south and west. Good for the aquarium.

Limnobium Bosci, while it is hardy southward, does not appear to be so in New Jersey. Its mottled foliage and silky rootlets are very attractive and make it valuable in the aquarium, but when grown out-of-doors in summer in tubs or pools, it is very vigorous and soon becomes crowded; the leaves, instead of floating, then appear in an erect state, the spongy condition of floating leaves having disappeared, the plant having no need of such. It is really a floating plant, propagated by division of runners, and should not be placed in shallow water, where it can readily root into the soil.

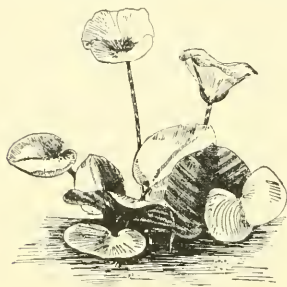
Trianea Bogotense is mentioned as synonymous with *L. Bosci*, but it is more sturdy in habit, of a lighter color—especially in winter—does not make such long runners, and forms more compact and attractive rosettes of leaves.

WM. TRICKER and L. H. B.

LIMNOCHARIS (from Greek for *sweep-loving*). *Alismaceae*. Four species according to the latest monographer (Micheli in DC. Monogr. Phaner. 3) in tropical America. Perennial aquatic herbs, stoloniferous, with ovate, petiolate, floating or emersed lvs., and perfect, with 3 outer and 3 inner parts, fertile stamens about 20, and several or many ovaries. Excellent minor aquatics for greenhouse culture or for planting out in warm summer ponds.

Humboldtii, Rich. (*L. Cömmersoni*, Spreng. *L. nymphoides*, Micheli, *Hydricleya Cömmersoni*, Rich.). WATER PUFFY. Flg. 1294. Stem prostrate and rooting; lvs. broad-cordate-oval, thick, mostly floating; fls. and

lvs. arising from bracted nodes, both long-stalked; fls. 2-2½ in. across, with 3 obovate-rounded light yellow petals; carpels 5-7, not united. S. Amer. B.M. 3248. B.R. 19:1640.—A handsome plant with the yellow fls. (lasting



1294. *Limnocharis Humboldtii* ($\times \frac{1}{2}$).

1 day) standing well above the water. In habit, remarkably like *Limnanthemum nymphoides*. Grows well in an aquarium or in shallow water. Continuous bloomer.

emarginata, Humb. & Bonpl. (*L. Plumieri*, Rich. *L. flava*, Buch.). Stouter; lvs. long-cordate-ovate, dock-like, standing out of the water; fls. on long-winged stalks, the yellow petals much contracted below; carpels 15-20, scarcely cohering. S. Amer. B.M. 2525.—Less frequent than the last.

The culture of *Limnocharis Humboldtii* is of the simplest. When grown in tubs, fill the latter two-thirds full of moderately rich soil, covering with sand and fill up with water. Two or three plants in the center will, in a short time, furnish the tub with its bright glossy green lvs., and numbers of its bright cheery yellow fls., which continue late in the season. In natural ponds, planted on the edge the plants grow very rapidly, and spread over a large surface of water. In artificial ponds, plant in tubs or boxes and place in shallow water or stand the tub or box on some stand, allowing 6-9 inches depth of water.



1295. *Linaria Cymbalaria*, or *Kenilworth Ivy*. ($\times \frac{1}{2}$.)

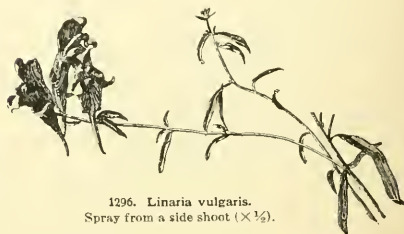
Limnocharis emarginata, or *L. Plumieri*, is entirely distinct from the preceding. The light green oblong, blunt lvs. are very characteristic and ornamental; petiole

triangular, 1-2 in. high; the fls., produced on a scape, are pale yellow bordered white. Seed is produced very freely, and as the seed matures the scapes fall to the water, the seed ripens and sinks to the bottom, and where grown out-of-doors, grows freely the following season. The flower-scape, as soon as it rests on the water, throws up a shoot, which produces another plant in a short time, which again produces flowers, seeds and shoots, and so on. The plant may be grown in pots or tubs or planted out in shallow water in early summer.

WM. TRICKER and L. H. B.

LINARIA (*Linum*, the flax, which the lvs. of some species resemble). *Scrophulariaceae*. Low herbs, sometimes subshrubs, of 130-150 species, widely distributed in extra-tropical regions, several species cult. for the oddly-irregular fls. and others for the festooning foliage. Lvs. alternate, or sometimes subverticillate, in the erect-growing species mostly narrow and entire; fls. solitary in the axils, or in terminal racemes, yellow, white, blue or purple; corolla perianate or ginning, 2-lipped, usually 1-spurred at the base (in rare or so-called *Peloria* states 5-spurred); stamens 4, ascending in 2 pairs, slender; style 1; fr. a dry capsule, opening by slits or pores near the summit.

Occasionally the fls. of the common toad flax (*Linaria vulgaris*) are regular. When Linnæus discovered this form, he took the plant to be of another kind and made for it the genus *Peloria*. This word *Peloria* is now used generically for the regular state of any normally irregu-



1296. *Linaria vulgaris*.
Spray from a side shoot ($\times \frac{1}{2}$).

lar flower. Such monstrosities occur now and then, particularly in the *Scrophulariaceae*.

In America, *Linarias* are little known as garden plants, although they are worthy greater attention. They are of two general classes,—the hardy perennials and the annuals. The perennials are prop. by seeds and by division, usually the latter. All the species are of easiest culture in any ordinary soil and exposure, and are largely able to shift for themselves when once established. The annuals may be started indoors; or in warm situations they may be sown where the plants are to stand.

A. *Plant trailing*: lvs. palmately veined and lobed (*subgenus Cymbalaria*).

Cymbalaria, Mill. **KENILWORTH IVY**. **MOTHER-OF-THOUSANDS**. Fig. 1295. Perennial tender glabrous herb, but sowing itself freely from seeds, long-trailing and rooting at the joints; lvs. cordate-orbicular or reniform, 5-7-rounded-lobed, on slender stalks longer than the blades; fls. solitary in the axils, on slender stems, small but pretty, lilac-blue with a yellowish throat; capsule globular, splitting from the top. En.—It sometimes has white fls. There is also a variegated-ld. variety. The *Kenilworth Ivy* is one of the most familiar of trailers on greenhouse bottoms and in odd corners; also as a trailing basket plant in greenhouses and dwelling houses. It is of the easiest culture, particularly in a moist and partially shaded place. Prop. by division of the long stems, or by seeds. It will not stand frost, but the plant will spring up year after year from seed, becoming essentially annual. It has become established in the open in many parts of the East. Continuous bloomer. A good basket plant for poorly lighted places.

AA. *Plant erect or nearly so: lvs. long.*

B. *Flowers yellow.*

vulgâris, Mill. TOAD-FLAX. BUTTER-AND-EGGS. Fig. 1296. Vigorous perennial, spreading freely by underground stems and in time forming large and persistent patches; stems strict, nearly or quite simple, slightly glaucous, 1-3 ft. high; lvs. many, scattered, linear, somewhat narrowed below; fls. in a terminal spicate raceme, erect-spreading, with hanging nectary spur, sulfur-yellow, but orange on the bearded palate. Eu. A.G. 13: 469.—Extensively naturalized, and commonly regarded as a bad weed; but it infests chiefly waste places, and although difficult to eradicate it does not spread very rapidly. Now and then it appears as an ornamental plant. It is more interesting to the general plant-lover than to the gardener. A double-fl. form is figured in G.C. III. 18: 554. The *Peloria* forms may have 5 spurs, or no spurs at all (R.H. 1851: 433).

Macedonica, Griseb. Robust perennial, 2-3 ft. high, branching; lvs. narrow-ovate or the upper ones lanceolate, somewhat cordate at the base, nearly or quite sessile, entire; fls. bright yellow, with deeper color on the palate, in long wand-like terminal racemes. Macedonia, Gn. 45: 948. J.H. III. 30: 469.—A showy plant, hardy, bearing its snapdragon-like fls. most of the season. Perhaps a wide-leaved form of *L. Dalmatia*, Mill.

BB. *Flowers blue or purple.*

C. *Perennial border plants.*

alpina, Mill. Compact-tufted plants, 6 in. or less high, with weak and spreading flower stems; lvs. linear or lanceolate, mostly in 4's; fls. in short racemes or heads, blue with an orange-colored palate, the straight or slightly curved, sharp spur as long as the corolla. Alps. F.S. 20: 2128. G.C. II. 14: 105.—A pretty little alpine, blooming in July and Aug.

triorithophora, Willd. Glaucous, 2-3 ft. tall; lvs. ovate-lanceolate, in 3's or 4's; fls. about 3 in a whorl (hence the name, *bearing three birds*), rather large, slender-stalked, violet and purple-striped, with orange palate, about 1 in. long, the spur inflated above and exceeding the lobes. Spain, Portugal. F.S. 22: 2297.—A handsome and interesting plant, rarely seen in American gardens.

cc. *Annual plants of the flower garden*
(See R. H. 1896, pp. 371-374).

bipartita, Willd. A foot high, erect, br. nching, with scattered or verticillate linear lvs.; fls. large, in a long racemose spike, violet-purple, with the palate orange-colored above and whitish towards the base, the spur curved, about as long as the corolla, standing oblique or horizontal; upper lip parted. Portugal. N. Afr.—Old-time annual, but it has never been popular in N. Amer. Var. **alba**, Hort., has yellowish white fls. Var. **splendida**, Hort., has handsome deep purple fls. There is also a var. **striata**, Hort.

Marocana, Hook. f. Fig. 1297. Spike much shorter and denser; fls. bright violet or rose, with a whitish palate, the spur long, pointed, as long as the pedicel and sometimes hanging nearly parallel with the axis of the spike; lvs. many, linear, scattered or whorled, hairy. Morocco. B.M. 5983.

reticulata, Desf. Fls. pubescent, purple, reticulated with purple, the palate yellow or copper-yellow, the spur pointed and shorter than the corolla and pointing downward; spike short; lvs. linear, scattered or verticillate. Portugal.—An old garden plant, but little known in America. Runs into two or three forms.

L. aprinoides, Dietr. See *L. heterophylla*.—**L. Broussonetii**, Chav. (*L. multipunctata*, Hoffmg.). Low annual, with yellow, black-spotted fls., orange on the palate, and lanceolate or

linear lvs.; 5-8 in. high, mostly upright. Spain.—**L. Canadensis**, Dum. is a weedy native plant, of no value to the garden. It is annual or biennial, strict, 1-2 ft., with very small blue fls.—**L. Dalmatia**, Mill. is a yellow-fl. perennial; see *L. Macedonica*, in the main list.—**L. hepaticifolia**, Steud. A good alpine, making a very low mat; fls. purple; lvs. cordate or reniform, lobed. Corsica, Sardinia.—**L. heterophylla**, Desf. (*L. agrinoides*, Dietr.). Annual, erect, with scattered linear lvs.; fls. straw-colored, with a yellow palate, in spicate racemes. Morocco. B.M. 6041.—**L. multipunctata**, Hoffmg.—**L. Broussonetii**, **L. purpurea**, Mill. Erect perennial, with long racemes of purple-bearded fls. and linear whorled lvs. Eu. Of little value.—**L. saratilis**, Hoffmg. & Link. Kockwork perennial, trailing, with thickish lanceolate lvs., and yellow fls. in short clusters. Spain. L. H. B.



1297. *Linaria Marocana.*
($\times \frac{1}{2}$.)

held by 2 or 3 pieces of turfy loam, and by imitating in other ways the natural conditions described above.

LINNÆA (named after Linnæus, at his own request; it was his favorite flower). **Caprifoliaceæ**. Hardy evergreen trailing subshrub with opposite, small lvs. and light pink, campanulate, nodding fls. in pairs on slender upright stalks. A graceful, dainty plant for rockeries, preferring a shaded position and porous, peaty soil. Prop. usually by division or cuttings of soft or half-ripened wood under glass. Only one species in the colder regions of the northern hemisphere. Calyx 5-parted; corolla campanulate, 5-lobed; stamens 4; ovary 3-celled; fr. dry, indehiscent, 1-seeded. By some botanists *Abelia* is united with this genus.

boralis, Linn. **TWIN FLOWER**. Fig. 1298. Stems slender, slightly pubescent; lvs. short-petioled, roundish or obovate, with few crenate teeth, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; fls. pedicelled in 2's at the top of slender, upright pedun-

LINDELÖFIA (Friedrich von Lindelof, of Darmstadt, a patron of botany). **Borraginaceæ**. Two species of hardy herbaceous perennials from the Himalayas, one of which is cult. It grows 1-1½ ft. high, and in June and July bears racemes of drooping, odd-colored fls. about three-fourths of an inch long, with a pale blue tube and 5 deep rose or purplish lobes. The racemes are about 6 in. long, and have 8-12 fls. The plant is likely to be winter-killed unless given a sheltered place, good drainage and winter covering. It is not fastidious as to soil. Easily prop. by division. It seeds freely and flowers the second year from seed.

Like *Solenanthes*, this genus has the habit and nutlets of *Cynoglossum*, but the stamens of *Cynoglossum* are included, while those of the other two genera are exerted. *Solenanthes* differs from *Lindelofia* in having a more tubular flower, the lobes being relatively shorter and erect or slightly spreading.

spectabilis, Lehm. Pilose; lvs. oblong-acuminate, the upper ones heart-shaped or clasping at the base; racemes bractless. B. R. 26: 50 (*Cynoglossum longiflorum*). J.H. III. 31: 235.

J. B. KELLER and W. M.

LINDEN. *Tilia*.

LINDËRA. See *Benzoin*.

LINDSÆA, or *Lindsaya*, is a genus of about 50 species of tropical ferns, none of which are advertised in America. Schneider, in his Book of Choice Ferns, says they usually die soon after importation, even if apparently in good condition on arrival. In their native habitat he says, these ferns usually creep about in poor, stony soil, which is frequently drenched and washed away by rain. They need a high temperature and humid atmosphere. Lately some success has been attained by placing *Lindsæas* in pots nearly filled with crocks, in which they are firmly

cles; corolla rose-colored or white, about $\frac{1}{2}$ in. long, fragrant. June–Aug. In N. Amer. south to Md., and Calif. in the Mts. B. B. 3:235. Gn. 24, p. 177.

ALFRED REHDER.



1298. *Linnæa borealis* ($\times \frac{1}{4}$).

LINOSPADIÆ (Greek, *linear spadix*). *Palmæac.* *L. Petrickiana* is a pinnate-leaved palm from New Guinea, int. 1899 by Sander & Co., who say: "The slender, alternate pinnae are slightly arched. The base is netted with brown fiber, small, hair-like glumes of the same color being apparent on the younger fronds and leaf-stalks. The young fronds are colored similarly to those of *Areca Ilexmanni*, and when developing have the luster and brilliancy of new copper."

Linospadix contains about 4 species of dwarf, unarmed palms, all from New Guinea, varying considerably in foliage. The genus is allied to *Bacularia*, but *Bacularia* has premorse leaf segments and erect anthers fastened at the base, while *Linospadix* has acuminate leaf segments and versatile anthers fastened on the back. *Linospadix* is distinguished from *Howea* (which see) by the stamens 6-9; pistillate fls. with 6-9 stamodes; ovule parietal.

Petrickiana, Sander. Pinnae once cut from the apex to a third or fourth the length of the pinna; laterally cut about six-sevenths of the way from the tips of the segments to the rachis; premature basal lvs. cut once from the apex to half their length, the 2 lobes ncut. G. C. III. 24:299.—This is a handsome linear-leaved palm of compact growth and well furnished with foliage, at least while in a young state. In its juvenile condition, the leaves of *L. Petrickiana* are simply bifid, the pinnate form gradually appearing as the plant attains age. Cultural conditions suited to the needs of *Calamus* and *Dæmonorops* will be most likely to succeed with *Linospadix*, and include a temperature of 70°, plenty of water, and some shade throughout the year.

W. H. TAPLIN and W. M.

LINOSYRIS (*Linum* and *Osyris*, which genera it resembles). *Compositæ*. One species, *L. vulgaris*, Cass., of Europe, is a good hardy perennial, growing 1½–2 ft. high, and bearing numerous small pale yellow heads; stems striat (from a hard root), striate, finely pubescent, bearing many alternate, small, linear, entire lvs. It is an excellent late summer and fall bloomer, thriving well in any good garden or border. Prop. by division.

The genus *Linosyris* is now referred to *Aster* by many botanists, the above species then becoming *Aster Linosyris*, Benth. It is also known as *Chrysocoma vulgaris*, Gneid. Horticulturally, it is distinct, with its yellow heads and peculiar habit. From *Aster* it differs technically in the absence of rays and in yellow fls. L. H. B.

LINUM (classical name). *Lindæac.* **FLAX.** Temperate-region plants of both hemispheres, of 80 or 90 species, herbs or sometimes subshrubs. They are erect-growing plants, with narrow alternate (rarely opposite)

and mostly entire lvs., and showy 5-petaled fls. which open in the sunshine. Stamens 5 and alternate with the petals, usually united at the base; ovary 1, 3-5-loculed, bearing as many styles as locules, and ripening into a dry capsule which may or may not be dehiscent. The fls. are borne in terminal racemes or cymes, and, although each flower may be short-lived, the continuity of bloom makes the plant showy. There are two horticultural sections,—the annuals and perennials. All are of easy culture in an open and warm place, fully exposed to the sun. Seeds of the annuals may be sown where the plants are to bloom or they may be started under glass. The perennials often bloom the first year from seed, and seeds are often used to propagate them; but the plants may be divided. There are several native *Linum*s, some of which are small-fl., weedy plants.

A. *Plant annual: fls. red or blue.*

B. *Bloom red.*

grandiflorum, Desf. **FLOWERING FLAX.** Figs. 1299, 1300. Erect, branchy, 1-2 ft., glabrous; lvs. many, alternate, broadly lanceolate to oblong, sessile or nearly so; fls. terminating very slender pedicels which are 1-3 in. long, the obovate petals wide-spreading (fl. 1-1½ in. across, and something like a single-fl. pink) and much exceeding the pointed scarious-edged sepals. N. Afr. B. M. 4956. R. H. 1848:401.—Very serviceable garden annual, and popular for its glossy bright fls. The color varies in the shades of red. Var. **rubrum** has bright red fls. Var. **kermesinum** is crimson. *L. coccineum*, Hort., is a scarlet-fl. form. In a warm, sunny place, the Flowering Flax makes a very satisfactory plant. It is not adapted to cutting, since the fls. are not durable. Will not stand frost.

BB. *Bloom blue.*

usitatissimum, LIND. **FLAX.** Much cult. for linseed and for fiber, and running wild along railroads and in fields: 2-3 ft. high, very slender-branched, glabrous; lvs. small, linear or lanceolate, acute, alternate; fls. about $\frac{1}{2}$ in. across, light blue, soon withering; pod large, mostly exceeding the scarious-edged sepals, nearly or quite indehiscent. **L. humile**, Mill., also cult. and some-



1299. *Linum grandiflorum*. Natural size.

times run wild, is lower and has a dehiscent capsule; it is probably only a form of the above.—Flax has been cult. from time immemorial, and it is unknown in an originally wild state. Some authorities consider it to be a modified form of *L. perenne*.

- AA. *Plant perennial: fls. yellow or blue (white vars.).*
 B. *Bloom yellow (L. trigranum, which may be sought here, will be found under the genus Reinwardtia).*

Flavum, Linn. Erect from a somewhat woody base, glabrous, 1-2 ft.; lvs. lanceolate or linear, alternate; fls. golden yellow, in a much branching cyme, the showy petals much exceeding the glandular-ciliate sepals. Eu. B.M. 312.—A good half-hardy perennial, but not particularly known in this country.

BB. *Bloom blue (or white).*

perenne, Linn. Fig. 1301. Erect-growing and branched, glabrous, 1-2 ft. tall; lvs. linear and acute, alternate; fls. rather small, azure blue (there is a white-fl. form), on the ends of slender pedicels, the styles and stamens of different lengths (fls. heterogonous) in different fls.; capsules ovoid, dehiscent, on inclined pedicels. Eu.—Worthy hardy perennial, summer-blooming, often flowering the first year from seed.

Lewisii, Pursh (*L. perenne*, var. *Lewisii*, Eaton & Wright). The West American representative of the above, and scarcely distinguishable from it except that the fls. are not heterogonous, pedicels more erect in fruit, calyx nerves not evident. Fls. $1\frac{1}{2}$ in. across, clear sky-blue, very pretty. B.R. 14:1163 (as *L. Sibiricum*, var. *Lewisii*).

Austriacum, Linn. (*L. perenne*, var. *Austriacum*, Voss). Lvs. linear, punctate; fls. rather small, violet-red or light blue; fruiting pedicels horizontal or reflexed. Austria.—Hardy North, growing 1-2 ft. high and blooming all summer.

Narbonnense, Linn. One to 2 ft. high, forming a spreading clump, glabrous and slightly glaucous, and very handsome for rockwork; lvs. linear-lanceolate, pointed, alternate; fls. $1\frac{1}{2}$ in. across, on slender pedicels in loose panicles, azure blue, with white eye and white stamens. Eu. Gn. 52, p. 401.—Blooms in late spring and early summer.

L. H. B.

LION'S EAR. *Leonotis*. L. Foot. *Leontice*; also *Prenanthes serpentaria*. L. Tall. *Leonotis Leonurus*.

LIPARIS (Greek, *fat, shining*). *Orchidaceae*. A large genus, containing over 100 species, distributed over the warm and temperate regions of the entire earth. The plants grow erect, with stems in some species 1 ft. high, bearing 1 or several lvs. and a terminal raceme of small, rarely medium-sized fls. Herbs, terrestrial or epiphytic; stems sometimes thickened at the base into a small pseudobulb, sheathed by scales; lvs. few, broad, contracted into sheathing petioles; fls. whitish, greenish yellow or purplish; sepals and petals nearly equal, linear, spreading; column long; lip nearly plane, often with two tubercles above the base.

L. tilifolia should be planted in well-drained soil; a shady bank is preferable. *L. Læselii* delights in a wet situation, just at the edge of the water.

Læselii, Rich. Plants 2-8 in. high; lvs. elliptic-lanceolate, 2-6 in. long; raceme with few greenish fls.; lip obovate pointed. In wet thickets, N. Amer. & Eu. B. B. 1:477. G.C. II. 21:144.

L. atropurpurea, Lindl. Plants 1 ft. or more high; lvs. 2-4, nearly round, acuminate plicate, near together at the upper part of the stem; raceme many-fl. fls. chocolate-purple; lip oblong, obtuse, recurved. June. Ceylon. B.M. 5529.—The most ornamental of the genus.

EDWARD GILLET and HEINRICH HASSELBRING.



1301. *Linum perenne* ($\times \frac{1}{2}$).

LIPPIA (August Lippi, French traveler, 1678-1704). Syn. *Aloysia*. *Verbenaceae*. The **LEMON VERBENA** is an old-fashioned favorite, with delightfully fragrant foliage, a sprig of which was often included in mixed bouquets. It is a low-growing, tender shrub, with long, narrow, pointed, entire lvs., which are usually borne in 3's. In summer, it bears minute fls. in a delicate, pyramidal panicle, composed of many-flowered spikes, which appear in groups of three at decreasing intervals along the main axis. The Lemon Verbena comes from South America, and in the North is deciduous. In northern gardens it needs a winter overcoat of straw. In S. Calif. it attains a large size out-of-doors. Full cultural directions are given at the end of this article.

The genus *Lippia* is botanically nearer *Lantana* than *Verbena*, though the common forms of all three genera are very unlike horticulturally. Some species of *Lippia* have their spikes crowded into dense heads, like *Lantana*. The drupe in *Lippia* is dry, but in *Lantana* it is often juicy. About 90 species, chiefly American, a few African. Shrubs, subshrubs or rarely herbs, hairy or not; lvs. opposite or in 3's, rarely alternate, entire, toothed or lobed, flat or wrinkled; calyx small, 2-4-lobed; corolla with a cylindrical tube, and 4 lobes.

Under the name of *L. repens*, Franceschi introduced into S. California in 1900 an interesting perennial plant designed as a substitute for lawn grass in the South. It makes a remarkably dense mat, and bears numerous tiny flowers an inch or so above the ground. The fls. are borne in a dense, bud-like head, covered with many tightly overlapping bracts. The fls. appear in rings, beginning at the base of the little head. Franceschi writes of this plant that it thrives in any



1300. *Linum grandiflorum*.

hiliifolia, Rich. **TWAYBLADE**. Plants 4-10 in. high; lvs. oval or ovate, 5 in. long; raceme with many purplish fls.; labellum large, wedge-obovate. Succeeds in well-drained soil on shady banks; woods and thickets, eastern N. Amer. B. B. 1:476. A.G. 12:153 and 13:517.— procurable from Dutch bulb dealers and dealers in native plants.

soil no matter how poor, rapidly covers the ground, smothering weeds, stands trampling, requires much less water than grass, needs no mowing, can be easily taken out if desirable, and is used in southern Europe for tennis grounds. Voss pictures this plant with an erect and tufted habit, and refers it, together with *L. canescens*, to *L. nodiflora*. These two names were kept distinct by Schauer in De Candolle's *Prodrum*, and specimens of Franceschi's plant come nearer to *L. canescens* than to *L. nodiflora*. Schauer's distinctions are given below, but there is doubt as to the chief point of difference; viz., whether any of the plants are annual. They all take root at the joints.

AA. *Plant annual.*

nodiflora, Rich. Stems herbaceous; calyx 2-parted, slightly 2-keeled, keels puberulous; the whole corolla a little more than one-twelfth of an inch long. Banks and sandy shores in the torrid zone and warmer parts of the temperate zone.

A. *Plant perennial.*

canescens, Kunth. Stem somewhat woody at the base; calyx 2-toothed, 2-keeled, the keels slightly villous; corolla conspicuously larger than in related species, rosy, with a yellow throat. S. America, in dry, grassy places.

citriodora, Kunth (*Atlophia citriodora*, Orteg.). LEMON VERBENA. Lvs. in whorls of 3 or 4, lanceolate, short-stalked, glabrous, densely covered beneath with glandular dots; spikes whorled and axillary or collected in terminal panicles, which can be 3 in. long and wide. B. M. 367 (*Verbena triphylla*). Gn. 56:1460. G. C. H. 11:201.

A florist should always have a few Lemon Verbenas. Save a dozen plants in spring, shift them as required, and in the summer plunge the pots outside. At the approach of frost bring them into the greenhouse, stand them under the lightest and coolest bench, and give them water enough merely to keep the wood from shriveling. In early February shake the plants out of the pots, shorten the unripened and weak wood, repot in fresh soil, using 4-inch pots, and start the plants into fresh growth in a temperature of 55°. In a few weeks they will be covered with new growths suitable for cuttings. Cuttings root readily in about 3 weeks. The sand of the cutting-bench should be a little warmer than the air. Water the sand twice a day, and keep it well soaked. Never allow the cuttings to wilt from sunshine or dryness. Transfer the cuttings when rooted to 2-inch pots, and in April shift to 3-inch pots, plunging them in a mild hotbed, whereby by the middle of May, with one pinching, they will have become fine, bushy plants. They need frequent syringing to prevent attacks of red spider.

WM. SCOTT and W. M.

LIQUIDAMBAR (a compound of the Latin *liquidus*, fluid, and the Arabic *ambar*, amber, the name given by the Spaniards in America from the fragrant sap which exudes from the tree). *Hammamelidaceae*. A genus of about 4 species, the one commonly known being the Sweet Gum or Liquidambar of the middle and southern states, a most interesting tree from its symmetrical head, star-shaped maple-like lustrous lvs., brilliant autumnal color, deep furrowed bark and corky winged branches. Its branches are short in proportion, and slender, giving it, when young, a narrow, pyramidal crown, which becomes, when old, a narrow, oblong crown. Its foliage in autumn usually assumes a deep crimson. Its corky branches, not a wholly constant character, add to its picturesque quality and lend to its interest in winter. In the southern states, where it frequents river bottoms and is one of the most common trees, it reaches the height of 80 ft. or more. Farther north, where it is found on the borders of swamps and is rarer, it reaches the maximum of 60-70 ft. On drier and higher ground, it remains a small tree. In cultivation it is of moderate growth, thriving both in low, damp places and on higher grounds, reaching a height of 30-40 ft. Beautiful at every stage, its habit adapts it to both informal and formal planting, in the latter especially particularly to street and park planting, under which conditions it succeeds well. One of the most valuable

trees in cultivation in the middle and southern states; its lack of hardiness farther north forbids its use there. It is free from insects and diseases, and is said to withstand salt air. Its resin resembles the liquid storax of the Orient. It is propagated by seeds, which should be stratified as soon as ripe, many of them lying dormant until the second year. It requires close pruning when transplanted.

styraciflua, Linn. SWEET GUM. BILSTED. STAR-LEAVED or RED GUM. ALLIGATOR TREE. A native tree, 80-140 ft. high; lvs. simple, alternate, generally rounded in outline, deeply and palmately 5-7-lobed, serrate, aromatic, deciduous, glabrous below except a pubescence in the axils of the veins; lobes triangular-ovate, acute; petioles 6-7 in. long, slender; fls. apetalous, monoecious, in globular heads, the staminate heads greenish, $\frac{3}{4}$ in. in diameter, in terminal racemes, the pistillate heads solitary, long-peduncled, at length drooping, 1-1 $\frac{1}{2}$ in. in diameter, hazing all winter; staminate fls. have no calyx, but numerous stamens intermixed with small scides; pistillate fls. cohere as to their ovaries, forming globular heads which harden in the fruit, having scales for sepals, 4 rudimentary anthers and 2-celled ovaries, 1-2-seeded; capsules 2-beaked at the summit, forming together a dense spinose head. March-May. Conn. and southern N. Y. to Fla., Ill., Mo. and Mex. G. F. 2:225. P. G. 3:111. G. C. H. 14:633. Mn. 4:117. Gn. 24, pp. 166, 167 and 38, p. 208.

