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001 26 1983
Cyclopaedia of American Horticulture
NOW THAT THE CYCLOPEDIA OF AMERICAN HORTICULTURE is completed, it is due the reader that some information be given him of the methods by which it has been made and of the resources that have been at command. It is due to the Editor that he be allowed to state his own point of view in respect to the meaning of the work. These remarks are made in no feeling of personal pride, for the writer is keenly aware of the many shortcomings of the book; but they may acquaint the reader with some of the difficulties with which such work is attended, and they may be suggestive to those who may desire to prosecute similar studies.

RETROSPECT

I. THE PROJECT

The most difficult part of the making of a cyclopedia is to project it. Its scope and point of view must be determined before a stroke of actual work is done. This much done, the remainder is labor rather than difficulty. The lay-out of the enterprise cannot be made in a day. It is a matter of slow growth. One must have a mental picture of the entire field and must calculate the resources. The plan once perfected, it remains only to work out detail after detail, taking up the tasks as they come, not caring nor even daring to look forward to the work that piles mountain high farther down the alphabet.

So far as the Cyclopeda of American Horticulture is concerned, the Editor had resolved and reviewed the enterprise for more than ten years. The first suggestion was a vague idea that a comprehensive work was needed. There were several hundred special works on American horticulture. Some subjects were well worked; others were untouched. There was no means of determining the extent of our wealth in cultivated plants. There were no suggestions, even, as to what that wealth might be. No survey had been made. Only a full inventory can tell us whether we are rich or poor; it gives us a scale by which to measure progress.

The first tangible result of this desire for some comprehensive view of American horticulture was the publication of "Annals of Horticulture for 1889." Some years before this time an endeavor had been made to interest a publisher in the project, but without success. This annual volume was designed to be "a witness of passing events and a record of progress." Five years these annual volumes were issued, the last one containing a summary sketch of horticulture at the World’s Fair, at which was made the greatest single effort to display our horticultural achievements and possibilities. In these annual volumes all the new plants and tools and movements of the year were intended to be recorded. Special investigations were made for some of the volumes. The issue for 1889 contained a list of all the kitchen-garden vegetables sold in North America in that year; that for 1891 contained a census of all the native plants which had been introduced into cultivation, showing that 2,416 species had become known to the horticulturist in Europe or America, although
many of these probably were not then in cultivation; that for 1892 made an annotated inventory of the varieties of apples that had been and were in cultivation in North America, showing that 878 varieties were actually offered for sale by American nurserymen in that year. But these volumes were isolated; they picked up the work piece by piece. An inventory of the whole field, critically and laboriously made, was needed before mere annals of yearly progress could signify much. We needed to know our status; thereafter chronicles would have a meaning.

From 1893, attention was given to the larger and comprehensive effort. A garden herbarium had to be made, for there was none in the country. The first plant had been put into this herbarium in 1889; it was a mere sprig of the greenhouse shrub Boronia megastigma. There are difficulties in making a garden herbarium: there are no professional collectors and one cannot buy specimens; many cultivated plants are too valuable to allow of specimens to be made. This herbarium now has more than 12,000 mounted specimens. Although small, nevertheless it has been invaluable. If it does not show nearly all the species, it shows the range of variation in some, and thereby suggests what may take place in all. It also shows what is actually cultivated under a given name, whether that name be correct or not.

Trial excursions were made into the evolution of various perplexed garden plants. Some of these essays have been published. Out of these efforts grew the volume, "Sketch of the Evolution of Our Native Fruits." The study of garden plants is a different subject from the study of wild plants. Mere descriptions are often of little value. The plant may have been bred away from the description within a decade. Specific descriptions of many of the common garden plants do not exist in books: the plants are not species in the book sense.

American horticultural books must be collected, for the comprehensive work, if it came, must contain American advice. One must know the range of New World experience and the occidental point of view. It has been the misfortune of many American writings that they have drawn too heavily from the experience of the Old World. Once this was necessary, but now it is time to break away. Fifty authors have written on viticulture in America, yet scarcely one has caught the spirit of the American grape-growing. Nearly twenty years of collecting by the Editor has brought together the completest library of American horticultural books.

The details entering into any comprehensive cyclopedia of horticulture are astonishing in number and variety. Consider some of the items: More than 10,000 species of plants in cultivation; almost every important species phenomenally variable, sometimes running into thousands of forms; every species requiring its own soil and treatment, and sometimes even minor varieties differing in these requirements; limitless differences in soils and climates in our great domain, every difference modifying the plants or their requirements; a different ideal in plant-growing and plant-breeding in the mind of every good plant-grower; as many different kinds of experience as there are men; many of these men not facile with the pen, although full of wholesome fact and experience; the species described in books which deal with the four corners of the earth; very few botanists who have given much attention to the domestic flora.

It was desired that the Cyclopaedia be new—brand-new from start to finish. The illustrations were to be newly made; the cultural suggestions written directly for the occasion from American experience, and often presented from more than one point of view; few of the precedents of former cyclopedias to be followed; all matters to be worked up by experts and from sources as nearly as possible original. Of course it
has been impossible to reach the ideals. There are limitations of expense and time as well as of capability: for it is yet a question whether our new country is ready for such a laborious work.

In America there has been but one cyclopedic work on horticulture, Henderson's "Handbook of Plants," 1881; second edition, 1890. This is in one volume. The most complete similar recent work in the English language is Nicholson's "Illustrated Dictionary of Gardening," four volumes, 1884-87. It is the work of the talented ex-Curator of the Royal Botanic Gardens at Kew, England. Mottet's French edition of Nicholson, five volumes, 1892-99, is the largest modern cyclopedic of horticulture, and the only one which excels in size the present American venture. Another popular English work in one volume is Wright & Dewar's revision of "Johnson's Gardener's Dictionary," 1894. Another recent French work, also in one volume, is Bois' "Dictionnaire d'Horticulture," 1893-99, with colored pictures printed in the text. In German is Rümpler's "Illustriertes Gartenbau-Lexikon," in one volume, with a recent new edition; also Siebert & Voss' "Vilmorin's Blumengärtner," one volume of text and one of plates, 1896, the most critical of all similar works. In judging the American work, the reader must bear in mind that there is really no critical horticultural-botanical writing in this country back of the present decade. The present Cyclopedia reflects the imperfection of our literature as well as the shortcomings of the Editor.

II. THE OFFICE DETAILS

Before the actual writing was begun, other cyclopedias were searched for suggestions of subjects to be inserted. Also, a card index was made to portraits of plants in the leading horticultural and botanical serials, to descriptions of plants in current publications, to monographs, and to the names of leading horticultural varieties in some of the larger groups. This card index grew during the progress of the work, and it now comprises about 35,000 cards.

The "trade lists" were also made. These lists were intended to afford a record of the plants actually in cultivation in North America north of Mexico. Catalogues of more than one hundred leading seedsmen, florists, and nurserymen were cut up, and all the information respecting the various genera pasted on yellow sheets of standard letter-paper size. Thus, on one sheet, or one set of sheets, would be all the entries on Abies, Bocconia, Saxifraga, and the like. On these "trade lists" were made notes respecting persons who are skilled in the culture of the particular plants, together with extracts from letters, items of experience, and other incidental information. The name of the catalogue from which the cuttings were made was preserved, in order that doubtful questions might be traced. In special groups, it has been impossible to determine just what species are in cultivation because they are not all recorded in printed catalogues and they are known chiefly to a few fanciers or collectors. This limitation is particularly apparent in orchids; also in such large special genera as Acacia and Eucalyptus. In such cases it is practically impossible to make complete lists, and it is probably scarcely worth while to make the effort; but all the species that are generally known are almost sure to have been recorded. Since the Cyclopedia is designed as a permanent work of reference, mere horticultural varieties have been omitted, as a rule; but an effort has been made to indicate the dominant types or races, the evolution of garden favorites, the good and bad "points" of important variations, and to suggest possible lines of progress.
These trade lists were "standardized" in order to determine the proper nomenclature for the various entries; for Virgilia had to be brought forward to Cladrastis and Anthemium placed with Zygadenus. This preliminary work had to be done with care. It necessitated, also, the adoption of some one work as a standard; and the only work which covered the field and answered other requirements is Index Kewensis. This work has been followed in the main, although every contributor has been free to express his own ideas of genera and species, and the recent monographs have been followed for special groups.

The work for a whole letter—as the letter A—was laid out in advance. The general theory was to assign every article to an authoritative writer. Articles that could not be assigned, or for which no person would hold himself responsible, fell to the editors. It therefore happened that many of the most critical puzzles fell to the office. On very important subjects, two to six persons were asked to contribute. If these persons wrote from experience, no effort was made to cause their statements to be uniform, although it was desired that they should harmonize whenever possible. It was desired that the work have personality, for this is vitality. In horticultural matters there is no final opinion.

The articles have been written by busy men. Serious delays have resulted in securing the manuscripts; and yet the Editor must express his gratification with the general promptness of the contributors. With scarcely an exception, the collaborators have seemed to feel a personal responsibility in the success of the undertaking. The manuscripts have been much edited, yet they have not been copied. Not a single parcel is known to have been lost in the express or mails. The Cyclopaedia has had a patient printer. On all kinds and sizes of paper, and in every style of script, with cabalistic editorial marks in pencil and in inks of various colors, these manuscripts have gone to the compositor. Returning from the printer, they have been sorted and filed, and finally tied in bundles, in which condition they now constitute a part of the archives of the Cyclopaedia.

Usually the printer received copy for one letter at a time. In large letters, as C, P, S, one section—as Ca, Po, St—comprised one sending, for it has been impossible to keep far ahead of the compositors. When all the manuscript was received from the various writers, cyclopedic works were consulted to see that no entries were omitted. The titles of all entries were copied when the manuscripts went to the printer, and the entries were checked off when they appeared in galleys and pages. Failure to check up entries in the letter A resulted in the loss of the article "Aubrietia," and the plate had to be recast in order to insert it.

The type-matter was first seen in "galleys" on green paper, with the cuts separate, known in the office as "the long green." Six proofs were received by the Editor, who sent four or five of them to specialists on the various subjects. Every line in the work has been read in the proof by experts. It requires from a week to ten days to get back the proofs from the various readers. The matter is then made up into pages, and read again. It is then cast, and the final proofs are placed on file. The galley proofs are gone over several times by the Editor, aside from the regular reading, each time for a specific purpose: once for alphabetic order of the entries; once for spelling of names; once for accent marks; once for signatures to the articles; once for references to the cuts; once for legends to the cuts; once for general style. A full page of the Cyclopaedia contains 14,000 pieces of metal. The reader will be lenient when he finds a misplaced letter. A clerk was employed to verify all references by hunting up the references themselves.
In the "make-up" it is an inviolable rule that wherever the book opens, an engraving will be seen. Adherence to this rule has made trouble in some cases. In one instance it was necessary to have a new cut made after the forms were made up, and to renumber the legends of more than one hundred pictures. The mechanical make-up was in the hands of I. B. Kraybill, foreman of the composing-room of the Mt. Pleasant Press, who gave the work loving and thoughtful care until, in the letter T, he was called to lay down his labors. The Editor hopes that the reader will regard his memory whenever the arrangement of the pictures is a source of satisfaction and pleasure.

The Cyclopedia has been edited in a room eighteen feet square, kindly allowed for this use by Cornell University. In this room were two long tables, which allowed of the disposition of manuscripts and pictures in delightful abandon; the garden herbarium of Cornell University; and a large collection of books, mostly loaned from the Library of Cornell University. Aside from monographs, botanical manuals, local floras, horticultural handbooks, dictionaries, the following works were on the shelves: Index Kewensis (intended to contain all species of flowering plants down to 1885—about 125,000 names); Bentham and Hooker's Genera Plantarum; Engler and Prantl's Natürlichen Pflanzenfamilien; De Candolle's Prodromus (17 volumes), and his Monographie Phanerogamarum (9 volumes thus far); the Kew List of new species introduced into cultivation between 1876 and 1896. Next in importance were the periodicals, containing perhaps 50,000 pictures of plants, many of them colored and mostly authentic. First rank must be accorded the peerless Curtis' Botanical Magazine, with its 125 volumes, containing over 7,600 colored plates. Edwards' Botanical Register, Loddiges' Botanical Cabinet, L'Illustration Horticole, Flore des Serres, Paxton's Magazine, Revue Horticole and The Garden are extensive works provided with colored plates, for details of which the reader may consult Vol. I, pp. xvii and xviii. Less extended periodicals containing colored plates have been used, as The Botanist by Maund, The Florist and Pomologist, Knowles & Westcott's Floral Cabinet, Meehan's Monthly and an incomplete set of Gartenflora and Revue d'Horticulture Belge. Of horticultural periodicals not containing colored plates, the Gardeners' Chronicle is a great store of botanical knowledge, being published since 1841. It is full of botanical monographs of garden genera, and is a rich repository of description of new species. A complete set of the Journal of Horticulture has been available and all the pictures in its third series have been indexed. Of American periodicals, Garden and Forest, American Gardening, American Florist, Florists' Exchange, Florists' Review and Gardening have been very helpful.

The three most useful bibliographical works on botany have been Pritzel's Thesaurus, Jackson's Guide to the Literature of Botany, and the Catalogue of the Kew Library. About two dozen cyclopedic works were thoroughly examined and kept at hand for various periods, as those of Nicholson, Mottet, Siebert and Voss; the Bois' Dictionnaire d'Horticulture, Johnson's Gardener's Dictionary, Paxton's Botanical Dictionary, Rümpler's Illustriertes Gartenbau-Lexikon, Loudon's Encyclopædia of Gardening, Lindley and Moore's Treasury of Botany and various editions of the prototype of all such undertakings,—Philip Miller's Gardener's Dictionary. The floras of foreign countries have been as indispensable as those of America. Flora Capensis (4 vols. thus far), Flora Australiensis (7 vols.) and the Flora of British India (7 vols.), have been used the most. On European plants, Koch's Synopsis Florae Germanicae et Helvetiae, Grenier & Gordon's Flore de France, Ledebour's Flora Rossica, and Bentham's Illustrated Handbook of the British Flora, and others, have been constantly at hand.

The office force consisted of the Editor and Associate Editor, the latter giving all his time to the work for four years. For a time, Alfred Rehder was employed at the Arnold Arboretum, near Boston, to work on the hardy trees and shrubs. For two months F. W. Barclay, a former student at the Massachusetts Agricultural College, and now gardener for C. A. Griseon, Haverford, Pennsylvania, joined the office at Ithaca, giving most of his attention to herbaceous plants. Heinrich Hasselbring, graduate of Cornell University and trained as a florist, joined the office force for a time, devoting his attention mostly to orchids. No other writers have been employed otherwise than as contributors. The Associate Editor has had particular charge of indexes, trade lists, bibliographical matters, and editing of manuscripts. Aside from constructive and administrative matters, the Editor has had special charge of illustrations, proof-reading, arrangements with contributors and the make-up of the galleys into pages. He has read every line of the work, much of it several times over. The Editor desires to express his appreciation of the aid which the Associate Editor, Wilhelm Miller, has rendered to him and to the Cyclopaedia. With unbounded zeal, persistent industry and painstaking thoroughness, he has given his best effort to the work from start to finish.

The pictures have been made by a score and more of artists. With the exception of the fifty half-tone full-page plates, they are all line drawings. The greater part of these drawings have been made from the living plants or other objects. Many have been drawn from photographs, of which a large collection was made. Some have been composed from combined suggestions of authoritative prints, botanical specimens, and other information. Some of the pictures are from the American Garden, having been made for that journal in the years 1890 to 1893, under the supervision of the present Editor. These engravings passed into the hands of the J. Horace McFarland Company, and by this company have been used for the present publishers. A number of the cuts have been borrowed from the Cornell University Experiment Station. Some of the illustrations are those used in the books in which the Editor is interested and which are published by The Macmillan Company. The pictures are intended to represent the average excellence of the plants, and, therefore, they are not idealized. The artists who have made the largest number of illustrations directly for the Cyclopaedia are: Charles W. Furlong and W. C. Baker, Instructors in Drawing in Cornell University; E. N. Fischer and C. H. L. Gebfert, Jamaica Plain, Mass., who had access to the Arnold Arboretum; Miss H. A. Wood, Kingston, Jamaica, West Indies, who has drawn tropical economic plants; G. R. Chamberlain, who has drawn many plants, particularly annuals, in the gardens of Cornell University; and Miss R. M. Huntington, who had access to the gardens at Smith College, Northampton, Mass.; Mrs. K. C. Davis and Miss Marie L. Robertson (now Mrs. B. M. Duggar), then at Ithaca, N. Y. The artistic work has been aided at almost every point by the personal interest of J. Horace McFarland, proprietor of the Mt. Pleasant Press, Harrisburg, Pa., where the type-setting and presswork have been done. Himself an expert photographer,
Mr. McFarland has given freely of photographs and advice; and he has also overseen the mechanical construction of the Cyclopedia with rare devotion and skill.

III. HOW A GENUS IS WRITTEN UP

The method of writing up a genus differs with the various writers. The Editor can speak only for himself, but the frequency with which persons ask for a specific method of procedure suggests that a brief narrative may be useful to students.

The first question that arises when a new genus is to be written up is the number of species to be accounted for. The "trade list" and the card index are consulted, and a list is made of all the species that are to be included in the account. The writer first standardizes the names with Index Kewensis as a working basis, and then consults some analytic account of the genus itself, as Bentham and Hooker's Genera Plantarum, and Engler and Prantl's Natürlichen Pflanzenfamilien. Herbarium specimens are examined. A characterization is made of the genus. All available works are consulted for suggestions as to its horticultural and economic importance.