L. orientalis, Mill. (*L. imberbis*, Ait.). A tree of Asia Minor, Very similar to *L. styraciflua* and differing in that the lvs. are smooth in the axils of the veins. A. PHELPS WYMAN.

LIQUORICE. See *Glycyrrhiza*.

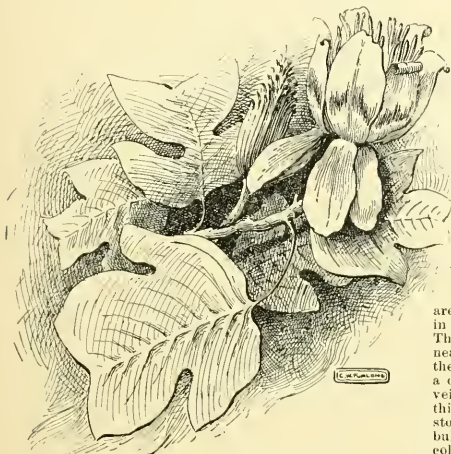
LIRIODENDRON (*lirion*, lily, and *dendron*, tree; referring to the shape of the flowers). *Magnoliaceae*. TULIP TREE. WHITEWOOD. YELLOW POPLAR. Hardy ornamental, deciduous tree of pyramidal habit, with alternate, long-petioled, rather large lvs., of unusual shape, and large tulip-like greenish yellow fls. appearing in spring. A very beautiful tree for park-planting and for avenues, with handsome, clean foliage of rather light bluish green appearance, rarely attacked by insects or fungi, assuming in fall a brilliant yellow color; the fls., though of not very showy color, are conspicuous by their size and shape. The Tulip Tree is also an important forest tree, and the soft, fine-grained, light yellow wood is much used in carpentry for furniture, boat-building and the manufacture of small articles; it does not split easily but is readily worked and bent to any required shape. The inner bark is said to have medical properties. The Tulip Tree grows best in deep, rich and somewhat moist soil. Transplanting is not easy; it is best done in spring, just before the tree starts into new growth. Prop. by seeds sown in fall or stratified and sown in spring; varieties are usually grafted or budded on seedling stock, rarely prop. by layers. The seeds are sometimes hollow, especially those grown along the eastern limit of the species. One species in N. America from R. I. and Vt. to Wis., south to Fla. and Miss.; also occurring in China. Lvs. with conspicuous deciduous stipules covering when young and inclosing the next leaf; fls. terminal, solitary, with 3 spreading sepals and 6 erect, broadly ovate petals; stamens numerous, with long and linear anthers; pistils numerous, forming a narrow column, developing into a light brown cone, at maturity the carpels, each consisting of a long, narrow wing with a 1-2-seeded outlet at the base, separate from the slender spindle. The Liriodendron is one of the noblest trees of the American forest.

Tulipifera, Linn. Fig. 1302. Tall tree, to 150, rarely to 190 ft., with a trunk to 10 ft. in diam., often destitute of branches for a considerable height, glabrous; lvs. about as broad as long, with 2 lobes at the truncate and notched apex and 2-4 lobes at the base, bluish green above, pale or glaucous beneath, 5-6 in. long; fls. greenish yellow, marked orange within at the base, 1 $\frac{1}{2}$ -2 in. long. May, June. S. S. 1:13. Em. 2:605. B. M. 275. Gng. 7:259. A. G. 1892:485. Mn. 2, p. 4; 6, p. 145. Gn. 34, p. 42. V. 20:86.—Var. *pyramidalis*, Lav. (var. *fastigiatum*, Hort.). With upright branches, forming a narrow pyramid. Var. *integrifolium*, Kirchn. Lvs. rounded at the



Flowers of the Tulip Tree, or Liriodendron

base without lobes. Var. *obtusilobum*, Pursh. Lvs. with only one rounded lobe on each side of the base. There are also several vars. with variegated lvs., of which var. *aureo-marginatum*, Hort. (var. *pauciflor.*, Hort.), with lvs. edged yellow, is one of the best. P.S. 19:2025; 20:2081.



1302. Tulip tree—*Liriodendron tulipifera* ($\times \frac{1}{2}$).

—In the middle West, *Liriodendron* is usually known as Whitewood. To lumbermen in the East it is known as Poplar and Tulip Poplar.

ALFRED REHDER.

LIRIOPE (named after the nymph *Liriope*). *Hemadrodæce*. A tender, bulbous plant from China, growing a foot high, with grass-like foliage and 1 or 2 scapes overtopping the lvs., which bear from July to September as many as 90 violet-colored fls. in a spike-like raceme 6–12 in. long and 1 in. wide. The fls. are less than $\frac{1}{2}$ in. across, 6-parted and arranged in groups of 3–5 along the raceme. They vary from dark purple through violet to whitish. The deepest color is the finest, and is set off by the yellow anthers. The genus has only one species and has been referred to 5 different families. The plant has a short, thick, stoloniferous rhizome, no stem; no perianth tube, and hypogynous stamens. It is procurable through Dutch bulb growers, and should perhaps be grown in the greenhouse the year round.

spicata, Lour. (*L. graminifolia*, Baker). Lvs. all radical, linear-lanceolate, obtuse, 3-nerved, with a few brown scales at the base; stamens 6; style columnar; ovary 3-celled. B.M. 5348, B.R. 7:593, and L.B.C. 7:694, all as *Ophiopogon spicatus*.—Var. *densiflora* (*L. graminifolium densiflorum*, Hort. Van Tuberger) is presumably the best form. W. M.

LISIANTHUS (Greek, *smooth flower*). *Gentianacæce*. The choice and rare plant known to catalogues as *L. Russellianus* is one of the largest-flowered species of the *Gentian* family. It is a tender annual from Texas and Mexico, and grows $1\frac{1}{2}$ ft. high, producing its 5-lobed, purple, dark-eyed fls. in summer and fall. Under favorable conditions the fls. are 4 in. across, as many as 10 or 11 on a plant, and individual blossoms have been known to last three weeks. The proper name of this plant is *Eustoma Russelliana*. In *Lisianthus*, the ovary appears to be 2-celled, because the placentæ are connivent in the middle of the cell, but in *Eustoma* the placentæ are separated from each other by a considerable space. *Lisianthus* has about 60 species, all tropical American; *Eustoma* only 2 species.

Russellianus, Hook. (Properly *Eustoma Russellianum*, G. Don). Glaucescens; stem simple, or with a few opposite branches. Lvs. opposite, connate, ovate or ovate-oblong, 3–5-nerved; fls. panicled, as large as a tulip; lobes obovate, spreading; stigma of 2 very large, green, velvety, spreading plates; pod oblong; seeds minute, pale brown. B.M. 3626, G.C. III. 4:240. R.H. 1863: 51 and 1881, p. 189. W. M.

This fine plant is difficult to grow in America. In the Old World it is usually treated as a cool greenhouse subject, being sown in early spring for summer and autumn bloom. The writer has not grown it for thirty years, but in view of the renewed interest in this plant, his experience may be useful. The seed should be sown carefully, and at every stage of the plant's growth over-watering should be guarded against. The seedlings are very likely to damp-off. When they are ready for transplanting from the seed-beds, use small pots. When larger plants are needed, place them in a light, airy place and give generous bottom heat. For soil, use good loam, sand and well-rotted manure. F. L. HARRIS.

LISSOCHILUS (Greek, *smooth lip*). *Orchidacæce*. This genus contains about 30 species distributed in tropical and S. Africa. Some of them are very handsome, but they seem to be little cultivated in America, only a single species being advertised here. The plants are terrestrial herbs, distinguished from their near allies by the dissimilarity of the sepals and petals, the latter being much larger and wider and usually of a different color. The lvs. are plicate and prominently veined, long and narrow; stems very short, leafy, finally thickened into pseudobulbs; raceme simple; scape long, stout, sheathed but leafless, growing beside the pseudobulb; labellum spurred or saccate, joined to the base of the column. The plants may be grown in a compost of fibrous loam, leaf-mold and sand. During the growing season they require plenty of water, but during three months of winter they should be allowed to rest and be kept dry.

Krëbii, A. Rich. Lvs. in tufts on the young stems, elliptic-lanceolate, 8–12 in. long; scape 2–3 ft. high; raceme 12–18 in. long, with 20–30 fls.; sepals linear-oblong, bent back, green, with dull purple blotches; petals much larger, golden yellow; lip yellow, pendulous, saccate between the small, rounded lateral lobes; middle lobe orbicular, notched in front. Flowers from May to Oct., the fls. remaining a long time. Natal. B.M. 5861.—Adv. 1895 by Pitcher & Manda.

L. giganteus, Welw. & Reichb. f. A gigantic orchid whose lvs. are said to grow to a length of 8 ft., with flower spikes twice as high; sepals linear, curled backward; petals oblong-quadrate, $1\frac{1}{2}$ in. across, pinkish rose; labellum 3 in. long, with a long spur; middle lobe trowel-shaped, purple, striped with darker lines. Congo. G.C. III. 3:617. S.H. 2:355. I.H. 35:53.—*L. Horsfieldii*, Batem. A robust plant, with plicate lvs. 2–3 ft. long and 5–6 in. broad, sharp-pointed; flower stalk twice the length of the lvs., with many large fls. 3 in. in diameter; sepals reflexed, rich purple-brown on the upper side; petals much larger, almost square, white, suffused with rose. B.M. 5486. Handsomer than the first.—*L. roseus*, Lindl. Lvs. broad and stiff; stem 3–4 ft. high; sepals brown; petals and labellum fine rose-colored. B.R. 30:12. Also a showy plant.—*L. speciosus*, R. Br. Pseudobulbs nearly underground; lvs. dark green, ensiform; scape 2–4 ft. high, with fragrant fls. 2 in. across; sepals small, green, reflexed; petals large, yellow; lip mostly yellow, apparently on the upper side, due to the inversion of the fls. June, July. Cape. B.R. 7:573 (erroneously numbered 578). P.M.E. 4:25. HEINRICH HASSELBRING.

LISTERA (after Martin Lister, 1628 (1)–1712). *Orchidacæce*. Small, slender, erect herbs, with fibrous or sometimes fleshy roots, bearing a pair of opposite green lvs. near the middle, and 1 or 2 scales near the base of the stem; fls. small, spurless, in a terminal raceme; sepals and petals similar, spreading or reflexed; labellum rather longer, narrow, entire or 2-lobed. About 10 species, natives of the north temperate zone.

convallarioides, Torr. Stem 4–10 in. high, with smooth, round-oval, obtuse, cuspidate lvs.; raceme 2–3 in. long, bearing 3–12 greenish yellow fls. June–Aug. In woods, Nova Scotia to Alaska and Calif.; south to N. C. in the Mts. B.B. 1: 473.

cordata. Very slender, 3-10 in. high; lvs. cordate-ovate, mucronate; raceme 1-2 in. long, with 1-20 minute purplish fls. June-Aug. In moist woods, Nova Scotia to Alaska and Ore., south to N. J.; Eu. B. B. 1: 473.

HEINRICH HASSELBRING.

LITHOSPÉRMUM (Greek, *rock seed*: the seeds like little stones). *Borraginææ*. This includes a few low-growing hardy herbaceous perennials of minor importance. The best known is *L. prostratum*, a rock-garden trailer, which bears numerous leafy spikes of blue fls., each about $\frac{1}{2}$ in. across, from early summer to autumn.



1303. Puccoon.—
Lithospermum canescens ($\times \frac{1}{2}$).

1304. *Lithospermum angustifolium*. Nat. size.

The common Gronwell, *L. officinale*, is rarely cult. as a medicinal herb. The rest are procurable from dealers in native plants. Seeds of the Gronwell and the western species are procurable, and plants of the other kinds. *L. prostratum* is said to be prop. only by cuttings of the previous year's wood; *L. multiflorum* by cuttings of young shoots. The kinds with red roots yield a dye.

Lithospermum has about 40 species in extra-tropical regions: herbs or subshrubs, rough, silky, or bristly; lvs. alternate: fls. white, yellow, bluish or violet; calyx 5-parted; corolla funnel- or salver-shaped, 5-lobed; stamens 5, fixed to the tube; ovary 4-lobed.

A. *Color of fls. blue or purplish.*

B. *Habit trailing: tube of corolla densely hairy, thrice as long as the calyx.*

prostratum, Loïs. GENTIAN BLUE GROMWELL. Subshrub: lvs. lanceolate-linear, margin somewhat revolute; tube of corolla pubescent outside, densely villous at apex. S. Eu. This is presumably the plant in the trade, since *L. prostratum*, Buckl., is a white-fl. annual properly called *L. Malabarense*. However, *L. prostratum*, Loïs., is referred by Index Kewensis to *L. fruticosum*, which see. *Gn.* 45, p. 135. *J. H.* 111. 32:475.

BB. *Habit erect: tube of corolla not hairy.*

fruticosum, Linn. Distinguished as above by DeCandolle, and apparently more of a shrub, with the leaf margins decidedly revolute. S. Eu.—Not cult.

AA. *Color of fls. pale yellow, yellow or orange.*

B. *Size of fls. small; tube about as long as the calyx: roots not red.*

C. *Inflorescence sparse: throat of corolla crested with appendages.*

officinale, Linn. GROMWELL. Much branched, 2-3 ft. high; lvs. lanceolate or ovate-lanceolate, 2 in. or less long; fls. dull white. Along N. E. roadsides, but naturalized from Eu.

CC. *Inflorescence dense: throat of corolla nearly devoid of appendages.*

pilosum, Nutt. Mostly unbranched, 1 ft. high; lvs. linear and linear-lanceolate, 2-4 in. long; fls. dull greenish yellow, crowded in a leafy thyrse. Western N. Amer.

BB. *Size of fls. large, showy: tube of corolla much longer than the calyx: roots red, long and deep.*

C. *Floral leaves reduced to bracts no longer than the calyx.*

multiflorum, Torr. Height 1-2 ft.; lvs. linear: fls. light yellow, spicate. Rocky Mts. to W. Tex.

CC. *Floral leaves much longer than the calyx.*

D. *Tube of corolla $\frac{1}{2}$ -2 times as long as the calyx: crests of throat little if at all projecting or arching.*

E. *Fls. nearly without pedicels: glandular ring at the base naked.*

canescens, Lehm. PUCOON, of the Indians. RED ROOT. INDIAN PAINT. Fig. 1303. Height 9-12 in. or more; fls. orange. Plains and open woods, in sandy soil, upper Canada to Ala., west to Ariz. B. M. 4389.

EE. *Fls. mostly pedicelled: glandular ring at base within bearing 10 very hirsute lobes or teeth.*

hirtum, Lehm. Height 1-2 ft.; fls. bright orange. Pine barrens, Mich. to Fla. and Colo.

DD. *Tube of corolla 2-4 times as long as the calyx: crests of the throat conspicuous and arching.*

angustifolium, Michx. Fig. 1304. Height 9-12 in. or more; lvs. all linear: fls. of 2 sorts, the earlier and conspicuous kind bright yellow, with corolla tube 1 in. or so long, later ones and those of the more diffusely branching plants with inconspicuous pale corolla, without crests in the throat and probably cleistogamous. Apparently all grades between early large fls. and late small ones. Prairies. D. M. Andrews says it has pale cream fls. Var. **longiflorum** (*L. longiflorum*, Hort., D. M. Andrews) is said to grow 1 ft. high, with larger, pale lemon fls. and comes true from seed. Grows wild in Colo. W. M.

LITRÆA. See *Agave*.

LITRÆA (Chilean name). *Anacardiææ*. A genus of small South American trees related to *Rhus*, and by Bentham and Hooker included in that genus. The plant cult. by some under this name seems not to be true to name, as it is a tree with undivided lvs., while the true plant is as a shrub with 1-3 pairs of lfts. and odd pinnate. D. C. Mon. Phan. vol. 4.

Aroerinha, March. (*L. molleoides*, Engl.). Shrub, 9-12 ft. high; lvs. of 5 lanceolate lfts., the rachis and

petiole narrow-winged; lfts. 2-3 in. long, glabrous, with small panicles of greenish yellow fls. and almost white drupes 1-2 lines in diam. Brazil.

J. B. S. NORTON.

LITŌNIA (Dr. Samuel Litton, professor of botany in Royal Dublin Society). *Liliacæ*. Littonia and Gloriosa are called Climbing Lilies. They are tender, tuberous plants, with glossy, lanceolate lvs. which curl at the tips into tendrils, enabling the plants to reach 6-8 ft. The fls. are 6-parted, but in Littonia the segments are not reflexed like a Cyclamen, as in Gloriosa. Fls. nodding, bell-shaped, orange, 1 in. or more across; segments oblong, acuminate, $1\frac{1}{2}$ in. long; capsule long, 3-celled; seeds scarlet, about the size of a sweet pea, round, arranged in 2 series. The odd-shaped tubers are about $1\frac{1}{2}$ in. across and may be planted outdoors in May. There are 4 species, 1 from Arabia, 1 from S. Africa and 2 from tropical Africa.

modesta, Hook. Lower lvs. in 3's, upper ones alternate; perianth segments provided with a small oblong nectary, partially closed by a ciliated scale on each side; style 3-cut, S. Africa. B.M. 4723. Var. **Kettii**, Hort., is an improved form, with larger and more abundant fls.

JOHN ENDICOTT and W. M.

LIVE-FOREVER. *Sedum Telephium* and other *Sedums*.

LIVERLEAF. *Hepatica*.

LIVERWORT. A general name for a group of cryptogamia (flowerless plants), somewhat allied to mosses and known as Hepaticæ. *Conocephalus* and *Marchantia* have been offered by dealers in native plants as suitable for rockwork and bog gardens. *Lunularia* is a common weed in greenhouses.

LIVING ROCK. Consult *Achalanthium*.

LIVISTONA (Patrick Murray, Baron of Livistone). *Palmeæ*. About 14 species of fan palms from tropical eastern Asia, Malaya and Australia. Trunks usually tall, stout, ringed below, clothed above with dead leaf-sheaths: lvs. spreading, orbicular, plicate, split to the middle or below; the segments bifid, infolded, naked or fibrous along the margins; rachis short; ligule small, cordate, free; petiole long, stout, flat or rounded above, convex below, often spiny along the margins; sheaths margined with reticulate fibers: spadices long, at first ascending, pendent in fruit, long-peduncled, loosely branched, the branches slender; spathes many, long, tubular, compressed, sheathing the peduncle, thick, coriaceous, bifid or 2-lipped, 2-keeled or ancipital; no bracts or bractlets: fls. greenish; fr. smooth and shining, oblong-globose or ellipsoidal, black, blue, yellow or brown.

From the seven allied genera mentioned under *Liencala*, *Livistona* is distinguished by the following characters: fls. hermaphrodite; carpels of the ovary globose, distinct or slightly cohering; styles short, distinct or cohering; albumen not twisted, broadly scooped out on the ventral side; branches of the spadices not bracted or the lower ones bracted.

A. *Lvs. glaucous beneath*.

Jenkinsiana, Griff. Lvs. 5-6 ft. broad, reniform, flabellate, 70-80-rid, glaucous beneath, the divisions very narrow, straight, shortly and obtusely 2-toothed. Assam.

AA. *Lvs. not glaucous beneath*.

B. *Petioles without spines*.

Woodfordii, Ridley. Petioles slender, without thorns, only $\frac{1}{2}$ in. thick: lvs. orbicular, quite thin, 2 ft. long, 18 in. wide, split into very narrow acuminate lobes, the lower ones free almost to the base, the inner ones split

only one-fourth of the way down: spadices very slender, the short slender branches protruding from the mouths of tubular brown sheaths; drupe globose, $\frac{3}{4}$ in. in diam., bright red. Polynesia. First described in G.C. 111. 23:177.—Nearly related to *L. australis*, but more graceful, with smaller flowers and fruit.

BB. *Petioles spiny below the middle*.

C. *Length of spines $\frac{1}{2}$ in. or less*.

olivæformis, Mart. (*Coriŷpha Gebunga*, Hort., in part). Stems medium: lvs. glabrous; petiole somewhat 3-angled; spines retrorse, 1-3 lines long; segments 12-15 in. long, deeply bilobed, the lobes very long, acuminate, linear, pendent, with or without very short filaments; fr. olive-shaped, solitary, or twin and connate to the middle. Brazil.

CC. *Length of spines 1 in. or more*.

D. *Shape of lvs. reniform*.

Chinensis, R. Br. (*Lutania Borbónica*, Hort., not Lam.). Stem 6 ft. high, more than 1 ft. thick, gray, with approximate rings: lvs. many; petiole equalling the blade, covered to about the middle with retrorse brown spines, 1 in. or more long; blade reniform, 4-6 ft. in diam.; segments linear-lanceolate, long-pendulous, deeply forked, filiferous, the lower 1-2 ft. long, 1-2 in. wide, the middle 3 ft. long, the lobes acuminate, 4-8 in. long. China.

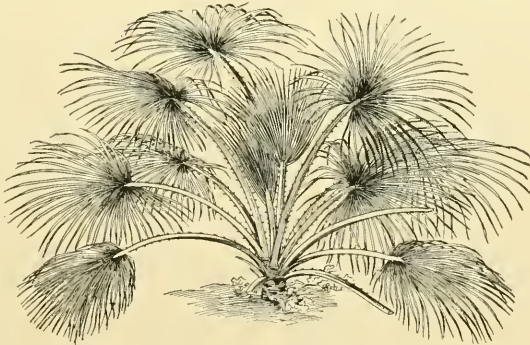
DD. *Shape of lvs. orbicular*.

retundifolia, Mart. (*Chamærops Bired*, Sieb. C. *Byrrhò*, Hort.). Stem 40-50 ft. high, 1- $1\frac{1}{2}$ ft. in diam., erect or subflexuous, brownish black, obscurely ringed; petiole 6 ft., with recurved spines $1\frac{1}{2}$ in. long at the base; blade 3-5 ft. in diam., suborbicular, at length somewhat peltate through reversion of the lowest lobes; segments 60-90, connate for one-third their length, bifid to the middle, the lobes long-acuminate. Java. R.B. 21:110. F.R. 1:301. S.H. 2:28.

BBB. *Petioles spiny from base to apex*.

E. *Segments of the lvs. free one-third of the way down*.

altissima, Zoll. Lvs. bright shining green, $1\frac{1}{2}$ -2 ft. long; segments free one-third of the way down, bifid at the apex; petiole 2-6 ft., upper part green, brown toward the base, inclosed in a reddish brown network of woody



1305. *Livistona humilis*.

fibers, armed on the margins with stout black recurved spines. Java.

EE. *Segments free nearly to the base*.

F. *Position of segments rigid, not drooping*.

australis, Mart. (*Coriŷpha australis*, R. Br.). Stems 40-80 ft. high: lvs. in a dense crown, orbicular, 3-4 ft. in diam., divided to or below the middle into 40-50 narrow, plicate, acuminate segments, either entire or 2-cleft at the apex. Australia. B.M. 6274. Gr. 26, p. 337. V. 9:328.

FF. Position of segments drooping.

g. Number of segments 10-12.

Hoogendorpii, Hort. Stem tall, cylindrical, with triangular leaf-scars: petiole rounded on the back, 3-5 ft. long, red-brown at the base, olive-green above; spines stout, recurved, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. apart, $\frac{3}{4}$ - $2\frac{1}{2}$ in. long; leaf suborbicular, $4\frac{1}{2}$ -6 ft. in diam.; segments plicate, cuneate, pendulous at the apex and 5-7-lobed, the lobes acute. Java. I.H. 21:174. F.R. 1:427. Gn. 25, p. 392.

gg. Number of segments more than 12.

humilis, R. Br. (*L. Maria*, F. Muell.). Fig. 1305. Stems 4-16 ft. high; lvs. at length orbicular-cordate, 3 ft. in diam., deeply divided; segments narrow, plicate, acuminate, the filaments between the lobes altogether wanting or very minute or 1 in. long; petiole much flattened, with acute edges bordered with small prickles intermixed with larger ones, often $\frac{1}{2}$ in. long. N. Australia. —Fig. 1305 is redrawn from Martius.

subglobosa, Mart. A medium-sized palm: lvs. glabrous, the rays 10-12 in. long, 2-parted nearly to the base, the lobes linear, very acuminate, pendulous; fr. subglobose. Java.—Known in Java as "Sedangan."

JARED G. SMITH.

This is the most extensively grown genus of fan-leaved palms in commercial horticulture of the present day, its commonest representative being the well-known "Chinese Fan Palm," *L. chinensis*, which is also known to the trade, and improperly, as *Lantania Borbonica*. In general, the members of this genus are by no means difficult to grow, though it is well to make some distinctions in culture between such strong-growing and comparatively hardy palms as *L. chinensis* and *L. australis*, and the more tender species from Java and northern Australia, among which *L. humilis*, *L. oliviformis* and *L. rotundifolia* are prominent.

For those of the first section a strong loamy soil well enriched with thoroughly decayed stable manure, good drainage, an abundance of water and a night temperature of 60° will provide satisfactory conditions for sturdy growth.

The more tropical species, of which *L. rotundifolia* is a good example, make better progress in a somewhat lighter soil and a higher temperature, 65° to 70° being more congenial to them than the cool treatment accorded their stronger relatives. More shade is also required for the warmhouse species, in order to retain the rich green color that a healthy *Livistona* should present.

Red spider and white scale are two of the most troublesome insects to the grower of *Livistonas*, the first being controlled to a great extent by thorough syringing, while the latter may be eradicated by the careful use of various insecticides, though avoiding the frequent application of extract of tobacco, the continued use of the latter substance often resulting in injury to the foliage of *Livistonas*.

L. australis is a more stubby-growing plant than *L. chinensis*, the fan-like leaves are stiffer and less graceful, and the footstalks are more thoroughly armed with stout spines, while the leaves are also smaller in proportion to the plant than those of *L. chinensis*. *L. Hoogendorpii* and *L. oliviformis* are somewhat alike in young plants, but the first has many more and coarser spines on the footstalks, and the stalks of *L. Hoogendorpii* are generally longer, the leaves of both being much divided. *L. rotundifolia* and *L. altissima* are much alike in a small state, and the writer is inclined to think that the seeds of the latter are sometimes substituted for those of *L. rotundifolia*. The leaves of *L. rotundifolia* are flatter and more even in outline, those of *L. altissima* being somewhat undulated, as though they were crowded on the stalk. In fact, small plants of *L. rotundifolia* are usually more symmetrical, and also have longer footstalks.

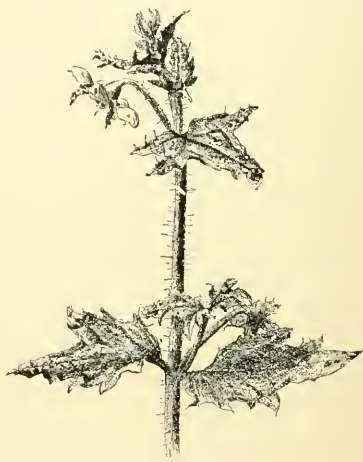
W. H. TAPLIN.

LLOYDIA (after Edward Lloyd, who found the plant in Wales). *Liliaceae*. About 4 species of bulbous plants, of which *L. alpina* was said by Baker to have the widest distribution of any plant in the lily family. Dwarf plants, with hard, grassy lvs. and small, whitish, long-lasting fls.; perianth 6-parted; segments withering and

persistent; stamens 6, hypogynous, shorter than the perianth; capsule obovoid; seeds flattish.

alpina, Salisb. (*L. serotina*, Sweet). Distinguished from the other species by having an oblique, somewhat rhizomatous rootstock and glands on the claws of the perianth segments. Radical lvs. 2-4, linear, convolute; stem usually 1-ft., 3-9 in. long; lvs. 3-4, small linear; fls. whitish, yellowish purple at its base. Mts. of Wales to Sicily, Himalayas, Colorado.—Adv. 1889 by F. H. Horsford.

LOASA (South American name). *Loasaceae*. These plants are too much like nettles to deserve cultivation, though their fls. are odd and interesting. The pain from their prickles lasts several days. Each of the 5-hooded petals contains a bunch of stamens. They are treated as half-hardy annuals. (See *Annals*.) A genus of about 50 tropical American herbs, erect or twining; lvs. alternate or opposite, entire, lobed or decoumpound; capsule 3-5-valved from the apex, rarely twisted; ovary 1-celled; ovules numerous. The allied genus *Blumenbachia* differs in having capsules which are longitudinally 5-10-valved and most frequently spirally twisted.



1306. *Loasa tricolor* ($\times \frac{3}{4}$).

A. Sepals as long as petals.

tricolor, Lindl. Fig. 1306. Annual, 2 ft. high; lvs. opposite, bipinnatifid, very prickly; sepals as long as the petals; petals yellow; crown red; filaments white. Chile. B.R. 8:667.

AA. Sepals shorter than petals.

B. Petals yellow.

hispida, Linn. Annual, $1\frac{1}{2}$ ft. high; lvs. alternate, 5 in. long, $3\frac{1}{2}$ in. wide, pinnatifid; segments lobed; sepals much shorter than the petals; petals yellow, over 1 in. long. June-Aug. Peru. B.M. 3057. G.C. III. 22:291. Gn. 25, p. 451.—Cult. in pots abroad.

BB. Petals white.

vulcanica, André (*L. Wallisii*, Hort.). Erect, bushy annual, 2-3 ft. high; lvs. 3-6 in. broad, 3-parted; segments serrate, each with a long stalklet, the lateral ones often divided into 3 lfts.; sepals shorter than the petals; petals white; eye of fl. of 2 concentric red

bands, with 5 yellow spots outside. New Grenada. B.M. 6410. L.H. 25:302. R.H. 1894, p. 233.

BB. *Petals brick-red.*

lateritia, Gill. Without stinging hairs; stem scarcely any: lvs. opposite, long-petioled, pinnatisect; segments rotundate, crenately lobed; peduncles twin, 1-nerved, terminal, about as long as the leaf; calyx lobes oval, longer than the corolla tube, half shorter than the corolla. Chile. The above description is from the original. A much confused plant (see addenda of Ind. Kew under Loasa and Blumenbachia; also equivocal passages in Engler & Prantl *Pfl. Fam.* 3:64:118, 119, Liefcrung 100). The stinging vine 10-20 in. high pictured in B.M. 3632 as *L. lateritia*, is a Blumenbachia, of the section Raphisanthe. *L. araucaana*, Hort., is usually given as a synonym of *L. lateritia* in botanies, but is kept separate in the trade.

LOBELIA (Matthias von Lobel, or L'Obel, 1538-1616, a Flemish botanist and author. Latinized *Lobelius*). *Lobeliaceae* (by some combined with the *Campuranaceae*). More than 200 herbs (or sometimes subshrubs in the tropics) of wide distribution in temperate and tropical regions, comprising many species with very showy flowers. Corolla gamopetalous and tubular, split down one side; lobes 5, the 3 on the lower side (as the fl. stands) somewhat united and forming a lip, the other 2 (1 on either side of the cleft or split) erect or turned back; calyx short-tubular or globose, joined to the ovary, short-toothed; stamens 5, united into a tube around the single style, the tube often protruding from the cleft into the corolla; fr. a 2-valved capsule. The flowers are blue, red or yellowish, on 1-fld. pedicels, which are arranged in a terminal raceme. Lvs. alternate, mostly narrow.

There are two horticultural groups of Lobelias, — the annuals and the perennials. The annuals are low, normally blue-fld. species suitable for bedding and edgings. They are of the easiest culture either from seeds or cuttings. See *L. Erinus* (No. 1). The perennials are again of two types, — the hardy and the half-hardy or tender. The hardy kinds are natives, of which *L. cardinalis* and *L. siphilitica* are the leading representatives. These inhabit bogs and low places, and the best results under cult. are to be expected in moist and cool spots. The half-hardy sorts are chiefly derivatives of the Mexican *L. fulgens*, a plant which is deservedly popular in the Old World, but which has not attained great favor here. These species may be bedded out in the northern states. They are carried over winter in pots or in a cellar. They usually give good results the first year from seed, if started early; or seeds may be sown in the fall and the plants carried over in a frame. The hardiness of the hybrid perennial Lobelias in this country is yet to be determined. It is probable that forms of *L. fulgens* will stand outdoors in the middle states if given winter protection. In the latitude of Washington they are hardy in winter but are scarcely able to withstand the summers.

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A. Plant annual (or so treated), low and diffuse-growing.

B. Beards or hairy tufts on only the two lower anthers.

1. **Erinus**, Linn. (*L. heterophylla*, Hort., sometimes, not valid. *L. gracilis*, Hort., not Andr. *L. bicolor*, Sims). Figs. 1:207-8. Diffuse and half-trailing annual or perennial, much used for edgings. Glabrous or slightly hairy below, 6-12 in. high; lvs. variable, the lower ones obtuse and obovate or spatulate and crenate-toothed, the upper ones oblanceolate or oblong (becoming linear

and acute near the top of the stem, and mostly sharp-angle-toothed; fls. $\frac{3}{8}$ - $\frac{3}{4}$ in. across, on slender pedicels, light blue with a lighter center; the calyx lobes awl-like, spreading, as long as the corolla tube; 3 lower lobes of corolla large and spreading. S. Afr. B.M. 514, 901. — One of the commonest of all annual edging plants, particularly for early season effects. In our hot climate, it often ceases blooming in midsummer, but with good soil, plenty of water, and occasional cutting back, it will bloom till frost. Seeds sown in January and February will give blooming plants by April and May. For fls. alone, rather than for edgings, the seeds may be started later, or even sown in the open ground. For definite results in edgings, however, it is usually better to start from cuttings. In the fall, lift the best plants and grow them in pots through the winter as stocks from which to secure cuttings. Cuttings taken in late January or February should give blooming plants by May.

Seedlings vary, and one cannot rely on them for specific effects in design work, although they may be best for the amateur who desires only fls. Some strains of seeds, however, come very true. *Lobelia Erinus* is also a good pot-plant for the winter conservatory.

Lobelia Erinus is exceedingly variable. The forms fall into three groups:

(a) *Variation in habit*: Var. **compacta** or **erecta**, dense-growing forms suitable for low, close edgings; subvarieties are blue, white, etc. The most popular bedding forms belong to this strain. The name *erecta* is often used for the taller strains. Var. **gracilis**, with slender growth and suitable for vases or baskets; blue. Var. **pumila**. Very dwarf.

(b) *Variation in color of foliage*: **GOLDEN QUEEN** and **GOLDELSE**, with yellowish foliage. Also forms with brassy foliage, but not constant.

(c) *Variation in color and size of fls.*: Var. **alba**, white. Var. **flöre pleno**, double. R.H. 1875:71. Var. **grandiflora**. Various large-fld. forms. Var. **Kermesina**. Crimson. Var. **Lindleyana**. Rose-color, with white eye. Var. **marmorata**. Fls. marbled. Var. **Paxtoniana**. Light blue with white eye; growth straggling. Var. **Royal Purple**. Purple-blue. Var. **speciosa**. Large-fld., light azure blue, with white eye. Var. **tricolor**. Fls. blue or pink, with white eye and carmine spots.

BB. *Beards or hairs on all the anthers*. The three following species are probably not in the Amer. trade, although they are known as cult. plants. The names sometimes occur, but the plants which they represent are probably forms of *L. Erinus*. But the descriptions will enable the student to distinguish whether the species occur.

2. **gracilis**, Andr. A foot or less high, slender, decumbent at the base, glabrous; lower lvs. ovate and deeply cut, the upper ones narrower and pinnatifid (becoming



1307. *Lobelia Erinus*. Natural size.



1308. *Lobelia Erinus*.

One of the most popular edging plants.

linear and entire at the top of the stem); fls. $\frac{3}{8}$ - $\frac{3}{4}$ in. across, blue with a whitish eye, the middle lower lobe strongly obovate, the 2 upper lobes small and curved and usually hairy; fl.-cluster loose and open, more or less 1-sided; seed angled, not winged. Anstral. B.M. 741.

3. *heterophylla*, Labill. Much like the last, but fls. larger, (the middle lobe nearly 1 in. long) and the lower leaves parted into linear lobes: seed winged. Austral. B.R. 23:204. P.M. 9:101.

4. *tenuior*, R. Br. (*L. ramosa*, Benth.). Erect or ascending, 12-18 in., pubescent: lower lvs. small, mostly ternately divided, the upper lvs. linear and mostly entire: fls. rather large, bright blue, borne far apart on very slender pedicels, the middle lobe much the largest and obovate: seed smooth and shining, compressed. Austral. B.M. 3784 (as *L. heterophylla*). B. 2:93. R.H. 1856:281. G.C. II. 15:105.

AA. *Plant perennial (rarely biennial), usually tall or strict-growing.*

B. *Corolla very unequally bilabiate or 2-lipped, the lower lip 3-lobed and deflexed, the upper lip very small.*

c. *Species: fls. blue (sometimes varying to white).*

5. *Kalmii*, Linn. A slender perennial (sometimes biennial?), 6-18 in. high, glabrous, branched: lvs. narrow-spattulate to linear at the top of the stem, remotely denticulate: fls. small ($\frac{1}{2}$ in. long), very light blue, in a long, loose raceme, on filiform pedicels. On wet banks and slopes and margins of bogs, in N. states: propagating by offsets. B.M. 2238.—Sold by dealers in native plants. Useful for bog planting.

6. *symphilitica*, Linn. Strong, weedy herb, 2-3 ft., glabrous or nearly so, mostly simple: lvs. thin, oblong-oval to lanceolate, attenuate to the apex but the point mostly blunt, small-dentate or crenate-denticulate, narrowed into a very short petiole: fls. about 1 in. long in a long, wand-like, racemose spike, blue or purplish, the tube about $\frac{1}{2}$ in. long; calyx hairy and enlarging in fruit, the lance-acuminate lobes conspicuous, and bearing aricles in the sinuses. Moist places. E. states. B.R. 7:537; 22:6 (as *L. glandulosa*). Mn. 7: 61.—Var. *alba*, Hort., has nearly white fls. Interesting plant for bog gardens and moist borders. In dry soils it will grow, but with less vigor.

cc. *Species: flowers in shades of red (or yellow or very rarely white).*

7. *cardinalis*, Linn. CARDINAL FLOWER. INDIAN PINK. Fig. 1309. Straight-growing, glabrous or very nearly so, 2-4 ft. tall, usually unbranched: lvs. narrow, varying from oblong-ovate to lanceolate, tapering both ways, the petiole very short or none, margin irregularly serrate: fls. bright intense cardinal (rarely varying to white), the tube $\frac{1}{2}$ in. long, the 3 lower lobes very narrow, the fls. borne in a long racemose spike in which the bracts are mostly very narrow and the upper ones little exceeding the pedicels: calyx hemispherical, the tube much shorter than the long-linear lobes: seeds distinctly tuberculate. Wet places, as in swales, eastern N. Amer. B.M. 320. G.W. F. 41.—One of the most showy of all native flowers, and worthy of cult. in any moist border. It has been long in cultivation, but has probably given no important horticultural forms.

8. *splendens*, Willd. Like *L. cardinalis*, but more slender, the lvs. narrower and glandular denticulate,

mostly sessile: seeds little tuberculate. Wet places, Tex., W. and S.—Once adv. by Sau.

9. *fulgens*, Willd. (*L. formosa*, Hort. *L. cardinalis*, Hort., in part). Very like the last, but fls. larger, deeper red and more showy, the 3 lobes of the lower lip broader: plant mostly pubescent (at least the foliage), and variously tinged or spotted with brown or bronze: bracts more leafy. Mex. B.M. 4092 (as *L. splendens*, var. *atro-sanguinea*).—Long in cult. and a most desirable plant. Not hardy without protection in the N. It has given rise to many horticultural forms, some of which (as "Queen Victoria") are commonly referred to *L. cardinalis*. The trade name *L. cardinalis atro-sanguinea* probably belongs to this species. The recent *L. cardinalis Nanseniana*, a purple-carmine sort, is probably *L. fulgens*. In Europe, this Lobelia is one of the popular bedding plants, but it has never gained popularity in Amer. In this country it is usually grown in pots and treated as a conservatory subject.

ccc. *Species-hybrids or derivatives: fls. mostly in shades of red, pink or purple.*

10. *hybrida*, Hort. The hybrid Lobelias are mostly of French origin, and they are little known in the Amer. trade, although they are occasionally imported by amateurs. It is doubtful if they will endure the winters of the northern states, although they make excellent pot subjects for blooming in the summer border. They may also be planted in the open and lifted on the approach of winter: or new stock can be raised from divisions of the old plants, or from offsets, or from seeds. Many of these hybrids are most showy, and they should be better known in Amer. It is probable that they are derived chiefly from *L. fulgens*, although they are said to come largely from *L. cardinalis*, but *L. fulgens* and *L. cardinalis* are confused amongst gardeners. *L. symphilitica* has also, apparently, entered into some of these hybrid derivatives, particularly those with blue or purple colors. These hybrids are sometimes known collectively as *L. hybrida* and *L. perennis hybrida*. Two recent forms deserve separate mention:

11. *Gerárdi*, Hort. Habit of *L. fulgens* or *L. cardinalis*: lvs. lanceolate or lance-oblong, glabrous, denticulate: fls. in a heavy terminal spike or raceme, rich violet, $1\frac{1}{2}$ in. or more long. Obtained by Chabanne and Gonjon of the Botanic Garden of Lyons, and introduced to the trade in 1895 by Rivoire Père et Fils, Lyons. The hispid calyx suggests *L. symphilitica*. R.B. 22, p. 112. I.H. 42, p. 268.—It varies into rose-color (var. *Lugdunensis*) and into coral-red, violet-purple, and the like. The pistillate parent was a form of *L. symphilitica* and the staminate parent was the "Queen Victoria" form of *L. fulgens*. The plant was named for M. Gérard, director of the botanical collection at Lyons.

12. *Rivoirei*, Hort. (Fig. 1310), comprises still more recent types, with very large rose or pink fls. (Gn. 56:1238, which plate represents several derivative Lobelias. G.C. III. 24:233.

BB. *Corolla somewhat equally 2-lipped, the lower lip only notched, the upper one 2-parted.*

13. *laxiflora*, HBK. (*L. Caranillesii*, Mart. *Symphylites bicolor*, Don). Tall, branching herb or subshrub, with thinly hairy stems: lvs. lanceolate or ovate-lanceolate, acuminate, sharp-denticulate: fls. nodding, on long, axillary pedicels, $1\frac{1}{2}$ in. long, cylindrical, the stamens projecting from the side, red and yellow, pubescent. Mex. B.M. 3600. G.C. III. 1:585.—An old plant requiring cool greenhouse culture, or thriving in the open in pots. It may also be planted out like *L. fulgens*.



1309. *Lobelia cardinalis*.
($\times \frac{1}{2}$.)



1310. *Lobelia Rivoirei*.
($\times \frac{1}{2}$.)

BBB. Corolla with all the lobes united by the tips into one lip.

4. *Tupa*, Linn. (*Tupa montana*, Hort. *L. Feuillii*, Don). Very strong herb or subshrub (4-7 ft. tall), erect and mostly simple; lvs. oblong-oval, mostly acuminate, rugose, tomentose, denticulate; fls. in a long, terminal raceme, blood-red, 2 in. long, the hooded lip curving downwards and the column of stamens ascending; calyx lobes short. Chile. B.M. 2550. R.H. 1898, p. 189.—Cool greenhouse; hardy in southern states with protection.

L. amena, Michx. Much like *L. siphilitica*, but the calyx plain and not hispid. N. C., south.—*L. aeneo* Thunb. Perennial, blue-fl., with somewhat fleshy lvs. and 2-winged stem. S. Afr. B.M. 227, as *L. decumbens*, and 2519, as *L. rhizophyta*.—*L. coronifolia*, Linn. Somewhat shrubby, with pinnatifid, hairy lvs. and handsome blue fls. (sometimes 1 in. long), on long scapes. N. Afr. B.M. 644. G.C. II. 15:105.—*L. Dortmanna*, Linn. WATER LOBELIA. Aquatic perennial, 1 ft. or less, with lvs. radical and submerged, and small pale blue fls. on a scape. Useful amongst aquatic plants. Native.—*L. hortensis*, DC. is a hybrid form of *L. amena*, probably not in cult. now.—*L. inflata*, Linn. INDIAN TOBACCO. Annual, of N. Amer., with ovate, pubescent, denticulate lvs., erect habit, and small blue or whitish fls.; herbage very astringent; plant formerly a domestic remedy.—*L. subulata*, Benth. Annual from Mex. with radical lyrate lvs. and small pale blue fls. on long pedicels. G.C. III. 2:304. L. H. B.

LOBLOLLY BAY. *Gordonia Lasianthus*.

LOCHËRIA (probably a personal name). Comprises a few species, which are now referred to *Achimenes*. In the trade are 2 species, *L. heterophylla*, Oerst., or *L. ignacensis*, Klotzsch (see *Achimenes heterophylla*, p. 18), and *L. hirsuta*, Regel (see *Achimenes hirsuta*, DC., p. 18, suppl. list).

LOCO WEED. See *Astragalus*.

LOCUST. Common Locust is *Robinia Pseudacacia*. Honey L.—*Gleditsia triacanthos*. Swamp or Water L.—*G. aquatica*.

LODEMAN, ERNEST GUSTAVUS (Plate X), horticultural investigator and writer, was born in Neuchâtel, Switzerland, May 3, 1867, and died Dec. 2, 1896, when connected with Cornell University, Ithaca, N. Y. His parents came to America when he was two years old, his father becoming, in 1870, professor of modern languages in the State Normal School of Michigan. The son entered the Agricultural College of Michigan, where he graduated in 1889. It was in this institution that the writer made his acquaintance. Modest and lacking in self-assertion, he needed encouragement and stimulus to make a strong investigator and teacher. In a real estate venture in Florida, before his entering the Agricultural College, he became interested in agricultural problems and resolved to devote his life to them. In 1890 he undertook work as private assistant to the writer; and from this he became assistant and instructor in Cornell University. In the extension work amongst New York farmers he had charge of the investigations on grapes and strawberries. He was the originator of the spray-calendar idea. In 1896 he published "The Spraying of Plants," which is yet the fullest presentation of the subject. This was prepared after a most thorough traversing of the subject, both as author and experimenter, including a visit to Europe for the purpose of tracing the French history of the subject. He was an accomplished scholar, speaking German and French with fluency and possessing a working knowledge of other languages. His early death deprived American horticulture of a promising leader. L. H. B.

LODICEA. The double cocoanut or coco de mer, as *L. Sechellarum* (properly *L. Callipige*, Comm.) has been termed, is one of the giants among palms, its straight and smooth trunk frequently reaching a height of 100 feet, and it is also a centenarian before its full growth is attained. The seeds of *Lodicea* are probably the largest known, the individual nuts being said to weigh sometimes 40 pounds, though the largest seen by the writer weighed about 15 lbs., and bore some resemblance to a malformed cocoanut. The formation of such

gigantic seeds requires a considerable period of time, and from the time of flowering to the full maturity of the seeds is said to cover a period of nearly ten years. The germination of such seeds is not an easy process, requiring much room and strong heat, the radicle being correspondingly large and running down for 3 ft. or more before the top growth begins. These first steps in the life of *Lodicea* develop some very tender processes. Young plants of this palm require a strong and moist heat; and a considerable amount of root room, in combination with a light but rich compost, is best adapted to their needs. Seeds sometimes require 3 years to germinate. They are not advertised for sale at present, but have been sold as curiosities now and then in America. Their germination is a great event, but the plants are never grown to any considerable height, as they require too much care and room. See G.C. II. 26:181; III. 4:732; 8:417. P.S. 5:523.

W. H. TAPLIN.

LOESËLIA (John Loesel, an early Prussian botanist). *Polemonioides*. Very close to *Gilia*, and often confounded with it. As finally outlined by Gray (Suppl. Syn. Fl.), it is confined to Mexico and includes perhaps a dozen species. It somewhat resembles the *Ipomopsis* section of *Gilia* in habit. *Fls. involucre or involucre-like; both bracts and calyx wholly or partly scarious; corolla funnel-form, either regular or one or two sinuses deeper; seeds winged or margined, the surface becoming mucilaginous when wetted. Snuff-tissue, rarely annual, with spinulose-toothed lvs.†

L. coccinea, Don, is a handsome coolhouse plant with brilliant rose-red tubular-trumpet-shaped fls. an inch long in terminal fascicles or compound bracted racemes, with stamens and 3-lobed stigma exserted; lvs. small and stiffish, oval or cuneate-oval, sharply and often spinulose dentate, grayish green; plant strict, pubescent, woody, perennial. Winter bloomer. It does not appear in Amer. trade lists. *L. tenuifolia*, Gray, and *L. effusa*, Gray, of S. Calif., are phlox-like plants offered by Orcutt, in 1891. The former, Gray subsequently referred to *Gilia tenuifolia*, Gray, and the latter to *Gilia Dönnii*, Kellogg. L. H. B.

LOGANBERRY. The Loganberry is a valuable hybrid product of San Cruz, Calif., from *Gilia*, in 1881, by Judge J. H. Logan, from a seed of the Aughtinbaugh blackberry, accidentally fertilized from an adjacent raspberry, supposed to be the old Red Antwerp. The Aughtinbaugh is a pistillate variety of *Rubus vitifolius*, the extremely variable wild blackberry of California, and was a chance seedling found beneath the oaks of Alameda, about 1860. It is a strong-growing, dark green vine of the dewberry type, but with fruit of the true wild blackberry flavor. The Loganberry fruit has many characteristics of both parents. It is a rich, dark red color when ripe, and sometimes is an inch and a quarter in length. The plant has been widely disseminated throughout the United States and Europe since 1893, when the California Experiment Station, after five years' testing, first distributed stock. G.F. 7:466.

The Loganberry is propagated from stolons developed in the autumn at the end of the canes, or from single-eye hardwood cuttings. Seedlings are especially unreliable. Plants should be trained upon a wall or trellis, keeping the berries from the ground. Two adjacent vines at Berkeley, California, cover 12 square yards and yielded four gallons of fruit in 1899. If careful winter protection is given, the plants can be grown in many parts of New England and the middle states, according to Bulletin 45 of the Rhode Island Experiment Station and Bulletin 147 of the New York (Geneva) Station.

The value of the Loganberry for the home garden wherever it is sufficiently hardy is generally recognized, but its value as a standard market crop has yet to be determined. It proves difficult to transport to the Los Angeles and San Francisco markets except when grown within a short distance, and dealers prefer the standard berries. When it can be gathered near the time of greatest perfection and delivered directly to the consumer, it becomes a very popular fruit.

CHAS. H. SHINN.

The Loganberry in the East.—In the East the Loganberry has not met the expectations at first entertained for

it. It is reported tender in nearly all localities, requiring the best of winter protection, and even then often being injured. Through covering with earth in late autumn is the most satisfactory method of doing this and is absolutely essential. The berries are large, but the plants, at best, are only moderately productive. In quality the fruit ranks low, though apparently improved by cooking. Few persons like the flavor of the fresh fruit. It now seems unlikely that the Loganberry will ever become prominent in the East. FRED W. CARD.

LOISELEURIA (after J. C. A. Loiseleur-Deslongchamps, physician and botanist in Paris, 1744-1849). Syn., *Chamaedon*, *Chamaeristas*, *Ericaceae*. Prominent hardy evergreen shrub with very small, mostly opposite, closely set, entire lvs., and with small, usually rose-colored fls. in terminal, few-fl. umbels. Well adapted for rockeries, forming depressed tufts, but not easy to grow and rarely cut. It grows best in a sunny or partly shaded position in a porous, peaty and sandy soil, which is well drained and has a constant but moderate supply of moisture. Prop. by seeds treated like those of *Azalea* or by cuttings of half-ripened wood under glass. Only one species in the subarctic regions and high mts. of the northern hemisphere, formerly included under *Azalea*, but more closely allied to *Kahalia*: corolla broadly campanulate, 5-cleft; stamens 5; capsule 2-3-celled.

procumbens, Desv. (*Azalea procumbens*, Linn.). Only a few inches high, quite glabrous; lvs. petiolate, oval to narrow oblong, revolute at the margin, about $\frac{1}{4}$ in. long; fls. 1-5 on rather short pedicels, pink or whitish, about one-fifth in. across. July, Aug. L.B.C. 8:762. ALFRED REIDER.

LOLIUM (the ancient Latin name), *Gramineae*. DARNEL RYE-GRASS. Includes about 6 species of the Old World grasses, 2 of which are introduced in the eastern states and 2 are familiar fodder grasses of the same region. Perennial Rye-grass was probably the first pasture grass to be cultivated in Great Britain, and is grown there yet to a considerable extent, where it is said to occupy the same relative position of importance that Timothy does here. A weedy species, *L. temulentum*, is supposed to be the "tares" of Scripture. It is the Darnel, although that name is sometimes, but perhaps erroneously, applied to other species. Spikelets several-fl., sessile, and placed edgewise on opposite sides of a zigzag axis, forming a narrow spike. Our 2 cult. species are short-lived perennials or the second scarcely more than an annual, not to be recommended for permanent pasture or lawn, but are frequently employed for hay or annual pasture. They are successful only in the moist regions of the eastern states. Seed sown in autumn or early spring, 25 to 30 pounds to the acre.

perenne, Linn. PERENNIAL RYE-GRASS. One to 3 ft. high, with flat, shining lvs. and a slender spike, 4-10 in. long; spikelets 8-16-fl., awnless or only short awned.

italicum, A. Br. ITALIAN RYE-GRASS. Considered by many as a variety of the preceding. Differs chiefly in having longer awns to the florets. A. S. HITCHCOCK.

LOMARIA (Greek, *Loma*; a forage). *Polypodiaceae*. A genus of rather coarse ferns occasionally with a short caudex, allied to *Blechnum*. Sori arranged in lines, parallel with the midrib, and occupying nearly the entire space between the midrib and the margin of the leaf. Lvs. of 2 sorts. Some 25 species are known, largely from the southern hemisphere. L. M. UNDERWOOD.

Lomaria gibba is one of the most distinct and symmetrical ferns in cultivation. It includes several valuable varieties. The terminal eyes-like crowns are most beautiful and graceful. In their young state *Lomarias* make good plants for table decorations, principally as center pieces, but after they begin to form a stem or trunk-like base, they make fine decorative house specimens. Var. *intermedia* is somewhat coarser than *L. gibba* and of more erect habit. Var. *crispa* differs only in the pinnae being more or less crested and wrinkled.

It does not grow quite as fast or as strong as either *L. gibba* or var. *intermedia*. There are several other varieties of less commercial value.

Propagation is entirely from spores, which are produced freely on the second or third course of fronds. These spores must be treated much like other fern spores. They should be sown or laid upon very fine peaty soil or fine leaf-mold with a good portion of very fine silver sand, in shallow pans, boxes or flats, and kept in a warm and close atmosphere, well shaded from the sun. A temperature of 75° to 80° is best suited to them. The pans or boxes should be covered with a pane of glass, and this must be removed at intervals in order to keep the germinating spores from damping-off. After the young plants are large enough to be handled with the assistance of a small stick, they may be pricked off and transferred into fresh soil of the same quality, with perhaps a little loam mixed in and again placed in a congenial, warm, moist place in the propagating or warthouse, and again covered with glass. Give air and ventilation to keep them from being attacked by fungus. After producing the first two upright fronds, they may be put into thumb-pots. The soil now should be one-half loam and one-half peaty or leaf-mold soil, with plenty of sharp sand. Ample drainage must be afforded, and the plants kept in a temperature of not less than 60° to 65°.

The *Lomarias*, above all other ferns, must never be allowed to get thoroughly dry. They love abundance of water. Under proper treatment, they will soon make fine specimens. When the plants are of good size, they may be grown into miniature tree ferns, and as they make quantities of roots and soon get pot-bound, they can be reduced and root-pruned and put back into smaller pots. With gentle bottom heat, they soon make a new set of roots and new crowns or tops. When thoroughly established in this shape, they make fine decorative plants. *Lomarias* should never be exposed to the full sun. HENRY A. SIEBRECHT.

A. Plant with a distinct caudex or trunk.

B. Lvs. 6-12 in. long.

ciliata, Moore. Caudex 6 in. high, $1\frac{1}{2}$ in. thick; stipules blackish; lvs. 8-12 in. long, the upper pinnae with a rounded auricle at the lower side of the base; fertile lvs. narrow-linear. New Caledonia.

lancoelata, Spreng. Caudex elongate, densely clothed with dark brown scales; lvs. 6-12 in. long, 2-4 in. wide, with close, slightly falcate pinnae; texture leathery; fertile pinnae linear spreading. Australia and Polynesia.

BB. Lvs. 1 $\frac{1}{2}$ -3 ft. long.

C. Lower pinnae connected at base.

discolor, Willd. Caudex ascending; stipules black, glossy, with dense scales at base; lvs. $1\frac{1}{2}$ -3 ft. long, 4-6 in. wide, with pinnae narrowed suddenly toward the point; fertile pinnae narrower and shorter. Australia and New Zealand.

gibba, Labill. Caudex 2-3 ft. high; stipules short, with black scales; lvs. 2-3 ft. long, 6 in. wide; fertile pinnae narrower, 4-6 in. long.—Var. *platyptera*, is advertised. *L. intermedia*, Hort., may be derived from this species. New Caledonia.

CC. Lower pinnae narrowed at base and distinct.

Boryana, Willd. Caudex stout, erect, 1-2 ft. high, woody, densely scaly; lvs. $1\frac{1}{2}$ -2 ft. long, 6-8 in. wide, narrowed and sometimes auricled at base; fertile pinnae narrow-linear, close. West Indies to Patagonia, Mauritius and S. Africa.—Probably includes 2 or 3 species, among them *L. zamiaefolia*, Hort.

AA. Plant with a stout, short, creeping rhizome.

Spicant, Desv. Sterile lvs. lanceolate, 6-9 in. long, 1- $\frac{1}{2}$ in. wide, gradually narrowed below; fertile lvs. 1 ft. long, with longer stalks (6-9 in.) and narrowly linear pinnae. En., western N. Amer.—The large Californian form with lvs. 2-3 ft. long is possibly a distinct species. The European plant was early called *Struthiopteris spicant* by Scopoli, by which name it is now cited.

as the earliest generic name. Hardy; needs deepest shade.

Nipponica, Kunze. Lvs. 15-20 in. long, abruptly pointed at the apex, the lower divisions gradually reduced and strikingly serrure-out; texture thick; fertile lvs. with pinnæ $\frac{1}{2}$ in. apart, narrow-linear, scarcely forming a wing to the rachis; indusia forming pod like structures, tough, persistent. Sometimes referred to the last species. Japan. L. M. UNDERWOOD.

LOMARIOPSIS. Consult *Acrastichum sorbifolium*.

LOMATOPHYLLUM is a genus of the lily family with 3-5 species in the Mascarene Islands. They have the habit and perianth of Aloe, but differ in the red-margined leaves and fr. a berry. They are fleshy subshrubs with hermaphrodite fls. and introrse anthers as in Sansoniera, but differ in having declined hypogynous stamens and several ovules in a cell, whereas Sansoniera has erect stamens inserted on the throat of the tube and solitary ovules. Not cult.

LÓNAS (possibly a recombination of some of the letters of Santolina). *Compositæ*. This includes an unimportant, hardy, yellow-flowered "everlasting" known to the trade as the African Daisy or *Athanasia annua*. The heads are about three-eighths of an inch across, and composed entirely of disk fls. There are 14 or more heads in the largest corymb, which may be 2 in. across. This plant was removed from Athanasia largely because it is an annual herb, while the Athanasias are shrubs or subshrubs. A more fundamental reason for giving this plant a separate genus is that it has a cup-shaped pappus, while in Athanasia the pappus is absent or consists of small, rather bristly chaff or else of hyaline hairs.

Inodóra, Gært. (*Athanasia annua*, Linn.). AFRICAN DAISY. Fleshy, branching, 1 ft. high; lvs. alternate, pinnatifid, the divisions linear, entire, remote; corymbs dense; seeds 5-ribbed, not hairy. Mediterranean region. B.M. 2276. J.H. III. 31:281.

LONDON PURPLE. See *Insecticides*.