Then follows the really important part of the undertaking—the accounting for all the species. All monographs of the genus are consulted; herbarium specimens are studied in detail; horticultural cyclopedias and handbooks are searched for descriptive notes of the species. Every effort is made to understand the species as a whole before any one species is actually described, for in this cyclopedia the species are compared and contrasted, not arranged alphabetically. A key to all the species must be outlined before the work of description can be undertaken. This means that every species must be studied and properly classified. This making of the key or classification comprises more than half the average work of writing up the various genera. Cultivated plants come from many parts of the world. In many cases no single account of the genus contains all the species. One or two species from outlying regions may not fit into any scheme of classification made in the books. The descriptions of them may be inadequate. Often a whole day will be spent in the endeavor to find characters that will allow these outlying species to be included in a common key. Moreover, botanical keys are often too minute and technical to be used in a horticultural work. The key-scheme once made, the description of the species is drawn from every available source;—from specimens and personal experience when possible; from authoritative monographs; from horticultural journals and treatises; from notes sent by correspondents; from the information contained in trade catalogues. On doubtful points correspondence is opened with persons who know the plants, particularly with those who advertise the given kinds. The fulness of the descriptions will depend on how difficult the plants are to distinguish and how important the group is to the cultivator. It has been the custom with the Editor to work mostly with bare outlines at first, afterwards filling in the matters of secondary and incidental importance from subsequent reading and investigation. It has been the custom of the Associate Editor to devour and digest all the incidentals, as well as the fundamentals, before beginning the writing.

In the editing of manuscripts, the first effort is to determine whether the author has accounted for all the names in the trade. Too often the troublesome names have been omitted, although he worked from lists sent from the Cyclopaedia office. These omitted names must be inserted, often necessitating the entire reconstruction of the classificatory scheme. The second attention is given to the scheme itself, to see that it
is properly coördinated or balanced; for a scheme is of no value unless the coördinate parts are contrasts of similar characters. Yet the failure to coördinate the keys was common, particularly in the earlier part of the work. For example, there is no service in the key that runs

A. Lvs. long-lanceolate, entire
AA. Fls. blue, in long racemes

and yet it has been constantly necessary to eliminate examples of this type. The third effort in the editing of manuscripts is the revision of nomenclature, for uniformity in this matter is of the utmost editorial importance. The fourth effort is to look up and insert all references to portraits of the plants. Beyond these efforts, the editing of the manuscripts had to do chiefly with matters of literary form.

To the looker-on, the actual writing of the articles may appear to be the larger part of the work. As a matter of fact, however, it has required more labor to secure articles from correspondents than it would have required to have written them ourselves. This is not because correspondents have been negligent, but because of the inherent difficulties of doing work at long range. The value of the material, however, is vastly improved and broadened because of the number of persons who have been engaged in preparing it. It is probable that two-thirds of the labor in preparing the Cyclopedia has been of a character that is not directly productive of written articles,—as correspondence, keeping of accounts, filing of material, securing illustrations, proof-reading.

**PROSPECT**

The Editor hopes that this Cyclopedia will never be revised. If new issues are called for, mere errors should be corrected; but beyond this, the plates should be left as they are, for it is the purpose of the book to make a record of North American horticulture as it exists at the opening of the twentieth century. It is hoped that subsequent progress may be recorded in annual supplemental volumes. It is planned to issue each year a supplement of say 75 to 100 pages, in the same size of page as the present book, with cumulative index, in paper covers; every five years these supplements may be completed into a volume. They should record the introductions of new plants and methods, contain revisions of important genera, encourage historical studies, and make reviews of the tendencies of plant culture in North America. The manuscript for the first two proposed supplements is already prepared. The first is a complete key to all the families and genera in the Cyclopedia, designed to enable the student to run down any species that he may have in hand. It was hoped that this key could be printed as a supplement to Volume IV, but the size of the volume forbids it. The second manuscript is a bibliography of the North American book writings on horticulture. These supplements are not definitely promised, but they will be made if there is sufficient demand for them.

It may not be out of place for the Editor to indicate what he conceives to be the most important features of the general plan of the Cyclopedia.

(1) The book represents a living horticulture. It has attempted to account for the species that are actually in cultivation in the country, rather than those that chance to have been described or pictured in other cyclopedias or in periodical publications. The best way of determining what plants are actually in cultivation is to make a list of
those that are offered for sale within a space of ten or fifteen years, supplemented with lists submitted by actual cultivators. It is not the fact that these plants are bought and sold that is important, but the fact that they are in cultivation at the present time in this country. These lists give us a census of our horticultural resources. A species-name which occurs in trade lists must be run down and inserted. Not knowingly has any been omitted.

(2) The species are compared and contrasted, as well as described. In all genera containing several species, keys or classificatory schemes have been devised. This makes it incumbent upon the writer that he understand each species, not merely copy a description of it. It enables the reader to name the species he has in hand. It is an analytic rather than a compilatory method. The reader will be surprised to know how much labor the mere introduction of keys has added to the making of the book. It has certainly more than doubled the labor. The Editor believes that he could make the entire Cyclopedia in two years' time if all the species were to be arranged alphabetically under the genus and without introductory keys.

(3) The leading articles are signed with the name of the writer. Thereby is responsibility fixed and due credit given. The chief value of the signed article, however, is the fact that it gives personality to the writings and presents a wide range of experience and achievement. It is singularly gratifying that horticulturists and botanists have responded with the greatest good will to the repeated calls for help. Their inspiration has saved the book. The botany of large and difficult groups has been placed bodily in the hands of specialists. The number of contributors is large and has grown with each volume. More than 450 persons have aided in the making of the Cyclopedia. The great number of signed articles gives the work a somewhat heterogenous character, and this may be considered by some persons to be a disadvantage; but the Editor has not accepted the current idea that a cyclopedia must necessarily be uniform and consistent in its treatment of various and unlike subjects.

(4) The book is primarily a cyclopedia of horticulture, rather than of gardening. It has endeavored to catch the large-area and commercial spirit of North American plant culture, while still holding to the many and varied amateur interests. Not all the entries are names of plants.

(5) It has attempted to represent plants as living and growing things that are still undergoing evolution. It has tried to indicate the range and extent of variation, rather than to treat plant-names as representing entities in nature. Whenever possible it has been the purpose to suggest the general lines of evolution in the important groups. This has introduced the historical method of treatment. Of course only the merest touch can be had with these subjects, because knowledge of them is yet to come; but it is hoped that the sympathetic reader will feel the drift of an evolutionary motive.

Other points of view that seem to the Editor to be important are: The effort to present a new set of horticultural pictures; to give biographies of persons who have had an important influence on the trend of American horticulture; to present geographical and historical subjects; to give special attention to tropical and subtropical economic plants; to cite freely references to literature.

It must be admitted that the foregoing categories are ideals. At all points, it is feared, the accomplishment has fallen far short of the purpose. The Editor would like to do the work all over again, so many are the improvements that might be made. One must make a book in order to learn how to make it. The work has grown as it
has progressed. At first it was intended to make a three-volume cyclopedia, but before the first volume was half written it was found that a fourth volume must be added in order to present the subject adequately. The observant reader will discover that the letter A is treated on the three-volume basis. The article "Apple" is wholly inadequate, but partial penance is done under "Pomology." The article "Asparagus" is the first that began to feel the fuller and larger treatment. Whatever usefulness the Cyclopedia may have has been rendered possible by the liberal policy of the publishers with whom it has been a joy and an inspiration to work.

The actual writing on the Cyclopedia was begun in January, 1899. A year had then been spent in making indexes and collecting data. The proof of the letter Z was received December 31, 1901. On the 8th of January, 1902, the Cyclopedia office was vacated. It was a sad parting. The pleasantest associations of a pleasant life had come to a finish. We knew that it was a turning-point. Hundreds of books had become familiar friends. We would never see them all together again. Like a child, the Cyclopedia had grown. Like the mature youth, it had left us. It was no longer ours.

Ithaca, New York,
January 11, 1902.

L. H. BAILEY.
## STATISTICS

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### Total number of synonyms (in italic type):

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<th>Volume</th>
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<td>2446</td>
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<td>II</td>
<td>2164</td>
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<td>III</td>
<td>1243</td>
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<td>IV</td>
<td>1069</td>
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<td><strong>Total</strong></td>
<td><strong>7482</strong></td>
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### Total number of species in supplementary lists (in italic type):

<table>
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<tr>
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<td>I</td>
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<tr>
<td>II</td>
<td>864</td>
</tr>
<tr>
<td>III</td>
<td>576</td>
</tr>
<tr>
<td>IV</td>
<td>733</td>
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<td><strong>Total</strong></td>
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Total number of Latin binomial and trinomial plant names accounted for (approximate): 24434

### III. The Number of Species (in black-faced type) Native to North America north of Mexico:

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<td>I</td>
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<tr>
<td>II</td>
<td>631</td>
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<tr>
<td>III</td>
<td>416</td>
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<tr>
<td>IV</td>
<td>764</td>
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<td><strong>Total</strong></td>
<td><strong>2419</strong></td>
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</tbody>
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### IV. The Dates of Publication:

<table>
<thead>
<tr>
<th>Volume</th>
<th>Publication Date</th>
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<tr>
<td>I</td>
<td>February 14, 1900</td>
</tr>
<tr>
<td>II</td>
<td>July 18, 1900</td>
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<td>III</td>
<td>April 23, 1901</td>
</tr>
<tr>
<td>IV</td>
<td>February 26, 1902</td>
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</tbody>
</table>

(XV)
COLLABORATORS

I. LIST OF CONTRIBUTORS TO THE CYCLOPEDIA

*The asterisk designates the contributors to the fourth volume. Many of the contributors have also assisted in reading proofs and in other ways.


*ADAMS, J. W., Nurseryman, Springfield, Mass. (Stephanandra. Viburnum.)

*Allen, C. L., Author of "Bulbs and Tuberous-rooted Plants," Floral Park, N. Y. (Tulipa.)

AMES, Oakes, Asst. Dir. Botanic Garden, and Instructor in Botany in Harvard Univ., Cambridge, Mass. (Several genera of orchids.)


Archdeacon & Co., Commission merchants, New York, N. Y. (Mushroom.)

Arnold, Jr., Geo., Gardener (formerly grower of aster seed), Rochester, N. Y. (China Aster.)

Atkins, F. L., Florist, Rutherford, N. J. (Platy-erium.)

Atkinson, Geo. F., Prof. of Botany, Cornell Univ., Ithaca, N. Y. (Mushroom.)

*Balmer, Prof. J. A., formerly Horticulturist, Wash. Exp. Sta. (Washington.)

*Barclay, F. W., Gardener, Haverford, Pa. (Herbaceous Perennials, Buxus, Sanguinaria, Silphium, Sisyrinchium, Smilacina, Statice, and many others, mostly hardy herbs.)

*Barker, Michael, Editor of "Gardening" and "American Florist," Chicago, Ill. (Salandra. Vallota. Many suggestions.)

*Barnes, Charles L., Prof. of Plant Physiology, Univ. of Chicago, Chicago, Ill. (Fertilization. Flower, Teratology. Has read proofs of physiological subjects.)

Barnes, William H., Secretary Kans. State Hort. Soc., Topeka, Kans. (Kansas.)


Bayerdsorfer, H., Dealer in florists' supplies, Philadelphia, Pa. (Everlasting Flowers.)

*Beach, Prof. S. A., Horticulturist, N. Y. Exp. Sta., Geneva, N. Y. (Corn. Thinning Fruit.)

Beadle, C. D., Botanist and horticulturist, Baltimore, N. C. (Bamboo.)

Beal, W. J., Prof. of Botany, Mich. Agric. College, Agricultural College, Mich. (Grass. Has read proofs of many genera of grasses.)

Beckert, Theo. F., Florist, Allegheny City, Pa. (Bougainvillea.)


*Bessey, Charles L., Prof. of Botany, Univ. of Nebraska, Lincoln, Nebraska. (Plant. Trees for the Plains. Has read several articles on grasses and native plants.)

Blair, Prof. J. C., Horticulturist, Ill. Exp. Sta., Champaign, Ill. (Greenhouse Glass. Illinois.)

*Brandegge, Mrs. Katharine, Botanist, editor of Zoe, San Diego, Calif. (Several genera of cacti, as Mammillaria, Melocactus, Percephylla, Pereskia, Phyllocactus, Pitocereus, Rhipsalis.)

Brandegge, T. S., Botanist, San Diego, Calif. (Notina.)

*Brantoon, Ernest, Landscape gardener, and editor of "California Floriculturist," Los Angeles, Calif. (Saxifraga, Palms, Phenix, Pittosporum, Richardia, Rose, Schinus, Trees, Vines, and other plants cultivated in southern California.)

*Bruckner, Nichol N., Dreer's Nursery, River ton, N. J. (The article "Fern." Many groups of tender ferns, Selaginella.)

*Budd, J. L., Prof. Emeritus of Horticulture, Iowa Agric. Coll., Ames, Ia. (Roses for the Prairie States. Has read proof of Iowa and of articles on important fruits.)

*Buffum, Prof. B. C., Horticulturist, Wyo. Exp. Sta., Laramie, Wyo. (Wyoming.)

Burbank, Luther, Plant-bredner, Santa Rosa, Calif. (Nicotiana. Has read proofs of Gladiolus, etc.)

Burnette, Prof. F. H., Horticulturist, La. Exp. Sta., Baton Rouge, La. (Louisiana.)

Burkill, T. J., Prof. of Botany and Horticulture, Univ. of Ill., Urbana, Ill. (Protoplasm.)

*CAMERON, ROBERT, Gardener, Botanic Garden of Harvard Univ., Cambridge, Mass. (Various articles and much help on rare plants. Alpinia, Campanula, Echinocactus, Nenaphila, Primula, Ramonda, Uncelina, etc.)


*CARD, Prof. Fred W., Horticulturist, R. I. Exp. Sta. Kingston, R. I. (Nebraska. Botany and culture of bush-fruits, as Amelanchier, Berberis, Blackberry, Buffalo Berry, Currant, Loganberry, Raspberry, Ribes.)

CLINKABERRY, Henry T., Gardener, Trenton, N. J. (Certain orchids, as Lelia.)


*CLOSE, C. P., Horticulturist, Del. Exp. Sta. (formerly Horticulturist Utah Exp. Sta.), Newark, Del. (Uath.)

COATES, LEONARD, Fruit-grower, Napa, Calif. (Olive. Orange. Has helped on other fruits.)

Cockerell, T. D. A., Entomologist, East Las Vegas, N. M. (New Mexico.)

Collins, John S., Fruit-grower, Moorstown, N. J. (Pear.)

*CONARD, Henry S., Senior Fellow in Botany, Univ. of Pa., Philadelphia, Pa. (Nymphaea, Victoria.)


*Coulston, Mrs. M. B., Formerly assistant editor of "Garden and Forest," Ithaca, N. Y. (Various native plants. Stiles.)

Coulter, John M., Professor and Head of the Dept. of Botany, Univ. of Chicago, Chicago, Ill. (Echinocactus.)


*CowEN, J. H., formerly Assistant in Horticulture, Colo. Exp. Sta., died 1900. (Certain Colorado plants, as Lepachys, Leucoosmium. Verbena.) See personal note under "Verbena."


Craig, W. N., Gardener, North Easton, Mass. (Mushroom.)


*CROPP, Carl, Seedsman, Vaughan's Seed Store, Chicago, Ill. (Stocks.)

CULBERTSON, H., El Cajon Packing Company, El Cajon, Calif. (Peach.)

CUSHMAN, E. H., Gladiolus specialist, Sylvania, Ohio. (Gladiolus.)

Darlington, E. D., Superintendent of Trials, Fordhook Experimental Farm, Doylestown, Pa. (Sweet Pea. Helped on Pea.)


*Davy, J. BurTT, Asst. Botanist, Univ. of Calif. Exp. Sta., Berkeley, Calif. (Trees and Vines of California, various Myrtaceae, and many important subtropical subjects, as Acacia, Callistemon, Eugenia, Eucalyptus, Myrtneas, Pittosporum, Psidium, Romnea, Schinus, Sollysia, Streptosolen, Tristania, Umbellaria, Washingtonia, Windbreaks, and others.)

Dawson, Jackson, Gardener, Arnold Arboretum, Jamaica Plain, Mass. (Rose.)

Dean, James, Florist, Bay Ridge, N. Y. (Nephrol- epis.)

Deane, Walter, Botanist, Cambridge, Mass. (Herbarium. Has read many proofs and helped on various botanical problems.)


Dorner, Fred, Carnation specialist, Lafayette, Ind. (Carnation.)

*Dossett, P. H., Associate Physiologist and Pathologist, U. S. Dept. Agric., Washington, D. C. (Violet.)


Drew, E. P., Manager Rocky River Nursery, Clifton, Park, O. (Picea.)

Dunning, D. M., Amateur, Auburn, N. Y. (Grapes under Glass.)

Dupuy, Louis, Wholesale florist and specialist in hard-woode plants, Whitestone, N. Y. (Erica. Has read other articles on heath like plants.)

Earle, Prof. F. S., Botanist at N. Y., Botanical Garden, Bronx Park, N. Y., formerly Horticulturist, Ala. Polytechnic Institute, Auburn, Ala. (Alabama. Packing, Storage.)

Earle, Parker, Horticulturist, Roswell, N. M. (New Mexico.)


Eisele, Jacob D., Manager of Dreer's Nursery, Riverton, N. J. (Cordyline. Pandanus. Has read proofs of several important subjects.)

Elliot, William H., Florist, Brighton, Mass. (Asparagus plumosus.)

Emery, S. M., Dir. Mont. Exp. Sta., Manhattan, Mont. (Montana.)

Endicott, John, Bulb-grower, Canton, Mass. (Littonia.)

Endicott, W. E., Teacher, Canton, Mass. (Achimenes. Asteraethera. Liea. Has made important corrections in many articles on bulbs.)

Evans, J. C., Pres. Olden Fruit Co., Kansas City, Mo. (Storage.)


Falconer, William, Supt. Bureau of Parks, Pittsburgh, Pa. (Romneya.)

Fawcett, Wm., Director Dept. Public Gardens and Plantations, Kingston, Jamaica. (The article "Tropical Fruits;" also Cherimoya, Cinchona, Marmalade Plum, Egg Fruit, Mango, Mangosteen, and others.)