LONGWORTH, NICHOLAS (1783-1863) has been called the "father of American grape culture." Plate X. He was born in Newark, N. J. He early went to Cincinnati, then in the young and growing West, and engaged in banking and other business. He early became interested in agricultural affairs, and particularly in the grape. From John Adlum he received the Catawba, and became the means of making grape-growing a commercial success in the Ohio valley. He was a leader in the company of horticultural experts and writers which made Cincinnati famous in the middle of the century. Longworth was one of the first to perceive that many strawberries are infertile with themselves, and to suggest the planting of pollinizers, although the imperfect nature of the strawberry blossom had been known long before his time. He also introduced the Clinton Everbearing raspberry, the first improved variety of *Rubus occidentalis*. Longworth was a pioneer of horticulture in the expanding West, and, more than that, he was a guiding spirit in horticultural affairs of national importance. In 1846 he published a pamphlet on "The Cultivation of the Grape, and Manufacture of Wine. Also, Character and Habits of the Strawberry Plant." He also contributed a chapter on the strawberry to Buchanan's "Culture of the Grape." For further notices, see Hovey's "Magazine of Hort." 29:160, "Evolution of Our Native Fruits," and our article on *Horticulture*. The portrait in Plate X shows Mr. Longworth at 74 years of age. L. H. B.

LONICERA (after Adam Lonicer or Lonitzer, a German physician and naturalist, 1528-1586). Including *Caprifolium*, *Xylosteum*, *Nintoa* and *Chamaecerasus*. *Caprifoliaceæ*. HONEYSUCKLE. Ornamental deciduous, rarely evergreen, shrubs of upright or climbing habit, with opposite, entire lvs. and tubular, mostly 2-lipped fls. of white, yellow, pink, scarlet or purple color, often fragrant, appearing in axillary pairs or in terminal

spikes or clusters; the red, yellow, blue or black berries are in many species very decorative. The Upright or Bush Honeysuckles are very valuable for shrubberies, and the low procumbent species, like *L. spinosa* and *ruficula*, are well suited for rockeries. Most of the cultivated species are hardy North, but *L. Standishi*, *fragrantissima*, *nummularifolia*, *Ledebouri*, *quinque-lobularis*, *Webbiana*, *ruficula*, and other Himalayan species are less hardy and need sheltered positions or protection North. Some of the handsomest in bloom are the well-known *L. Tatarica*, *floribunda*, *spinosa*, *Maackii*, *Morrovi*, *Ledebouri*; for the sweet-scented early fls., *L. Standishi* and *fragrantissima* are to be recommended. Honeysuckles with very decorative fruits are *L. Morrovi*, *Tatarica*, *gracilipes*, *alpigina*, *chrysantha*. *Loniceras* thrive in almost any good garden soil, and prefer mostly sunny position, but *L. ciliata*, *nigra*, *Ledebouri*, *hispidula* and *Xylosteum* grow as well or better in partly shaded situations. Pruning may be done during winter except in the early-flowering species,



1311. Fly Honeysuckle, *Lonicera ciliata*.
($\times \frac{1}{2}$)

like *L. Standishi*, *fragrantissima*, *gracilipes* and *hispidula*. The Climbing Honeysuckles are well adapted for covering walls, arbors and other trelliswork; they have mostly handsome and often sweet-scented fls., but are somewhat deficient in foliage, with the exception of *L. Japonica*, and apt to become leafless and unsightly at the base, and therefore may be mixed with other climbers, like *Ampelopsis*, *Akebia*, *Clematis*. They perhaps show their beauty to the best advantage when allowed to ramble over shrubs and small trees. Those of the *Caprifolium* group are mostly hardy North, with the exception of the southern European species and *L. hispidula*, while of the *Nintoa* group *L. Japonica* is hardy North, at least in a sheltered position; this species makes also a very handsome ground cover, and, like *L. Periclymenum*, grows well in shade, but the others prefer sunny positions. Prop. by seeds sown in fall or stratified and by cuttings of ripened wood; also by green-wood cuttings under glass in summer, but *L. Caprifolium*, *sempervirens* and allied species grow less readily in this way. *L. spinosa* is sometimes grafted high on stems of *L. Tatarica*, thus forming a small weeping tree. About 140 species throughout the north-

ern hemisphere, more than 60 of which, besides many hybrids, are in cultivation. Lvs. sometimes sinuately lobed, in a few species with distinct stipules, mostly deciduous; fls. in axillary peduncled pairs or in sessile whorls at the end of the branches; calyx 5-toothed; corolla with short or slender, often gibbous tube, 2-lipped or almost equally 5-lobed; stamens 5; ovary inferior, usually 2-3-celled; berry few to many-seeded.

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A. Habit upright: fls. in pairs, rarely solitary.

B. Fls. with almost regular 5-lobed limb.

C. Corolla not gibbous at the base: low shrubs, with slender, recurving or prostrate branches and small lvs.

1. *spinosa*, Jacq. (*L. Albertii*, Regel). Shrub, to 2 ft., with slender branches; rigid and spiny in high alpine regions, glabrous; lvs. linear or linear-lanceolate, sometimes with 2-4 teeth at the base, glaucous or bluish green, $\frac{3}{8}$ - $1\frac{1}{2}$ in. long; fls. on slender erect peduncles, rosy pink, fragrant, with slender tube; stamens exerted. May, June. Turkestan, Himal. Gt. 30:1065. B.M. 7394.

2. *rupicola*, Hook. f. & Thoms. Low and almost prostrate: lvs. often in 3's, oblong to oblong-ovate, glabrous or tomentose beneath, about $\frac{1}{2}$ in. long; fls. short-peduncled, light pink, with short tube; stamens and style included. June, July. China, Himal.

cc. Corolla more or less gibbous: erect shrubs: lvs. larger.

D. Bracts at the base of fls. large, ovate or cordate.

E. Color of fls. yellow or scarlet.

3. *involuturata*, Banks (*L. flavescens*, Dipp.). Shrub, to 3 ft., with upright branches, glabrous or somewhat pubescent; lvs. elliptic-ovate to oblong-lanceolate, bright green, thin, slightly pubescent beneath when young, 2-5 in. long; fls. erect, long-peduncled; corolla yellowish or slightly tinged red, viscid, pubescent, with short erect lobes, about $\frac{1}{2}$ in. long; berries black, shining, almost enclosed by the enlarged purple bractlets. May-July. Ontario to Alaska, south to Utah and Calif. B.R. 14:1179. B.B. 3:242.

4. *Ledebouri*, Eschsch. (*L. intermedia*, Kellogg). Similar to the former, but more vigorous, branches sometimes sarmentose, to 15 ft. long; lvs. of firmer texture, dark green above, pubescent beneath; fls. more salver-shaped, with rounded, spreading lobes, scarlet-red outside, $\frac{3}{4}$ in. long; stamens shorter than lobes. May-July. Calif. Gt. 2:64. R.H. 1843:373.—Much handsomer than the former, but more tender.

EE. Color of fls. white.

5. *hispida*, Pall. Shrub, with spreading branches, bristly-hispid: winter-buds large, 2-valved; lvs. obovate to oblong, ciliate and hirsute, at least when young, sometimes glaucous beneath, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long; fls. nodding, white, salver-shaped, hispid, $1\frac{1}{2}$ - $1\frac{1}{2}$ in. long; bractlets none; fr. oblong, bright red. April, May. Altai, Himalayas.—Distinct and handsome with its rather large white flowers.

DD. Bracts small and narrow.

6. *cærulea*, Linn. Much-branched erect or spreading shrub, to 3 ft., with glabrous or pubescent branchlets; lvs. often stipulate oval or obovate to oblong-lanceolate, pubescent or almost glabrous, pale or glaucous green, 1-2 in. long; fls. short-peduncled, yellowish or greenish white, $\frac{1}{2}$ - $\frac{3}{2}$ in. long; fr. blue, bloomy; berries connate only at the base, but wholly covered by the connate bractlets and hence seemingly connate. April, May. N. Eu., N. Asia and in N. America south to Tenn., Wis., and Calif. B.M. 1965.—Var. *villosa*, Torr. & Gr. Branchlets and lvs. villos pubescent. Var. *graciliflora*, Dipp. (*L. Karelini*, Hort., not Ege.). With upright rather slender, bright red branches, slightly pubescent; fls. with slender tube.

7. *gracilipes*, Miq. (*L. Phylomela*, Hort.). Shrub, to 6 ft., almost glabrous; lvs. roundish-ovate to oblong-ovate, ciliate, bright green often with reddish margin, 1-2 $\frac{1}{2}$ in. long; peduncles slender, nodding, usually 1-fl.; corolla pink, rarely white, $\frac{3}{8}$ in. long; fr. rather large, pendulous, bright red. April, May. Japan. G.F. 10:265.—A graceful species; one of the earliest to bloom, and very handsome in June with its pendulous scarlet fls.

8. *ciliata*, Muhlent. (*L. Canadaensis*, Marsh.). Fig. 1311. Shrub, to 5 ft.; lvs. ovate or oval, rounded or cordate at the base, ciliate, pubescent beneath when young, $1\frac{1}{2}$ -3 in. long; fls. slender-peduncled, always in pairs, yellowish, sometimes slightly tinged red, $\frac{3}{8}$ in. long; fr. light red. April, May. Canada to Pa. and Mich. B.B. 3:241.

BB. Fls. 2-lipped.

C. Ovaries and frs. connate or partly connate, only occasionally separate: fls. rather small.

D. Bractlets none: fls. white or yellowish.

9. *oblongifolia*, Hook. Shrub, to 5 ft.; lvs. almost sessile, oval-oblong, obtuse, pubescent beneath, 1-2 $\frac{1}{2}$ in. long; fls. slender-peduncled; corolla hairy outside, yellowish white, sometimes tinged purplish; berries dark red. May, June. Quebec to Manitoba, south to Pa. and Mich. B.B. 3:240.



1312. *Lonicera Xylosteum* ($\times \frac{8}{8}$).

10. *Standishi*, Carr. (*L. Sinensis*, Hort. *L. fragrantissima* of some). Half-evergreen shrub, with spreading branches, to 6 ft.; branchlets with reflexed bristly hairs; lvs. coriaceous, oblong-ovate to ovate-lanceolate, acuminate, ciliate, bristly hairy on both sides or glabrous above, 3-4 in. long; fls. on rather short curved peduncles, white or slightly blushed, very fragrant, $\frac{3}{4}$ - $\frac{1}{2}$ in. long; fr. scarlet. March, Apr. China. B.M. 5709. G.C. 111. 5:245. R.H. 1873, p. 148.

11. *fragrantissima*, Lindl. (*L.*, or *Caprifolium*, *Nia-guarilla*, Hort.). Similar to the former, but with long and slender recurring and almost glabrous branches; lvs. broadly ovate or obovate, acute, almost glabrous, but bristly on the midrib beneath and ciliate, 1-2½ in. long; corolla glabrous outside. March-May. G.C. III. 5:245. R.H. 1873, p. 169.—Less hardy than the former. Both have handsome half-evergreen foliage and very early, sweet-scented, though not very showy flowers.

DD. *Bractlets present, small, glandular: fls. dull violet or brownish red.*

12. *alpigena*, Linn. Shrub, to 8 ft., with stout branches; lvs. oblong-obovate or obovate, short acuminate, glossy and dark green above, light green and often pubescent beneath, 2-4 in. long; fls. long-peduncled, with short usually yellowish green tube and brownish red limb; fr. bright scarlet, shining. April, May. Mts. of M. Eu. and W. Asia.—Very handsome in fruit.



1313. *Lonicera Tatarica* (× ½).

13. *orientalis*, Lam. (*L. Caucasicæ*, Bieb.). Shrub, to 10 ft., almost glabrous; lvs. elliptic or ovate to oblong-ovate, rarely oblong-lanceolate, dark green above, pale or glaucous beneath, 2-4 in. long; fls. short-peduncled, pale violet or pinkish; fr. black, wholly con- nate. May, June, W. Asia to Kamschatka. Gt. II:359. —Fls. and frs. not very conspicuous.

cc. *Ovaries and frs. separate.*

D. *Fls. white or yellowish white, changing to yellow: branches pubescent.*

14. *Xylósteum*, Linn. Fig. 1312. Shrub, to 10 ft.; lvs. broadly oval to obovate, acute, dull green, pubescent above, usually glabrous at length, 1-3 in. long; fls. peduncled, yellowish white, often slightly tinged red, hairy outside; bractlets pubescent, about half as high as ovary; berries dark red. May, June. En., W. and N. Asia, sometimes escaped from cultivation. B.B. 3:241.

15. *Mórowi*, Gray. Shrub, to 6 ft., with wide spreading branches; lvs. oval or oblong-ovate, dark green above, grayish tomentose beneath, 1-2 in. long; fls. peduncled, pure white at first, pubescent outside, upper lip divided nearly to the base, with spreading lobes; bractlets pubescent, about as long as ovary; fr. blood-red. May, June. Japan. A.F. II:1267. Gng. 5:329.—Very decorative, with its bright red fruit from August until late in fall. There is also a var. with yellow fruit.

16. *Ruprechtiana*, Regel. Shrub, to 12 ft.; lvs. ovate-lanceolate to lanceolate, acuminate, usually dark green above, grayish pubescent beneath, 2-4 in. long; fls. on rather long peduncles, pure white at first, glabrous outside; bractlets only glandular-ciliate, small, about one-third of the ovary; fr. red or sometimes yellow. May, June. Mansuria. Gt. 19:645.—This species and the preceding are likely to hybridize with the following; these hybrids are very common, and may be recognized by the glabrescent foliage and the tinge of pink in the fls. The true *L. Ruprechtiana* is much rarer than its hybrids.

DD. *Fls. pink or red, sometimes white, but not changing to yellow.*

17. *Tatarica*, Linn. Fig. 1313. Shrub, to 10 ft., almost glabrous; lvs. cordate or rounded at the base, ovate to ovate-lanceolate, ciliate, sometimes slightly pubescent beneath when young, 1-2½ in. long; fls. slender-peduncled, pink, crimson or white, the upper lip deeply divided, spreading; bractlets small, glabrous; fr. red, rarely yellow. May, June. S. E. Russia to Siberia. B.R. 1:31. R. II. 1868:392. Gt. 18:627.—Variable in size and shade of fls. Var. *alba*, Regel (var. *alba grandiflora*, Hort.). Fls. white, large. Var. *angustifolia*, Kirchn. (*L. angustata*, Wender.). Lvs. narrow-lanceolate: fls. bright pink. Var. *latifolia*, Lond. (var. *grandiflora* and var. *grandiflora rubra*, Hort.); var. *speciosa*, var. *pulcherrima*, Hort.). Large-leaved form, with large pink fls., the lobes bordered lighter pink. R.H. 1844:109. A form of this with deeper pink fls. is var. *speciosa*, Carr. (var. *parvifolia*, Jäger (var. *gracilis*, Carr.; *L. parvifolia*, Hayne, not Edgew.). Lvs. smaller, obtuse; fls. pure white, small, with broad and short lobes; fr. orange-red. Var. *rubriflora*, DC. (*L. Sibirica*, Hort.). Fls. deep pink.

18. *floribunda*, Boiss. & Buhse. Shrub, to 8 ft.; finely tomentose; lvs. roundish ovate to oval, obtuse, pubescent on both sides, bluish or grayish green, ½-1½ in. long; fls. slender-peduncled, light pink, upper lip divided (not beyond the middle), with ovate erect lobes; bractlets small, pubescent; fr. red. June. Transcauc., Persia. Gt. 12, p. 163, Figs. 4-6.—Very free-flowering shrub, with distinct, bluish green foliage.

AA. *Habit climbing, rarely almost shrubby.*

B. *Fls. in pairs, 2-tipped, sometimes crowded at the end of branches; tube slender. (Nintoa.)*

19. *Japónica*, Thunb. Fig. 1314. Climbing, to 15 ft. high; branchlets usually pubescent when young; lvs. half-evergreen, roundish ovate to oblong, pubescent beneath or almost glabrous, 1½-3 in. long; fls. short-peduncled, white, changing to yellow, often purplish outside, very fragrant, glandular-pubescent outside, 1½-2 in. long; fr. black, separate. June-Aug. China, Japan; naturalized in some places from N. Y. to N. C. B. B. 3:240.—Var. *aureo-reticulata*, Arb. Kew. (*L. reticulata aurea*, Hort. *L. brachypoda reticulata*, Hort.). A form of var. *flexuosa*, with the smaller and shorter fls. handsomely netted yellow. B.H. 21:59. Var. *flexuosa*, Arb. Kew. (*L. flexuosa*, Thunb. *L. brachypoda*, DC.). Less high climbing; lvs. ovate or oblong, obtusish, mostly only pubescent on the veins beneath; peduncles usually as long as petioles or shorter; corolla 1-1½ in. long, with the limb shorter than tube; bractlets broad, as long as ovary. Var. *Chinensis*, Bak. (*L. Chinensis*, Wats.). Lvs. ovate, acute, ciliate and pubescent only at the veins beneath, often with purplish hue beneath; peduncles usually longer than petioles; corolla 1½-2 in. long, tube about as long as limb; bractlets narrow, about half as long as ovary. B.R. 9:712. B.M. 3316. L.B.C. II:1037. Var. *Halliana*, Arb. Kew. (*L. flexuosa*



1314. *Lonicera Japonica* (× ½).

Commonly known in this country as *L. Halliana*.

Halliana, Dipp. *Caprifolium Hallianum*, Hort.). Of vigorous growth; lvs. usually pubescent on both sides when young, oblong-ovate, acute, to 2½ in. long; fls. short-peduncled; tube as long as limb; bractlets broad, half as long as ovary. Flowering in fall, otherwise hardly different from the type. A.G. 12:663. Gng. 3:293.

20. *longiflora*, DC. Climbing shrub, glabrous; lvs. oblong-lanceolate, shining above, pale beneath, 2-2½ in. long; fls. in short-peduncled pairs, sometimes crowded towards the end of branches; corolla white, changing to yellow, fragrant, 3-4 in. long, with very slender tube; bracts small, subulate; fr. white. S. China. B.R. 15; 1232 (as *Caprifolium longiflorum*).—Tender. Int. 1900, by Franceschi.

21. *Hildebrandiana*, Coll. & Hemsl. Climbing shrub, glabrous; lvs. broadly ovate or elliptic-ovate, abruptly pointed, 4-6 in. long; fls. on stout peduncles; corolla 5-7 in. long, glabrous outside, yellow at first, changing to orange-red, with long and slender tube. Summer. Upper Burma. G. C. III. 24:219. B. M. 7677.—This has the largest flowers of any species, but is not hardy North.

BB. Fls. sessile, in usually 6-fld. whorls at the end of the branchlets, forming terminal spikes or clusters: upper lvs. mostly connate, usually climbing. (*Caprifolium*.)

c. Corolla distinctly 2-lipped.

D. Tube of corolla slender, 1 in. or more long, glabrous inside except No. 27: corolla never bright yellow.

E. Whorls of fls. forming a peduncled head or spike: bractlets large.

22. *Periclymenum*, Linn. (*Caprifolium Periclymenum*, Koem. & Schult.). WOODBINE. Fig. 1315. Climbing several ft. high: lvs. all distinct, ovate to oblong-ovate, acute, 1½-3 in. long, dark green above, pale or glaucous beneath and sometimes sparingly pubescent; fls. in a peduncled dense head, very fragrant, yellowish white, usually carmine or purple outside and glandular pubescent, 1½-2 in. long. June-Sept. Eu., N. Afr., W. Asia.—Var. *Belgica*, Ait. Of more vigorous growth, sometimes shrubby; fls. bright red outside; blooming all summer. Probably var. *sempervirens*, Hort., figured in Gn. 45:306, is not very different. Var. *quercifolia*, Ait. Lvs. sinuately lobed; a curious but less desirable form. Var. *serotina*, Ait. Similar to var. *Belgica*, but flowering in fall.

23. *Etrusca*, Santi. Climbing; lvs. broadly oval to obovate, usually obtuse, the upper ones connate into an oval obtuse disk, rarely distinct, 1-3 in. long, glabrous or pubescent; fl. heads dense peduncled, often in 3's; corolla yellowish white, usually tinged red, fragrant, 1½-2 in. long, with very slender tube. May-July. Distributed through the whole Mediterranean region in many different forms.—Var. *gigantea*, Hort. Of vigorous growth, with large pubescent leaves.

24. *Heckerdti*, Hort. Not much climbing; lvs. elliptic or oblong-elliptic, acute, almost sessile, the upper pairs connate, glaucous beneath, glabrous, about 2 in. long; fls. in peduncled spikes with few somewhat remote whorls, purple outside and sparingly glandular, 1½-2 in. long; bractlets about half as long as ovary. Origin unknown, probably garden hybrid of *L. Etrusca* and an American species.

EE. Whorls of fls. all, or at least the lower ones, in the axils of connate lvs.

25. *Italica*, Schmidt (*L. Etrusca*, Hort. *L. Caprifolium*, Auth.). Climbing; lvs. broadly oval to oblong obovate, the upper connate, glabrous, 2-4 in. long; the upper whorls without connate lvs. at the base, somewhat crowded; fls. yellowish, usually purple outside and glabrous, fragrant, to 2 in. long; bractlets about half as long as ovary, smaller on the upper fls. June-Aug. Probably hybrid of *L. Etrusca* and *L. Caprifolium*, much cultivated, mostly under the name of the latter. Gn. 45, p. 307 (as *L. Etrusca* and *L. Caprifolium*); 54, p. 26. F.S. 11:120 (as *L. Caprifolium major*). Var. *Babella*, Tausch. Fls. dark purple outside.

26. *Caprifolium*, Linn. (*Caprifolium hortense*, Lam. C. *perfoliatum*, Roehl.). Fig. 1316. Climbing; lvs.

oval to oblong, the upper connate into a roundish cup, almost glabrous, 2-4 in. long; whorls usually 2 or 3, each in the axils of connate lvs.; fls. yellowish white, mostly purplish outside and often slightly hairy, to 2 in. long, fragrant; bractlets very small or none. May, June. M. Eu. to W. Asia. N. 2:296. B. B. 3:237.—Sometimes escaped from cultivation and described under the name *L. grata*, Ait., as an American species. Var. *Alba*, Ait. (*L. pallida*, Hort. *L. praecox*, Hort.). Fls. white, appearing early. R.H. 1856:141.

27. *implexa*, Ait. Much branched but less high climbing, evergreen; lvs. oval to oblong-lanceolate, sessile, the upper connate into an elliptic, acute or mucronate disk, glaucous, glabrous, 1-2 in. long; fls. in several whorls, each in the axils of connate lvs., scentless, yellowish white; tube slightly hairy within; limb rather short; stamens little exerted. May, June. S. Eu., N. Afr. B.M. 640.

DD. Tube of corolla gibbous or more or less ventricose, less than 1 in. long, pubescent within, but almost glabrous within and slender in No. 28.

E. Bractlets small or none.

F. Disk of connate lvs. mostly roundish, often emarginate at the ends.

28. *flava*, Sims (*Caprifolium Fräseri*, Pursh). Climbing to 10 ft.; lvs. broadly oval to elliptic, the upper connate, bright green above, glaucous beneath, glabrous, 1½-3 in.; fls. in a peduncled head, bright or orange-yellow, fragrant, 1-1½ in. long; tube slender, longer than limb. April, May. N.C. to Ky., Ga. and Alab. B.M. 1318. L.B.C. 4:338. G.F. 3:190. Gn. 45, p. 307.—This species is rare in cultivation and mostly the following is cult. under this name.

29. *Sullivanti*, Gray (*L. flava*, Auth. not Sims). Fig. 1317. Climbing about 4-5 ft., very glaucous; lvs. oval or obovate, the upper connate into a large disk, becoming thickish and very glaucous above, often finely pubescent beneath, 2-4 in. long; fls. in short-stalked or almost sessile spikes; corolla pale yellow, often marked purplish outside, about 1 in. long; tube gibbous, only little longer than limb. May, June, Ontario to Manitoba, south to Tennessee. R.H. 1856:221 (as *L. flava*). G.F. 3:191.—Very handsome in fall with the abundant scarlet berries.

30. *Bröwni*, Carr.

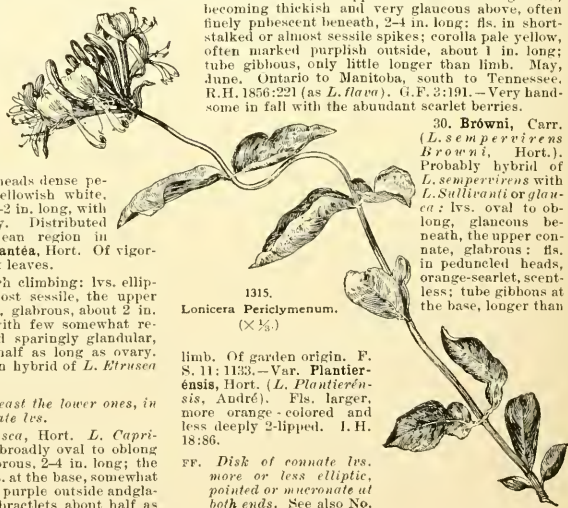
(*L. sempervirens* Brown, Hort.). Probably hybrid of *L. sempervirens* with *L. Sullivanti* or *grata*; lvs. oval to oblong, glaucous beneath, the upper connate, glabrous; fls. in peduncled heads, orange-scarlet, scentless; tube gibbous at the base, longer than

1315.
Lonicera Periclymenum.
(×½)

limb. Of garden origin. F. S. 11:133.—Var. *Plantierensis*, Hort. (*L. Plantierensis*, André). Fls. larger, more orange-colored and less deeply 2-lipped. I.H. 18:86.

FF. Disk of connate lvs. more or less elliptic, pointed or mucronate at both ends. See also No. 30.

31. *hirsuta*, Eat. (*Caprifolium pubescens*, Goldie). High climbing, with usually hirsute branchlets; lvs. petioled, broadly oval or ovate, obtuse, the upper connate and abruptly pointed, dark green above, pubescent on both sides when young, 2-4 in. long; fls. in short, mostly peduncled spikes, scentless, bright or orange-yellow, pubescent without, about 1 in. long, with the



tube gibbous at the base; ovary and bractlets usually glandular. June, July. Vt. to Manitoba, south to Pa. and Ohio. B.M. 3103. Gn. 45, p. 307.



1316. *Lonicera Caprifolium* ($\times \frac{1}{2}$).

32. *Douglasi*, Hook. (*L. glaucescens*, Rydb. *L. glauca*, var. *Douglasi*, A. Gray, partly). Climbing; branchlets glabrous; lvs. short-petioled or almost sessile, the upper connate, oval to obovate, glabrous above, pubescent beneath, $1\frac{1}{2}$ -3 in. long; fls. in short, almost sessile spikes; corolla yellow, mostly reddish outside and hairy, $\frac{3}{4}$ -1 in. long; tube gibbous, longer than the limb; ovary and bractlets glabrous. May, June. Ontario to the Saskatchewan, south to Pa. and Neb. B.M. 3:238.—Rare in cultivation, but sometimes a hybrid of *L. hirsuta* and *Sullivanti* is found under this name in gardens. It is figured in G.F. 9:345.

33. *dioica*, Linn. (*L. glauca*, Hill. *L. media*, Murr. *L. parviflora*, Lam.). Usually shrubby, with slender, sarmentose branches, rarely climbing, glabrous; lvs. short-petioled or almost sessile, the upper connate, oval to oblong, obtuse, with usually undulate and transparent margin, very glaucous beneath, $1\frac{1}{2}$ -3 in. long; fls. in sessile or short-stalked spikes, greenish or whitish yellow, often tinged purplish, glabrous outside, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, the tube gibbous, about as long as limb. May, June. Quebec to Manitoba, south to Ohio and N. C. B.R. 2:138.

EE. *Bractlets as high as ovary or slightly shorter, roundish.*

34. *hispidula*, Dougl. Bushy shrub with sarmentose branches, rarely twining, usually hirsute; lvs. oval to ovate, rounded or cordate at the base, often with foliaceous stipules, the upper connate or sometimes distinct, usually small, rarely to $2\frac{1}{2}$ in. long, ciliate and pubescent, rarely glabrous; fls. in slender-peduncled and often panicle spikes, pink or yellowish, glabrous or hirsute, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, with short gibbous tube. June, July. Brit. Columb. to Calif. B.R. 21:1761.—Var *Californica*, Greene (var. *vedicillans*, A. Gray). Of more vigorous growth, with large lvs. to 3 in. long; corolla glandular-pubescent outside. Calif.

cc. *Corolla with almost regular or slightly 2-lipped limb: limb several times shorter than tube.*

35. *ciliosa*, Poir. (*L. occidentalis*, Hook.). Low sarmentose shrub; lvs. petioled, ovate or oval, glabrous

beneath, glabrous but ciliate, the upper connate, 2-4 in. long; fls. in short-peduncled heads of one or few whorls; corolla slightly 2-lipped, with ventricose-gibbous tube, yellow to orange-scarlet, sometimes hirsute outside, $1\frac{1}{4}$ - $1\frac{3}{4}$ in. long. June, July. Brit. Col. to Calif. and Ariz.

36. *sempervirens*, Linn. (*Caprifolium sempervirens*, Michx.). TRUMPET HONEYSUCKLE. Fig. 1318. High climbing, glabrous; evergreen southward; lvs. oval to oblong, glaucous beneath, the upper connate, 2-3 in. long; fls. in peduncled interrupted spikes; corolla with almost equal limb; tube slightly ventricose, glabrous, $1\frac{1}{2}$ -2 in. long, scarlet or orange-scarlet, rarely yellow. May-Sept. Conn. to Fla., west to Neb. and Tex. B.M. 781. R.H. 1856:361. Gn. 45, p. 307.—Var. *flava*, Regel (*L. flava nova*, Hort.). Fls. yellow. Gt. 2:38. Var. *fuchsoides*, Hort. (*L. fuchsoides*, Hort., not of Hemsl., which is a Chinese species of the Nintox group and not yet introduced). Similar to var. minor, but tube more expanded above, bright scarlet. Var. *minor*, Ait. Lvs. oblong or narrow oblong; fls. more slender, orange-red or orange-scarlet. Very free-flowering, but more tender. B.M. 1753. B.R. 7:556. Gn. 34:300. Var. *speciosa*, Carr. Differs from the type by more brilliant scarlet fls. F.S. 11:1128. Sometimes cult. as *L. Magnevillea*, a name also applied to *L. dioica*, and a darker red form of *L. Caprifolium*.

L. angustifolia, Wall. Erect shrub, to 10 ft.: lvs. lanceolate; fls. long-peduncled, white, fragrant, with regular 5-lobed limb. Himal. F.S. 4, pp. 407, 408 b. Tender.—*L. arborea*, Boiss. Erect shrub or small tree, to 30 ft.: lvs. roundish ovate, pubescent; fls. short-peduncled, 2-lipped, pinkish, small. Spain.—*L. bella*, Zabel (L. Morrowi \times Tatarica). Intermediate between the two; fls. white to pink. Garden origin.—*L. biloba*, Desf.—*L. canescens*.—*L. canescens*, Schousb. Climbing, grayish tomentose; lvs. ovate, small; fls. in pairs, white, 2-lipped, with slender long tube, fragrant. Spain. N. Afr.—*L. chrysantha*, Turcz. Allied to *L. xylosteum*, higher; lvs. larger, acuminate; fls. larger, changing to bright yellow. N. E. Asia. Gt. 12:494. Handsome hairy shrub, with rather light green foliage and bright coral-red berries.—*L. confusa*, DC. Allied to *L. canescens*, but fls. and lvs.



1317. *Lonicera Sulivanti* ($\times \frac{1}{2}$).

somewhat larger and ovary glabrous. Japan, China. B.R. 1:70 (as *L. Japonica*). Gn. 45, p. 307. Has been often confounded with *L. Japonica*, but is easily distinguished by the small subu-

1318. *Lonicera sempervirens* ($\times \frac{1}{4}$).

late bracts. — *L. conjugialis*, Kellogg. Erect shrub: lvs. oval or ovate, pubescent; fls. slender-peduncled, small, 2-lipped, dark purple. Washington to Calif. — *L. depressa*, Royle. Low shrub, with small oval to oblong, glabrous lvs.; fls. peduncled, light pink, with short tube and regular limb, small. Himal. Var. *Myrtillus*, Clarke. Fls. short-peduncled; bracts narrower. — *L. diversifolia*, Wall. = *L. quinquefoliaris*. — *L. gibbiflora*, Maxim. = *L. chrysantha*. — *L. gibbiflora*, Dipp. Probably hybrid of *L. Ruprechtiana* and *chrysantha*; *L. notha* is also sometimes met with under this name. — *L. Ibrica*, Bieb. Erect shrub, to 8 ft.; lvs. roundish ovate, pubescent; fls. short-peduncled, 2-lipped, small, yellowish; berries bright red. N. Persia, Caucasus. — *L. Kamschatka*, Hort. = *L. Kesselringi*. — *L. Kesselringi*, Regel. Closely allied to *L. orientalis*; lvs. elliptic-lanceolate; fls. with narrow, not gibbous tube. Kamschatka. Gt. 40, p. 124. — *L. Korolbóri*, Stapf. Closely allied to *L. floribunda*, but filaments much longer and hairy and upper lip more deeply divided. Persia. G.F. 7:35. Hardy and tree-flowering. — *L. Maacki*, Maxim. Shrub, to 10 ft.; lvs. oblong-ovate; fls. short-peduncled, white, fragrant, 2-lipped, about 1 in. long. June, July. N. China, Amurland. Gt. 33:102. Handsome hardy shrub, flowering after the other Bush Honeysuckles. — *L. Maximowiczii*, Maxim. Shrub, to 6 ft.; lvs. oblong-elliptic; fls. peduncled, purplish violet, 2-lipped, rather small. N. E. Asia. Gt. 17:597. — *L. micrantha*, Regel = *L. floribunda*. — *L. micrantha*, Dipp. Hybrid of *L. Tatarica* and *Xylosteum*, or, no decorative value. Garden origin. — *L. microphylla*, Willd. Erect shrub, to 3 ft.; lvs. oval, about $\frac{1}{2}$ in. long; fls. slender-peduncled, 2-lipped, yellowish white, small; berries connate, orange-red. Altai to Himal. — *L. Mundeniënsis*, Rehder (*L. bella* \times *Ruprechtiana*). Lvs. oblong-ovate, dark green above; fls. white. Garden origin. Gt. 42, p. 101, Figs. 1-4. — *L. Muscaviensis*, Rehder (*L. Morrowi* \times *Ruprechtiana*). Similar to *L. Morrowi*, but of more upright and vigorous habit. Garden origin. Gt. 42, p. 101, Figs. 1-3. — *L. Myrtillus*, Hook. f. & Thoms = *L. depressa* vars. — *L. nervosa*, Maxim. Shrub, to 10 ft., with slender dark purple branchlets; lvs. ovate, with purple veins; fls. small, pink, long-peduncled, 2-lipped; fr. black. China. Hardy, graceful shrub. — *L. nigra*, Linn. Shrub, to 5 ft.; lvs. elliptic to elliptic-lanceolate; fls. slender-peduncled, pink, small; fr. black. Mts. of M. En. — *L. notha*, Zabel (*L. Ruprechtiana* \times *Tatarica*). Intermediate between the two; fls. white to pink. Garden origin. — *L. nummularifolia*, Janb. & Spach. Similar to *L. floribunda*, but fls. short-peduncled or almost sessile. W. Asia to Afghan. — *L. obovata*, Royle. Similar to *L. microphylla*; lvs. very small, obovate; fls. small, with almost regular limb, yellowish white. Himal. — *L. parvifolia*, Edgew. = *L. depressa*. — *L. propinqua*, Zabel (*L. albigena* \times *Ledebouri*). An interesting hybrid, in one form more like the first, in the other more like the second parent. Of

garden origin. — *L. Pyrenæica*, Linn. Erect shrub, almost glabrous; lvs. connate-oblong; fls. slender-peduncled, tubular-campanulate, regularly 5-lobed, white, $\frac{3}{4}$ in. long. Pyren. Mts. — *L. quinquefoliaris*, Hardw. Shrub, to 10 ft., with slender, spreading branches, similar to *L. Xylosteum*; fls. almost sessile, larger, yellowish; berries white. Himal. B.R. 30:53 (as *L. diversifolia*). — *L. Regeliana*, Dipp. Probably hybrid of *L. chrysantha* and *Xylosteum*. — *L. Schmitziana*, Dipp., not Roelz = *L. orientalis*. — *L. Segrezianis*, Lav. Closely allied to *L. Xylosteum*; lvs. more pubescent, dark bluish green; fls. short-peduncled, yellowish. Supposed to be a hybrid of *L. quinquefoliaris* and *L. Xylosteum*. — *L. splendida*, Boiss. Allied to *L. implexa*, and *Etrusca*; glabrous, glaucous; fls. in a many-fl., sessile head, yellowish white, tinged purple. Spain. F.S. 11:130. — *L. Tangutica*, Maxim. Slender shrub, with small, obovate or oblong lvs.; fls. slender-peduncled, small, with 5-lobed limb, pale pink. China. Gt. 40, p. 581. — *L. tonantilla*, Hook. f. & Thoms. Erect shrub, to 12 ft.; lvs. small, ovate to oblong, pubescent; fls. short-peduncled, nodding, small, regular, white. Himal. B.M. 6486. Tender. — *L. transilucens*, Hort. = *L. quinquefoliaris*. — *L. Webbiana*, Wall. Allied to *L. albigena*. Lvs. larger, acuminate, pubescent; fls. paler; ovaries separate. S. E. Eu. to Himal. — *L. Zabeli*, Rehder. Allied to *L. floribunda*, but quite glabrous and lvs. somewhat larger. Probably hybrid of *L. floribunda* and *Tatarica*. Gt. 42, p. 103, Figs. 1-3. Very free-flowering and handsome.

ALFRED REIDER.

LOOSESTRIFE. See *Lysimachia* and *Lythrum*.

LOPEZIA (after the Spaniard Lopez, who wrote up the natural history of the New World). *Onagraceæ*. About 21 species of herbs from Mexico and Central America. Erect, branching, glabrous or pubescent; lvs. alternate or the lower opposite, dentate; fls. usually small, in leafy racemes or subcorymbose at the ends of branches, slender-pedicelled; calyx limb 4-parted, unequal, deciduous, linear-lobed; petals 4, short or long-clawed, unequal, the posterior ones narrower, the claws glandular at the apex; stamens 2, attached to the pistil, one anther-bearing, the other petal-like; ovary 4-celled; capsule globose, leathery; seeds obovoid, with a leathery, granulated coat.

albiflora, Schlecht. Fig. 1319. Suffruticose, diffuse, 2 ft. high; young branches somewhat hairy; lvs. connate at the base, ovate-lanceolate, irregularly serrate or remotely dentate, largest $\frac{1}{2}$ in. long; pedicels horizontally spreading, slender; petals white, often tinged slightly pinkish at base, larger ones obliquely spatulate, obtuse and mostly notched, smaller ones linear, obtuse, as long as sepals. Mex. — Cult. at Harvard Botanic Garden, where the plant differs from the original description by the lvs. being usually ovate or perhaps oblong-ovate, and the smaller petals longer than the sepals. It seems to flower through the winter.

1319. *Lopezia albiflora* ($\times \frac{1}{2}$).

coronata, And. Annual; lvs. scattered or in whorls, glossy, glabrous; two upper petals linear, bright lilac; two side ones larger; lamina roundish subovate, light lilac, with dark red mark at base. Mex. S.B.F.G. I. 2:108. — Cult. in S. Calif.

LOPHANTHUS (Greek, *crested flower*; application not evident). *Labiatae*. Of this genus we cultivate 2 species of hardy herbaceous perennials, which are rather tall and coarse and bear spikes of more or less purplish fls. in summer. The genus contains 7 species, all from America or N. E. Asia. Lvs. serrate, veiny, petioled, lower usually subcordate and upper ovate; fls. small, in dense sessile whorls crowded into terminal spikes, which may be interrupted below; stamens exserted; anthers separated or distant, not approximate in pairs, their cells parallel or nearly so. Of minor value.

anisatus, Benth. GIANT HYSSOP. Height 2-3 ft.; lvs. ovate, anise-scented when crushed, white beneath; fls. blue; calyx teeth tinged purple or violet. July, Aug. Prairies, Wis. to Rockies. B. R. 15:282.—This species grows 3-5 ft. high, on dry hills, and has pale purple flowers.

scrophulariaefolius, Benth. Height 4-6 ft.; lvs. not anise-scented, not white beneath; fls. dull purplish; calyx teeth whitish. Borders of thickets, N. Y. to Wis. and N. C.—This plant grows 2 ft. high and has lavender-blue flowers in June.

LOPHOSPERMUM. See *Maurandia*.

LORDS AND LADIES. *Arum maculatum*.

LOQUAT. See *Eriobotrya Japonica*.

LOTUS meant several things to the ancients: (1) the Greek Lotus, a leguminous plant on which horses fed. This was probably what we call to-day *Lotus corniculatus*, the common Bird's-foot Trefoil of temperate regions. (2) the Cyrenean Lotus, an African shrub, the fruit of which was eaten by certain North African tribes who were called Lotus eaters. The fruit was said to be honey-sweet, the size of an olive and in taste like a date. This was probably *Zizyphus Lotus*, a prickly shrub whose fruit is, however, considered inferior to that of the common jujube, *Zizyphus sativa*. Other conjectures have been: *Celtis australis*, a tree which has a small, sweet berry; *Mirafraia tridentata*, a thorny desert shrub whose succulent fruit has a stimulating quality, and *Rhamnus Lotus*, another North African plant. European Lotus is a name for *Diospyros Lotus*, a kind of date plum which is cult. in S. Eu., but the fruit is hardly edible. (3) The Egyptian Lotus or Sacred Lily of the Nile. This is *Nymphaea Lotus*, which, like the Hindu Lotus, has rose-colored as well as white flowers. American cultivators at the present time almost universally consider that the true Egyptian Lotus is *Nelumbium speciosum*, now called *Nelumbo*, but *Nelumbium speciosum* is not a native of Egypt. (4) The Hindu and Chinese Lotus, also called the Sacred or Pythagorean Bean. This is *Nelumbo Indica*, better known as *Nelumbium speciosum*. The name Lotus was doubtless used for other water lilies, particularly the blue-flowered *Nymphaea esculenta*. These plants are described in this work. See *Nelumbo* and *Nymphaea*.

Lotus of the botanists is a genus of 50-100 species, found in temperate regions: herbs or subshrubs, glabrous, silky or hirsute; lvs. with 3 lfts., crowded at the apex of the petiole and commonly 2 joined to the stem and resembling stipules; fls. pea-shaped, yellow, red, rosy or white, often in axillary, few-fld. umbels, rarely solitary; calyx lobes longer than the tube; keel beaked; pod oblong or linear. Leguminosae.

A. Lvs. thread-like; fls. odd, not pea-shaped.

Bertholletii, Masf. (*L. peliorynchus*, Hook. *L. polyorchensis*, Hort.). Small, much-branched, slender bush, with a silvery lute; lfts. whorled, 8-9 lines long; fls. 1½ in. long, in loose clusters of about 20 toward the end of the branches, short-petioelled, scarlet or crimson fading to orange; standard recurved like a horn; keel acute, longer than the wings. Cape Verde, Canaries. B. M. 6733. R. H. 1895:308.—*Peliorynchus* means braised or discolored nose. Called "Coral Gem" in catalogues. Grown chiefly in hanging baskets. Prop. by division or cuttings.

AA. Lvs. not thread-like; fls. pea-shaped.

B. Fls. yellow.

corniculatus, Linn. BIRD'S-FOOT TREFLOIL. BABIES' SLIPPERS. Perennial, prostrate or ascending, a few in. to 2 ft. high, glabrous or hairy; lfts. obovate or ovate, ½ in. long, the 2 stipular ones broader and very oblique; fls. yellow, often tinged bright red, 5-10 in an umbel; calyx lobes about as long as the tube. Temp. regions and Australia. Var. *flöre-pleno* has showy double fls.—A hardy trailer for covering dry banks and rockwork, blooming all summer and autumn. Also grown for forage.

BB. Fls. pink or white.

australis, Andr. Perennial, diffuse, sometimes subshrubby, glabrous or pubescent; lfts. narrower than in *L. corniculatus*, and the stipular ones less dissimilar, but varying from obovate and under ½ in. long, to linear and 1-1½ in. long; fls. usually pink, but varying from white to purple-red. Australia. B. M. 1365. L. P. C. 11:1063 and B. 5:211 (as *L. albidus*).—Int. 1900 by Franceschi.

BBB. Fls. dark purple or dark red.

C. Lfts. linear-lanceolate.

Jacobæus, Linn. Perennial, subshrubby; fls. about 3 in a flat-topped cluster, dark purple, almost black. Cape Verde. B. M. 79.—Treated as a tender annual bedding plant.

CC. Lfts. obovate to elliptic.

Tetragonolobus, Linn. WINGED PEA. Annual trailer; fls. solitary or twin, purplish cardinal-red. Mediterranean region. B. M. 151.—*Tetragonolobus* was once considered a separate genus, largely because of the 4 leafy wings of the pod. Grown chiefly for food, the pods being eaten when young and the seeds, when roasted, substituted for coffee. Seeds sown in drills in April. Plants require no care except water during drought.

L. Balaubensis, a pink-fld. Abyssinian plant, was int. to America trade by Franceschi, who says it was originally sent out by Danmann & Co., Naples, Italy, and is not worth cult.—*L. Caariensis* *Horbindus* is not in Index Kewensis. Franceschi writes that it has yellow fls. and is desirable for rockeries and hanging baskets; that it is not far from *L. corniculatus*, but has a different habit; and that it was offered many years ago by Wildpret of Orotana and later by Albert Scheubel of Hamburg.

W. M.

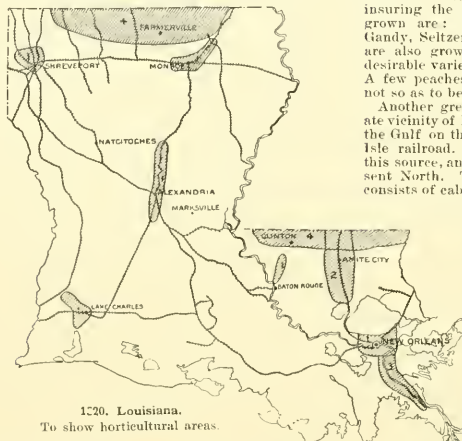
LOUISIANA (Fig. 1320) is situated at the extreme lower limit of the great Mississippi system, bordering on the Gulf of Mexico. These bodies of water have an important bearing upon the climate, and make it possible to grow some of the subtropical plants. The prevailing wind is from the south, somewhat cool and always laden with moisture, and the southern portion of the state, being only about 30 feet above the sea level, receives the heaviest rainfall, 70 inches, while the northern portion, being more elevated and further from the gulf, has an annual rainfall of 45 to 50 inches. This, as a rule, well distributed throughout the state, the seasons of greatest drought being early spring and early autumn. The highest recorded summer temperatures run from 98° along the Gulf coast, to 102° in the northern part of the state, while the average winter temperature is 56°. Occasionally a northwestern blizzard reaches down into the state, causing a heavy fall in temperature, accompanied with sleet, and once in a great while, snow. There was a temperature of 9° below zero in 1895, and 13 inches of snow. A minimum of 15° below zero was subsequently recorded in northern Louisiana. These occasional blizzards have forced the culture of tropical fruits down to the section immediately bordering on the Gulf. As the soil has such an important bearing on the character of the fruit, a rough classification of the different kinds is here given.

First: The Sandy Hills and Uplands.—These occupy the northwestern portion of the state, along with a section in the eastern part, south of the state of Mississippi. The lands are characterized by sandy soils, with pine and oak forests, and produce the best apples, stone-fruits and berries.

Second: The Bluff Lands.—These occupy a broken strip, running parallel with the Mississippi, from 30 to

50 miles from its western bank, and disappear near the Gulf in what are known as "islands," such as "Avery's Island" and "Jefferson's Island." There is also another section of these lands on the east bank of the river immediately south of the Mississippi state line. These lands are characterized by a yellow clay loam, very fertile, and by forests of magnolia, gums, oaks, etc. They produce some of the stone fruits well, and an abundance of pears, berries and figs.

Third: The Prairie Lands.—These occupy a portion in the central southwestern part of the state; are treeless, low and are also known as rice lands. The soil is



1270. Louisiana.

To show horticultural areas.

poor but improves with cultivation, and gradually the planting of figs, pears, peaches, plums and grapes has been extended.

Fourth: The Alluvial Lands.—These make up all the other portions of the state not mentioned, including the river bottoms. The soil is generally dark, ranging from black to light red, very fertile and abounding in an abundant growth of timber. They produce the heavy yields of cotton and corn in the northern portion, and the sugar cane, oranges, lemons, persimmons, figs and bananas, as well as other tropical fruits, in the southern part.

The leading varieties of vegetables are grown in every section of the state, and the home garden furnishes an abundant supply during all seasons of the year, under proper management. Those vegetables most popularly grown for home consumption are as follows: Asparagus (on the sandy soils only), artichoke (both Globe and Jerusalem), bean, beet, cabbage, carrot, collard, corn, eruss, cucumber, cashaw (pumpkin), endive, egg-plant, kohlrabi, leek, lettuce, melon, mustard, okra, onion, parsley, pea, pepper, Irish potato (two crops), sweet potato, radish, spinach, tomato, turnip and rutabaga. Occasionally there is found the vegetable pear (*Sechium edule*), martynia, brussels sprout, celery, chervil, garlic, kale, salsify, parsnip, cauliflower and field pumpkin. The majority of these vegetables may be sown several times during the year. Celery and cauliflower, however, are sown early in August in order to mature by the Christmas tide.

The commercial truck sections are found in various sections of the state. Along the Illinois Central railroad a direct line to Chicago from New Orleans, which runs through the warm sandy pine lands, the most extensive truck farms are to be seen. The vegetables grown are radishes, beans, cantaloupes, cucumbers and tomatoes. The town of Roseland alone, in 1898, shipped 50,000

bushels of radishes. Hundreds of car-loads of these vegetables are sent to the Chicago, Cleveland and St. Louis markets during the months of March, April and May. This section also produces enormous quantities of early strawberries, as hundreds of acres are planted each year, and shipments are sent by car-load lots from the stations on this line in Tangipahoa parish. The plants are set in August and September of each year, and, as a rule, are kept but one season. Abundance of pine straw is used for mulch, and when an early spring frost threatens, this mulch is also used to cover the plants as well, oftentimes protecting them so that the first and most valuable fruits escape and mature, thus insuring the most profitable picking. The varieties grown are: Cloud, Michel Early, Miller, Bubach, Gandy, Seltzer and Creole Beauty. The Japan plums are also grown in this section extensively, the most desirable varieties being the Abundance and Burlbank. A few peaches and Japan persimmons are grown, but not so as to become a commercial product.

Another great truck section is found in the immediate vicinity of New Orleans, and along the river towards the Gulf on the New Orleans, Port Jackson and Grand Isle railroad. New Orleans is supplied mainly from this source, and at the same time enormous amounts are sent North. The truck grown for the latter purpose consists of cabbages, onions, tomatoes, beans, peas, egg-plants and cantaloupes. Cucumbers are also grown, both in the hothead and in the open, oftentimes bringing high returns when sent North, the winter prices ranging from 30 cents to \$2.50 per dozen.

The lower portion of this section contains also the great orange groves of the state. They are located all along the river, and it is only when a belated blizzard visits this section that a crop failure is experienced. Some of these orchards contain more than 100 acres.

The stocks now used are almost entirely the common sour and *Citrus trifoliata*. Occasional seedlings and lemons are used, but not to any extent. The first two mentioned are the hardest stocks known, and mature their wood, making a more desirable tree. The varieties grown are: Satsuma, Boone Early, Sweet Seville, Parson Brown, Brazilian, Baldwin No. 1, Creole, Homosassa, Washington Navel, DuRoi Blood, Hart Tardiff, Rivers Unknown and Schonberger. Besides these, large quantities of mandarins, tangerines and Kumquat oranges of various varieties are grown. The various scale insects, so serious when no care is given, are, as a rule, kept in complete control by the careful use of insecticides, and the laws governing the importation of infected trees are rigidly enforced. As oranges in Louisiana are grown on such different soil from the orange sections of other states, one or two points must always be kept in view. Beds should be raised before the trees are set, and the crown roots of the young tree should be just at the surface of the ground. These requirements are necessary on the alluvial lands of the lower Mississippi. The Satsuma, Kuwohai and Dai Dai are Japanese varieties, and when worked upon *Citrus trifoliata* stock will stand much more cold than the sweet-orange. The Satsuma thus worked is the most desirable and will stand a temperature of 13° F. without injury. The orange industry is increasing annually, the crop for 1898 being upwards of 300,000 boxes.

Another truck section is found along the Iron Mountain railroad north of Alexandria; it is limited to only a few crops, such as melons, tomatoes and Irish potatoes. Along the Vicksburg, Shreveport and Pacific railroad large quantities of Irish potatoes are grown, while along the Kansas City, Pittsburg and Gulf railroad and the Mississippi Valley railroad, only limited quantities of truck have been sent out. From reliable statistics it is found that the annual output of Louisiana approximates 40,000 tons of fruit and 60,000 tons of vegetables. The varieties of these vegetables grown for the Northern markets are as follows: The Acme and Beauty

tomatoes, the Chartier radish, the New Orleans Market eggplant, the Peerless and Triumph Irish potatoes, the New Orleans Market and White Spine cucumbers, the New Orleans Market cantaloupe, the Drumheads, Flat Dutch, Succession, All-Seasons and Nonesuch cabbages, the Italian and Bermuda type of onions, the First and Best and Alaska peas, the Early Mohawk and Valentine beans. In the northern part of the state large quantities of Irish potatoes are grown, and oftentimes the second crop is very profitable. The first crop is planted in January or February and harvested in May and June. The seed for the second crop is prepared for planting by special treatment, consisting of gradually exposing the tubers to the light and moisture, which matures them and excites the eyes into growth. As soon as this is accomplished they are ready for planting, which is usually during August. They are harvested in November.

Upwards of 3,500,000 bushels of sweet potatoes are grown annually, the varieties best known being Pumpkin, Creole, California, Bermuda, Red and Yellow Nansemond, Hayman, Providence, Yellow Jersey, Southern Queen and Violes. The last variety is one of the most desirable of the newer sweet potatoes.

The culture of fruit, other than oranges and strawberries, has been neglected in great measure. Apples do fairly well in the northern part of the state, the desirable varieties being Smith, Horse, Red June, Magnum, Early Harvest, Cullasago, Shannon, Shoekley and Red Astrachan. Grapes are grown but sparingly, as the long, warm, moist season offers the best conditions under which the grape diseases develop, and the frequent rains hinder the use of fungicides; however, in the northern and southwestern portions of the state the following varieties have been found desirable: Champion, Diamond, Eaton, Niagara, Concord, Delaware, Brighton, Sweet Mountain, Herhemont and Jaques. Only the Chinese type of pears is at all grown, as it offers more resistance to the blight than the others. The desirable varieties are Le Conte, Kieffer, Smith, Garber, Dai Dai, Golden Russet and Mme. Von Siebold. The European varieties of plums do not succeed, but many of the American and Japanese sorts do well. The desirable varieties are Burbank, Abundance, Satsuma, Kelsey, Chabot, Wild Goose, Robinson and a few others. The fig is grown universally in all sections of the state, the best varieties being Celeste, Brunswick, White Ischia, Magnolia, Angelique, Lemon, Mission and Reine Blanche. The Japan persimmons are being set extensively, using chiefly the Hyakume, Kurokume, Nero Zami, Mochiya, Tsuru and Among. These fruits are large, showy, and will stand transportation well. The Elberta, Sneed, Peen-to (in the south) and Chinese Qing peaches prevail.

The other fruits, grown in a limited way, are quinces, gomi, blackberries, dewberries, a very few raspberries, pomegranates, bananas, jujubes and pawpaws. There are a few other tropical fruits that are grown only for specimens.

Louisiana abounds in beautiful flowering shrubs and wild flowers. The planting of all kinds of ornamentals is very extensive, roses bloom throughout the season, and the camellia finds a congenial home throughout the southern part of the state. In and around New Orleans the finest ornamental plantings will be found, St. Charles avenue, the principal residence street, being especially beautiful, with its palms, roses, camellias and ornamental vines. This is not confined to the wealthier classes, for nearly all these ornamentals grow readily from cuttings with little care, and even the poorest people oftentimes have the choicest flowers and roses around their doorstep.

F. H. BRUNETTE.

LOUSEWORT. *Pedicularis*.

LOVAGE. *Levisticum*.

LOVE APPLE. First popular name of the Tomato, now dying out in America. **Love-in-a-mist.** = *Nigella*. **Love-lies-bleeding.** *Amarantus caudatus*.

LOXOSCAPHÉ (Greek, *an oblique boat*). *Polypodiaceae*. A small genus of southern hemisphere ferns, related to *Davallia*. Indusium forming a compressed,

suborbicular or cup-shaped sac, open only at the top; lvs. with linear segments. For culture, consult *Davallia*.

thecefera, Moore (*Davallia concinna*, Schrad.). Stipes 3-4 in. long; lvs. 6-9 in. long, bipinnate; divisions 2-3 lines long, $\frac{1}{2}$ line wide. S. Amer. and Africa.

feniculæra, Moore (*Davallia faniculæra*, Hook.). Stipes 6-8 in. long; lvs. 9-18 in. long, quadripinnate; divisions less than $\frac{1}{2}$ line wide. Fiji Islands.

L. M. UNDERWOOD.

LUCERNE. See *Alfalfa* and *Medicago*.

LUCŪLIA (probably adapted from a native name). *Rubiaceae*. A genus of 2 species of tender shrubs from the Himalayas, bearing in winter terminal corymbs sometimes a foot across, composed of 20-40 pink or white, fragrant, salver-shaped fls. with 5 rounded lobes, each fl. being $1\frac{1}{2}$ -2 in. across. A plant of *L. gratissima* is on record which attained $6\frac{1}{2}$ ft., bearing 24 bunches of fls. each 2 ft. in circumference, beside 30 smaller bunches. Calyx tube top-shaped; lobes unequal, deciduous; stamens 5, inserted on the tube of the corolla; filaments very short; disk annular; ovary 2-celled; style 2-branched.

L. gratissima is one of the most beautiful winter-flowering shrubs for house decoration, and deserves to become more popular with florists for Christmas sales. The wood ripened after flowering furnishes the best cuttings. Newly rooted plants require a night temp. of 60° at first, but the temp. should be gradually reduced and the plants hardened off before they are planted outdoors for the summer. Young plants should never be allowed to get dry from the time of first potting until they are taken outdoors. For potting a light soil is desirable. When the pots are well filled with roots, apply liquid manure two or three times a week until the buds appear. During the summer the plants should be syringed daily, as they are subject to red spider. The plants should be lifted, potted and brought indoors the last week of Aug. If left out later they do not set flower buds as well. As soon as the buds appear the plants should be moved to a warmer house, with a night temp. of 55°. After flowering the plants should be trimmed somewhat, given less water, kept in a night temp. of 45° and syringed daily. They start slowly, but make hardy growths for planting out.

gratissima, Sweet. In the wild a tree attaining 16 ft.; lvs. opposite, ovate-oblong, acuminate, acute at the base, 4-6 in. long; panicle decussately branched; fls. pink or rose, forming a gorgeous rounded mass; corolla lobes imbricated in the bud; stamens inserted in the tube, slightly exserted. S.B.F.G. 145. B.M. 3946. G.C. 111. 21:81. R.H. 1843:385 and 1890:180. Gn. 35, p. 58; 41, p. 469; 55, pp. 42, 167. A.F. 7:443 and 10:679.

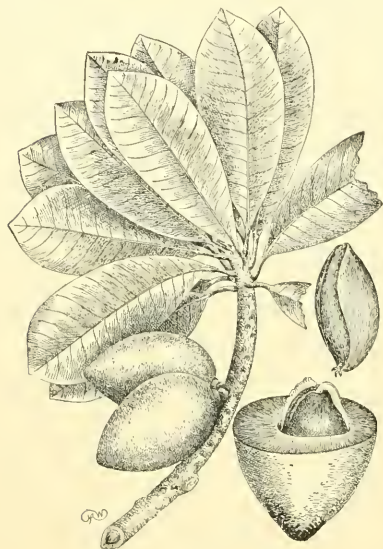
L. Pincoña, Hook. Lvs. oval; fls. in a compound cyme, the lobes pure white above, changing to a cream, with a rosy tinge, outside rosy and the tube red. Distinguished by the presence of 5 pairs of tubercles at the base of each sinus. B.M. 4322. Gn. 35, p. 59 and 41, p. 469.—*L. sprengera*, Hort., is not in Index Kewensis. H.A. Siebercht writes that it is in every way like *L. gratissima*, except that the fls. are much larger and of a deeper color. He says it is a stronger grower and just as fragrant.