Fernow, Prof. B. E., Director College of Forestry, Cornell Univ., Ithaca, N. Y. (Conifers. Forestry. Pine.)

Flinn, Kenneth, Gardener, Brookline, Mass. (Diosma.)


Foord, J. A., Asst. in Dairy Husbandry, Cornell Univ., Ithaca, N. Y. (New Hampshire.)

Franceschi, Dr. F., Manager S. Calif. Acclimatizing Ass'n, Santa Barbara, Calif. (Rare plants grown in S. Calif., as Dasylium, Flacourtia, Fouquieria, Farceana, Hazardia, Parkinsonia, etc. Has corrected many proofs.)

Galloway, B. T., Dir. of Bureau of Plant Industry, U. S. Dept. Agric., Washington, D. C. (Floriculture. Has read various important articles, including Violet.)

Gannett, Frank E., Editor, "The News," Ithaca, N. Y.; formerly see Y to President of the U. S. Philippine Commission. (Philippine Islands.)

Garcia, Prof. Fabian, Horticulturist New Mex. Exp. Sta., Mesilla Park, N. M. (New Mexico.)

Garfield, Chas. W., Horticulturist, Grand Rapids, Mich. (Michigan.)

Gerard, J. N., Amateur, Elizabeth, N. J. (Various articles, especially on bulbous plants, as Crocus, Iris, Masaqui, Narcissus.)

Gillett, Edward, Nurseryman, Southwick, Mass. (Hardy Ferns. Liparis. Has read numerous proofs on native plants, especially hardy orchids.)

Goff, Prof. E. S., Horticulturist, Wis. Exp. Sta., Madison, Wis. (Wisconsin.)

Good, Jessie M., Organizer, American League for Civic Improvement, Springfield, O. (Village Improvement.)


Gould, Mrs. Thos., Petunia specialist, Ventura, Calif. (Petunia.)

Green, Prof. S. B., Horticulturist, Minnesota, Exp. Sta., St. Anthony Park, Minn. (Minnesota.)

Green, Wm. J. Horticulturist, Ohio Exp. Sta., Wooster, Ohio. (Ohio. Greenhouse sub-irrigation.)

Greene, Edward L., Prof. of Botany, Catholic Univ. of America, Washington, D. C. (Dodecatheon. Help on Viola.)

Greenlee, Miss Lennie, Bulb-grower, Garden City, N. C. (Lili.)

Greiner, T., Specialist in Vegetables, La Salle, N. Y. (Garden vegetables, as Artichoke, Asparagus, Bean, Cress, Corn Salad, Kohlrabi, Lettuce, Onion, Parsley, Parsnip, Rhubarb.)

Grey, Robert M., Gardener, North Easton, Mass. (Numerous important orchid groups, as Cyripedium, Epidendrum, Lycaste, Maxillaria, Masdevallia, Odontoglossum, Oncidium, Orchid, Phalaenopsis, Saccobium, Stanhopea, Zygopetalum.)

Groff, H. H., Gladiolus specialist, Simeoe, Ont. (Gliadiolus.)

Gurney, James, Gardener, Mo. Botanical Garden, St. Louis, Mo. (Caeti.)

Hale, J. H., Nurseryman and pomologist, South Glastonbury, Conn. (Connecticut. Peach. Storage.)

Halsed, Prof. B. D., N. J. Exp. Sta., New Brunswick, N. J. (Diseases. Fungus.)
Hoffmiller, Geo., Landscape Architect and botanist, Berkeley, Calif. (Epidendrum.)

*Hansen, Prof. N. E., Horticulturist, S. Dak. Exp. Sta., Brookings, S. Dak. (South Dakota.)

Harris, Frederick L., Gardener, Wellesley, Mass. (Lisianthus. Medinita.)

*Harris, W., Supt. of Hope Gardens, Kingston, Jamaica. (Certain tropical fruits, as Mammee Apple, Persia, Pomelo, Tamarind, etc.)

Harris, W. K., Florist, Philadelphia, Pa. (Ficus elastica. Help on Lilium Harrisii.)

Harrison, C. S., Pres. Park and Forest Soc. of Neb., York, Neb. (Psudotsuga.)


Hart, J. H., Supt. Botanical Department, Trinidad, W. I. (Theobroma. Tropical Fruits.)

Hasselbring, Heinrich, Asst. Pathologist, Ill. Exp. Sta., Urbana, Ill. (Iris. The article "Orchids," and botany of most orchid genera from Gogona to Zygopetalum. Several aca- thads, as Schauera and Thunbergia. Also Rust, and has helped on plant diseases.)

Hastings, G. T., formerly Asst. in Botany, Cornell Univ., Ithaca, N. Y.; now Science Teacher, Santiago, Chile. (Some tropical plants, as Ber- ria, Bertholletia. A few grasses, as Hierochloe, Holcus, Hordenum.)

Hatfield, T. D., Gardener, Wellesley, Mass. (Numerous and varied contributions, as Gesneria, Glossinia, Lachenalia, Leca, Macrozamia, Eamo- crata, Oralis, Pelargonium, Reinwardtia, Rhezia, Richardsonia, Rufeletia. Has read many proofs.)


*Heinsohn Co., H. J., Manufacturers of pickles and canned goods, Pittsburg, Pa. (Tomato.)


Henderson, Prof. L. F., Botanist, Idaho Exp. Sta., Moscow, Idaho. (Phacelia.)

Herrington, A., Gardener, Florham Farms, Madison, N. J. (Chrysanthemum coccineum. Hollyhock.)

Hews, A. H., Manufacturer of earthenware, North Cambridge, Mass. (Pots.)

*Hexamer, Dr. F. M., "American Agriculturist," New York, N. Y. (Several biographical sketches, as Fuller, Harris, Tharber.)

*Hicks, G. H., late of U. S. Dept. Agric., Washing- ton, D. C. (Deceased). (Seed-testing.)

*Hicks, Henry, Nurseryman, Westport, L. I. (Li- gustrum. Transplanting.)

Higgins, J. E., Horticulturist and teacher, Honolulu, H. T. (Hawaiian Islands.)

Hill, E. G., Florist, Richmond, Ind. (Begonia.)


Hollister, E. J., Celery cultivator, Holley, Col. (Celery.)

Hoope, Josiah, Nurseryman, West Chester, Pa. (Hedges.)

Horsford, Fred H., Nurseryman, and specialist in lilies, Charlotte, Vt. (Alpine Gardens. Lilium. Has read proof of many articles on native plants and hardy herbaceous perennials.)

*Huex, Robert, Amateur rosarian, Philadelphia, Pa. (Rose.)


Huntley, Prof. F. A., Horticulturist, Idaho Exp. Sta., Moscow, Idaho. (Idaho.)

*Hutchins, Rev. W. T., Sweet Pea specialist, Springfield, Mass. (Sweet Pea.)

*Irish, H. C., Horticulturist, Mo. Botanical Gar- den, St. Louis, Mo. (Capsicum. Laetaea. Pepper. Tetragonia.)

*Jacob Chas. W., & Allison, Importers, New York, N. Y. (Raffia.)

*Jackson & Perkins Co., Nurserymen and special- ists in Clematis, Newark, N. Y. (Clematis. Rose.)

Jaenicke, Adolph, Manager propagating dept., J. L. Childs, Floral Park, N. Y. (Primula.)

Jeffers, A., Editor "Cornucopia," Norfolk, Va. (Kale. Potato.)


*Junghanns, R. L., San Juan, Porto Rico. (Rex- soda. Help on Mignonette.)

*Kains, M. G., Horticulturist, School of Practical Agric. and Hort., Briar Cliff Manor, N. Y. (Minor vegetables, as Horse-Radish, Okra and Rouquette. The article Sweet Herbs, also Sage, Savory, Scarey Grass, Tansy, and other sweet, pot or medicinal herbs. Also Chicory, Ginseng and Glycyrhriza.)


*Keller, J. B., Florist, Rochester, N. Y. (Many groups of hardy herbaceous perennials. Article on Herbaceous Perennials.)

Kelsey, Harlan P., Nurseryman, Boston, Mass. (North Carolina plants, as Galax, Leucothoe and Paronychia. Help on proofs.)

KERR, J. W., Nurseryman, Denton, Md. (Maryland. Help on Plun.)

KIPT, ROBERT, Florist, Philadelphia, Pa. (Cut-flowers.)

KINNEY, L. F., Horticulturist, Kingston, R. I. (Celery.)

KNAPP, S. A., Special commissioner U. S. Dept. Agric., Lake Charles, La. (Philippine Islands.)

LAGER & HURRELL, Orchid cultivators, Summit, N. J. (Cattleya.)

LAGER, JOHN E., Orchid specialist, Summit, N. J. (Oncidium.)

LUKE, Prof. E. R., Horticulturist, Ore. Exp. Sta., Corvallis, Ore. (Oregon.)

LORD, BURNET, Seedsmen, Philadelphia, Pa. (David Lordth.)

LAWSON, G. N., Instructor in Hort., Cornell Univ., Ithaca, N. Y. (Geranium. Impatiens.)

LE MOYNE, P. J., Amateur in orchids, Chicago, Ill. (Sobralia.)

LEWERS, ROSS, Fruit-grower, Franktown, Nev. (Nevada.)

*LINN, S. H., Nurseryman, Des Moines, Ia. (Rhubarb.)

LONSDALE, EDWIN, Florist, Wyndmoor, Chestnut Hill, Philadelphia, Pa. (Conservatory.)

LORD & BURNHAM Co., Horticultural architects and builders, Irvington-on-Hudson, N. Y. (Greenhouse Construction.)

LORTHROP & HIGGINS, Dahlia specialists, East Bridgewater, Mass. (Dahlia.)

LYON, T. T., Pomologist, South Haven, Mich. (Died 1900.) (Pear.)

*MACDOUGAL, D. T., Dir. of the Laboratories, N. Y. Botanical Garden, Bronx Park, N. Y. (Sup. Transpiration.)

MACOMBER, J. T., Fruit-grower, Grand Isle, Vt. (Peach.)

MACPHERSON, JAMES, Landscape gardener, Trenton, N. J. (Euphorbia. Has read proofs of several orchid genera.)


MCKAY, Prof. A. B., Horticulturist, Miss. Exp. Sta., Agricultural College, Miss. (Potato. Strawberry.)

MCILLEN, ROBERT, Wholesale grower of mignonette, Pearl River, N. Y. (Mignonette.)

MCWILLIAM, GEO., Gardener, Whitinsville, Mass. (Dipladenia. Lucilia.)


*MANNING, WARREN H., Landscape Architect, Boston, Mass. (Herbaecous Perennials. Rock Gardens.)

MASON, Prof. S. C., Dept. of Horticulture and Forestry, Berea College, Berea, Ky. (Labeling. Layering.)

MASON, Prof. W. F., Horticulturist, N. C. Exp. Sta., Raleigh, N. C. (Fig. North Carolina.)

MATTHEWS, Prof. C. W., Horticulturist, Ky. Exp. Sta., Lexington, Ky. (Kentucky.)

MATTHEWS, F. SCHUYLER, Artist, Boston, Mass. (Color.)

*MATTHEWS, WM., Florist and orchid grower, Utica, N. Y. (Various orchids, as Gongora, Grammatophyllum, Longopsis, Limatodes, Miltonia, Pholidota, Selenipedium, Sophronitis. Has read many proofs on orchids.)

*MAV, JOHN N., Wholesale florist, Summit, N. J. (Rose. Help on florists' flowers.)

MAVARD, Prof. S. T., Horticulturist, Mass. Hatch. Exp. Sta., Amherst, Mass. (Massachusetts.)

MEAD, T. L., Horticulturist, Oviedo, Fla. (Columbia. Orange. Has helped in matters of southern horticulture.)


MEREDITH, A. P., Gardener, South Lancaster, Mass. (Humea.)

*MILLS, T. REV. EDMUND M., Amateur rosarian, Elmira, N. Y. (Rose.)

*MISCHIE, EMIL, Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (Quisqualis. Toxylon.)

MOON, SAMUEL C., Nurseryman, Morrisville, Pa. (Oak.)

MORRILL, ROLAND, Fruit-grower, Benton Harbor, Mich. (Pearch.)

MORRIS, O. M., Horticulturist, Okla. Exp. Sta., Stillwater, Okla. (Indian Territory. Oklahoma.)

*MOTT, JR., SAMUEL R., Manager of Genesee Fruit Co.'s Freezing and Cold Storage Dept., Rochester, N. Y. (Storage.)

*MUNSON, T. V., Nurseryman and grape hybridist of Denison, Tex. (Grape culture in the South. Texas.)

*MUNSON, Prof. W. M., Horticulturist, Me. Exp. Sta., Orono, Me. (Maine. Vaccinium.)

*MURRELL, GEO. E., Fruit-grower, Fontella, Va. (Virginia.)

*NEHRING, H., Milwaukee, Wis. (Phenix, Sabal, Serenoa, Tabernamontana, Tecoma, Thunbergia and other plants cultivated in his garden at Goha, Fla.)

NEWBURY, H. E., Specialist in tuberose culture, Magnolia, N. C. (Polianthes.)
COLLABORATORS

NEWELL, A. J., Gardener, Wellesley, Mass. (Certain orchids, e.g., Odontoglossum.)

*NEWMAN, J. S., Vice Dir. S. C. Exp. Sta., Clemson College, S. C. (South Carolina.)

*NORTON, Prof. J. B. S., Pathologist Md. Exp. Sta., College Park, Md. (Genera of EMPORIACEAE. Phyllanthus. Numerous botanical puzzles.)

OGSTON, COLIN, Gardener, Kimball orchid collection, Rochester, N. Y. (Dendrobium.)


O'MARA, PATRICK, of Peter Henderson & Co., New York, N. Y. (Potting. Has read various important articles, suggested contributors and given other aid.)

ORPET, EDWARD O., Gardener, So. Lancaster, Mass. (Border. Cyclamen. Dianthus, and certain orchids.)

PARSONS, Jr., SAMUEL, Landscape architect, New York, N. Y. (Lawn. Help on Park.)

PEACOCK, LAWRENCE K., Dahlia specialist, Atoe, N. J. (Dahlia.)

PENNOCK, F. M., Horticulturist, San Juan, Porto Rico. (Porto Rico.)

*PETERSON, WM. A., of the firm of P. S. Peterson & Son, Nurserymen, Chicago, Ill. (Paeonia. Transplanting of large trees.)

*PIERCE, NEWTON B., Pathologist Pacific Coast Laboratory, Div. of Veg. Phys. and Path., U. S. Dept. Agric., Santa Ana, Calif. (Walnut.)


POWELL, GEORGE T., Dir. School of Practical Agriculture and Horticulture, Briar Cliff Manor, N. Y. (Pey. Has read proofs of other important fruits.)

*PRICE, Prof. R. H., Horticulturist, Texas Exp. Sta., College Station, Texas. (Texas.)

PRINCE, L.B., Pres. Board of Regents, New Mexico Agric. College, Santa Fe, N. M. (The article "Prince.")

*PURDY, CARL, Specialist in California bulbs, Ukiah, Calif. (California native plants, as Brodiaea, Calochortus, Erthythronium, Fritillaria, Stropharium. Help on Lilium.)

RANE, F. W., Horticulturist and Prof. of Horticulture, N. H. College, Durham, N. H. (New Hampshire.)

RAWSON, GROVE P., Florist, Elmina, N. Y. (Lantana.)

RAWSON, W. W., Seedsman and market-gardener, Boston, Mass. (Cucumber. Lettuce.)


*REHDER, ALFRED, Asst. at the Arnold Arboretum, Jamaica Plain, Mass. (Botany and culture of most of the hardy trees and shrubs. The article "Trees").


ROSE, N. JOHNSTON, Landscape Gardener, Dept. of Parks, New York, N. Y. (Various exotics.)

ROTH, FILIBERT, Chief of Div. of Forestry, Department of the Interior, Washington, D. C. (Fagus.)

*ROWLEE, Prof. W. W., Asst. Prof. of Botany, Cornell Univ., Ithaca, N. Y. (Liatris. Salix.)


*SANDSTEN, Prof. E. P., Horticulturist Md. Exp. Sta., College Park, Md. (Self-sterility.)

SARGENT, Prof. C. S., Dir. Arnold Arboretum, Jamaica Plain, Mass. (Abies. Has read proofs of Picca. Prunus, etc.)

*SCOTT, WM., Florist, Buffalo, N. Y. (Important florists' plants and flowers, as Acacia, Convolvulus, Cyclamen, Cytisus, Smilax, Melosideros, Perovskia, Perilla, Piqueria, Stephanotis, Syringa, Verbena, etc. Also Packing Flowers.)

SCOTT, WM., Gardener, Tarrytown, N. Y. (Bertolonia and other tender foliage plants.)


*SEARS, Prof. F. C., Dir. Nova Scotia School of Horticulture, Wolfville, N. S., formerly Horticulturist Utah Exp. Sta. (Utah. Help on Canada.)

*SEAVY, MRS. FRANCES COPLEK, Landscape Gardener, Chicago, Ill. (Railroad Gardening.)
COLLABORATORS

SEMPEL, JAMES, Specialist in China asters, Bellevue, Pa. (Aster.)

SEXTON, JOSEPH, Founder of the pampas grass industry, Goleta, Calif. (Pennisetum.)

SHEPPARD, CHARLES U., Special agent U. S. Dept. Agrie. in charge of experiments in tea culture, Summerville, S. C. (Tea.)

SHINN, CHARLES H., Inspector of Experiment Stations, Univ. of Calif., Berkeley, Calif. (California, Fig, Loganberry, Sequoia, etc.)

SHORE, ROBERT, Gardener, Botanical Dept., Cornell Univ., Ithaca, N. Y. (Various articles, as Acalypha, Bedding, Dichorisandra, Episcea, Fittonia, Hymenophyllum, Thysacanthus, Trachelospermum, Vases.)