Geo. McWILLIAM and W. M.

LUCŪMA (Peruvian name). *Sapotaceae*. About 50 species of trees and shrubs, largely S. American, two of which are tropical fruit trees. *L. Rivinica* produces the Egg Fruit, or Ti-es, which is about the size and shape of a hen's egg, and tastes like the yolk of an egg sweetened with sugar. As cult. in S. Fla. and S. Calif. it makes a large evergreen bush or small tree. It is related to the Sapodillo, but the floral parts of the latter are in 6's instead of 5's. *L. mammosa* produces the Marmalade Plum (Fig. 1321), which has a rough and rusty skin and russet-colored edible pulp. This fine fruit grows wild in the West Indies and the Philippines.

mammosa, Gærtn. **MARMALADE PLUM.** Fig. 1321. Lvs. obovate-oblong or spatulate, chartaceous, 6-8 in. long, 2-3 in. wide, mucronate; calyx segments 9-10, inner ones larger and notched; ovary 5-celled; fr. usually 1-seeded by abortion. S. America, West Indies, Philippines.

Rivicola, Gaertn. Lvs. elliptic-obovate, obtuse, membranous, 4-8 in. long, 1½-3 in. wide; calyx 5-parted; ovary 5-celled; seed oval-globose. Brazil, French Guiana.—Var. *angustifolia*, Mart., is the Egg Fruit or TI-ES of the W. Indies. It has elliptic-lanceolate lvs., acute at both ends. Fig. 1322. Cult. in S. Fla. and S. Calif. W. M.



1321. *Lucuma mammosa* (× ½).

Lucuma mammosa, the "Mammee Sapota" of Jamaica, is the fruit of a tree found wild also in Cuba and the northeastern part of S. America. The tree is ornamental, about 30 feet high, of a pyramidal shape. It is occasionally seen where it was originally planted in pastures near dwelling houses, but except for the droppings from cattle and horses, it receives no other cultivation. It requires a good deep soil and an annual rainfall of about 70 inches. The flowers are cream-colored, about ½ inch long, springing directly from the bark. The fruit is about 6 inches long, with usually only 1 seed. It has a russet-colored rough skin. The flesh is of a dark yellowish-red color, soft and sweet; it has been compared to a very ripe pear, but is more luscious. Marmalade is made from the fruit, whence the name of "Marmalade Plum."

W. L. FAWCETT.

LUDWIGIA (C. G. Ludwig, botanist and botanical author at Leipzig, 1709-1773). *Onagraceae*. About 25 species of aquatic or semi-aquatic small herbs, widely distributed in temperate and warm climates. Fls. small and inconspicuous in the axils of the leaves, the parts usually in 4's. Lvs. mostly small and mostly entire or very nearly so, usually not distinctly petioled. The stems are often creeping, sometimes floating. The opposite-lvd. species are by some referred to the genus *Isnardia*. The Ludwigias have little standing as horticultural subjects. They are sometimes useful in bog gardens, and one is advertised for aquaria. Three species are in the Amer. trade.

A. *Leaves opposite.*

palustris, Ell. (*Isnardia palustris*, Linn.). WATER PURSLANE. Trailing in muddy places or floating on shallow water, rooting at the joints; lvs. oval or oval-ob-

long, narrowed into a short petiole; fls. very small, usually reddish.—Widely distributed in this country; offered as a bog plant.

Mulertii, Mulert. Lvs. lance-oblong, usually narrowed into short petioles, entire; fls. yellow; fr. oblong, truncate on top, ¾ in. long.—Int. from S. Amer. by Hugo Mulert, then of Cincinnati, and described in "Isis" (published in Germany) in 1880 or 1881, and also in the "Aquarium," Vol. III, p. 43, 61. It is now widely distributed amongst growers of aquarium plants. It seems not to have been studied by systematic botanists. It is prized for its graceful habit and because it is ever-green. Grows well from cuttings and from seeds.

AA. *Leaves alternate.*

alternifolia, Linn. SEED-BOX, or RATTLE-BOX. An erect shrub, 2-3 ft. or more tall, in appearance not unlike an Epilobium: lvs. lanceolate or oblong-lanceolate, narrowed below, entire or sometimes with mere suggestions of teeth; fls. large for the genus (¾ in. across), with yellow caduceous petals; capsules large, square in cross-section. Bogs in eastern states.—Interesting, but not showy. L. H. B.

LUEHÉA (F. Karl van der Lüke, Austrian botanist interested in the Cape of Good Hope). *Tiliaceae*. About 16 species of trees and tall shrubs from the warmer parts of America with usually toothed lvs. and handsome white or rosy fls. borne in a terminal panicle, or sometimes in the axils; sepals and petals 5; stamens numerous, the outer ones often without anthers; ovary 5-celled; capsule rather woody, loculicidally semi-5-valved. An undetermined species is advertised in Santa Barbara, 1900, from Paraguay. Franceschi writes that the inner bark is used generally in Paraguay instead of string. *Luehea* is also spelled *Luhea*, and the genus of this name of the Verbenaceae is a South African genus referred to *Stilbe*.

LUFFA (*Luffa* is the Arabic name). *Cucurbitaceae*. RAG GOURD. DISH-CLOTH GOURD. VEGETABLE SPONGE. Six species (according to Cogniaux, Vol. 3, DC. Monogr. Phaner.) of annual tendrill-climbing herbs, inhabiting the tropics of the Old and New Worlds. Fls. monoecious, the staminate ones in a long-stalked raceme or cluster, the pistillate ones solitary and shorter-peduncled; calyx bell-shape or top-shape, strongly 5-lobed; corolla of 5 soft yellow or whitish petals, sometimes ragged-edged; stamens usually 3, borne in the calyx tube; fr. a long, gourd-like pepo, becoming dry when ripe and the fibrous interior sponge-like. Known south as "California Okra."

Of late years, the Luffas have come into prominence in American gardens, being an importation from the tropics and China and Japan. In other countries, the fruit is eaten when young, being cooked like squash or served in soups and stews. The young fruit is sometimes sliced and dried. (See Geogreson, A.G. Sept., 1892, and Bailey, Bull. 67, Cornell Exp. Sta.) In this country, Luffas are grown mostly for curiosity and ornament. The fibrous interior of the dried fruit, when bleached and prepared, is used as a sponge for the bath and for scrubbing (whence "Vegetable Sponge"). The culture is the same as for cucumbers and melons. They are tender plants, running 10 to 15 ft. The Luffas are widely dispersed in the tropics as cultivated plants. The genus divides itself into 2 groups,—those species (*L. Egyptiaca* and *L. acutangula*) with fruits not spiny or tuberculate, and those with spiny fruits. Only the following species are known to be in cult. in this country:

Egyptiaca, Mill. (*L. cylindrica*, Roem. *L. Petola*, Ser., *L. Felchii*, Naud., *L. lirtida*, Hort. [at least in part], not Cav., *L. Fabiana*, *Japónica*, *Mexicana* [?] and *sueticiflora* *Alba*, Hort.). NAGA ITO-URI of Japanese. SAUKWA of Chinese. The commonest Dishcloth Gourd; stems slender-running, furrowed, roughened; lvs. roundish in outline, mostly 15-lobed, coarsely toothed, very scabrous above and beneath; staminate fls. 2-3 in. across, wilting in the sun; ovary cylindrical or clavate, pubescent, destitute of distinct ridges, ripening into a slender, cylindrical, curved fruit 1-2 ft. long. Probably native to the Old World, but widely distributed in the tropics. A.G. 13:526.

acutangula, Roxbg. (*L. fatida*, Cav.). SING-KWA of Chinese. Fig. 1323. Lvs. rounded, scarcely lobed, very coarsely toothed; ovary 10-ribbed, ripening into a strongly ribbed fruit. Tropics. Gt. 48, p. 136. L. H. B.

LUISIA (after Don Luis de Torres, of whose personality little is known). *Orchidaceae*. Curious epiphytic herbs, with simple or branched erect stems, bearing alternate, elongated, fleshy-terete lvs.; fls. sessile, on short lateral spikes; sepals and petioles sub-similar, connivent or half-spreading; labellum adnate to the column, somewhat concave, with small lateral lobes and a large, spreading, entire or bifid middle lobe; column short; pollinia 2, on a broad, short pedicel. About 10 species. These plants are rarely cult. They grow well in any warm or intermediate house.

tères, Blume. Spike few-fl'd.; lateral sepals narrower than dorsal, which is similar to the petals; labellum bi-auriculate, oblong-sulate, apex bifid.

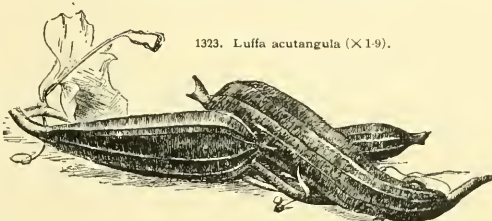
L. tères, Lindl. = *Sarcanthus teretifolius*.

HEINRICH HASSELBRING.

LUNARIA (*Luna*, Latin for moon; name referring to the silvery white partition of the large pods). *Cruciferae*. MOONWORT. HONESTY. Two herbs of Europe and W. Asia, both cult. in old gardens. Lvs. rather large, simple, broad or more or less cordate; fls. purple, in terminal racemes or panicles, rather large and showy; fr. stalked in the calyx, becoming a very large, flat, disk-shaped silicle, with deciduous valves and a thin, persistent septum; seeds winged, 2-4 in each compartment. The plants are easy of cultivation under any ordinary garden conditions. They are interesting for their showy fls., but are grown mostly for their great flat pods, which are used in winter bouquets. They are called "Honesty"

because the seeds can be seen through the pods. Prop. by seeds; or the second species rarely by division. The species sometimes escape from gardens.

annua, Linn. (*L. biennis*, Moench). Fig. 1324. Loose-



1323. *Luffa acutangula* (×1.9).

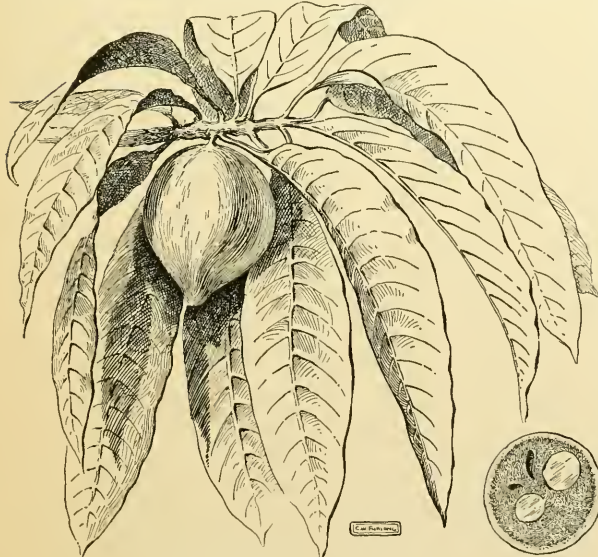
bairy plant, 1½-2½ ft. tall, branching as it matures; lvs. somewhat cordate or halberd-cordate, coarsely and irregularly toothed, stalked; fls. numerous, pink-purple, fragrant, in late spring or early summer; pods about 2 in. long and somewhat narrower, very flat, rounded at the ends, tipped with the persistent style. Europe. R. H. 1857, p. 30.—Frequent in old-fashioned gardens. There is a recent form with handsomely variegated lvs.; also a white-flowered form. Annual and biennial.

rediviva, Linn. Differs from the last in being perennial, the fls. smaller and lighter colored (often grayish purple), and the pod elliptic or lance-elliptic, and tapering to either end. Europe.—Less common and less valuable than the other.

L. H. B.

LUNGWORT. *Mertensia*.

LUPINUS (from the Latin *lupus*, a wolf; because a crop of Lupines was supposed to destroy fertility). *Leguminosae*. LUPINE. A group of about 80 species mostly confined to western N. America, a few growing in eastern N. America and in the Mediterranean region. Most are annuals or herbaceous perennials, one species in cult. being shrubby. All are showy plants with conspicuous flowers in terminal racemes, those of the species in cult. being mostly verticillate. The flowers are blue, white or yellow, or a union of these, papilionaceous and free-blooming. All are of easy cult. in any garden soil, except that they are said not to succeed in soil containing lime. They are adapted to borders in masses, and to all places in which low-growing showy herbs would be found. Some make good bedding plants, others cut-flowers. They are propagated by seed, the perennials also by division. They do not bear transplanting when once established, hence it is recommended to sow seed where the plants are finally desired. A few species are of value economically for soiling or plowing under. Leaves usually digitate, with 5-15 entire leaflets; flowers with calyx deeply bilabiate, 5-toothed, unequal; corolla with simple erect, broadly ovate standard, having strongly reflexed sides; wings united at the apex and enclosing the keel; stamens



1322. *Lucuma Rivicoa*, var. *angustifolia* (× ¾).

united into a closed tube: pod 2-valved, flattened, enclosing several large seeds. A very variable genus in the garden.

There are numerous garden hybrids of unknown parentage. Some of these names will be found in the supplementary list. Voss groups these under the name of *L. hybridus*, Hort., or Florists' Lupines. They have variegated flowers.

In addition to those described below the following native species have been advertised, mostly by Gillett, in 1881, for western collections. Probably they are not in cult. They are mostly described in Bot. Calif.: *L. albicaulis*, Chamissois, *densiflorus*, *lepidus*, *leucophyllus*, *ornatus* and *villosus*.

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A. Perennials.

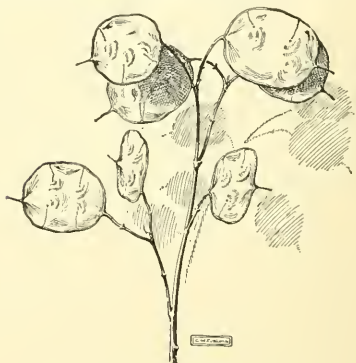
- B. Plants shrubby..... 1. *arbores*
 BB. Plants herbaceous.....
 C. Lvs. with 1 leaflet..... 2. *diffusus*
 CC. Lvs. with several lfts., digitate.
 D. Foliage not conspicuously hairy above.
 E. No. of lfts. 5-9.
 F. Lfts. shorter than petioles.
 G. Pod $\frac{1}{2}$ in. long... 3. *perennis*
 GG. Pod $\frac{3}{4}$ in. long... 4. *parviflorus*
 FF. Lfts. as long as petioles..... 5. *argenteus*
 EE. No. of lfts. 10-16..... 6. *polyphyllus*
 DD. Foliage conspicuously hairy or silky above.
 E. Lvs. parti-colored,
 striped..... 7. *Nootkatensis*
 EE. Lvs. light blue, with dark spot on the standard..... 8. *Plattensis*

AA. Annuals.

- B. Fls. yellow.
 C. No. of lfts. 13-15..... 9. *sulphureus*
 CC. No. of lfts. 7-10..... 10. *luteus*
 BB. Fls. blue, white or red, but self-colored.
 C. Arrangement of fls. in whorls.
 D. No. of lfts. 9-11..... 11. *pilosus*
 DD. No. of lfts. 5-7.
 E. Plant villous..... 12. *micranthus*
 EE. Plant merely pubescent. 13. *affinis*
 CC. Arrangement of fls. scattered.
 D. Lfts. hairy on both sides... 14. *hirsutus*
 DD. Lfts. not hairy above.
 E. Color of fls. white..... 15. *albus*
 EE. Color of fls. blue..... 16. *pusillus*
 BBB. Fls. of 2 or more colors.
 C. Foliage hairy on both sides... 17. *Hartwegii*
 CC. Foliage not conspicuously hairy above.
 D. Height about 5 ft..... 18. *mutabilis*
 DD. Height 1 ft. or less.
 E. Arrangement of fls. alternate..... 19. *subcarnosus*
 EE. Arrangement of fls. whorled..... 20. *nanus*

1. *arbores*, Sims. TREE LUPINE. Lfts. 7-11, lanceolate-linear, acute, silvery downy below, entire: fls. somewhat verticillate, in tall, loose racemes, sulfur-yellow, fragrant: pods pubescent, $1\frac{1}{2}$ -2 in. long. July-Sept. Common in Calif. B.M. 682. Gn. 30, p. 289 and 47-1017. —Shrub, 4-10 ft. high, somewhat pubescent, not hardy at the north. Var. *Snow Queen* or *Queen of the Snow* is pure white. Var. *adversum* has been advertised.

2. *diffusus*, Nutt. DEER CABBAGE. Stem decumbent and many-branched, 1-2 ft., somewhat woody at the base, densely silky: lvs. large, oval or oblong-ovate, obtuse, mucronate, on long, soft-silky petioles: fls. more or less alternate, on a very long (6-12 in.) spike, light blue, the standard with a greenish yellow center: pods oblong, flattish, very woolly. April. Sandy barrens, N. Car. to Fla. —Hardiness North not determined.



1324. *Lunaria annua* ($\times \frac{1}{2}$). (See p. 949.)

3. *perennis*, Linn. SUN-DIAL. COMMON WILD LUPINE. Stem erect, 1-2 ft. high, rather stout, minutely pubescent: lvs. long-petioled, soft-downy; lfts. 7-9, obovate-oblong to lanceolate, obtuse, glabrous above, soft-downy below: fls. in large, loose terminal spikes or racemes, alternate, blue, varying to white. June, July. Canada to Fla. B.M. 202. Mn. 6:101. B.B. 2:269. —Desirable species, growing in the poorest soil, preferring sandy land. Grows from subterranean rootstocks.

4. *parviflorus*, Nutt. Fig. 1325. Fls. light blue, smaller than in *L. perennis*. Columbia river to Yosemite and Wahsatch. —Fig. 1325 is from a photograph by D. M. Andrews.

5. *argenteus*, Pursh. Fls. blue or cream-colored. West ern N. Amer. B.B. 2:269.

6. *polyphyllus*, Lindl. (*L. grandiflorus*, Lindl.). Stout, erect species, forming tufts 2-5 ft. high: lvs. distant, mostly radical, long-petioled; lfts. lanceolate, glabrate above, silky hairy below, 2-6 in. long: fls. on long stalks, alternate, pedicelled, deep blue: pod 1- $\frac{1}{2}$ in. long, narrow. June-Sept. Washington to Calif. S. B. F. G. II. 356. Gn. 45, p. 459 and 55:215. —A common garden species of merit, succeeding in any good soil. Var. *albiflorus*, Hort. (var. *albus*), is white, bold and showy. Var. *bicolor*, Hort., is variegated blue and white.

7. *Nootkatensis*, Don. Stem hairy, decumbent, with long, spreading hairs, 2-3 ft. high: lfts. 5-9, narrowly obovate-oblong, smooth above, hairy below, mucronate; stipules lanceolate, nearly as long as the lfts.: fls. in dense racemes, blue, variegated with red and yellow, with large veins, variable. May-July. Nootka Sound. B.M. 1311 and 2136. —Coarse, starchy species, said to be unsuitable for small gardens, but of merit.

8. *Plattensis*, S. Wats. June, July. Neb., Wyo., Dak. B.B. 2:269.

9. *sulphureus*, Dougl. Stem very erect, white silky: lfts. narrowly lanceolate, densely hairy on both sides, shorter than the petiole: fls. in tall, dense racemes, sulfur-yellow: pods woolly, 1 in. long. July, Aug. Mts. of Oregon. R.H. 1890, p. 252. —Strong species branching above, bare below.

10. *luteus*, Linn. YELLOW LUPINE. Fig. 1326. Stem erect, nearly simple, hairy, 2 ft. high: lfts. lanceolate, acute, hairy: fls. on pubescent stalks longer than the

lys., verticillate, yellow, fragrant; pod oblong, flat. June, July. S. Eu. B.M. 140.—Succeeds in the poorest soil. Useful for cut-flowers, for the border, for fodder or for plowing under to improve sandy soils. As a fodder, it may be fed green or as hay.

11. *pilosus*, Linn. Stem hairy, 2-4 ft. high: lfts. oblong-lanceolate, hairy: fls. verticillate, pedicelled, rose, the middle of the standard red. S. Eu.

12. *micranthus*, Dougl. Stem slender, 3-12 in. high, hairy: lfts. linear, $\frac{1}{2}$ -1 in. long: fls. in short, dense racemes, somewhat verticillate, very small, violet, standard and wings narrow: pod linear. Gravelly places, Ore. to Calif.—A slender plant of branching habit.

13. *affinis*, Agardh. Stem rather stout, 8-10 in., pubescence very short: lfts. broadly wedge-obovate, obtuse, long, more or less smooth above; stipules one-half the length of lvs.; petioles twice longer than the lfts.: fls. on a long stalk, deep blue: pod linear. Early spring. Calif.—A free, hardy species, often growing very rank.

14. *hirsutus*, Linn. BLUE LUPINE. Stem hairy, 2-3 ft. high, branching toward the top: lfts. 7-9, oblong or oblong-oval, hairy, long-petioled: fls. somewhat verticillate or scattered, large, mostly purple, sometimes variegated with blue or violet: pod large, very hairy. July, Aug. S. Eu.—Used ornamentally and as an economic plant for the same purposes as *L. luteus*. It is valuable for fodder and for plowing under. Var. *albus*, Hort., has white fls. Var. *ruber*, Hort., and var. *foliis roseis* are advertised.

15. *albus*, Linn. WHITE LUPINE. Erect stem, $1\frac{1}{2}$ ft. high: lfts. obovate-oblong, 5-7, hairy below, $1\frac{1}{2}$ -2 in. long: fls. alternate stalked, on erect stems, quite large, white: pods large. Summer. Asia and S. Eu.—A good fodder plant said to be of greater thrift than *L. luteus*, and remaining green longer. Succeeds well on the poorest soil and is valuable for plowing under. Seeds are sown April-July, the plants plowed under when in flower.

16. *pusillus*, Pursh. Lfts. about 7, mainly oblong, acute: fls. blue or purple. Prairies. B.B. 2:270.

17. *Härtwegii*, Lindl. Stem erect, 2-3 ft. high, somewhat branching: lfts. 7-9, oblong, obtuse, very hairy: fls. in many-fl. elongated racemes, blue; standard whitish, then reddish. June-Sept. Mexico. B.R. 25:31.—Var. *albus* is also sold. Possibly a perennial but cult. as an annual.



1325. *Lupinus parviflorus*.

18. *mutabilis*, Sweet. Stem erect, branched, somewhat woolly, 5 ft. tall: lfts. 7-9, lanceolate, obtuse, hairy below and somewhat glaucous: fls. large, somewhat verticillate, fragrant; standard white mixed with blue, becoming blue with a large yellow mark in the center; wings and keel white. June-Aug. Mts. of S. America. S.B.F.G. 130. B.M. 2682.—Attractive species, erect and branching but half-hardy.

Var. *Cruickshanksii*, Hook. (*L. Cruickshanksii*, A. Gray). Fls. large, fragrant, white, the standard yellow-rose, becoming violet. B.M. 3056.

19. *subcarinosus*, Hook. Stem 8-10 in. high, ascending, silky pubescent: lfts. 5-7, obovate-lanceolate obtuse,



1326. *Lupinus luteus*.

somewhat fleshy, smooth above, silky below and on margins: fls. in pyramidal racemes, alternate; standard orbicular, deep blue with a white spot in the center divided by a longitudinal fold: pod linear-oblong, silky. Spring. Texas. B.M. 3467.—Spreading species of merit.

20. *nanus*, Dougl. Stem slender, $\frac{1}{2}$ -1 ft., often branching from the base, hairy: lfts. 5-7, linear to ob-lanceolate pointed, pubescent both sides, stalks 1-3 times longer: fls. in elongated, loose racemes, verticillate on slender stalks, large, white, pointed with clear blue, edged with deeper blue; wings bluish, hiding white-brownish keel: pod hairy. June, July. Calif. S.B.F.G. 11. 257. B. R. 20:1705.—This species and its varieties are very floriferous, giving a fine effect in masses and in the border. Var. *albus*, Hort., white, tinged with lilac. Var. *albo-coccineus*, Hort. A very compact variety, the lower half of the spike rosy red, the upper white; forms compact tufts and is called a superior variety.

L. angustifolius, Linn., with blue fls., is much grown in Eu. as a fodder plant and for plowing under: annual. Native to the Mediterranean region.

The following are garden hybrids of unknown origin. They mostly have variegated fls. and are common in cult.: *L. atro-violaceus*. Perennial, 2 ft. high. Fls. dark violet, striped with white and yellow.—*L. coelestinus*. Annual, 2 ft. high. Fls. light blue.—*L. Dunnetti*. Fls. blue-purple, gold and white. According to Voss, this is the same as the kinds known to the trade as *superbus*, *insignis* (Vilmorin, not Dippé), *tricolor elegans*, and *superbus Dunnetti*. There is also a double form.—*L. hybridus*. Probably mixed kinds.—*L. pubescens*, Benth. Perennial or subshrubby: the pubescence short, spreading hardly silky in the new parts: lfts. 7-9, oblong-lanceolate, acute, shorter than the petiole, pubescent on both sides: fls. loosely arranged almost in whorls; pedicels shorter than the calyx: pod hirsute, 4-6-seeded. The above is from the original description. Bentham neglects to state the color of the fls., but an allied species has blue fls. Mottet must be in error in calling this an annual. Mex. Central Amer. Colombia.—*L. tricolor*. See L. Dunnetti.

A. PHELPS WYMAN.

LYCASTE (fanciful name). *Orchidaceae*. This genus contains about 30 species, all natives of S. Amer., Mexico and the West Indies. The flowers are freely produced and remain in good condition on the plant for several weeks. They are normally borne singly on erect or sub-erect bracted scapes, but sometimes twin-flowered stalks occur. Pseudobulbs ovate or oblong-ovate, bearing 1- several plicate leaves at the summit, and sheathing leaves from the base: sepals sub-similar, spreading, the lateral pair united with the base of the column and forming a spur-like chin or mentum; petals smaller, projecting forward, with the tips often recurved; labellum 3-lobed, the lateral lobes erect, middle lobe ascending or recurved, with a fleshy, tongue-like callus on the disk; pollinia 4. In *Lycaeste* the scape arises from the very young leafy axis, which does not develop until several months later. The scape, therefore, appears from the base of the bulb. Among the species, *L. Skinneri* is a favorite orchid with growers. The species of *Lycaeste*

are very distinct from each other and do not fall readily into natural groups. This was probably the cause of Reichenbach's complaint that "it is nearly as satisfactory to study this group as it is to brush hedgehogs." The arrangement in the key is purely artificial, and does not indicate close relationship among the species grouped together.

HEINRICH HASSELBRING.

The genus *Lycaste* is closely allied to *Maxillaria* and has a similar geographical range, being found from Mexico and the West Indies to Peru and southeastern Brazil. Notwithstanding this wide distribution, however, they readily subject themselves to one general mode of treatment, and may be grown in a light, cool portion of the Cattleya or warm end of the Odontoglossum department, where they should receive plenty of indirect solar light, moisture and sufficient ventilation to ensure an active atmosphere.

During winter, the night temperature should range from 50° to 55° Fahr., and that of the day 60° to 65°, or a few degrees higher, with sun heat and ventilation. In summer, the air should be as cool as possible, and contain plenty of moisture.

When *Lycastes* are growing they need a good supply of water at the roots, and should never be allowed to remain dry for a long time, even when at rest. Light syringing overhead is beneficial at all times in bright weather when air can be admitted. The deciduous species, however, must be carefully watered when at rest, for it must be remembered that in easting their foliage they lose most of their active radiating surface, thus reducing evaporation to a minimum.

For special treatment, they may be divided into three groups, *L. aromatica*, *L. costata* and *L. Harrisonia* forming good types. The *L. aromatica* section embraces besides the type *L. caudata*, *L. cruenta*, *L. Deppii*, *L. lasioglissa*, *L. macrobulbon* and kindred sorts, all more or less deciduous. These grow best in pots in a mixture of equal parts chopped peat fiber and sphagnum moss, with a small quantity of leaf-mold added. About one-third of the pot space should be devoted to drainage of broken charcoal or potsherds, and the compost must be carefully and rather firmly pressed in about the roots, leaving the base of the pseudobulbs on a level with or a little below the rim of the pot. The best time for transplanting is just after the plants start into new growth, at which time give a more abundant supply of water.

The *L. costata* group includes, besides the type, such species as *L. lanipes*, *L. locusta* and *L. Skinneri*, which, excepting the last, are but semi-deciduous, large-growing species. They succeed best under pot culture, and should be grown in a compost of about equal parts chopped sod, from which some of the fine soil has been removed, and decomposed leaves, adding a little chopped live sphagnum to keep the soil porous and to retain moisture. The compost should become nearly dry occasionally to prevent it from becoming sour.

The *L. Harrisonia* section is small; the type and *L. tetragona* are good examples; all are sempervirent and grow best under basket culture in porous material consisting of chopped peat-fiber and live sphagnum, well mixed and interspersed with nodules of charcoal. The compost should be pressed in moderately firm about the roots to keep the plant steady, and newly imported pieces should be held in place by copper or brass wire crossed between the pseudobulbs.

Lycaste stock is usually supplied by new importations, but plants may be increased by cutting through the rhizome between the pseudobulbs, two at least being left to each piece.

ROBERT M. GREY.

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L. cristata = *Paphinia cristata*. — *L. Harrisonia* is probably an error for *L. Harrisonia*.