SIMONDS, O. C., Landscape Gardener, Buena Ave., Chicago, Ill. (Landscape Cemeteries, Shrubbbery.)

SLINGERLAND, Prof. M. V., Entomologist Cornell Exp. Sta., Ithaca, N. Y. (Insecticides. Insects.)

SMITH, A. W., Grower of cosmos and moonflower seed, Amerieus, Ga. (Cosmos.)

SMITH, ELMER D., Chrysanthemum specialist, Adrian, Mich. (Chrysanthemum.)

SMITH, IRVING C., Market-gardener, Green Bay, Wis. (Onion. Help on Kohl-Rabi and Strawberry.)

SMITH, JARED G., Dir. Hawaii Exp. Sta., Honolulu, H. Terr. (Nearly all palms, some aroids and various other genera, as Centarea, Cerasium, Cotyledon.)

SMITH, J. M. (deceased), Fruit-grower and market-gardener, Green Bay, Wis. (Strawberry.)

SPENCER, JOHN W., Fruit-grower, Westfield, Chautauqua Co., N. Y. (Grapes in the North. Help on important fruits.)

STALEY, ARTHUR, Walnut-grower, Fullerton, Calif. (Walnut.)

STARNES, HUGH N., Prof. of Agriculture and Horticulture, Univ. of Georgia, Athens, Ga. (Georgia. Sweet Potato. Tomato. Watermelon.)


STEEL, W. C., Fruit-grower, Switzerland, Fla. (Tulipum. Help on floriculture in Florida.)

STINSON, Prof. JOHN T., Dir. Mo. Fruit Exp. Sta., Mountain Grove, Mo. (Arkansas.)

STRONG, WM. C., Nurseryman, Waban, Mass. (Kenrick.)

STUBBS, W. C., Dir. La. Exp. Sta., Baton Rouge, La. (Orange.)


TABER, G. L., Nurseryman, Glen St. Mary, Fla. (Persimmon.)


TAPLIN, W. H., Specialist in palms and ferns, Holmesburg, Philadelphia, Pa. (Culture of many palms, ferns and foliage plants.)

TAYLOR, FREDERICK W., Dir. Dept. of Horticulture, Pan-American Exposition, Buffalo, N. Y. (Nebraska.)


THOMPSON, C. H., formerly Asst. Botanist, Mo. Botanical Garden, St. Louis, Mo. (Some genera of cacti, as Echinocereus, Epiphyllum.)

*THORBEURN & CO., J. M., Seedsmen, New York, N. Y. (Hyacinth. Seed Trade. Have many proofs of bulbs, annuals, vegetables, herbs, etc.)

TOUMY, Prof. J. W., Yale Forestry School, New Haven, Mass. (Arizona. Date. Opuntia. Root-Galls.)

TRACY, S. M., Horticulturist, Biloxi, Miss. (Mississippi.)


*TRELEASE, WM. W., Dir. Mo. Botanical Garden, St. Louis, Mo. (Certain desert plants of the lily family, as Aloe, Aipera, Gasteria, Haworthia, Yuca. Shave. Shavetentic. Oralis.)

*TRICKER, WM., Specialist in aquatics, Dreer's Nursery, Riverton, N. J. (Aquarium. Aquatics. Most aquatics, as Limnanthemum, Limnocharis, Nymphaph, Nelumbo, Outinandra, Victoria.)

TROOP, Prof. JAMES, Horticulturist, Ind. Exp. Sta., Lafayette, Ind. (Indiana. Persimmon.)

*TUCKER, GILBERT M., Publisher and editor of "The Country Gentleman," Albany, N. Y. (J. J. Thomas. Luther Tucker.)

TURREN, WM., Gardener, Oceanie, N. J. (Forcing of Fruits. Mushroom.)

TUTTLE, H. B., Cranberry-grower, Valley Junction, Wis. (Cranberry.)

*UNDERWOOD, Prof. L. M., Columbia University, New York, N. Y. (Botany of all ferns. Selaginella and some other flowerless plants.)

*VAN DEMAN, H. E., Pomologist, Parksley, Va. (Date. Nut Culture. Strawberry.)
Vaughan, J. C., Seedsman and florist, Chicago and New York. (Christmas Greens.)
Vick, James, D. Landreth's Sons, Philadelphia, Pa. (Malvarious. Melobesia.)
Voorhees, Prof. Edward B., Dir. N. J. Exp. Sta., New Brunswick, N. J. (Fertilizers.)
Waldron, Prof. C. B., Horticulturist, N. Dak. Exp. Sta., Fargo, N. Dak. (North Dakota.)
Ward, C. W., Wholesale florist, Queens, L. I. (Pelargonium. Help on Carnation.)
*Warder, R. H., Supt. Lincoln Park, Chicago, Ill. (Warder.)
Watrous, C. L., Nurseryman and pomologist, Des Moines, 1o. (Iowa. Pear. Trees on Plains.)
Watts, R. L., formerly Horticulturist of Tennessee Exp. Sta., Scalp Level, Pa. (Tennessee.)
Wellhouse, Fred, Fruit-grower, Fairmount, Kans. (Kansas.)
Whitten, Prof. J. C., Horticulturist, Mo. Exp. Sta., Columbia, Mo. (Missouri.)
*Wickson, Edward J., Prof. of Agricultural Practice, Univ. of Calif., and Horticulturist, Calif. Exp. Sta., Berkeley, Calif. (Almond, Apricot, Cherry, Grape, Lemon, Lime, Nectarine, Pear, Strawberry, Walnut and Vegetable Gardening in California.)
Woolson, G. C., Nurseryman, Specialist in hardy herbaceous perennials, Passaic, N. J. (Mer-tensia. Has read numerous proofs.)
Wortman, S. W., Mushroom-grower, Iselin, N. J. (Mushroom.)
*Wright, Charles, Fruit-grower, Seaford, Del. (Pear. Help on Delaware.)
Ziegeiebel, Dents, Florist, Needham, Mass. (Pansy.)

II. LIST OF THOSE WHO HAVE ASSISTED BY READING PROOF, AND IN OTHER WAYS

Abraham, Charles, Nurseryman, San Francisco, Calif. (Trees in Calif.)
Allen, R. C., Fruit-grower, Bonita, Calif. (Olives.)
Alverson, A. H., Grower of caeti, San Bernadino, Calif. (Caeti.)
Apgar, Austin C., Prof. of Botany, N. J. State Normal School, author of "Trees of the Northern U. S.," Trenton, N. J. (Trees.)
Bailey, W. W., Prof. of Botany, Brown Univ., Providence, R. I. (Rhode Island.)
Ball, C. D., Wholesale florist, Holmesburg, Philadelphia, Pa. (Palmes and decorative plants.)
Barker, Charles, Fruit-grower, Milford, Del. (Peach.)
Bassett & Son, Wm. F., Nurserymen, Hammon-ton, N. J. (Native plants, as Hibiscus.)
Betschere, C., Florist, nurseryman and seedsman, Canal Dover, Ohio. (Gladiolus.)
Boardman, S. L., See. Maine Hort. Soc., Augusta, Me. (Maine.)
Breck & Sons, Joseph (Corporation), Seedsmen, Boston, Mass.  (Portrait of Joseph Breck.)
Breese, J. S., Nurseryman, Fayetteville, N. C.  (North Carolina.)
Brown, O. H., Amateur, Bordentown, N. J.  (Aquatics.)
Budget & Son Co., J. A., Manufacturers of pickles and vinegar, market-gardeners, Providence, R. I.  (Cucumber. Martynia.)
Burpee, W. Atlee, Seedsman, Philadelphia, Pa.  (Seed Testing.)
Bush & Sons, Viticulturists, Bushberg, Mo.  (Grapes.)
Caldwell, Geo. C., Prof. of Agric. Chemistry, Cornell Univ., Ithaca, N. Y.  (Fertility. Fertilizers. Lime.)
Chamberlin, John, Journalist, Buffalo, N. Y.  (Native plants. Ranunculus.)
Clark, Miss Josephine A., Librarian, U. S. Dept. Agric., and author of a card index of new species of North American plants, Washington, D. C.  (Information as to species after the date of Index Keferensis.)
Clark, J. C., Dreer's nursery, Riverton, N. J.  (Pansy.)
Coville, Frederick V., Botanist, Dept. of Agric. Washington, D. C.  (Juniperus. Suggestions on various matters.)
Cranfield, Frederic, Asst. Horticulturist, Wisconsin Exp. Sta., Madison, Wis.  (Irrigation.)
Daileddouze Bros., Wholesale florists, Flatbush, Brooklyn, N. Y.  (Mignonette.)
Dailey, Charles L., Fruit-grower, Salem, Ore.  (Pruine.)
Dandy, Charles E., Pruine-grower, Salem, Ore.  (Pruine.)
Dandridge, Mrs. Danske, Amateur, Shepherdstown, W. Va.  (Hardy plants.)
Davenport, Geo. E., Botanist, specialist in ferns, Medford, Mass.  (Several ge. ra of ferns.)
Day, Miss Mary A., Librarian, Gray Herbarium of Harvard Univ., Cambridge, Mass.  (Rare books.)
Devol, W. S., Editor and agriculturist, Redlands, Calif.  (Vegetables in California.)
Devron, Dr. G., Amateur of bamboos, New Orleans, La.  (Bamboo.)
Dock, Miss M. L., Lecturer on plant life, forestry and village improvement, Harrisburg, Pa.  (Bartram. Village Improvement.)
Dosch, H. E., See'y, State Board of Hort., Hillsdale, Ore.  (Oregon.)
Downer's Sons, J. S., Fruit-growers, Fairport, Ky.  (Kentucky.)
Dreer, Henry A. (Inc.), Seedsmen and Plantmen, Philadelphia, Pa.  (Many and varied services, especially in aquatics, ferns, foliage plants and rare annuals.)
Eisen, Gustav, Author of Gov't. bulletins on figs and raisins, San Francisco, Calif.  (Fig. Raisin.)
Elliot, J. Wilkinson, Landscape Architect, Pittsburgh, Pa.  (Kochia, Oak, and some hardy herbaceous perennials.)
Ellwanger & Barry, Nurseryman, Rochester, N. Y.  (Hardy plants.)
Emerson, Prof. R. H., Horticulturist, Neb. Exp. Sta., Lincoln, Neb.  (Nebraska.)
Fernald, M. L., Asst. in Gray Herbarium, Cambridge, Mass.  (Salvia.)
Fields, John, Dir. Agr. Exp. Sta., Stillwater, Okla.  (Oklahoma.)
Fisher, Dr. Jabez, Fruit-grower, Fitchburg, Mass.  (Massachusetts.)
Ganong, W. F., Prof. of Botany, Smith College, Northampton, Mass.  (Cacti, and many proofs of physiological subjects.)
Gifford, John C., Asst. Prof. of Forestry, College of Forestry, Cornell Univ., Ithaca, N. Y.  (Poinciana.)
Goodman, L. A., Fruit-grower, Kansas City, Mo.  (Missouri.)
Greenman, J. M., University Museum, Cambridge, Mass.  (Zinnia.)
Harris, J. S., Fruit-grower, La Crescent, Minn.  (Minnesota.)
Hays, Williet M., Prof. of Agric., Univ. of Minn., Minneapolis, Minn.  (Plant-Breeding.)
Heiges, S. B., Pomologist, York, Pa.  (Pennsylvania.)
Heiss, J. B., Florist, Dayton, Ohio.  (Palms.)
Heller, A. A., Botanist, Lancaster, Pa.  (Porto Rico.)
Herbst, J. L., Fruit-grower, Sparta, Wis.  (Strawberry.)
Hewson, Wm., Orchid-grower for Wm. Scott, Buffalo, N. Y.  (Odontoglossum. Oncidium.)
Hicks, D. C., Fruit-grower, No. Clarendon, Vt.  (Vermont.)
Hosmer, A. W., Botanist, Concord, Mass.  (Poplygala, and some other native plants.)
XXVI

COLLABORATORS

Howard, A. B., Seed-grower, Belchertown, Mass.  
(Verbena.  Zinnia.)
Hutt, H. L., Prof. of Horticulture, Out. Agric.  
College, Guelph, Out.  (Kale.  Kohlrabi.)
Jack, Mrs. Annie L., Chateauguay Basin, Prov.  
Que.  (Native Plants.)
Jepson, Willis L., Botanical Dept., Univ.  
Calif., Berkeley, Calif.  (A few Californian subjects.)
Jennings, E. B., Specialist in pansies, South- 
port, Conn.  (Pansy.)
Jones, Rev. C. J. K., Los Angeles, Calif.  (Var- 
ious Californian plants.)
Jordan, W. H., Dir. N. Y. Exp. Sta., Geneva,  
N. Y.  (Fertility.  Fertilizers.)
Katzenstein, Otto, Manager Pinehurst Nurser- 
ies, Pincherst, N. C.  (Stillagina.)
Keedie, Dr. R. C., Prof. of Chemistry, Mich.  
(Fertility.  Fertilizers.  Lime.)
Kellogg, Geo. J., Pomologist, Lake Mills, Wis.  
(Wisconsin.)
Kerman, John, Market-gardener, Grimsby, Ont.  
(Tomato.)
Kinney, T. L., Fruit-grower, South Hero, Vt.  
(Vermont.)
King, F. H., Div. of Soils, U. S. Dept. Agric.,  
Washington, D. C.  (Irrigation.  Mulching, etc.)
Ladd, E. F., Prof. of Chemistry, N. D. Agric.  
Coll., Agricultural College, N. D.  (North Dakota.)
Lake, D. S., Nurseryman, Shenandoah, Iowa.  
(Trees on Plains.)
Latham, A. W., Sec. Minn. Hort. Soc., Minne- 
apolis, Minn.  (Minnesota.)
Leir, E. F., Prune-grower, San José, Calif.  
(Prune.)
Lindley, J. Van, Nurseryman, Pomona, N. C.  
(North Carolina.)
Lube, Fred K., Gardener, Mo. Botanical Garden,  
St. Louis, Mo.  (South Dakota.)
Lupton, J. M., Market-gardener, Gregory, L. I.  
(Cabbage.)
Lyons, Wm. S., Census Bureau, Washington, D. C.  
(Palms.)
MacDowell, J. A., Nurseryman, City of Mexico,  
Mex.  (Cacti.)
Macfarlane, Prof. J. M., Dir. U. of P. Botanic  
Garden, Philadelphia, Pa.  (Hybridization.  
Nepenthes.  Pinguicula.)
New York, N. Y.  (Many important bulbs.)
Makepeace, A. D., Cranberry-grower, West  
Barnstable, Mass.  (Cranberry.)
Manda, W. A., Horticultural expert, South  
Orange, N. J.  (Orchid pictures.)
Manning, C. H., Sheridan, Wyo.  (Wyoming.)
Manning, Jacob W., Nurseryman, Reading, Mass.  
(Dried specimens of herbaceous perennial plants.)
Manning, Robert, Sec. Mass. Hort. Soc., Boston,  
Mass.  (Biographical sketches.  Horticulture.)
Maxwell Bros., Fruit-growers, Geneva, N. Y.  
(Quince.)
McDowell, Prof. R. H., Agriculturist and horti- 
culturist, Nev. Exp. Sta., Reno, Nev.  (Nevada.)
McTeer, John, Gardener, Montecito, Calif.  
(Some plants cult. in Calif.)
Mead, Prof. Elwood, Cheyenne, Wyoming.  
(Wyoming.)
Meiham, Thos., Nurseryman, Germantown, Pa.  
(deceased).  (The article "Horticulture.")
Meriam, Dr. Horatio C., Salem, Mass.  (Paeonia.  
Papavera.)
Merrill, L. H., Prof. of Chemistry, Me. Agric.  
Coll., Orono, Me.  (Maine.)
Miller, E. S., Specialist in Bulbs, Floral Park,  
L. I.  (Many articles on bulbs.)
Miller, H. H., Paw Paw, W. Va.  West  
Virginia.)
Moon, Wm. H., Nurseryman, Morrisville, Pa.  
(Pennsylvania.)
Moorehead, James R., Grower of Caeti, Cactus  
Farm, Moorhead, Texas.  (Caeti.)
Moses, Wallace R., Fruit-grower, West Palm  
Beach, Fla.  (Orange.  Pineapple.)
Mudge, W. S., Fruit-grower and melon raiser,  
Hartland, N. Y.  (Maskelon.)
Nanz & Neuner, Florists, seedsmen, and nursery- 
men, Louisville, Ky.  (Kentucky.)
Nash, Geo. V., Gardener, N. Y. Bot. Garden,  
Bronx Park, N. Y.  (Genera of grasses.)
Nickels, Miss Anna B., Grower of Caeti, Laredo,  
Texas.  (Certain genera of Caeti.)
Ohmer, Nicholas, Fruit-grower, Dayton, Ohio.  
(Ohio.)
Osterhout, W. J. V., Botanical Dept., Univ. of  
Calif., Berkeley, Calif.  (Variegation.)
Parsons, Samuel B., Nurseryman, Flushing,  
L. I.  (The articles "Horticulture" and "Po- 
ymology."  
Hutchinson, Minn.  (Minnesota.)
Pennock, C. J., Florist and Gardener, Kennet  
Square, Pa.  (Tomato.)
Pericat, Alphonse, Gardener, West Philadel- 
phia, Pa.  (Laliocattleya.)
Pierson, F. R., Nurseryman, Tarrytown-on-  
Hudson, N. Y.  (Bulbs.)
Agric., Washington, D. C.  (Indiana.)
Ramsay, F. T., Nurseryman, Austin, Tex.  
(Texas.)
(Polemonium.)
SIEVERS, JOHN H., Specialist in pelargoniums, San Francisco, Calif. (Pelargonium.)
SIMPSON, J. H., Botanist, Braidentown, Fla. (Vitis, Zania and some Florida subjects.)
SLAYMAKER, A. W., Fruit-grower, Camden, Del. (Delaware.)
SMALL, JOHN K., N. Y. Botanical Garden, Bronx Park, N. Y. (Polygonum.)
SMITH, ARCHIBALD, Manager Joseph Breck & Sons Corporation, Boston, Mass. (Seeds.)
STEWART, W. J., Sec. Soc. American Florists, Boston, Mass. (Syringa.)
SOLTAN, CHRIS, Grower of pansy seed, Jersey City, N. J. (Pansy.)
STANTON, GEO., Ginseng specialist, Apulia Station, N. Y. (Ginseng.)
STOCKBRIDGE, Prof. H. E., Dir. Fla. Exp. Sta., Lake City, Fla. (Tomato.)
STORRS & HARRISON, Nurserymen, Painesville, Ohio. (Various plants.)
STUARTVANT, EDMUND D., Specialist in aquatics, Station E., Los Angeles, Calif. (Victoria and other aquatics.)
SUZUKI & IDA, Yokohama Nursery Co., New York, N. Y. (Japanese plants.)
THOMPSON, MRS. J. S. K., Spartanburg, S. C. (Perfumery Gardening.)
THURLOW, T. C., Nurseryman and specialist in peonies, West Newbury, Mass. (Peonia.)
TODD, FREDERICK G., Landscape Architect, Montreal, P. Q. (Hardy trees and shrubs.)
TROTH, HENRY, Photographer of plants and landscapes, Philadelphia, Pa. (Photography.)
VICK'S SONS, JAMES, Seedsmen, Rochester, N. Y. (Various plants.)
WATSON, H. D., Farmer and fruit-grower, Kearney, Neb. (Trees for the Plains.)
WEBB, Prof. WESLEY, Dover, Del. (Delaware.)
WEDGE, CLARENCE, Fruit-grower, Albert Lea, Minn. (Minnesota.)
WHILDDIN POTTERY CO., Philadelphia, Pa. (Pots.)
WHITE, J. J., Cranberry-grower, New Lisbon, N. J. (Cranberry.)
WILLARD, S. D., Nurseryman, Geneva, N. Y. (Important fruits, as Cherry.)
YOUNG, B. M., Specialist in nut culture, Morgan City, La. (Pecan.)

COLLABORATORS
ABBREVIATIONS

I. OF GENERAL EXPRESSIONS

cult. .................................. cultivated, etc.
diam. .................................. diameter
E. ........................................ east.
fl. ........................................ feet.
in. ........................................ inches
N. ......................................... north.
s. ......................................... south.
trop. ....................................... tropics, tropical.
W. ......................................... west.

II. OF BOTANICAL TERMS

fl. ........................................ flower.
fls. ....................................... flowers.
fd. ......................................... flowered.
fr. ......................................... fruit.
h. ........................................ height.
lf. ......................................... leaf.
lf. ......................................... leaflet.
Ivs ....................................... leaves.
st. ......................................... stem.
sts. ....................................... stems.
syn. ....................................... synonym.
var. ....................................... variety.

III. OF BOOKS AND PERIODICALS

To aid the student in the verification of the work, and to introduce him to the literature of the various subjects, citations are made to the portraits of plants in the leading periodicals to which the American is most likely to have access. These references to pictures have been verified as far as possible, both in the MS, and in the proof. A uniform method of citation is much to be desired, but is extremely difficult, because periodicals rarely agree in methods. With great reluctance it was decided to omit the year in most cases, because of the pressure for space, but the student who lacks access to the original volumes may generally ascertain the year by consulting the bibliographical notes below.

An arbitrary and brief method of citation has been chosen. At the outset it seemed best to indicate whether the cited picture is colored or not. This accounts for the two ways of citing certain publications containing both kinds of pictures, as The Garden, Revue Horticole, and Gartenflora.

The figures given below explain the method of citation, and incidentally give some hints as to the number of volumes to date, and of the number of pages or plates in one of the latest volumes.

A few works of the greatest importance are mentioned elsewhere by way of acknowledgment (p. xv). The standard works on the bibliography of botany are Pritzel's Thesaurus and Jackson's Guide to the Literature of Botany; also, Jackson's Catalogue of the Library of the Royal Botanic Gardens, Kew.


B.F. ...... See F.

B.H. ...... La Belgique Horticole. Ghent. 35 vols. (1851-1885.)


B.R. ...... Botanical Register (1815-1847). Vols. 1-14 edited by Edwards; vols. 15-33 by Lindley. In vols. 1-23 the plates are numbered from 1-2014. In vols. 24-33 they are numbered independently in each vol. There are 688 plates in vols. 24-33. "An Appendix to the First Twenty-three Volumes" (bound separately or with the 25th vol.) contains an index to the first 25 vols. An index to vols. 24-31 may be found in vol. 31. (33:70=vol. and col. plate.)

D. ........ Dana. How to Know the Wild Flowers. New York. 1863. (298=page.)


RADISH (Raphanus sativus). Plate XXXI. The Radish is one of the most popular of garden vegetables. It is of quick growth, and the product is secured at the time of the year when fresh vegetables are in demand. In order that Radishes may be of the best quality, they should have made a rapid growth. The soil should be rich, light and loose, one that drains readily and does not bake with heavy rains. Radishes fit for the table may be had in three to six weeks from the sowing, depending on the variety and the "quickness" of the soil. They are often grown as a catch-crop with other vegetables. They may be sown in the rows with early beets, peas or other crops, and they are usually mature enough for use before they seriously interfere with the main crop. Sometimes seeds of Radishes are sown in the rows of slow-germinating things, like carrots and parsnips, in order that the seedlings may mark the row and thereby facilitate tillage. Many of the Radishes may be allowed to remain long enough to produce an edible tuber. Aside from the root-maggot, the Radish is relatively free from insects and diseases. When the root-maggot appears in any place, it is usually best to discontinue the growing of Radishes in that area for two or three years, until the insects have been starved out. The maggots may be killed by an injection of bisulphide of carbon into the earth about the plants; but this is usually more expense than the product is worth. Early Radishes may be grown in hotbeds or coldframes with the greatest ease, and in these places they are usually less subject to the attacks of the cabbage maggot, since the crop is matured in advance of the maggot season. Radishes are readily forced in the winter months. It is necessary that the house be light. The soil should be a sandy loam, free from silt and clay. It is best to grow Radishes in solid beds rather than on benches. They thrive best in a low temperature. The temperature during the day should not exceed 65° to 75° in the shade, and at night it may drop to 45° to 50°. If the temperature is too high, and particularly if the plants are given bottom heat, the plants tend to run to top rather than to root. The seed is usually sown in rows from 3-8 inches apart, and they are thinned in the row until they stand 2 or 3 inches apart. In order that the crop shall be uniform and mature simultaneously, it is advisable either to sift the seed or to transplant the young Radishes. Galloway has found by experiment that Radish seeds two-twenty-fifths of an inch in diameter are too small to give a satisfactory and uniform crop. He therefore advises that seeds be run through sieves with a mesh of that diameter in order to separate the small speci- mens. In a certain experiment, he secured from two pounds of commercial seed 19% ounces of large seed, 10% ounces small seed, the remainder being bits of gravel, sticks and other impurities. The chief value of this sorting lies in the greater uniformity of the crop.

Almost every plant can then be relied upon to reach maturity. It is the practice in some houses to transplant the young Radishes. The seed may be sown in flats or in beds at one end of the house, and when the Radishes have made two or three leaves, they are transplanted into permanent quarters. In this operation, all the small and weak plants are discarded and the crop is therefore more uniform. It is supposed by some growers, also, that the breaking of the tap-root in the process of transplanting tends to make the tuber shorter and thicker and to induce an earlier maturity. By means of transplanting, the use of the house may be economized. Whilst one crop is growing, another may be started in a seed-bed or in flats. As soon as the best crop is removed, the ground may be thoroughly raked, fertilized, and the new plants put in. In some cases the new crop is transplanted between the rows of the old crop a few days before the latter is removed; but, unless the soil is rich and in good condition, it is better to wait until the crop is removed in order that the land may be thoroughly fitted for the new plants. Radishes are often forced in connection with lettuce, and they thrive well in the same temperature. The varieties most used for forcing, as also for the early spring crop in the garden, are the globular or half-long kinds. With these varieties, a depth of soil of 4 inches is sufficient for good results.

The Radish is variable in size, shape, color and consistency of root and in season of maturity. Varieties may be classified as spring, summer and winter Radishes; as globular, half-long and long Radishes; as red, white, gray and black Radishes. Figs. 2060-2062 show some of the forms.

The origin and nativity of the Radish are questions of dispute. For geographical reasons, it is supposed that the Radish is wild in temperate Asia, probably in the oriental part, although truly indigenous Radishes are not yet known. Not infrequently the Radish runs wild about gardens, and in
that case the root soon deteriorates into a small, slender, woody and more or less fibrous member. It has been thought by some that the Radish is only a modified form of the wild charlock, or *Raphanus Raphanistrum*. In fact, experiments were made on the charlock by Carrière, who was able in a few years to produce edible Radishes from the wild plant. While these investigations seem to be conclusive, they nevertheless do not prove that such was the actual origin of the garden Radish. Despite doubts, whilst accepting Carrière’s experiments, was unable to understand how the Radishes of India, China and Japan could have originated from the charlock, since that plant is unknown in those countries and the Radish has been grown there for centuries. It is possible that the Radish was carried eastward from western Asia and Europe, but such has not been the general course of the migration of plants. It is possible that the Radishes of the Orient are a different species from those in Europe, although they are generally regarded as the same species. See *Raphanus*.

The experiments of E. A. Carrière with the wild Radish (Journ. d’Agric. Prat., 1869, also separately printed) form a classical example of the possibilities of plant-breeding. In five years, by means of cultivation and selection alone he was able to produce from a troublesome weed practically all the important type-forms of Radish in cultivation. Carrière began by gathering seeds of the wild *Raphanus Raphanistrum* (Fig. 2063), which he collected as far as possible away from all cultivated plants of the same family. Duplicate sowings were made in light, dry soil at Paris and in strong clay soil in the country. The roots at Paris were mostly white or rose and the long form dominated; in the country all the colors and all possible forms were obtained. The roots of the wild plant were very slender, dry, fibrous, always the same shape, always white, hard, woody and inedible. The roots of the same species after four generations of seed were large, various in form and color, fleshy, the flesh white, yellowish, rosy or violet, succulent, and good to eat. Figs. 2064, 2065.

Carrière gives three pictures of the wild type with which he began, and eight pictures of various types produced after five years of intelligent cultivation and selection. The original root was about 7 inches long, but it was half an inch thick for a distance of barely an inch and a half. Taking extreme cases, the length of root was increased from 1½ to 10 inches, the thickness from ¼ to 5 inches, the weight from 22 to 651 grams. In terms of percentage the length was increased 666 per cent, the thickness 1,900 per cent, the weight 338 per cent. Among the forms pictured by Carrière were the common long, the carrot shape, the turnip shape, the beet shape and others,—in all 8 types, the length and diameter of which are given in every instance. All these roots had the characteristic flavor of the Radish well developed. There were others which in flavor approached turnips and other root crops of the mustard family.

The Rat-tail Radish, Fig. 2066, is grown for its much-developed soft pods, which may be used as Radishes and in the making of pickeles. It is rarely grown in American gardens, although it is well worth raising as a curiosity. It is annual, and its cultivation presents no difficulties.

**Garden Notes on Radish.**—A very small area will furnish an abundance of Radishes for a family. Radishes are of easy culture, and as they are at their best when not more than an hour out of the ground they make one of the most desirable vegetables for the home garden. In order to secure high quality it is essential to use well-bred seed, secure a quick growth, and use the product when in prime condition.

*Spring Radishes.*—The earlier quick-growing sorts will reach a usable size in 20-40 days from planting, and become pithy and worthless within 10-12 days later. Therefore repeated sowings are necessary to insure a continuous supply. The plant is very hardy, and the first sowing should be made as soon as the ground can be worked. The richer and more friable the soil can be made the better, and there is little danger of over-maturing provided that the manure is fine; and the older and better decomposed it is the more satisfactory will be the results. Having mixed the fertilizer with the soil and made it as fine and smooth as possible, form drills about 1 in. deep and 18-22 in. apart, and drop 15-30 seeds to the foot, covering with about ½ in. of soil well firmed down with the hand or hoe. From 2 to 4 feet of drill will furnish an abundant supply for one person during the time those from a single sowing are usable, and sowings should be repeated once in 10 or 12 days.

Early Radishes are often ruined by "maggots." We know of no certain preventive other than covering the soil just after planting with a heavy dressing of unbleached wood ashes. A still thicker dressing of tobacco dust will often enable one to get good roots when otherwise the crop would be a failure. Market-gardeners
Raffia is the Malagasy name of a palm which furnishes a staple article of commerce called raffia fiber. It is indigenous to Madagascar, where it grows without cultivation on hillsides and in the wild. The seed stalk, or frond, produces 80-100 long green division 2-5 ft. in length, like the leaves of the sugar cane, but of a dark lustrous green color and thicker and stiffer. The under part of this green leaf is a pale greenish yellow color, and from that side the inner skin is peeled off in the same manner as the skin on the outside of a pea pod, except that it peels off straight to the tip without breaking. It is then of the palest green, and after being dried in the sun assumes a light straw color. This is the raffia fiber of commerce.

Raffia fiber is extensively used by the natives for making cloths called silk lambas and rehanas, which bring fancy prices in Europe and America, where it is used in the manufacture of various kinds of hats, etc. A large trade is also done in raffia fiber in Europe for use in the manufacture of fancy baskets, but in America, while raffia fiber has been used to a limited extent in the manufacture of hats, its principal use is for tying vines, flowers, asparagus and celery bunting, and for grafting. It is soft as silk and not affected by moisture or change in temperature so as to risk cutting or wounding the most delicate tissues, and it does not break or ravel when folded or knotted. These qualities bring it into general use in Europe, especially in the vineyards of France, where it is extensively used, and consequently maintains its price. It is virtually inexhaustible in Madagascar, the supply being limited only by the scarcity of labor. For export, the fiber is collected in large skeins, twisted or plaited, and then packed in compressed bales of about 100 kilograms (220 lbs.) each. About 20,000 bales are exported annually.

Chas. W. Jacob & Allison.

Ragged Lady. Nigella Damascena.

Ragged Robin. Lychnis Fls-cuculz.

Rag Gourd. Luffa.

Railroad Gardening. Plate XXXII. This expression usually refers to the formal use of flower beds about railroad stations. Such work is ornamental gardening, not landscape gardening, the latter being the art of arranging plants and shrubs to make nature-like pictures. Most of the so-called landscape gardening that is done at railroad stations is really ornamental gardening. Carpet beds are relatively costly as compared with Hardy shrubbery. They last but a few months and then leave bareness, while the hardy trees and shrubs skillfully arranged are interesting the year round. This making of nature-like pictures with relatively simple, inexpensive and permanent materials is a much higher art than that involved in creating and maintaining formal flower beds. However, both things have their places. Many a tired traveler is cheered by the bright colors of a neatly kept railroad station. Such displays are suitable at the stations if anywhere along the line. They are always preferable to dirt, ugliness and a general air of indifference.

W. W. Tracy.
It may be well to begin an account of railroad gardening with an historical sketch.

The Movement in England.—Planting has been done on the station-grounds of some English railways for many years, but it is almost exclusively limited to purely ornamental gardening. The corporations do little beyond offering prizes to station-masters and their assistants. This system has been in operation for about twenty-five years on the Great Eastern, since 1885 on the Midland, and more recently on the Great Western railway. The prizes range from 5s. to 2½, and in 1900 aggregated £300 on the Midland railway. The little planting that is done by the railway companies themselves is confined to a few trees of low growth near stations, to a background of shrubs for some of the so-called “platform gardens,” and to sowing broom and gorse on certain slopes of the permanent way between stations. The “allotment gardens” that attract attention on English roads are small tracts near stations that are rented to employees of the roads, who use them as vegetable, fruit, and, to some extent, as flower gardens. The Railway Banks Floral Association is a new and interesting factor in the improvement of English railway rights of way. Lord Grey was the originator of the novel and excellent scheme. The society is an organization for interesting owners of adjacent property, and for collecting money and materials for sowing and planting railway “banks” (downward slopes) and “cuttings” (upward slopes) of the permanent way, to the end of making them more attractive. The results have been eminently satisfactory.

Denmark’s Progress.—In Denmark the railways belong almost without exception to the government, and improvements are begun when the roads are constructed. These consist of five classes of work: (1) planting of station-grounds; (2) hedges as a substitute for fences; (3) vegetation on embankments as a protection against erosion; (4) allotment gardens near block signal stations. Planting on station-grounds is purely for esthetic purposes; the other features, while possessing some attractions, are maintained chiefly for their economic advantages. The materials for planting are obtained from nurseries (“planteskoler”) owned by the roads and consist for the most part of shrubs, largely conifers. These nurseries, as well as the entire planting, are under the supervision of a “planteor,” i.e., a chief botanical instructor. The allotment gardens, like their English namesakes, are tracts near the block signal stations where railway employees conduct vegetable and fruit gardens for their own use, and sometimes care for a few flowering plants.

Conditions in Sweden.—Ornamental planting has been universal on government railways, as well as on the majority of private railways in Sweden since 1862. According to the Royal Administration of the Swedish State Railways, the following distinctions are made: (1) decorative and fire protective plantings on station-grounds; (2) mixed plantings (decorative and economic) on “habitation grounds”; (3) plantings along the railway lines as hedges or for protection against snow. Station planting consists of trees selected to suit the climate of various parts of the country, of shrubs, and of perennials and annuals (flowering as well as bedding plants). At the largest stations (only about 75) annuals are exclusively used for “modern or elegant combinations.” The planting at habitation grounds consists of fruit trees, small fruits, a few ornamental shrubs, some flowering plants, and a small kitchen-garden. The state railways yearly plant out about 40,000 hard-wooded plants (trees and shrubs), and 400,000 soft-wooded plants (perennials and annuals), which are nearly all grown at five greenhouses, hotbeds and nurseries situated in different parts of the country. About 20,000 fruit trees and 500,000 gooseberries and currants are at present planted out on the habitation grounds. On private railways the same scheme is followed on a smaller scale. (See G. F. 2:36 for further facts regarding railway planting in Sweden.)