- A. *Scape originating in the axil of a leaf above the new leafy axis; labellum with transverse furrows. (Colar.)* 1. *jugosa*
- AA. *Scape originating in the axil of a leaf below the young leafy axis; labellum usually with longitudinal crests or callosities.*
- B. *Pollinia seated on a common stipe.*
- C. *Scape erect or suberect, normally 1-fl. (Lycaste.)*
- D. *Middle lobe of the labellum semi-oblong, rounded, etc., usually obtuse or truncate.*
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- EE. *Smooth or pubescent.*
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- CC. *Scape pendulous, normally several-fl. See Paphinia.*
- BB. *Pollinia seated on 2 distinct stipes. (Bifrenaria.).....* 16. *Harrisonia*
17. *indora*

1. *jugosa*, Nichols. (*Colar jugosa*, Lindl.). Pseudobulbs 2-3 in. long, with lanceolate-acuminate lvs. 6-9 in. in length, springing both from the apex and base; scape clothed with large bracts, and bearing 2-3 fls., which are subglobular when fully expanded; sepals broadly oblong, obtuse, cream-colored to waxy white; petals ovate-oblong, obtuse, marked with black-purple, transverse bands; labellum smaller, velvety and covered with fleshy ridges; side lobes longitudinally streaked, and middle lobe streaked and splashed with dark purple. Jan.-May. Brazil. B.M. 5661. Gn. 16, p. 77 and 49, p. 294. — Fls. persistent for many weeks.

2. *lasioglissa*, Reicheb. f. Pseudobulbs 3 in. long, ovoid, compressed; lvs. 8-12 in. long, elliptic-lanceolate; scape 1-fl.; fls. 5 in. across; sepals spreading, narrowly oblong, dull brown or greenish brown; petals one-third as long, erect, concave, obtuse, golden yellow; labellum as long as the petals, also golden yellow; lateral lobes short, obtuse; middle lobe oblong, covered with long, soft hairs; callus ovate, notched. Autumn and winter. Guatemala. B.M. 6251. — Very odd but not showy.

3. *gigantea*, Lindl. Pseudobulbs often 6 in. high, bearing 2-3 oblong-lanceolate lvs. 1½-2 ft. long; scape 1-fl., somewhat shorter than the lvs.; sepals ovate to lanceolate, 3 in. long, rather olive-green; petals somewhat smaller, lanceolate, spreading, of the same color; labellum oblong-lanceolate; side lobes acute; middle lobe ovate, acuminate, serrate, rich maroon bordered with a narrow orange margin; erect fleshy, emarginate. The fl.-stems are said to attain a height of 2 ft., with a single large flower. In most of the specimens in cult. the lip is abruptly rounded off. June-Aug.; Nov., Dec. Widely dispersed in Cent. Amer. B.M. 5616. B.R. 51:34.

4. *Schilleriana*, Reicheb. f. Plant resembling *L. Skinneri* in habit; pseudobulbs 2-lvd.; lvs. elongate-lanceolate, up to 2 ft. long; scape 1-fl., suberect, 8 in. long; sepals large, spreading, oblong-lanceolate, 4 in. long, brown; petals erect, with recurved tips, small, 1½ in. long, white, speckled with brown on the back; labellum as long as the petals, white, speckled and tinged with rose; side lobes small; middle lobe ovate-quadrate,

crenulate; callus tongue-shaped, concave. Often the parts of the flower are more or less spotted and hairy in places. July, Aug. Colombia. Gt. 1321.

5. *lámpies*, Lindl. Pseudobulbs large; lvs. lanceolate, 12-18 in. long; fls. solitary, as many as 15 on a plant, creamy white; sepals and petals oblong-lanceolate; labellum smooth; lateral lobes ovate-obtuse; middle lobe oblong, obtuse, serrate, with a concave, ribbed callus. Oct. Ecuador.—Lindley says the fls. are pale green, 2½ in. long before they expand, without a trace of any other color.

6. *locústa*, Reichb. f. Pseudobulbs pyriform; lvs. oblong-ligulate, acute; fls. smaller than those of *L. Deppii*, all green except the white column; the odd sepal oblong, obtuse; the lateral ones linear-oblong, acute; petals bent down inside of the lateral sepal; labellum with acute side lobes and a semi-oblong, fleshy, convex middle lobe, all green; on the disk are 2 narrow keels, confluent behind into a fleshy emarginate callus. Peru.

7. *cándida*, Lindl. Pseudobulbs ovoid, much compressed; lvs. oblong-acuminate; fls. about 2 in. across; sepals spreading, reflexed and acute at the apices, oblong, slightly woolly at base, yellowish green, sometimes dotted with light rose; petals whitish, revolute, obtuse; labellum white, with a few rose-colored spots; disk plate obtuse emarginate at the apex; column hairy on the inner surface. Costa Rica.—Var. *Lawrenceana*, Hort. Sepals and petals tinted with rose, otherwise the fls. are like those of the type. Var. *rúbra* has been offered.

8. *costata*. Pseudobulbs oblong, compressed, 3-5 in. long; lvs. 2-3 at the apex, 6-10 in. long, broadly oblong-lanceolate, acuminate; scape erect, as long as the pseudobulb; fls. large, nearly white or creamy yellow; dorsal sepals oblong-lanceolate, the lateral sepal similar but falcate, united with the column to form a blunt spur; petals smaller, somewhat undulate; lateral lobes of the labellum small, erect; middle lobe ovate-rotund, toothed. Peru. B.M. 5706 (as *L. Barringtonia*, var. *grandiflora*).

9. *macrobulbon*, Lindl. Pseudobulbs very large, ovate, compressed, with several large, oblong, acute lvs.; scapes usually 2 from each pseudobulb much shorter than the lvs.; fls. large, yellow; sepals ovate-oblong, spreading; petals shorter, somewhat concave, with recurved tips; labellum oblong, as long as the petals, spotted on the disk with brown. Colombia. B. M. 4228 (as *Maxillaria macrobulbon*).

10. *Skinneri*, Lindl. Pseudobulbs oblong-ovate, 3-5 in. high, 1-2-lvd.; lvs. oblong-lanceolate, 9-12 in. long; scapes 5-6 in. long, each bearing a single waxy flower 5-6 in. in diam.; sepals ovate-oblong, white tinged with rose; petals half as long, broadly ovate, pointing forward with acute, reflexed tips, striated and tinged with dark rose; lateral lobes of the labellum erect truncate; middle lobe oblong-ovate, recurved, with a fleshy tongue-shaped callus on the disk, dark crimson-purple. The most useful of the genus. Spring. Guatemala.—B.M. 4445. F.M. 11:1 (*Maxillaria Skinneri*). Gn. 25:440; 30, p. 374; 37:397. F. 1861:65 (var.). A.F. 4:519. J.H. 111, 34:367. A.G. 14:433.—The following varieties are advertised:

Var. *álba*, Hort. A large-fl. white variety with a tinge of yellow at the base of the labellum and a yellow, tongue-shaped appendage in its throat. 1.H. 27:405.

Gn. 25:440. F.M. 1872:35. G.C. 111, 7:424. A.F. 6:631
Var. *albo-sanguinea* No description. Var. *cándida* Hort. White. Var. *delicatissima*, Hort. Fls. large, rose white; labellum white blotched with rose. Feb. Var. *grandiflora*. No description. Var. *purpurata*, Hort. Sepals and petals rose-white; labellum crimson-purple. Var. *rosea*, Hort. A beautiful variety with deep rose fls. and a white labellum spotted with crimson. Var. *superba*. Sepals and petals white; labellum crimson.

11. *plana*, Lindl. A robust plant, with large ribbed pseudobulbs and ample-pointed oval lvs.; fls. 3-4 in. across; sepals oblong, plane, rich madder-red inside; petals smaller, with recurved tips, white, tipped with crimson; labellum smaller, white spotted with crimson; side lobes crenulate; middle lobe rounded, obtuse, serrate, crested. Winter. Bolivia. B.R. 29:35.—Var. *Measuresiana*, Williams. Sepals reddish brown, tipped with green; petals and labellum white spotted with bright rose, except on the margins of the petals. Autumn.

12. *tetrágona*, Lindl. Pseudobulbs ovate, tetragonal; lvs. solitary, ovate-lanceolate; scape 1-4 fld.; fls. greenish streaked with crimson; sepals and petals oblong-ovate, rather obtuse, half-spreading, the 2 lower forming a blunt, projecting angle at base; labellum smaller, white and purple or green and purple, with a shovel-shaped appendage on the disk. Fls. not beautiful, but very fragrant, remaining fresh for two months, June. Brazil. B.M. 3146 and B.R. 17:1428 (both as *Maxillaria tetragona*).

13. *erúnta*, Lindl. Pseudobulbs compressed; lvs. many, oblong, membranaceous; scape bearing 1 yellow flower (rarely 2), much larger than those of *L. aromatica*;



1327. *Lycaste aromatica* (× 1.5).

1328. *Lycaste Harrisonia*, var. *eburnea* ($\times \frac{1}{2}$).

sepals ovate, obtuse; petals similar, erect and smaller; labellum half as long as the sepals; lateral lobes rounded; middle lobe rounded-truncate, crisp on the margin, pubescent; crest small, fleshy. Like *L. aromatica*, but the lvs. much broader, fls. larger, and the labellum of different shape and somewhat spotted with purple. Mar., Apr. Guatemala. B.R. 28:13 (*Maxillaria cruenta*). Gn. 44:933 (*Lycaste aromatica*).

14. *aromatica*, Lindl. Fig. 1327. Pseudobulbs ovate, compressed; lvs. many, sheathing, oblong-lanceolate; scape erect, 1-fl., shorter than the lvs.; fls. yellow, $2\frac{1}{2}$ in. across; sepals and petals ovate-oblong, acute; the latter smaller and pointing forward; lateral lobes of the labellum with narrow, projecting blades; middle lobe spatulate, dentate, recurved, and having a large truncate plate as a crest. Winter and spring. Mexico. B.R. 22:1871.—Floriferous.

15. *Deppii*, Lindl. Pseudobulbs ovate, clustered; lvs. 3-4, broadly elliptic-lanceolate, $1\frac{1}{2}$ -2 ft. long; scape erect, bearing 1 or 2 fls. 4 in. in diameter; sepals oblong-lanceolate, dingy green, spotted with chocolate-purple; petals smaller and obovate, white; labellum bright yellow, with a few purple spots; lateral lobes small, rounded; middle lobe ovate-acuminate, recurved, waved, with a yellow callus. Vicious and free-flowering. Aug. to May and June. B.M. 3395. L.B.C. 17:1612 (both as *Maxillaria Deppii*). P.M. 2:268 (*Maxillaria Deppii*).—Named after Deppe, but originally spelled Deppii. Var. *punctatissima*, Hort. Fls. much spotted with dark purple. Guatemala.

16. *Harrisonia*, G. Don. Some authors prefer to call this *Biventraria Harrisonia*, Reichb. f. Pseudobulbs 3-4 in. high, 4-angled; lvs. solitary, lanceolate; scape erect, 1-2-fl.; fls. 2-3 in., cream-colored; sepals spreading, oval, the 2 lower forming a kind of open spur at their united bases; petals oval, spreading; lateral lobes of lip rounded, crenate; middle lobe rounded-emarginate, crenate; all beautiful purple; inside tawny, with purple lines, and an orange callus. Spring. The fls. last a

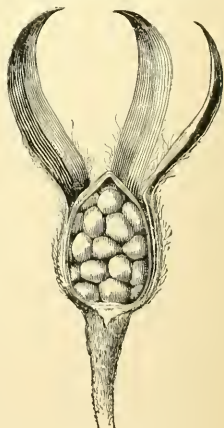
long time. Brazil. B.R. 11:897. B.M. 2927. P.M. 2:496 (all as *Maxillaria Harrisonia*). Var. *alba*, Kränzl. Sepals white, tinged with pink; petals pure white; labellum yellow, with purple veins; front of middle lobe white, with rose veins. Aromatic. Fls. last about three weeks. Gt. 38:132. G.C. II:25:437. Var. *eburnea*, Hort. Fig. 1328. Sepals and petals white; labellum white, richly streaked with carmine; throat yellow. April, May. Brazil. A.G. 12:407. Var. *citrina*, Hort. (*L. citrina*, Lindl.). Fls. large, fleshy; sepals and petals lemon-yellow; lip white, stained with lilac. Brazil.

17. *inodora*, Lindl. (*Biventraria inodora*, Lindl.). Pseudobulbs usually ovate-oblong, 4-angled, 3 in. high; lvs. solitary, short-stalked, oblong-lanceolate, 1 ft. long and 4 in. wide; scape half as long as the pseudobulb, bearing 1-2 large, spreading, brownish green fls. with red hairy lips; sepals roundish oblong, tinged with red, the lateral ones ending in a spur-like projection at base; petals ovate-acuminate, all recurved at the tip; middle lobe of the labellum roundish oblong, undulate, having an elevated process at the center. Resembles *L. tragona*, but its fls. are not fragrant. Spring.

Since these descriptions were put in type, we learn that Lager & Hurrell have in stock *Lycaste fulvescens*, Hook. Following is a description from the "Orchid Grower's Manual" (see also B.M. 1493): "Pseudobulbs large, broadly ovate, somewhat membranous plicate lanceolate leaves two or more from their top, and handsome, tawny yellow flowers, on slender radical scapes. The flowers have lanceolate sepals $2\frac{1}{2}$ in. long, the lateral ones falcate, connate at the base into a blunt spur; the petals are similar, but slightly smaller; and the orange-colored lip is oblong, 3-lobed, with an emarginate appendage on the disk, and an ovate-obtuse front lobe, beautifully fringed at the margin with wavy hairs. Colombia."

HEINRICH HASSELBRING.

LYCHNIS (from the Greek word for *tamp*, in allusion to the flame-colored fls. of some species). *Caryophyllaceae*. As commonly understood, Lychnis includes 30 to 40 small herbs of the temperate parts of the northern hemisphere. The technical generic characters are so variable and unimportant, however, as to allow the genus to be thrown into *Silene* or to be broken up into 7 or 8 distinct genera (for the latter, see Williams, Journ. Bot. 3:167), according to the point of view of the particular author. They are annuals, biennials or perennials, of easiest culture in ordinary garden soil. They are plants which like the sun. They are mostly erect-growing, and the leaves are opposite and entire. The capsule usually has but one locule or compartment, and the seeds are borne on a central or axile placenta (Fig. 1329). The styles are usually 5 or rarely 4, in this differing from *Silene* (in which the styles are 3), and the calyx teeth are commonly 5. In some species, the styles are 3 and the capsule is more than 1-loculed at base, but in these cases the habit of the plant and minor technical characters enable one to refer them to Lychnis rather than to *Silene*. The stamens are 10; and the petals 5 and usually with a 2-celled scale or a pair of teeth at the base of the blade. In the following synopsis of the garden kinds, little attempt is made to follow technical botanical divisions.

1329. Capsule and seeds of Corn-cockle ($\times 1\frac{1}{2}$). Showing axile placenta.

Some of the species of *Lychnis* are amongst the best known of old-fashioned flowers, as the Mullein Pink, Maltese Cross and Ragged Robin. These are essentially flower-garden subjects. Others, as *L. alpina*, are better known as border or rockwork plants. All species are easily grown from seeds, the biennials and perennials blooming the second year. The perennials are often propagated by division.

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<i>Agrostemma</i> , 1, 5.	<i>elegans</i> , 20.	<i>sempiflorens</i> , 11.
6, 7.	<i>hubriata</i> , 7.	<i>Semo</i> , 14.
<i>alba</i> , 9.	<i>Fios-cneuli</i> , 11.	<i>Sieboldii</i> , 12.
<i>alpina</i> , 4.	<i>Fios-Jovis</i> , 6.	<i>Silene</i> , 7.
<i>Chalcedonica</i> , 2.	<i>fulgens</i> , 3, 12.	<i>speciosa</i> , 12.
<i>Cœli-rosa</i> , 7.	<i>Githago</i> , 1.	<i>splendens</i> , 10.
<i>Coronaria</i> , 5.	<i>grandiflora</i> , 12.	<i>Succica</i> , 4.
<i>coronata</i> , 12.	<i>Haagesna</i> , 13.	<i>tonensis</i> , 5.
<i>dioclea</i> , 8.	<i>oculata</i> , 7.	<i>vespertina</i> , 9.
<i>diurna</i> , 8.	<i>pleniissima</i> , 11.	<i>Viscaria</i> , 7, 10.

A. *Calyx lobes long and leafy: petals not crowned.*

1. **Githago**, Scop. (*Agrostemma Githago*, Linn.). CORN-CKOCKLE. Figs. 1329-30; also 825. An annual weed in wheat-fields, and difficult to eradicate because the seeds are not readily screened from the wheat in the threshing or fanning-mill: plant strict, 2-3 ft. tall, white-hairy: lvs. nearly linear: fls. long peduncled, red-purple and showy, the obovate entire petal limbs exceeded by the narrow calyx lobes—these lobes falling when the fruit is ripe. Eu.—Rarely cult. in old gardens.



1330. Flower of the Corn-cockle (*Lychnis Githago*) in bud. Natural size.

long, with narrow upward-enlarging ribbed calyx and spreading, obovate-notched limb. June. B.M. 257. —Probably Japanese, but long in cult., and one of the best of all old-fashioned flowers. The fls. are usually brick-red to scarlet, but there are varieties with rose-colored, flesh-colored and white blossoms; also with double fls. The arrangement of the petal-limbs suggests the Maltese cross, hence one of the common names. Rarely persists for a time as a weed.

3. **fulgens**, Fischer (not Hort.). An erect-stemmed perennial, hairy: lvs. ovate to ovate-oblong, roughish, tapering below but scarcely petioled: fls. few, in a rather dense terminal cluster, bright scarlet, each petal divided into two broad lobes, on the outer side of which are two other and very narrow lobes, the ends of the main lobes slightly toothed; calyx oblong or ovate, 10-ribbed, with erect teeth. Siberia, China, Japan. B.M. 2104. B.R. 6:478.—Perhaps not in cultivation in this country. The plant that passes under this name is probably a form of *L. coronata*. From *L. Chalcedonica* it is distinguished by lower stature, much larger fls., and the well-marked side teeth or lobes on the petals.

4. **alpina**, Linn. Glabrous, tufted, a ft. or less tall: fls. mostly at the base, thickish, linear or oblong: fls. pink, with 2-lobed petals (segments linear), and short,

broad calyx with red teeth. N. Asia, Eu., and Amer. B.M. 394. L.B.C. 9:881 (as *L. Succica*).—An attractive alpine.

BB. *Fls. mostly larger, borne singly or in loose clusters, or at least the clusters not all terminal.*

c. *Plant white-woolly throughout.*

5. **Coronaria**, Desv. (*Agrostemma Coronaria*, Linn. *Coronaria tonensis*, A. Br.). MULLEIN PINK. DUSTY MULLEIN. ROSE CAMPION. Fig. 1332. Biennial or perennial, 1-2½ ft. tall, forking towards the top: lvs. oblong, oblong-oval or oblong-spatulate, the lower ones obtuse or nearly so, tapering to a more or less clasping base: fls. large (1½ in. across), circular in outline, crimson or rose-crimson, borne singly on the ends of the branches; petals with appendages at the throat; calyx with filiform teeth. Eu. and Asia. B.M. 24.—A common plant of old gardens, and sometimes escaped. The glowing fls. and white foliage make it a conspicuous plant. A hybrid of this and *L. Fios-Jovis* is figured in G.C. III. 2, p. 101.



1331. *Lychnis Chalcedonica*. ($\times \frac{3}{4}$.)

6. **Fios-Jovis**, Desv. Perennial, 12-18 in., making a clump: lvs. in a rosette, also canline, oval-lanceolate, more or less clasping: fls. small (½ in. or less across), bright red or rose, in a rather dense, umbel-like cluster. Eu. B.M. 398 (as *Agrostemma Fios-Jovis*).—Hardy perennial, rarely seen in old gardens.

CC. *Plant not white-woolly, green.*

D. *Petals 2-notched or 2-cleft. (Forms of No. 12 may be sought here.)*

E. *Annuals.*

7. **Cœli-rosa**, Desv. ROSE OF HEAVEN. Fig. 1333. A very floriferous annual, 12-18 in., glabrous: lvs. linear, long-acuminate and very sharp-pointed: fls. on slender



1332. *Lychnis Coronaria*.

stems, about an inch across, the petals only slightly notched, rose-red, with a linear bifid scale at the throat; calyx club-shaped. Mediterranean region. B.M. 295 (as

Agrostemma Celi-rosa.—A popular garden annual, loving the sun. There is a white-fl. form; also var. *fimbriata*, Hort., with toothed petals. The species is known also as *Silene Celi-rosa*. For an account of the leading garden forms, see Rehder, M.D.G. 1897, p. 346.



Var. *oculata* (*L. oculata*, Backh. *Viscaria oculata*, Lindl.), is a handsome form with purple-eyed fls. B.R. 29:53. B.M. 4075.

EE. *Biennialis* and *perennialis*.

8. *diocia*, Linn. (*L. diocia*, Sibth.). RED or MORNING CAMPION. Coarse, hairy and usually somewhat viscid, 1-2 ft. tall, forking above; lvs. ovate-lanceolate or oblong, the cauline ones broad-based or clasping; fls. normally red (varying to pink and white), in loose, elongating or forking clusters (or at first single on the ends of the branches), opening in the morning, not fragrant, more or less dioecious; calyx oblong, reddish, not exceeding $\frac{1}{2}$ in. in length; fr. or capsule large and globose, wide-mouthed, the teeth recurved. Eu. and Asia.—Frequent in old gardens, and also run wild in waste grounds in the eastern states. There are double-fl. forms.

9. *alba*, Mill. (*L. vesperina*, Sibth.). WHITE or EVENING CAMPION. Very like the last, and perhaps not specifically distinct, but more viscid; lvs. longer; fls. usually white and fragrant and opening at evening; calyx longer and green; capsule ovate to conical, with teeth erect or spreading, not recurved. May, June. Eu.—In old gardens and also escaped. There is a double-fl. form. This and the last are easily grown perennials or biennials.

10. *Viscaria*, Linn. GERMAN CATCHFLY. Interesting hardy perennial, 6-20 in. high, glabrous, but with viscid patches beneath the fl.-clusters; lvs. long-linear, the lower ones tapering towards the base; fls. not large, red, in opposite short-stalked clusters, which form an interrupted glomerate panicle; calyx $\frac{3}{4}$ in. long, reddish, usually somewhat swollen above the middle, with short teeth. Eu., N. Asia. G.C. III. 20:122.—Sometimes seen in old gardens, and a useful plant with a tufted habit; a most profuse bloomer in sunny places. There are forms with deep red and white fls.; also double-fl. Var. *splendens*, Hort., has rose-pink fls. Var. *elegans*, Hort., has scarlet and white-striped fls.

DD. *Petals 4-lobed or parted*.

11. *Flös-cuculi*, Linn. RAGGED ROBIN. CUCKOO FLOWER (whence the Latin name). Perennial, slender, 1-2 ft. tall, slightly roughened, and glandular above; root-lvs. oblanceolate; stem-lvs. lance-linear to linear and rather small; fls. in a loose, cymose-panicleate cluster, red or pink, the petals cut into 4 linear segments; calyx short-oblong, 10-ribbed. Eu., N. Asia.—

Common in old gardens and also naturalized in parts of the eastern country. The double form (red or white) is prized for its close packed, fimbriate fls. An old-time and deserving favorite, blooming profusely and for most of the season. Hardy.

Var. *plenissima*, Hort. (*L. plenissima semperflorens*, Hort.), is an excellent very double form, blooming from spring till fall, and also forcing well.

DDD. *Petals several-toothed or fimbriate, but not lobed*.

12. *coronata*, Thunb. (*L. grandiflora*, Jacq.). Perennial, or often biennial under cultivation, erect, glabrous; lvs. oval-elliptic and acute, the cauline ones sessile or nearly so; fls. very large (nearly or quite 2 in. across), the wide-spreading petals sharply several-toothed or somewhat lacinate, brick-red or cinnabar, scattered or in an open panicle. China, Japan. B.M. 223. L.B.C. 15:1433. F.S. 10:979.—Half-hardy or tender perennial, growing 1-1 $\frac{1}{2}$ ft. high, mostly a spring and summer bloomer. Of this handsome plant there are various forms, and to at least some of them, the name *L. fulgens* is frequently applied.

Var. *speciosa* (*L. speciosa*, Carr. *L. fulgens*, var. *speciosa*, Voss). Usually not so tall, very bushy; lvs. narrower and sharper; fls. very large and redder (usually scarlet), the petals less toothed and indistinctly 2-notched. R.H. 1870-1:330.

Var. *Sieboldii* (*L. Sieboldii*, Van Houtte. *L. fulgens*, var. *Sieboldii*, Hort.). Fls. large and pure white, with lacerate and obscurely 2-notched petals.

13. *Haageana*, Lem. Hybrid of *L. fulgens* and *L. coronata*, and a good intermediate, the fls. being large, with 2-notched petals and 2 short side teeth or lobes and dentate ends to the large lobes. It is a hardy or half-hardy perennial, 12 in. or less high, in summer producing large clusters of orange-red, scarlet or crimson fls., which are nearly 2 in. across. Very desirable. I.H. 6:195. F.S. 22:2322.

14. *Senno*, Sieb. & Zucc. Erect-growing, villous perennial, with sessile, ovate or lance-ovate lvs. and 1-3 large fls. at the ends of the branches, deep carmine (or in some forms with striped fls.), the petals deeply cut into several divisions which are again toothed at the ends. Japan.—Little known in this country.

L. H. B.

LYCIUM (Greek, *Lykion*, a name given to a Rhamnus from Lycia, transferred by Linnaeus to this genus). *Nolanacea*. MATRIMONY VINE. BOX THORN. Ornamental deciduous or evergreen shrubs, with usually spiny and



1334. Old-time garden Tomato, *Lycopersicum esculentum*. (See p. 958.)

1333. *Lychnis Celi-rosa*. Natural size.

often slender and sarmentose stems and with alternate or fascicled, short-petioled, entire lvs.; the whitish violet or purple fls. are funnelform and appear in axillary clusters or solitary, and are followed by usually very decorative berries of scarlet or red, rarely yellow or black. Most of the species are tender, but *L. halimifolium*, *L. Chinense*, and also *L. Turcomanicum* and *L. Ruthenicum* are hardy North. The two first named are especially attractive in fall, when the long and slender branches are loaded with scarlet or bright red frs., which contrast well with the green foliage. The leaves remain fresh and unchanged in color until they drop, after severe frost. The species are well adapted for covering walls, fences, arbors and other trellis work, but are, perhaps, most beautiful when the branches are pendent from rocks or from the top of walls. They are also used sometimes for hedges, and for warmer regions especially *L. Afrum* may be recommended. It is much used in S. Africa for this purpose under the name of Cafir Thorn. The Box Thorns grow in almost any soil that is not too moist. They should not be planted near flower beds or similar places, where the suckers are apt to become troublesome. Prop. readily by hardwood cuttings or suckers; also by layers and seeds. About 70 species distributed through the temperate and subtropical regions of both hemispheres. Lvs. mostly rather small, often fleshy; fls. axillary, solitary or clustered; calyx campanulate, 3-5-toothed; corolla funnelform, with usually 5-lobed limb; stamens mostly 5: fr. a berry, with few to many seeds.

A. Lvs. rather large: corolla 5-lobed, dull purplish. *halimifolium*, Mill. (*L. vulgare*, Dun. *L. fuscidum*, Koch). Shrub, with long and slender, spiny or unarmed branches, recurring or sarmentose, glabrous; lvs. cuneate, narrow, oblong-lanceolate, acute or obtuse, grayish green, $1\frac{1}{2}$ -2 in. long; fls. 1-4, long-pedicelled; corolla $\frac{1}{2}$ in. across, limb about as long as tube; filaments hirtute at the base: fr. oval, orange-red or sometimes yellow, to $\frac{1}{2}$ in. long. May-Sept. China to S. E. Eu. Gn. 31, p. 334 and 34, p. 63. B.B. 3:138.—This species and also the following are often confounded with *L. Europaeum* and *L. Barbarum*, which are chiefly distinguished by the filaments being glabrous at the base, by the longer tube and by the narrower and smaller lvs. They are not

hardy North and are rare in cultivation, while *L. halimifolium* and the following are hardy.

Chinense, Mill. Similar to the former, of more vigorous growth; branches to 12 ft. long; lvs. ovate to lanceolate, bright green, $1\frac{1}{2}$ -3 in.; fls. somewhat larger; fr. scarlet or bright orange-red, ovate to oblong, sometimes almost 1 in. long. June-Sept. China. G.F. 4:102.—The larger fruited form is sometimes distinguished as var. *megistocarpum*, Hort. (var. *macrocarpum*, Hort.).

AA. Lvs. small, $\frac{3}{4}$ in. long or shorter.

Chilense, Bert Shrub, with slender, often procumbent and mostly spinelose branches; lvs. cuneate at base, oblong, glandular-pubescent on both sides, grayish green, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; fls. usually solitary; pedicels longer than the 5-lobed, whitish pubescent calyx; corolla about $\frac{3}{8}$ in. long, pubescent and yellowish outside, limb 5-lobed, purplish within, about as long as tube; fr. orange-red, July-Oct. Chile.—The grayish color and glandular pubescence gives the foliage a frosted appearance. Int. 1900 by Franceschi, Santa Barbara, Calif.

Richii, Gray. Shrub, with slender spiny branches; lvs. short-petioled, cuneate, obovate, obtuse, glabrous or minutely puberulous when young, about $\frac{1}{2}$ in. long; fls. usually 2-3; calyx as long as pedicels, with elongated teeth; corolla $\frac{1}{2}$ in. long, tube longer than 4-lobed limb; fr. globose, bright red, $\frac{1}{4}$ in. across. May-Sept. S. Calif.

horridum, Thunb. Erect, spiny, much-branched shrub, to 3 ft., glabrous; lvs. sessile, spatulate, glabrous, about $\frac{1}{2}$ in. long; fls. short-pedicelled, small, whitish, with rather slender tube and 3-4-lobed limb. S. Afr.—As I have seen no specimens of the plant in trade under this name, I am not sure whether it is the true *L. horridum* of Thunberg described above, or perhaps *L. Afrum*, which is much used in S. Africa for hedges; the latter is easily distinguished by its large purple fls.