In various other countries there are scattered instances of ornamental, economic and protective planting on railways, including the cultivation of fruits along the rights of way of certain railways of Germany and of France.

The Canadian Pacific Railway Company has planted a considerable part of its right of way to tamarack and other suitable trees to supply the tie material of the future.

The director of the association called Het National Belang, at Utrecht, says that the association has made contracts with the State Railway Company and the Holland Railway to plant the dykes of their roads.

Different kinds of willows, low apple and pear trees (half-stem apple) on perennials, and from the Ombu, and wild prune trees are used, the fruit of the last being used for jam.

The common quince is used to a limited extent in Uruguay for binding earth on embankments, and the Paradise tree for shading station platforms. "The Ombu is the national tree of Uruguay,—useless as fuel or as timber, useless as food, but as welcome as Jonah’s gourd at midday at certain seasons.”

The Royal Railway Department of Siam reports through M. Kloog, acting Director General of Railways, that efforts have formerly been made to establish protective Tam trees on embankments in the Korat section, which were destroyed by cattle; Eucalyptus trees from seed received from Australia have developed quickly into "stately trees"; and good success has also resulted from the introduction of a tree from Manila which is said to strongly resemble the cherry
PAPILLON GARDENING

Forsythia and catkins are made to order for the twig without a look at the tree, and is well suited for making shady alleys"; and that India rubber trees are used at smaller stations.

Remarkable work has been done in Algiers. The director of the P. L. M. Railroad Company writes that about 535,000 trees have been planted between 1869 and 1875, of which 455,000 were forest trees and 30,000 fruit trees. The prevailing forest trees are eucalyptus and locusts; others are mulberry, plane, pine, cypress, wil- low, and camphor. About one-fifth of the forest trees were planted about stations and watch- towers for ornament, and the remaining four-fifths were used in protective plantings. The fruit trees include mandarin, orange, lemon, medlars from Japan, pome- grante, apricot and almond. This information comes through Daniel S. Kibler, U. S. Consul at Algiers.

In Mexico some companies, notably the Mexican Central, maintain flower gardens and parks at larger stations.

Railroad Gardening in the United States.—The first traceable indications of the approach of the move- ment in this country date back to about 1870. It was not until several years later that infrequent allusions to the work crept into print. From the year 1880, how- ever, the movement gained in favor so rapidly that the late W. A. Stiles said of it in Garden and Forest, Mar. 13, 1889: "Railroad gardening has come to be con- sidered a necessary part of construction and main- tenance among prosperous and progressive companies seeking to develop local passenger business.

Leading Spirits.—As nearly as can be determined with certainty, the first railroad garden made in this country occupied the triangular plot of ground formed by the main line and the "Y" of the Baltimore & Ohio railway, at Relay Station, where the through line from Washington joins the main line from Baltimore to the west. Frank Bramhall, of the passenger department of the Michigan Central R. R., says of this plot: "I first saw it just before the Civil War," "Harper's Magazine" for April, 1857, gives a wood-cut of this station and its surroundings, but makes no mention of the planting.

The first example of gardening known to have been made by a railroad, as far as we have learned, was to be seen in 1869, on the line of the Central railroad of New Jersey, on the stretch between Elizabeth and Bound Brook. The credit for this was directly due to the late president of the road, J. T. Johnson. That gentleman was therefore one of the pioneers, if not actually the first American railway official to recognize the advantages, and to encourage the development of such improvement of station-grounds.

Another early example, also on the Baltimore & Ohio road, is a little flower garden which has been main- tained for fifteen years or more at Buckhorn Point, on a narrow strip of ground between the tracks and the edge of a precipitous height overlooking the valley of the Cheat river.

In 1880, the Boston & Albany Company built a new station at Newtonville, Mass., and a baggage- master (name unknown) who took charge at that point in 1881
evidenced an interest in the care of the grounds that attracted the favorable attention of the assistant engi- neer, who sent him men and material for grading and sodding. This so encouraged the baggage-master that he solicited the townpeople for money to buy seeds and plants, and with such success that he maintained for three years a flower garden that favorably impressed the higher officials of the road, and led to the establishment of similar gardens at other points, and eventually to the adoption of a system of planting which has, under intelligent, artistic supervision, been radically changed in style till it now stands as the nearest approach to a comprehensive and consistent example of railroad gardening known in this or in any other country.

Among the first railway companies to improve their station-grounds by planting were the Central of New Jersey (1869), the Baltimore & Ohio (date uncertain), the Boston & Albany (1880), the New York Central & Hudson River (1880), the Erie (1881), the Southern Pacific (1885), the Pennsylvania (1886), and the Austin & Northwestern of Texas (1887).

Summary of Present Condition.—At the present time one or two of the pioneer roads in this work have aban- doned it, while others have greatly increased its extent and improved its style, and many new ones have taken it up. Prominent among the latter are the Michigan Cen- tral, the Chicago & Northwestern, the Illinois Central, the Delaware & Hudson, the Philadelphia & Reading, the Lake Shore & Michigan Southern, the Chicago, Burling- ton & Quincy, the Atchison, Topeka & Santa Fé with its San Francisco & San Joaquin Valley line, the Cleveland, Cincinnati, Chicago & St. Louis, the Boston & Maine, the Long Island, the Union Pacific, and the Northern Pacific railroads, all of which have planted more or less tender material, with the use of an increasing proportion of permanent planting. A number of others have reserved plots for future improvement, and some have turfed such spaces. Several prominent companies do no di- rect planting, but seek to secure the embellishment of station-grounds by offering annual prizes to certain employees. This plan has proved fairly satisfactory and should become far more so under a uniform, well- defined system of improvement and with competent supervision.

The planting so far done consists largely of strictly ornamental gardening, that is, of formal grouping, car- pet-bedding, and of similar planting composed of tender material, but it is encouraging to note evidences of growing dissatisfaction with this ephemeral style of horticultural improvement. The most brilliant and pro- gressive railroad men are quick to recognize its limi- tations and defects, once their attention is directed to the matter, and, seeing its radically ineffectual results, to look for something better. Examples of increasing knowledge in this direction are seen in the action of


On the left, Auburndale Station, Boston & Albany R. R. The plan provides for a porte cochere, driveways, steps to an overhead bridge and to an underground passage.

On the right, Chestnut Hill Station, Mass. Both reproduced from "Garden and Forest."
Railroad Gardening

various companies that are even now turning from the rustic and fleeting summer show of perishable material. For instance, the New York Central & Hudson River Railway Company reports: "Heretofore the planting has consisted largely of bedding plants. Since the flowers have matured a stage before their commercial importance can be determined with some degree of accuracy, and permanent facilities provided in the way of side-tracks, freight and passenger stations, we have adopted a liberal policy toward the permanent improvement of station-grounds with ornamental trees, shrubs and vines instead of annuals."

So with the Michigan Central road; the extensive summer bedding that has been made a feature at certain points, is now limited to the summer season; permanent planting is used for any additional grounds that are improved. Similarly the Boston & Maine, the Philadelphia & Reading, the Pennsylvania, the Lake Shore & Michigan Southern and several others are constantly increasing the amount of hardy material used, while an official of the Chicago & Northwestern says: "The tendency on line is to replace flower beds with hardy flowering shrubs and plants to the greatest extent possible, partly because the greater part of our planting is seen by passengers while traveling at a high rate of speed, and shrubbery and hardy plants attract more attention than small, low flower beds; and partly because shrubs entail less labor and more rest in their care during winter, and also obviates the necessity of planting out and taking up the plants each season."

Thus, by one train of reasoning or another, progressive railway men are gradually sitting out the chaff and retaining the good grain of correct methods and artistic results in their gardening. But it would seem that, as a class, they are not reaching the pitch of the subject as directly as is their custom in the more practical features of railroad business.

From Mr. Stiles' editorial (previously mentioned) we find that in 1889 the highest authority in the art of planting, writing: "In the few exceptions, railroad gardening has failed to accomplish what the public has a right to expect of it from an artistic point of view. Instead of using their opportunities to increase the taste and knowledge of the communities they serve, railway managers have generally been satisfied to reproduce all that was glaringly bad in the prevailing horticultural fashion of the time. Perhaps this is inevitable, and it will continue so long as the need prevails for the advancement of the average expert of a higher class than the ordinary jobbing gardener. It is the old story—a man employs an architect to build his house, but thinks he needs no advice in laying out his lawn.

"The principles that underlie good railroad gardening are simple. They relate, so far as such gardening has been attempted, to the immediate surroundings of country stations and to the shaping and turling of the slopes rising and falling from the permanent way."

"The essential features are: convenient and abundant approaches, and some treatment of the ground not needed for approaches. This treatment should be at once economic and artistic, and of a character simple enough to be successfully maintained by the station-master and his assistants, under the inspection and with the occasional advice of a higher official charged with the management of the horticultural affairs of the corporation."

"The selection of a system of general treatment is the only difficult thing, and it is here that railway managers have usually failed. Most railroad gardens—and this is true of the East Amherst and of a badly laid out and constructed approach, bordered with turf in which are cut as many large and often grotesquely-shaped beds as can be crowded in and filled during four months with the most common annuals, and quite bare of all covering during the remaining eight months; of a few shrubs, mutilated almost past recognition by bad pruning, and by a clump of plants to complete the design of the name of the station in stones (more 'toys'). As Bacon wrote three centuries ago, 'You may see as good sights many times in tarts.' Such grounds are not artistic, therefore bad from the point of view of the public. They are enormously expensive and difficult to maintain, therefore bad from the point of view of the railroad.

"If railroad gardening is ever to become a potent and permanent means of public education, it must be organ¬ized upon a more economical basis, and with more regard to the laws of good taste and good business. This subject has already occupied the attention of a few thoughtful men, and we are confident that some progress has at last been made."

Mr. Stiles goes on to commend the plans of the new station-grounds of the Boston & Albany railroad for "convenience, neatness and simplicity. No beds, no cutting out flowers, striving for a consistent scheme of permanent planting, aiming at nature-like effects instead of the purely ornamental, i.e., formal gardening, previously used. This happy result was due to the influence of Prof. Charles F. Gilbert, landscape architect, of the Artistic Road, and to Mr. Wm. Blish, its president. Designs for the improvement of the grounds around these stations were made by F. L. Olmsted, the veteran landscape architect, and since 1884 the development of these plans, as well as all of the horticultural interests of the road, have been in charge of a competent landscape gardener, Mr. E. A. Richardson, who says: "The plan followed is to conform the treatment and development of the station-grounds to the character of the station's locality. It is a consistent scheme of permanent planting, aiming at being followed amid natural surroundings, and a more cultivated style in highly cultivated regions; to utilize all natural advantages of ground surface, rocks, water and native growths; to make large use of trees, shrubs, vines and plants indigenous to the locality where improvements are being made; to supply beds for shrubs with from eighteen to twenty-four inches of good loan; and to plant so closely in the beginning that as the plant grows they can be transplanted to supply other grounds as needed." It goes without saying that these methods are not only the most practical but that they insure the most artistic results.

Railroad Gardening in Florida.—Possible development of railroad horticulture is limited in the southern states only by the taste and work expended. With logically treated station-grounds southern railways would become pleasant highways studded with charming groups of foliage and bloom, expressing the type of the country traversed and marking the advance into a different climate. Florida, especially, should become celebrated for its railroad gardens. Its chief "crop" is conceded to be the winter tourist, and this appeals more strongly to this class than the contrast of luxuriant vegetation with northern ice and snow. Each station-ground should be planted to emphasize this contrast on a scale usually increasing, reaching a climax in the novel and effective semi-tropical vegetation points to the southern part of the state. Such a planting scheme should commend itself as the best advertisement for securing both pleasure-seeking and home-seeking patrons among "Little Inhabitors" of the land. The Florida East Coast Railway Co. has improved several of its station-grounds, notably, with decorative plants at St. Augustine and with roses at Ormond, but the most striking work on this railroad is the planting of the Florida Central Railroad Co. The Florida division of the Southern Air Line, and the Jacksonville & Southwestern railroads have done similar planting. All that has been done is ineffective con-
pared to the possibilities, for roses and half-hardy shrubs thrive throughout the state, while south of the 27th parallel semi-tropical plants make fine growth and bloom profusely.

**Possibilities in California.**—California offers limitless opportunities for railway horticultural development ranging from the semi-tropical growths of the citrus belt to the alpine plants on the verge of the everlasting snow that caps the mountains. A few examples of railroad gardening that existed in the southern part of the state about 1890 were maintained wholly by private enterprise as a means of advancing real estate interests. Some years later, however, embellished stationgrounds aggregating a goodly number existed. But these were scattered, the state being so large that no railway company could afford to establish gardens throughout the extent of its lines at once, and the most progressive communities secured the first improvements of this class. The Southern Pacific Railway Company was the originator of the work and has expended large sums in beautifying choice spots along its route, as at Merced, Fresno, Santa Monica, Pomona, Pasadena, Riverside. The range of soil and climate is wide. At Los Angeles there are palms dating from the Spanish occupation, a collection of semi-tropical shrubs, and a display of yuccas, cacti and other curious vegetation from the Arizona desert.

We quote in full a paragraph from Mr. Reimers, landscape gardener of the Southern Pacific Railroad of California in the following: "The gardens of California should be given a classic Mediterranean aspect. It has the climate, the coloring of rock, of soil and of sky, together with the warm blue sea of Italy, Spain and Greece. The state—

(Rheum) and casuarina, which latter does exceptionally well, eucalyptus, acacia in all except the most tender varieties, grevillea, ligustrum, magnolia, *Franklinia Californica* and *F. excelsa* where water is available, crape myrtle, abutilon, oleander and pomegranate (both the last do magnificently), olive and carob which do finely, and roses, which are inclined to burn and to stop flowering during the heat of midsummer away from the coast. Vines used are passifloras, which thrive in the heated valleys, begonias and wistarias, also jasmine, which incline to burn when used in the interior of the state, as do also maple trees. Of palms, Pritchardia and *Washingtonia* are as easily grown as onions; *Phoebis Convolvulacea* does well, and *Chamomelis* grows slowly. A long list of plants, tender in the east, are mentioned, among them geraniums, which are spoken of as being "killed to the ground away from the coast some winters." The plants that have proved best adapted to alkali soils are: Phoenix, Pritchardia and *Washingtonia* among palms, the European sycamore, cottonwood, olive, crape myrtle and some eucalyptus. Mr. Reimers is of the opinion that: "The gardens of California should be given a classic Mediterranean aspect. It has the climate, the coloring of rock, of soil and of sky, together with the warm blue sea of Italy, Spain and Greece. The state—

2068. One method of treating a railway ground.

Roses in bloom all winter are the special attraction at several points. Along the ocean, where difficult horticultural problems are met, the use of mesembryanthemums, eucalyptus and other succulents is general. Where water is available, passifloras, ipeas and the tropical hibiscuses make a wonderful show. In some places acres of bamboo, planted closely in shifting sands, are of great value. (Water is essential for their establishment.) Some of the best railway gardens are on the Monterey line from San Francisco past San Jose to the ancient capital of the state. At Castroville there is a picturesque "wilderness" garden overlooking at all seasons with fragrance and bloom, and the little railroad gardens along the "peninsula" (San Mateo county) have a more finished aspect than any others in the state.

Johannes Reimers, landscape gardener of the San Francisco & San Joaquin Valley Branch of the Santa Fé railroad, furnishes the following information: "For lawns, we use exclusively a mixture of Australian rye grass 90 per cent and white clover 10 per cent. We find that this mixture gives a lawn better able to withstand the heat, drought and poor soil usually furnished for filling the many needs. The grass retains its rich color even when almost dying from thirst, and makes a strong turf that is not likely to burn even when watered in the heat of a cloudless summer day; and it also requires less water and less fertilizer than either bluegrass or timothy. We make much use of a regular form of the Pride of China tree (Melia Azedarach), known as the Texas umbrella tree, for shade around buildings and for avenues. Its low, spreading form makes it harmonize with the broad-roofed Spanish style of architecture used for our buildings. It is a rapid grower and is not deformed by the continuous northwest trade-winds."

Other trees and plants mentioned include the paulownia, pepper, catalpa, mulberry, fig, the brachychiton lining of the cypress has not been appreciated here; and what might not be done with the fig, the olive and the palm on these hillside slopes?"

Mr. Chas. H. Shinn, of the California Experiment Station, says: "There seems no doubt that the time will come when one of the special features of travel in California will be the horticultural display at thousands of small railroad gardens scattered along every valley and mountain from San Diego to Siskiyou."  

Treatment of the Right of Way Between Stations.—On this point the Garden & Forest editorial previously quoted says: "What is needed is a ground covering that will be more permanent than turf and will not need its constant cutting and attention, and which can be secured without the enormous first expenditure for accurate grading and the deep soil that makes a grass slope presentable," and adds: "Such low plants as wild roses, dwarf willows and sumac, sweet fern, bayberry, etc. when once established will prevent surface soil from washing, will not grow tall enough to interfere with operating the road, and if destroyed by fire would soon grow again from the root and re-cover the ground."

The proof of these deductions is seen yearly on many roads, where thousands of miles of railroad rights of way which, in the spring and early summer, are like ribbons of flowered brocade linking the towns together but later in the season some blackened wastes from accidental or intentional fires. Year by year this mournful program is repeated.

Railway officials offer no practical objections to the use of small trees and of shrubs between stations that apply when they are placed with discretion; viz., on the outer boundaries of rights of way that are 100 or more feet wide, on straight stretches, or on long tangents, and not on short curves or near grade crossings. The trees should never be encased by the danger of trees falling across them in wind storms, nor should the telegraph
wires and poles be interfered with, nor the view of the line obstructed. The danger to planting from fire can never be entirely eliminated until some non-spark-producing fuel is substituted for coal.

Can the horticultural department of a railroad be made partly self-supporting? The question is a double one; by one means or another this department might be made at least partly self-supporting, but the consensus of opinion among railroad men is distinctly against the advisability of making it so, except indirectly.

It is conceivable that railroad nurseries and greenhouses might supply planting stock to individuals to their advantage; and possibly railway rights of way aggregating immense areas might be planted to crops, perhaps to fruit trees as is done to some extent in European countries (a project which has also been recently suggested for the roads of India), but the opinion is general that legitimate railroad business is limited to the transportation of people and of freight. Even if this is true, it is still certain that the department may legitimately be made to yield substantial financial returns. This feature of the department work is as yet in a preliminary stage that makes definite conclusions as to the extent of its benefits impossible, but enough has already been done to demonstrate the usefulness of a well-conceived and correctly developed policy of protective and economic planting.

Planting for Protection.—Planting for protection, as practiced so far, includes: (1) covering banks with vegetation to prevent erosion, and (2) planting for protection from wind and snow, and from landslides. All this has been successfully done in various parts of the world. Snow hedges are comparatively common at home and abroad. A notable example of confidence in the advantage of belts of trees for this purpose is seen in the groves planted recently by the Northern Pacific Railway Company. About 1,500 trees were set out in 1900, and the chief engineer of the road says: "This experiment has been undertaken to determine the possibility of substituting groves for snow fences. It is necessary to protect all railway cuts in these prairie regions in some manner, as the strong winds across the treeless prairies cause the snow to drift badly. A strip 100 feet wide is cultivated to keep down weeds and overcome danger from fire, and through the middle of it runs a grove 60 feet wide, while the inner edge being 125 feet from the center line and parallel with the tracks through cuts. The trees are planted in parallel rows spaced 6 feet apart at right angles with and 3 feet apart parallel with the track. The two outer rows on each side are golden Russian and laurel-leaved willows; the third row from the outer margins, box elder and ash; and the five central rows, cottonwood. This arrangement is expected to produce a dense grove, increasing in height from both sides to the center, which will furnish an effective wind-break."

The feasibility of planting for protection against the encroachment of shifting sand on the seacoast, along rivers, and on so-called desert lands, has been demonstrated by the researches and experiments of the Division of Agrostology of the United States Department of Agriculture. The advantages of such plantings are sure to be eventually utilized by the rail and road companies whose lines are exposed to this danger.

Planting for Economic Purposes.—Possibilities are considered great in the direction of producing timber for furnishing cross ties and yard posts. It is asserted that under competent superintendence this branch can be made not only to pay the entire expenses of the department but to become a source of revenue. This branch of the work appeals to practically all railways regardless of their other phase can be expected to, and to what extent the fortunes of various groves of locust, catalpa and tamarack influence the happiness of dignified chief engineers it would be difficult to learn, but that numbers of them are turning otherwise unoccupied railway lands to this use is certain. In the state of Indiana some railway companies have planted a part of their holdings with trees for the double purpose of growing timber for economic uses and to secure the resulting reduction in taxes, which is a feature of the state forestry law.

Protection of Natural Scenery.—Notwithstanding the prominence given in railway advertising to fine natural scenery, little credit seems due to railway companies in general for protecting such scenery. There is a mighty influence for their own and the public good is proved by a few instances. It is learned that the unofficial work of representatives of the New York Central and the Michigan Central roads did much to create the public sentiment that led to the formation of government parks on each side of Niagara Falls, and that the same roads should be credited with comprehensive and extended efforts to secure legislation looking to the prevention of further defacement of the palisades of the Hudson.

Disagreeable Features and their Suppression.—There are two important classes of disfigurement: defacement by signs and defacement by abused and neglected grounds adjoining railway rights of way. The more noticeable of these is the display of hideous sign-boards that disfigure railway rights of way and, indeed, seem to have the right of way on highways of every description. These signs are usually somewhat grotesque and cogent reason for massing plantations of small trees, shrubs and vines at certain points along rights of way where the topography of adjacent land invites such disfigurement. These gaudy signs not only blot out or mar most fine landscape views (being adroitly placed to that direct end), but are allowed to distort otherwise unobjectionable farm buildings, while the approach to villages and towns is announced in screaming colors by the crowding together of these frightful adjuncts of civilization.

While railway companies are not strictly responsible for these conditions, it is certain that they might sway public opinion and result in a much needed persistent, systematic work in the way of "planting out," the disfigurements, and by establishing attractive plantations wherever possible. This policy is likely to result in a reformation in the direction of the second source of unpleasantness—sign boards from trains via the unkempt, sordid and often wretchedly squalid appearance of grounds adjoining rights of way through villages, towns and small cities. If a park is maintained on the station-gardens, nearly the residents will improve the good spirit and improve the looks of neighboring back yards. To this end, a rule against dumping on railway ground should be strictly enforced. The objectionable features in large stations must almost certainly be ended until mitigated by the efforts of municipal art and social service leagues.

Attainable Ideals.—Railway companies can do no
RAILROAD GARDENING

more effective advertising than by demonstrating the possibilities of the country traversed for home-making. Instead of dreary wastes of dust and cinders, their way-station grounds should present refreshing scenes of shade and verdure. Their grounds should be treated according to the rules of landscape art that hold good in all planting. Where adjacent land drops away giving good vistas, these should be preserved; objectionable features should, as far as possible, be "planted out;" sky lines should be varied, banks clothed, and variety and views supplied, particularly in flat and uninteresting regions.

In short, railroad gardens should be in the hands of those who will adorn instead of destroy them who will locate the features of that will take care of themselves after planting is established — features that require considerable expenditure, a good knowledge of trees and of shrubs, and a large amount of taste in the designer at the outset, but after being established, like the island gardens of Paris, "the hand of man might be withheld for half a century without their suffering in the least."

"Railroad Gardening Literature.—"Seven Lamps of Architecture," by Ruskin; "Landscape Gardening," by Samuel Parsons, Jr; "Ornamental Gardening for Americans," by Elias A. Long; "Der Stadtebau" (Vol. 9 of Part 4 of "Handbuch der Architektur"), Press of Bergerstrasser, Darmstadt, 1890, by J. Stulben; Bulletins of the U. S. Dept. of Agric., Division of Forestry, especially No. 1 (1857) and No. 7 (1893). "Garden and Forest," Jan. 16, 1889; Mar. 15, 1889; Apr. 3, 1889; May 15, 1889; June 22, 1889; July 29, 1889; Aug. 27, 1889; Sept. 24, 1889; Oct. 22, 1889; Nov. 19, 1889; Dec. 17, 1889.

RAISIN. Fig. 2071. Up to about 30 years ago, practically the entire Raisin industry of the world was confined to the Mediterranean districts of Europe and Asia. While it is true that Raisin vines were planted in other widely distant countries at a much earlier date, e.g., California 150 years ago, it was not until the early 70's that the Chilean Raisins, as well as those of the newer districts of California and Australia, were actually found in the markets of the world. Since that time, however, the development of the industry in these new districts has been most rapid, and it has been shown that even higher quality and flavor are possible.

In California the growth of the Raisin industry has been enormous, the output now reaching about 100,000,000 pounds annually, or more than the entire yearly consumption of the United States a few years ago. In 1894, the growers found themselves face to face with what was thought to be another problem of over-production. The price of Raisins fell below the cost of production. Lack of system in marketing has since been shown to have been the cause, for by cooperative methods in grading, packing and marketing, the industry has again been placed on a sound and fair remunerative basis. The first importation and planting of the vines were made in 1850 that the first California cured Raisins were exhibited at the State Fair, and it was not until 10 years later that the first large-scale vineyards (one at Davisville, Solano county, and another at Woodland, Yolo county) came into full bearing. One hundred and twenty thousand pounds were produced that year, nearly all by these two vineyards. Planting in various parts of the state followed. Fresno, Riverside, El Cajon valley in San Diego county, Los Angeles and Orange counties soon became important centers of the industry but the production of citrus fruits has now largely superseded Raisin-growing in all the last mentioned except the Fresno district, where at present three-fourths of the entire output of the state is produced. The acreage is now about 50,000, with nearly 45,000 of these in the Fresno district, including Tulare, Merced and Kern counties. The climate of this region is eminently suitable for Raisin culture. The summers are hot and dry and the winter rains scanty and late, thus insuring a high saccharine content of the grapes and ample opportunity for sun-curing, by which means alone, it is thought, Raisins of high quality can be produced. As the system in vogue in all districts is essentially the same as that in Fresno, a short résumé of the practices of that region will suffice.

Alluvial soils and deep upland loams of the plains are considered the best. Irrigation is absolutely necessary. At first flooding and furrow irrigation were practiced, but since the placing of the ditches the water has escaped into and completely filled the loose soils (in some cases originally 60 ft. deep) from below, thus producing a system of "subirrigation," as it is called there; and it is in this way that most of the vineyards are supplied with water at present. Indeed, in some localities, it is no longer a question of how to bring the water to the land, but more how to keep it out. Serious damage has resulted in some of the newer vineyards, where the seepage water has completely swamped the land. "Tight" canals and ditches at the start would have avoided this trouble, but it was not realized until too late. The vines are all planted low, six inches being the favorite height for the stump. With the exception of the "Seedless Sultanas" and the "Thompson Seedless," which require long pruning, the canes are cut back to 2 or 3 eyes; the number of canes left varies from 5 to 15, according to the age and size of the stump. Summer pruning is seldom practiced. Clean, thorough tillage is maintained until the vines cover the ground and obstruct operations. The grapes ripen about September 1, and are allowed to become thoroughly ripe before they are gathered. When the sugar percentage has reached 23 or 24 per cent, the fruits are considered ripe. The bunches are then cut with small shears (care being taken not to pull off the bloom), placed on wooden trays and exposed to the sun. The time required for full curing ranges from 10-12 days for the earlier grapes to as long as three weeks for the later ones. When the juice has reached about the consistency of jelly the Raisins are placed in the so-called "sweat boxes" to undergo the "sweating" process, in order to equalize the moisture content throughout the whole mass. The Raisins are then ready for grading and packing. A great many brands and grades have been packed, designated at first much the same as the imported ones, but lately the American Winegrowers' Association has endeavored to establish and maintain distinctly Californian brands. The "Crown Imperial Clusters," "5-Crown Dehesas," "4-Crown Clusters," "3-Crown Clusters," "2-Crown London Layers" are some of the principal brands. The loose or detached berries are, of course, always marketed separately as distinct grades. A great many have lately been "seeded" by means of a specially designed machine, put up in 1-pound and 2-pound packages, and marketed for cook-
RAISIN

The varieties planted are: White Muscat of Alexandria, the Muscatel Gordo Blanco and Malaga; and for seedless, the Raisins, the Seedless Sultanana and Thompson Seedless. It is safe to say that the first two are the prevalent varieties and produce the finest Raisins. The Gordo Blanco is the favorite with some on account of its fruit uniformity and beauty, but it ripens late and is almost entirely consumed as raisins.

The seedless varieties are both small. "Currants" (which, by the way, are not currants) are the fruit of the Zante or Corinth grape-vine, and are only partially successful, and as they command a higher price, are not considered profitable in California.

The Raisin vine is subject to the same diseases and insect pests as are the wine and table varieties of the grape, and these are combated by the usual methods. Doury mildew is unknown in California, and up to the season of 1900 no phyllloxera had made its appearance in the Fresno vineyards. In the fall of that year, however, it was discovered in the district, and to what extent it will reduce the acreage, will, of course, depend upon the vigilance of the growers and promptness with which replantings with resistant stocks are made.

Of late years high assertions have been made for the Salt river and Gila valleys of Arizona as Raisin regions. It is said the grapes ripen earlier and have that advantage over the California districts, as well as that of being nearer to market. How far these advantages will count against the California Raisin in the competition remains as yet to be seen.

For a complete and detailed account of Raisin-growing and curing, as well as a bibliography of the subject, see "The Raisin Industry," by Gustav Eisen; also, "California Fruits, and How to Grow Them," by E. J. Wickscon.

ARNO LO V. STUBENBRAUCH.

RAISIN-TREE, JAPANESE

Hovenia dulcis.

RAMONDIA (L. F. E. von Ramond de Carbonnières, French botanist and traveler, 1755-1827). Often spelled Ramondia, but originally written Ramondia. Gesnoderieae. Ramondia Pyrenaica is one of the choicest and most popular alpine plants. Few, if any, inhabitants of rock gardens have been so often pictured. It is a small, tufted, hairy perennial herb, like most alpine plants, and its leaves bear one or two fls., in spring. The fls. are an inch or so across, and normally purple or violet, but there is a pure white variety which is in great favor. The Ramondias vary in the number of their petals, or rather corolla-lobes. For example, P. Nathanii often has 4-lobed and 5-lobed fls., on the same plant. The floral parts in the genus are in 4's, 5's or 6's. These plants are rare and local in Europe and are interesting as being among the few alpine survivors of a family that is now so typically tropical. A genus of about 3 species: corolla with scarcely any tube, rotate or broadly bell-shaped; perfect stamens as many as the corolla-lobes, affixed at the base of the corolla; ovary superior; capsule oblong; seeds many. Ramondias are woolly or villous plants with soft, wrinkled leaves. The plants require perfect drainage.

Although three Ramondias are in the trade, only one is well known. This is R. Pyrenaica, which is hardy in the eastern states. It is a beautiful, dwarf, alpine plant well adapted for the rock garden. It is rather hard to establish but can be easily grown from seed. If seeds are sown in the spring, and the small plants grown along in pots for the first summer and kept in a cool shady position, they will make neat little plants by the end of autumn. They should be kept in a coldframe for the winter. These one-year-old plants grown in pots are much easier to establish than younger plants. They can be planted in small pockets in the rockery in a slightly shaded and elevated position, and given good, deep, peaty soil. When the plants get established they will blossom freely, and if allowed to ripen their seed they will sow themselves freely amongst the rocks. Old plants can also be increased by division. They ought to be covered in winter with some hay or dry leaves so that they will not be heaved out of the ground by the alternate thawing and freezing.

A. Color of fls. purple or white.

b. Corolla 5-parted, rotate.


R. Corolla 5-parted, more concave, short bell-shaped to funneliform.

Heidreiche, Janka (Janka, or Janka, Heidreiche, Boiss.). Lvs. ovate, entire, oblong, silky white above, rusty-wolly below; fls. 1-2-fls.; fls. violet. According to Boissier it normally has a 5-parted calyx, 4-lobed corolla and 4 stamens. Thessalsy. G. 55, p. 394.

AA. Color of fls. yellow.

Serbica, Pau. This is said to be distinguished by its blue anthracs; also the fls. are said to be normally 5-lobed. Servia. - R. Nathanii is said to be a variety that is more commonly 4-lobed than the type. S.H. 1:161.

ROBERT CAMERON AND W. M.

RAMONDIA. See Ramonda, above.

RAMPION (Campanula Rupunculus) is a vegetable sometimes cultivated for winter salads. The roots are chiefly used, generally in a raw state, but the leaves may also be used as a salad. The roots are white, a foot or so long, and spindle-shaped, like a long radish. They are ready for use in Oct. or Nov., and may be used all through the winter. According to Vilornin's "Vegetable Garden," the seeds of Rampion are the smallest of all kitchen-garden seeds, and their germinating power lasts five years. The seed may be sown in the open ground, either broadcast or in drills. The precautions usually taken with winter seeds must be observed. In order not to sow the seed too thickly it is well to mix it with sand. The seed should not be covered, merely firned into the soil. Frequent and careful waterings are necessary until the plants become established. Thinning is an important operation. Every plant allowed to remain should have at least 4 inches each way for development. The plants like a light, rich soil, partial shade and water during the hot season. Although Rampion is a biennial plant it sometimes runs to seed the first year, especially if the seed be sown early. It is, therefore, sometimes advisable to postpone seed-sowing until June. For botanical description, see Campanula.
RAMPION

RAMFION, HORNED. Phyteuma.

RAM'S HEAD. Cypripedium arietinum.

RAMSTED. Linaria vulgaris.

RANDIA (Isaæ Rand, author of an index of plants cult. at Botanical Gardens of the Society of Apothecaries of Chelsea published 1790 and 1792). Rubiaceæ. A genus of about 100 species of tropical shrubs, trees, and woody climbers. Plants often spiny; lvs. opposite, obovate-oblong to lanceolate, frequently coriaceous; stipules between the petioles and stem, short, and usually joined together: fls. white, yellow or reddish, small or large, axillary or rarely terminal, solitary, corystose, or fascicled; fr. a berry, globose or ovoid, 2-loculed, many-seeded. For distinctions from Miœriostigma and Gardenia, see Gardenia.

A. Shrubs having spines.

B. Corolla oblong--

dumetorum, Lam. (R. floribunda, DC.). A small tree or rigid shrub with stout, straight, often long spines; lvs. 1-2 in. long, short-petioled: fls. white or greenish yellow, fragrant, not large, solitary or rarely 2-3 on a peduncle; corolla 3/4-3 in. across; berry globose or ovoid, 3/4-1 1/2 in. long, yellow. Tropical Asia. Cult. in S. Fla.

AA. Shrubs or trees without spines.

Bb. Corolla-tube 4-10 in. long.

maculata, DC. (Gardënia Stawleyana, Hook.). A much-branched shrub 10-15 ft. high; lvs. elliptical or oblong-oblong, 1 1/2-2 1/2 in. long, wide; characeæs, acuminate, narrowed at base; pedicel usually with glands near its union with the midrib; fls. usually purple with white lobes, solitary, terminal or at ends of short lateral branches, sessile: fr. oval, oblong or globose, pointed, 1 1/2-3 in. long. Tropical Africa. B.H. 1891:40. B.R. 51:47. B.M. 4185. Gm. 38:773.

cc. Lobes of corolla acute.

Ruziana, DC. A tender shrub with dark green, lanceolate, acute lvs., and white or pale yellow fls. terminal, solitary, sessile; corolla-tube somewhat hairy; lobes spreading: fr. cylindrical, yellow. 10-nerved. Brazil, Peru.