L. Afrum, Linn. Upright, rigid, spiny; lvs. linear-spatulate, small; fls. solitary, tubular, with short limb, purple, 1 in. long. N. and S. Afr. B.R. 5:354. S.P.F.G. II. 4:324.—*L. Barbarum*, Linn. Spiny or unarmed slender shrub. Similar to *L. halimifolium*; fls. 3-5; tube inside and filaments at base glabrous, tube longer than limb. N. Afr.—*L. Europaeum*, Linn. (*L. Mediterraneum*, Dun.). Spiny shrub, with spreading branches; lvs. spatulate, thickish; fls. short-pedicelled, with the slender tube much longer than limb. Mediter. region.—*L. fuchsoides*, HBK. = *Ischraea fuchsoides*.—*L. ovoidum*, Dun. (*L. rhombifolium*, Dipp.). Allied to *L. Chinense*. Lvs. rhombic-ovate; fr. oblong, large, with concave apex.—*L. pallidum*, Miers. Spiny spreading shrub, to 3 ft.; lvs. spatulate, glaucous, 1-2 in. long; fls. pedicelled, pale greenish purple, funnelform, almost 1 in. long; fr. globose, bright red. Ariz. and Utah to Mexico. G.F. 1:341. Has proved hardy in the Arnold Arboretum.—*L. Ruthenicum*, Murr. Upright spiny shrub; lvs. linear, small, thick; fls. small, with rather long tube; fr. globose, black.—*L. Turcomanicum*, Turcz. Slender spiny shrub, allied to *L. halimifolium*; lvs. and fls. smaller, tube more slender and longer; fr. globose. Turkestan, N. China.—*L. subglobosum*, Dun. Allied to *L. halimifolium*, dwarfier, more erect, less spiny; lvs. smaller; fr. subglobose, small. S. Europe.

ALFRED REIDER.

LYCOPERSICUM (*wolf peach*; probably an allusion to its inferiority as compared with the peach), *Solanaceae*. TOMATO. Perhaps nearly a dozen herbs of the western side of S. America, two of which are in common cultiva-

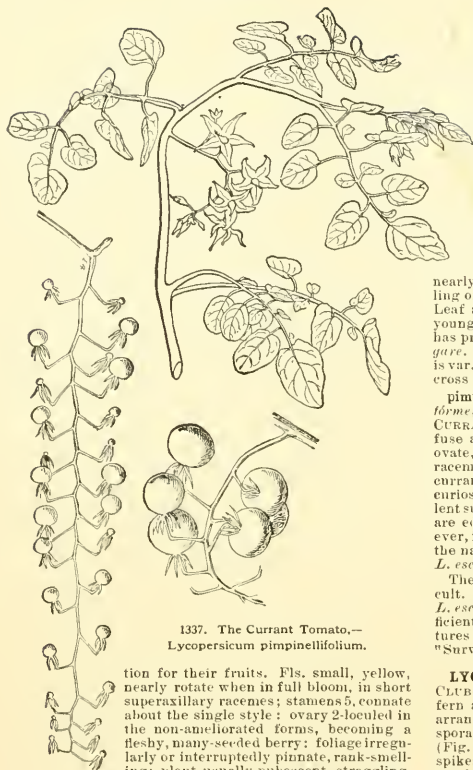


1335. Upright Tomato, *Lycopersicon esculentum*, var. *validum*.



1336. Leaves of Tomatoes.

1. *Lycopersicon esculentum*, var. *grandifolium*.
2. var. *vulgare*; 3, cross of the two.



1337. The Currant Tomato.—
Lycopersicon pimpinellifolium.

tion for their fruits. Fls. small, yellow, nearly rotate when in full bloom, in short superaxillary racemes; stamens 5, connate about the single style; ovary 2-loculed in the non-aneuroclerated forms, becoming a fleshy, many-seeded berry; foliage irregularly or interruptedly pinnate, rank-smelling; plant usually pubescent, straggling.

In native conditions, Tomatoes are probably perennial, but in domestication they are treated as if annual. Tender to frost. See *Tomato*.

esculentum, Mill. COMMON TOMATO. Fig. 1334. Plant spreading, with grayish green, mostly conduplicate ("curled") leaves and slender, ascending shoots; lvs. pinnate, with small, nearly entire leaflets interposed, the main leaflets notched or even lobed towards the base; fls. in a short raceme of 4-6; fr. medium to small, flattened and furrowed on the sides.—In cultivation for more than 300 years. Two hundred years ago red and yellow varieties were known. The great evolution of the Tomato did not take place until this century, giving rise to the garden race.

Var. vulgare, Bailey. Fig. 1336, No. 2. This is the common garden Tomato of North America, distinguished by very heavy growth, greener foliage, much larger and plane lvs., the comparative absence of stiffish ascending shoots (in the mature plant), few fls., and larger, "smoother" (i. e. not furrowed) fr., which has numerous locules or cells.—There is every reason for believing that the original Tomato had a 2-loculed (2-celled) fruit, but the course of aneurocleration has multiplied the locules; it has also modified the foliage and the stature of the plant (see "Survival of the Unlike," Essays 4 and 20).

Var. cerasiforme, Hort. (*L. cerasiforme*, Dunal). CHERRY TOMATO. Still grown for its little globular frts

(in red and yellow), which are often 2-loculed: plant less large and dense-foliaged, the lvs. smaller, grayer; growth more erect.—Probably a very close approach to the wild plant. Fruits used for pickles and preserves.

Var. pyriforme, Hort. (*L. pyriforme*, Dunal). PEAR and PLUM TOMATO. Differs from the last only in having pear-shaped or oblong fruits.—Probably occurs wild in very nearly the form seen in old gardens.

Var. validum, Bailey. UPRIGHT TOMATO. Fig. 1335. A remarkable cultural form, of low, stiff, erect growth, and small, condensed, curled lvs.—Originated as a chance seedling in France about 50 years ago. Looks like a potato plant.

Var. grandifolium, Bailey. LARGE-LEAF TOMATO. Lvs. very large, plane, the fls. few (about 2 pairs) and large, with margins entire or very nearly so, and secondary fls. usually none.—Of seedling origin about 30 years ago. The Mikado and Potato Leaf are the leading varieties at present. In very young plants, the leaves are usually entire. This race has produced crosses of commercial value with *var. vulgare*. In Fig. 1336, No. 2 is a leaf of *var. vulgare*, No. 1 is *var. grandifolium*, and No. 3 is a leaf of a hand-made cross between the two.

pimpinellifolium, Dunal (*L. racemigerum* and *racemiforme*, Lange. *Solidum racemiformum*, Vilm., not Dunal). CURRANT TOMATO. Fig. 1337. Plant weaker, very diffuse and twiggy, scarcely pubescent; lvs. with small, ovate, nearly entire fls., and very small secondary fls.; racemes elongating, distichous, bearing 10-40 small, currant-like, red berries. S. Amer.—(Grown as a curiosity and for ornament. The plant makes an excellent summer cover for brush or rubbish piles. The fruits are edible, but are too small for domestic use. However, it has been introduced as a garden vegetable under the name of German Raisin Tomato. It hybridizes with *L. esculentum* (see Fig. 1338).

The other species of *Lycopersium* are unknown in cult. Some of them are very like aboriginal forms of *L. esculentum*, and it is doubtful whether they are sufficiently distinct to be worth keeping as species. Pictures of other *Lycopersiums* will be found in Essay 4, "Survival of the Unlike." L. H. B.

LYCOPODIUM (Greek, wolf-foot). *Lycopodium*.

CLUB-MOSS. GROUND-PINE. RUNNING-PINE. A genus of fern allies, with erect or trailing stems, narrow lvs., arranged in 4 to many ranks, and bearing spores in sporangia, located either in the axils of ordinary lvs. (Fig. 1339) or in the axils of modified lvs. clustered in spikes (Fig. 1340). About 100 species are known. Commonly used for holiday decorations. The spores of some species form the official *Lycopodium powder*. The plants which florists grow as *Lycopodiums* are *Selaginellas* (which see).

A. Lvs. many-ranked.

B. Sporangia in the axils of unaltered lvs.

Selago, Lion. Stems erect, 3-9 in. long, dichotomously branched; lvs. ascending, hollow at base, glossy green, not reflexed. Northern hemisphere, usually in high altitudes.

lucidulum, Michx., is more common in lowlands, and has lvs. wide in the middle and erose.

squarrosum, Forst. Stems pendulous, 1-2 ft. long, 2-3 times dichotomously branched; lvs. firm, dark green, spreading, $\frac{1}{2}$ - $\frac{3}{4}$ in. long; sporangia in the axils of reduced lvs., forming a spike. East Indies.

BN. Sporangia aggregated in terminal spikes.

c. Stems pendulous; lvs. acute.

Phlegmaria, Linn. Stems $\frac{1}{2}$ -2 ft. long, dichotomously forked; lvs. $\frac{1}{2}$ - $\frac{3}{4}$ in. long, ovate; spikes copious, lax, 3-6 in. or more long. Tropics of Old World.

cc. Stems erect, tree-form.

cernuum, Linn. Stems erect, reaching 3-4 ft., copiously branched; lvs. crowded, linear; spikes sessile, $\frac{1}{4}$ - $\frac{3}{4}$ n. long, curved downward. Tropics of both hemispheres, occasionally in our gulf states.

obscurum, Linn. (*L. dendroideum*, Miexb. *L. Japonicum*, Thunb.). Stems 6-12 in. high, much-branched; lvs. loose, erect; spikes erect, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Temperate N. Amer. to Japan.—The common Ground Pine.



1338. *Lycopersicon esculentum* beneath; *L. pimpinellifolium* at top; hybrid between.

ccc. Stems (main ones) wide-trailing, with erect branches.

annötinum, Linn. Stems trailing, often several feet long, with numerous ascending branches 6-8 in. high, which bear sessile, solitary spikes. Arctic and north temperate zones of both hemispheres.

clavatum, Linn. Main stem trailing to the length of several feet, usually much branched; spikes 1-4 on an elongated peduncle. Arctic and north temperate regions of both hemispheres.—The common Club-Moss.

AA. Lvs. 4-ranked, on fan-like branches.

complanatum, Linn. Fig. 1340. Stems trailing on the surface of the ground; branches spreading out in a horizontal plane; lvs. of the under side of stems reduced to slender, spreading, cuspidate apices; first and second forks of peduncles approximate. Northern hemisphere.—*L. Chamæparissus*, R. Br., is an allied species, with stems growing underground.

L. M. UNDERWOOD.

LYCÖRIS (named after a nereid in Greek mythology), *Amaryllidaceæ*. A genus of 5 species of remarkable bulbs from China and Japan, with large, 6-parted flowers. Four species are in cultivation, two of which are hardy in New England. Two bloom in summer and two in early autumn. Two have red fls., one has lilac or purple fls., one yellow or orange. Three have the perianth segments more or less recurved and fluted or crisped at the margin. In all cases the fls. appear without foliage, being borne on a scape 1-3 ft. long, in un-

bels of 4-12 fls. each 3-4 in. across. The white filaments and yellow anthers are conspicuous features. The leaves make their growth, die down, and after a long rest the bulbs send up flower-stalks alone. These plants are highly esteemed in China and Japan, and bulbs are constantly being sent to the western world, but with us they seem to be wayward and uncertain, particularly as to the time of blooming. *Lycoris aurea* reverses the custom of nature. It rests in the wet season and flowers in the dry season. How the bulbs can remain dormant during the early Chinese summer, with the thermometer at 85° in the shade and a yearly rainfall of 100 inches, is a mystery. Botanically this genus is placed next to *Hippeastrum*, an American genus, in which the seeds are numerous in a locule, and usually flat, while in *Lycoris* they are few in a locule and tergid. Horticulturally *Lycoris* is most nearly comparable to *Nerine*, but the seeds of the former are black and of the latter green. Baker, Handbook of the Amaryllideæ, 1888.

A. Blooming in July and August.

B. Fls. dull red.

sanguinea, Maxim. Bulb ovoid, 1 in. in diam.; neck 1-2 in. long; lvs. linear; stamens shorter than the perianth segments. Japan.—The only species with segments neither wavy nor reflexed. Baker says the fls. are bright red. The Yokobona Nursery Co. is probably mistaken in giving the blooming period as May and June. They also advertise var. *alba*. J. N. Gerard says the lvs. of this and the next appear in March; also that the fls. of *L. sanguinea* are dull brownish red.

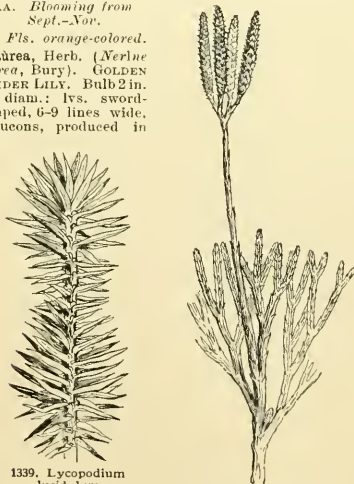
BB. Fls. rosy lilac.

squamigera, Maxim. (*Amaryllis Hüllii*, Hort., at least in part). Fig. 1341. Bulb globose; lvs. produced in spring, 9-12 lines wide; fls. rosy lilac, banded yellow. Japan. B.M. 7547. G.C. III. 21:137. G.F. 3:177.—The only fragrant kind. Var. *purpurea*, Hort., introduced about 1898. This species is hardy in New England.

AA. Blooming from Sept.—Nov.

B. Fls. orange-colored.

aurea, Herb. (*Nerine aurea*, Bory). GOLDEN SPIDER LILY. Bulb 2 in. in diam.; lvs. sword-shaped, 6-9 lines wide, glaucous, produced in



1339. *Lycopodium lucidulum*.

Common in cool woods. Sporangia in the axils of foliage leaves.

1340. *Lycopodium complanatum*.

Denizen of dry banks. Sporangia in spikes.

May. China. B.M. 409 and B.R. 8:611 (as *Amaryllis aurea*). G.C. III. 17:263 and 18:545. Gn. 47:997.—Baker says it blooms in Aug. and has bright yellow fls., but all the colored plates show orange colored fls.

BB. Fls. bright red.

radiata, Herb. (*Verlue Japonica*, Miq.). Bulb globose, $1\frac{1}{2}$ in. diam.; neck short; lvs. produced in winter, linear; stamens much longer than the perianth segments. China and Japan. B. R. 7:396 (as *Amaryllis radiata*). A. G. 13:211.—The perianth segments are more recurved than in any other species. The tube is very short, while in all the other kinds here described it is $\frac{3}{8}$ in. long.

Lycoris aurea has been cultivated for many years in American gardens, though it is not a common plant. Lately, with large importations of *L. radiata*, the interest in the genus has wided. These species have the handsomer flowers, and are preferably cultivated under glass, though the bulbs are probably hardy in warm, protected borders; at least they have more than one



1341. *Lycoris squamigera* ($\times \frac{1}{2}$).

been frozen in pots at Elizabeth, N. J., without apparent harm. In its habitat in China, *L. aurea* rests in the wet season, and the most success in culture has been found in growing it in a greenhouse, taking care to cultivate the foliage and rest the bulbs in warmth and moist earth. The same general directions may be followed for *L. radiata*. As with all bulbs, a vigorous growth of foliage is essential to the future appearance of flowers. *L. squamigera* and *L. sanguinea* are perfectly hardy; their leaves appear in March, mature and disappear. The flowers come in the nature of a surprise in July and August. The former species has a columnar scape 2-3 ft. tall and a cluster of large, amaryllis-like flowers, of a bright rose purple, rather attractive in the back row of a garden, but not of first rank. *L. sanguinea* has a scape $1\frac{1}{2}$ -2 ft., with small orange-red flowers, dull and curious rather than striking. The two former species have the beauty of the Nerines, but the two latter have none of this resemblance.

J. N. GERARD.

LYGÓDIUM (Greek, twining). *Schizandraceae*. CLIMBING FERNS. A genus of twining ferns, with the sporangia borne singly under overlapping scales on the under surface of reduced portions of the leaf. Some 30 species are known from all parts of the world. For cult., see *Ferns*.

A. *Sterile pinnules palmate*. (Native species.)

palmatum, Sw. HARTFORD FERN. Lvs. 2 ft. or more high, twining, bearing pairs of cordate-palmate pinnules $1\frac{1}{2}$ -2 in. long, on short petioles; fertile pinnules 3-4 pinnatifid, with the ultimate divisions linear. Mass. to Fla. and Tenn.—Requires light, moist soil and partial shade.

AA. *Sterile pinnules pinnate*. (Exotic glasshouse species.)

scandens, Sw. Pinnules 4-8 in. long, 2-4 in. broad, with a terminal segment and 4 or 5 on each side, which are simple and usually ovate. India and China.—Most of the American material cultivated under this name belongs to the next species.

Japonicum, Sw. Pinnules 4-8 in. long, nearly as wide, deltoid, with a pinnatifid terminal segment and 2 or 3 lateral ones on each side, all unequal and the lowest long-stalked and pinnate in the lower part. Japan and the East Indies.—The common species in cultivation.

L. M. UNDERWOOD.

LYON, THEODATUS TIMOTHY (Plate X), pomologist, was born in Lima, N. Y., January 13, 1813, and died in South Haven, Mich., February 6, 1900. He was the son of a farmer. His school going was very limited. In 1828, his parents went to the territory of Michigan, where he was employed in many pioneer pursuits, as farming, lumber-making, post-boy, tanner, merchant. He became more and more interested in farming, and in 1844 started a nursery on the farm at Plymouth, Mich. He collected varieties from the local orchards, and found their names much confused. His interest was challenged, and gradually he became absorbed in a study of pomology, which in that day meant mostly knowledge of varieties. Articles on the varieties of Michigan apples in the "Michigan Farmer" attracted the attention of Charles Downing, and a correspondence and exchange of varieties resulted. His name appears in the list of correspondents in the revised editions of Downing's "Fruits and Fruit Trees." For some years, Mr. Lyon was president of a railway company. In 1874, he moved to the "fruit belt" of southwestern Michigan, where he became president of the Michigan Lake Shore Nursery Association, and where he lived until his death. The nursery association was not successful financially. In 1888, Mr. Lyon wrote a full (412 pp.) and careful "History of Michigan Horticulture," which was published in the seventeenth report of the State Horticultural Society, a society of which he was president from 1876 to 1891, and honorary president until his death. In 1889, he took charge of the South Haven sub-station of the Michigan Experiment Station; and here, with his fruits and trees, he lived quietly and happily to the last.

Mr. Lyon was one of the last of the older generation of pomologists. Like his colleagues, he was an expert on varieties. He was one of that sacred company which placed accuracy and cautiousness before every consideration of ambition or personal gain. His friends knew that he had not the temper of a commercial man. At one time it was said of him that he was the most critical and accurate of American pomologists. The fruit lists of the Michigan Horticultural Society, his labors in revision of nomenclature for the American Pomological Society, and his various bulletins of the Michigan Experiment Station, show his keen judgment of varieties. Personally, he was retired, modest, cautious in speech, generous, simple in habit and manner.

L. H. B.

LYONIA (after John Lyon, who introduced many American plants into England, died before 1818 in Asheville, N. C.). Syn., *Xolisma*, *Eriodiceae*. Ornamental evergreen or deciduous shrubs, with alternate short-petioled lvs., and small white fls. in clusters, usually forming terminal racemes or panicles. Only the deciduous *L. ligustrina* is hardy North, but is less desirable than other hardy species of allied genera. It prefers moist, peaty soil, while the evergreen tender *L. ferruginea* thrives best in a sandy, well-drained soil. Cult. and prop. like *Leucothoë* and *Pieris*. About 10 species in E. N. Amer., W. Indies and Mexico. Allied to *Pieris* and often included under *Andromeda*. Calyx lobes 4-5, valvate; corolla glabrous or urceolate, pubescent; stamens 8-10; capsules 4-5-valved, with ribs at the sutures; seeds numerous.

ligustrina, Muhl. (*Andromeda paniculata*, Ait. *L. paniculata*, Nutt.). Deciduous, much-branched shrub, to 10 ft.; lvs. obovate to oblong-lanceolate, entire or obscurely serrate, pubescent beneath, 1-2 in. long; fls. in leafless racemes, forming terminal panicles; corolla globose, whitish, one-sixth in. long. May-July. Canada to Fla., west to Tenn. and Ark. B. B. 2:570.

ferruginea, Nutt. (*Andromeda ferruginea*, Walt.). Evergreen shrub or small tree; lvs. cuneate, obovate to oblong, with revolute margin, scurfy when unfolding, especially below, 1-2 in. long; fls. nodding, globular, white, in clusters in the axils of the upper lvs. Feb., March. S. C. to Fla. S. S. 5:234. L. B. C. 5:430.—Handsome evergreen shrub, but rarely cult., hardy only South. Var. **arborescens**, Michx. (*Andromeda rigida*, Pursh). Of vigorous growth, more rigid and with crowded lvs., growing into a small tree. Var. **fruticosa**, Michx. (*A. rhomboidalis*, Nonv. Duh.). Shrubby; lvs. sparsely, conspicuously reticulated. ALFRED REIDER.

LYONOTHAMNUS (*Lyon's shrub*; named for W. S. Lyon, who sent specimens to Asa Gray from Santa Catalina Island, California). *Saxifragaceae*. A monotypic genus confined to the islands of the Santa Barbara channel, and represented by two forms, — *L. floribundus* as described by Gray, and *L. asplenifolius* as described by Greene. These forms differ only in the structure of the lvs., as the species is dimorphic. Locally the tree is known as ironwood. It is rather plentiful in Santa Cruz Island, attaining 40 and 50 ft. in height. It is less frequent and more dwarfed in other islands of the group.

Fls. hermaphrodite; calyx 1-3-bracteoid; tube hemispherical; lobes 5; disk lanate; petals 5, orbiculate, imbricate in the bud; stamens 15, inserted with the petals on the margin of the disk; carpels 2, free; ovules 4; stigma subcapitate.

floribundus, Gray. Lvs. opposite, lanceolate, petiolate, subterete, oleander-shaped; fls. white, very numerous in a large, flattish, terminal cyme. — Highly praised for outdoor culture and for pots. The clusters are 4-5 in. across. The form *asplenifolius* has pinnate lvs. with pinnæ cut to the rib. F. FRANCESCO.

LYSICHITUM (Greek, a loose or free cloak; probably referring to the spathe). Also written *Lysichiton*. *Araceae*. A genus of one species, a plant resembling the skunk cabbage, offered in 1892 by Oregon dealers. Nearly stemless swamp herb with large lvs. from a thick, horizontal rootstock; spathe sheathing at base, with a broad colored lamina or none, at first enveloping the cylindrical spadix, which becomes long-exserted upon a stout peduncle; fls. perfect, crowding and covering the spadix; perianth 4-lobed; stamens 4; ovary 2-celled, 2-ovuled; ovules horizontal, orthotropous.

Camtschatcense, Schott. Lvs. 1-2½ ft. long, 3-10 in. wide, oblong-lanceolate. May, June. E. Siberia, Japan, Ore., Calif.

LYSILOMA is a small leguminous genus allied to *Acacia*, but not in cultivation. They are tender trees and shrubs, with flowers in heads or in cylindrical spikes. The pods are straight and flat, and the valves open away from the persistent sutures. Some of these plants are often called *Acacias*. Thus *A. acapulcensis* = *L. acapulcensis*, Benth.; *A. divaricata* = *L. schideana*, Benth.; *A. latifolia* = *L. latifolia*, Benth.

LYSIMACHIA (probably after King Lysimachus). *Primulaceae*. LOOSE-STRIPE. Found in temperate and subtropical regions of all parts of the world. Erect or creeping leafy herbs, with opposite or whorled, entire, usually black-punctate lvs., spicate, racemose or solitary fls., a rotate, 5-parted corolla with an equal number of slightly monadelphous stamens opposite the lobes, a 1-loculed capsule, and many seeds on a central placenta. Only a few in cultivation, and these all perennials. They differ from related genera in the absence of staminodia between the stamens, which are usually slightly united.

A. Flowers yellow.

B. Stem creeping; lvs. round-ovate, obtuse.

Nummularia, Lind. MONEY-WORT. CREEPING CHARLIE. CREEPING JENNY. Glabrous, forming large patches; lvs. opposite, rarely cordate, petiolate, ½-1 in. long; fls. 8-12 lines broad; sepals cordate or lanceolate, acute, half as long as the 5 oval, sparingly dark-dotted corolla lobes; filaments glandular. June-Aug. Europe; also naturalized extensively in the eastern U. S. R. H. 1891, p. 303. B. B. 2:589. — Very useful for rustic vases and baskets, also for carpeting ground in shady places. Var. *aurea*, Hort. Lvs. all or in part bright yellow.

BB. Stem erect; lvs. lanceolate, acute.

c. Plant glabrous or nearly so; fls. 3-6 lines broad.

stricta, Soland. Simple or branched, glabrous, 8 in. to 2 ft. high; lvs. opposite, lance-linear, acute at both ends, glaucous beneath, scarcely veiny, 1-3 in. long; fls. 3-5 lines broad, very numerous, in a distinct, elongated, terminal raceme; pedicels 3-9 lines long, slender; corolla lobes elliptical, streaked with purple; filaments

glandular. Common on moist ground in the eastern U. S. B. M. 104 [as *L. bulbifera*]. D. 141. B. B. 2:588. — Often bears bulbets in the leaf-axils after flowering.

quadrifolia, Linn. Usually simple, sometimes slightly pubescent, 1-3 ft. high; lvs. verticillate, in 3's-4's, rarely some opposite, lanceolate, oblong or ovate, acute, 1-4 in. long, green beneath, veiny; fls. axillary, 3-6 lines broad, on very slender pedicels, which are ½-1½ in. long; calyx and corolla as in the last. Dry soil, eastern U. S. D. 139. B. B. 2:588.

cc. Plant densely pubescent; fls. 9-12 lines broad.

vulgáris, Linn. COMMON YELLOW LOOSESTRIPE. Tall and erect, 2-3 ft. high, and stout; branched above, downy, especially on the stem; lvs. verticillate, in 3's-4's, ovate-



1342. *Lythrum Salicaria* (× ½). (See p. 962.)

lanceolate or lance-oval, acute at both ends, nearly sessile; fls. in the upper axils, or densely paniculate at the summit; calyx often red-margined; corolla large, the lobes broad, glabrous. Europe, Asia. R. H. 1891, p. 303. — Quite showy when grown in clumps.

punctata, Linn. (*L. verticillata*, Bieb.). Tall and stout: lvs. verticillate, in 4's, lanceolate, ovate or cordate ovate, acute, subsessile; corolla lobes oval, denticulate, glandular-ciliate, acute; stamens united. Very similar to *L. vulgaris*, but differs in the calyx lobes not red-margined; fls. in axillary, equidistant whorls, not paniculate, and corolla glandular. Eu. W. Asia. B.M. 2295 (as *L. verticillaris*).

AA. *Flowers white.*

clethroides, Duby. Tall and stout, 3 ft. high or less, sparingly pubescent, rarely glabrous: lvs. opposite, large, 3-6 in. long, and sessile, broadly lanceolate, attenuate at each end, radical spatulate: fls. $\frac{1}{2}$ in. in diam., in a very long, slender, terminal 1-sided spike, pedicels short, bracts subulate; corolla lobes ovate-lanceolate, obtuse; stamens not monadelphous. Japan. Mn. 8, p. 141.—Fine for cut-flowers, also for border.

L. brachystachys, Bunge (*L. brachystachys*, Carr.). Lvs. lanceolate: fls. white, dense. China. R. H. 1881-90.—*L. ciliata*, Linn. = *Steironema ciliatum*.—*L. Ephemera*, Linn. Lvs. linear: fls. white, dark eye. Eu. R. H. 1891, p. 303. B.M. 2346.—*L. hybrida*, Michx. = *Steironema lanceolatum*.—*L. lanceolata*, Walt. = *Steironema lanceolatum*.—*L. Leschenaultii*, Duby. Lvs. lanceolate: fls. carmine. India. R. H. 1891, p. 303.—*L. nitans*, Nees. Lvs. lanceolate: fls. dark purple. Cape of Good Hope. B.M. 4941.—*L. parviflorum*, Franch. Lvs. oval: fls. yellow, axillary or in head. China. B.M. 7226.—*L. polyantha*, Fernald. Similar to *L. quadrifolia*, but fls. in a distinct terminal raceme. Eastern U. S.—*L. producta*, Fernald. Similar to *L. stricta*, but lower lvs. often verticillate and raceme very leafy bracts passing into the foliage-lvs. Eastern U. S.—*L. thyrsoiflora*, Linn. = *Naumburgia thyrsoiflora*. K. M. WIEGAND.

LYTHRUM (Greek, *blood*; possibly from the styptic properties of some species, or the color of the fls.). *Lythraceæ*. About 12 widely scattered species of herbs or subshrubs, of which 3 are cult. in hardy borders. Branches 4-angled: lvs. opposite or alternate, rarely whorled, linear-oblong or lanceolate, entire: fls. rosy purple or white, in the upper axils usually solitary,

lower down more or less whorled; calyx tube cylindrical, 8-12-ribbed; petals 4-6, obovate; stamens as many or twice as many; capsule 2-celled, with an indefinite number of seeds.

Lythrums grow about 2-3 ft. high in the wild, but improve wonderfully in cultivation, often attaining 4-5 ft. and flowering freely. Some of them are called willow-herbs or soldiers in England from their strong, erect habit and willow-like leaves. They are of easy culture in any moist soil, and are usually planted amid shrubbery, where they hold their own. They are denizens of low grounds, swamps and meadows. They flower in summer and are prop. by division. A nameless species from Japan has been considerably advertised of late, but the specimen in the writer's hands is *L. alatum*.

A. *Stamens twice as many as the petals.*

B. *Fls. in an interrupted, leafy spike.*

Salicaria, Linn. SPIKED or PURPLE LOOSESTRIFE. Fig. 1342. Height 2-3 ft.: lvs. opposite or sometimes in whorls of three, lanceolate, 2-3 in. long: fls. purple; stamens barely if at all exerted. North temp. regions. Australia. B. B. 2: 473.—Best of the genus. Vars. **superbum** and **roseum**, Hort., have rose-colored fls. Var. **roseum superbum**, Hort., may be the same as the preceding varieties. It is large-fl., rose-colored, more robust (4-6 ft.), and somewhat later in blooming. It is an excellent form. It is generally sold as *L. roseum superbum* (not as a var. of *L. Salicaria*).

BB. *Fls. solitary in the upper axils, racemose.*

virgatum, Linn. Lower lvs. opposite, rounded at the base: calyx not bracted. Eu., N. Asia.

AA. *Stamens not more numerous than the petals.*

alatum, Pursh. Lvs. mostly alternate, obtuse: stamens exerted. N. Am. B. B. 2: 472.

F. W. BARCLAY and W. M.

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