F. W. Barclay.

RANÈVEA (anagram of Rarenea, and now first published). Rarenea of Bouché. Palmaeae. One species of palm allied to Hyophorbe, from which it differs, among other things, in its dwarfer habit, usually dioecious flowers, and in the flowers being arranged alternately on the short branches of the spadix. Bouché's generic name Rarenea dates from 1878. It appears in Bentham & Hooker (3:883) as Rarenia. In spelling it is so similar to Rarenia of Vellozo, 1825, that the two cannot be distinguished by pronunciation. In the interest of perspicuity, therefore, the name is here changed to Raneæa. Bouché himself this plant and Rarenea occur in the American trade.

Hildebrandtii (Ranœna Hildebrandtii, Bouché). Becoming 8-12 ft. high, but flowering under cultivation when half that height, spineless, erect; lvs. elliptic-oblong or ovate-oblong in outline, long-stalked, pinnae, the pinna 20 or more pairs and narrow-lanceolate-acute; spadix long-stalked, the stamine recurved and with short densely flowered spreading branches, the pistillate erect with elliptic strict branches thickened at the base: fls. pale straw-color, the outer lobes of the petals 3 and joined at the base, the stamens 6: fr. black. Comoroe Islands (east of Africa). I. H. 27:403. B. M. 6776. G.F. 4:259. An excellent dwarf palm, described by W. Watson in Kew Journal and extensively used as an ornamental and as a Kentia. It deserves to take a prominent place among garden palms, its small size, free habit, elegance, good constitution, being all in its favor, while in the freedom with which it flowers and produces seed we have an exceptional character among dwarf palms." Perfect flowers are sometimes produced, although the plant is habitually dioecious. Raneæa is one of the most valuable Palms of recent introduction. L. H. B.

RANUNCULUS (Latin diminutive for frog; many of the species grow in wet places). Ranunculeae. Buttercups. (Crow-foot). The genus is by far the largest in the family, comprising fully 200 species. Ninety of these are native or naturalized in North America. Most members of the genus are naturally hardy, being found in mountainous regions and in cold and temperate parts of the globe.

Generic description: Perennial (rarely annual) herbs: lvs. alternate, simple, entire, lobed, dissected or divided: fls. yellow, white or red; sepals usually 5, deciduous or persistent, pearly or hairy; stamens 2, 3 or 4; pistil 1, ovary inferior or superior, usually 2-chambered or 4-chambered, perianth Attached. For structure of the flower and fruits, see Figs. 1574, 2073, 2074. For the botanical description of the present species, see Fig. 2074.

The cultivated forms of R. Asiatius are constantly increasing in number. They are of two main types: (1) the florists' section, called Persian Ranunculus, or true R. Asiatius. These require more care than the others. They are quite variable in form and color, and are the most highly cultivated members of the genus. (2) The gardeners' section, called Turban Ranunculus, or var. Asiaticus. Compared with the former, these have larger, broader, 3-parted lvs., not so much cut: fls. larger and broader, with many crisp petals, not flat and spreading but erect and curved inward, forming a spherical flower, as in the double peonies. See No. 7.

K. C. Davis.

CULTURE OF THE ASIATIC RANUNCULUS.—The culture of Ranunculus in gardens and by florists has been confined chiefly to the Persian and Turban Ranunculus R. Asiatius, since the Asiatic species is far more attractive than the European. In England and in other European gardens, R. Asiatius has been in cultivation a very long time. Parkinson mentions it in his Paradisus, published in 1629. He termed it "the double red-crowfoot of Asia." Since his time R. Asiatius and its varieties have been greatly improved both in size of flowers and variety of colors. The flowers are very double, almost globular in outline, and often exceed 1 inches in diameter, while the colors now embrace almost every shade from blue, and everything from white and variegated. A well-known mass of these charming flowers when in full blossom is a sight not soon forgotten. They are not as well known in American gardens as in those of England or at least not in the eastern states, since the writer has rarely met with them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season in this country is about the last week in May and the first week in June, which is too late for spring bedding, while the season of blossoming is too short for summer bedding. Therefore a position should be given them in the herbaceous border where they will receive some shade during the warmer parts of the day, or a level place in a rock garden with a northern aspect. The roots are tuberos, being like miniature dahia roots.
They are not hardy, at least not in any of the northern states. The tubers should be carefully lifted after the foliage has all "ripened off" (which occurs usually toward the end of August), and stored until the follow:

2075. Ranunculus amplexicaulis \( (X \frac{1}{2}) \).

ing spring in some cool shed where they will not freeze. They should be planted as soon as the frost is well out of the ground in spring, about 2 inches in depth and about 6 inches apart, making the soil very sandy on top so that the leaves will push through readily without heaving the soil. Like their congeners the European Ranunculi, they like plenty of moisture at the roots during the growing season, and if they can be shaded from the sun when in flower their blossoming period will be materially lengthened. They may also be grown for flowering in the greenhouse. The writer usually grows a few pans each year, planting the roots in pans of light soil towards the end of January and placing them in the coolest greenhouse, where they will blossom towards the middle of April. The writer also prefers the Turkish varieties, since they are stronger-growing and rather larger than the Persian. The species may be propagated by seeds, but this process is not worth while for most people because the bulbs may be procured so cheaply.

Of the native and European species of Ranunculus, those of the Batrachium section, such as \( R. \) aquatilis and its varieties, are interesting aquatic plants, while \( R. \) repens, var. flore pleno, and \( R. \) amplexicaulis are useful as subjects for the bog garden.

For herbaceous borders or moist corners in the rock garden \( R. \) aconitifolius, var. flore pleno, \( R. \) cortusafolius, \( R. \) aconitifolius, \( R. \) acris, \( R. \) amplexicaulis, \( R. \) pulcherrimus and \( R. \) Ficaria are the only species worth growing. These are readily propagated from seeds or by division of the plants in spring.

EDWARD J. CANNING.

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(See also the supplementary list.)

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acris, 11.
adoneus, 2.
amplexicaulis, 1.
Asiaticus, 7.
bulbosus, 5.
Californiaus, 10.

\( \begin{array}{ll}
\text{Key to Species.} \\
\text{A. Lvs. entire; blades of stem-lvs. amplexicaulis; fls. white} & 1. \text{amplexicaulis} \\
\text{AA. Lvs. somewhat lobed or divided.} & \\
\text{B. Fls. yellow (except in some} & \text{2. adoneus} \\
\text{double forms of} \text{R. Asiaticus).} & \\
\text{C. Foliage much} & \text{3. repens} \\
\text{tubed and} & \text{4. montanus} \\
\text{parted into linear segments.} & \\
\text{cc. Foliage with rather broad} & \text{5. bulbosus} \\
\text{tubes or divisions.} & \text{6. Suksdorfii} \\
\text{d. Plant spreading by runners} & \text{7. Asiaticus} \\
\text{or rootstocks.} & \text{8. orthorhynchus} \\
\text{e. Akenes compressed,} & \text{9. cortusafolius} \\
\text{margined} & \text{10. Californicus} \\
\text{EE. Akenes turgescent} & \text{11. acris} \\
\text{dD. Plant not spreading by runners nor rootstocks.} & \text{12. aconitifolius} \\
\text{eE. Roots decidedly bulbous} & \\
\text{EE. Roots not bulbous.} & \\
\text{f. Plants very low and} & \\
\text{glabrous} & \\
\text{ff. Plants usually much} & \\
\text{taller and more or less} & \\
\text{hairy.} & \\
\text{a. Fruit borne in a spike} & \\
\text{bb. Fruit borne in a} & \\
\text{globose or oral head} & \\
\text{H. Leaf of akenes as} & \\
\text{long as the body,} & \\
\text{straight} & \\
\text{HH. Leaf of akenes} & \\
\text{nearly as long as} & \\
\text{the body, but} & \\
\text{reverted} & \\
\text{HHH. Leaf of akenes very} & \\
\text{short.} & \\
\text{i. Upper stem-lvs.} & \\
\text{wanting; petals} & \\
\text{normally 6-15.} & \\
\text{j. Upper stem-lvs.} & \\
\text{present; petals} & \\
\text{normally only 3-7.} & \\
\text{k. Forskohlii} & \\
\text{l. Forskohlii} & \\
\text{m. Forskohlii} & \\
\text{n. Forskohlii} & \\
\text{oo. Forskohlii} & \\
\text{pp. Forskohlii} & \\
\text{qq. Forskohlii} & \\
\text{rr. Forskohlii} & \\
\text{ss. Forskohlii} & \\
\text{tt. Forskohlii} & \\
\text{uu. Forskohlii} & \\
\text{vv. Forskohlii} & \\
\text{ww. Forskohlii} & \\
\text{xx. Forskohlii} & \\
\text{yy. Forskohlii} & \\
\text{zz. Forskohlii} & \\
\text{1. amplexicaulis, Linn. Fig. 2075. Stems erect, 5-10} & \\
\text{inches high, with 2-3 flowering branches; glabrous; lvs.} & \\
\text{entire, ovate or lanceolate, amplexicaul, glabrous,} & \\
\text{acris, 11.} & \\
\text{cortexficus, 8.} & \\
\text{Dentatus, 4.} & \\
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\text{R. Ficaria, 5.} & \\
\text{S. Ficaria, 12.} & \\
\text{T. Ficaria, 5.} & \\
\text{U. Ficaria, 12.} & \\
\text{V. Ficaria, 5.} & \\
\text{W. Ficaria, 12.} & \\
\text{X. Ficaria, 5.} & \\
\text{Y. Ficaria, 12.} & \\
\text{Z. Ficaria, 5.} & \\
\text{2076. Ranunculus repens, Double-flowered \( (X \frac{1}{2}) \).} & \\
\text{Tip of a demument plant, which roots at the joints.}
\end{array} \)
RANUNCULUS

glabrous or at first with hairy edges soon becoming glabrous, glaucous: fls. 3-6, either terminal or axillary, pure white, with yellow stamens; sepals pointed; petals much larger, obtuse. Mts. of S. E. En. B. M. 206 (Plate, L.B.C. 16:1868. J. H. III. 35:345. G. C. II. 19:788.

2. adoneus, Gray. Plant shaggy-hairy, 4-12 in. high, sometimes becoming decumbent; root slender, fibrous; lvs. usually 2-3-times 3-parted and lobed; lobes all narrow, ovate, axillary divisions of lvs. sessile or nearly so; petioles of basal lvs. membranous in lower part; stem-lvs. sessile or on a sheathing base, usually borne opposite, resembling an involucre: petals 5 (or 6 to 8), large, yellow, rounded or cuneate at base, much exceeding the lanceolate sepals which are hairy beneath; akenes somewhat compressed, acutish; style long, straight, subulate; head globose to oblong. Summer. Rockies of Colo., altitude 10,000 ft. — Int. 1881. Procureable from dealers in Colorado plants.

3. repens, Linn. Plant more or less hairy, spreading by runners: root fibrous: fl-stems often ascending 6-12 in.: lvs. petioled, 3-divided; middle lft, or all lfts. stalked, often again 3-lobed or cleft, and somewhat ciliate-toothed, bases cuneate or truncate; petals oblong, 5-6 lines long; sepals much shorter, spreading, hairy below; akenes compressed, margined; head short, stout, slightly bent: head globose. May-July. Low place, from Nova Scotia to Newfoundland to Va. and westward; also Eu. and Asia. - A double-flowered form (var. flore pleno). Fig. 2076, is not uncommon in gardens.

4. montanus, Willd. MOUNTAIN BUTTERCUP. Plant 6 in. high, pubescent, with soft appressed or spreading hairs, especially toward the top; rootstock creeping, 1-3 in. high, ½ in. thick; radical lvs. few, petiolate, smooth, orbicular in outline, 3-parted, and lobed into blunt-toothed segments; stem-lvs. sessile or nearly so, clasping the stem, 3-5-parted into narrow somewhat toothed or entire lobes; fls. solitary, terminal, the simple or once-branched stem 1 in. across or larger; sepals conic, acute, yellowish green, slightly hairy; petals 5, large, broadly obovate, bright yellow, with small scale and pore at base: akenes turgid, glabrous; head strongly hooked, puberulent. May-July. Eu. B. M. 3622. L.B.C. 17:1610.


5. bulbosus, Linn. (R. speciosus, Hort.). Plant from a true bulb, erect, about 1 ft. high, hairy; lvs. petioled, 3-5-parted, the divisions sometimes stalked; segments lobed: fls. terminating the branches, bright yellow, large; petals large, obvate, shining above; sepals much smaller, often reflexed; akenes compressed, with short beak, and borne in a globose head. Spring and summer. Persia, Eu., N. Africa. - The double form is perhaps best suited for cultivation.

6. Suksdorffii, Gray. Roots fibrous; stems slender; 3-6 ft. high; glabrous, radial and lowest stem-lvs. small, about 6-8 lines long, subreniform to broadly flabelliform, with truncate base, deeply 3-5-eleft or parted; divisions cuneate, again 2-5-eleft or incised; upper stem-lvs. with linear divisions; fls. 1-3, deep yellow; petals round-obovate, retuse: akenes turgid-lenticular, sharp-edged, glabrous; style persistent for a time, slender, ¾ fine long, equaling the akenes body; head of fruit globose. July, Aug. Damp places, 6,000-8,000 ft. Mts. of Wash., Ore., and Mont. - This rare species was offered by F. H. Horsford in 1889.

7. Asiaticus, Linn. Fig. 2077. Plant erect, either simple or branched, ½-1 ft. high; roots fibrous; lvs. petiolate, becoming sessile upwardly, ternate or bifoliate; segments toothed or deeply 3-lobed; fls. terminating the stems and branches, variable in color among the cultivated forms; calyx spreading, becoming reflexed; petals large, obvate, blunt: fr. in a spike. May-June. Asia Minor. F. S. 16:1670 (fl. pl.). B. B. 16:113 (var. superbusissimus). -Higly bred double fls. of many kinds are in cult. Roots are sold as "bulbs." The Persian and Turban Ranunculuses belong here.

8. orthorrhynchus, Hook. Plant 10-18 in. high, erect, branched, hirsute to nearly glabrous; root thick, fibrous: lvs. oblong in outline, pinnately compound: fls. 5-7, eleft and incised, quite variable; upper lfts. often confluent and sessile or nearly so, lower ones well stalked: petals 7-10, yellow, rarely purple beneath, obvate; sepals much shorter, pubescent beneath, reflexed, deciduous: akenes glabrous, obliquely ovate, compressed, margined; style of same length, straight, rigid, persist-
10. *Ranunculus*, Benth. Plant rather weak, \(\frac{3}{4}-2\) ft. high, usually pubescent or hisrate, branching and without leaves in upper part; roots fibrous; lvs. ternately divided or parted, or palmately 5-divided into linear or narrow, often 2-3-parted divisions; petals 6-15, glossy yellow, oblong or narrowly obovate; akenes flat, slightly margined, beak very short. Rather dry places, W. Calif., and adjacent Ore.

11. *aeris*, Linn. Figs. 1874, 2074, 2075, 2078. Plant hairy up to the sepals, erect, \(\frac{3}{4}-3\) ft. high, often branched; radical lvs. on long, slender petioles; others with shorter petioles sheathing the stem or nearly sessile; lvs. 3-parted nearly to the base, the divisions ovoid-elliptic, 2-3-lobed and cuneately toothed or cut; bracts linear, lobed or entire; fls., yellow, 9-12 lines across, several, or rather short peduncles; sepals hairy beneath, ovate, shorter than the petals; petals 5, glabrous, obvolute, oblong, bearing a prominent scale at base; akenes compressed, coriaceous on margins; style very short; head globose. May–Sept. Newfoundland, Canada, eastern states. Said to be naturalized from Europe. — Var. *flore-pleno*, Hert., is more common in cult. The best forms are deep, glossy, golden yellow and very double. Called BACHELOR'S BUTTONS. B. M. 215.

12. *aconitifolius*, Linn. Plant pubescent, \(\frac{3}{4}-3\) ft. high, branched; lvs. palmately 3-5-parted, parts cut-toothed, upper ones sessile and with oblong to linear-saccate lobes; fls. white, several on a stem; sepals flat, pubescent; petals oblong, cuneate to orbicular. May, June. Mountains of middle Europe. — Var. *flore-pleno*, Hert. (var. *plenus*), called WHITE BACHELOR'S BUTTON and FAIR MAIDS OF FRANCE, has very ornamental, double, white, gobosse flowers. Gr. 45, p. 29, and 48, p. 366. Var. *luteus-plenus*, Hert. Fls. much doubled but of a golden yellow color. The type and varieties are suited to borders and half wild places.


*n. anemonoides*, Zahl. 6 in.: fls. white or tinged rose. Austria. Gr. 22:354. — *R. aquatilis*, Linn., sometimes called Lodowert, Ram's Foot, etc., is an interesting aquatic plant common in temperate regions, the floating lvs. often broad and 3-lobed, while the submerged lvs. are cut up into numerous thread-like segments. — *R. bulbifera*, Linn., is a yellow-flowered species offered in single and double forms by Dutch bulb dealers. Mediterranean region. — *R. cardinaliflorus*, Hook., offered in Colo., in 1900, is considered by Gray as *R. affinis*, var. validus. It is an American species pictured in B.M. 2990 with yellow fls. 1/4 in. across.—*R. flaveolus*, Mühl. Height 1 ft. June. N. Am. Mn. 2:1.—*R. ficaria*, Linn., called Lesser Celandine or Plieowert in England, is a native of Europe and the Caucasus region. It has yellow fls. about 1 in. across. A double form is procurable from Dutch bulb dealers.—*R. larvatus*, Linn., is a European species of which a double form is advertised by Krellage, of Haaren, Holland.—*R. Loddiges*, Hook., the New Zealand water lily, grows 2-4 ft. high, has peltate lvs. and waxy white fls. 4 in. across, borne in many-flowered panicles. In Europe it is considered a cool greenhouse plant. It is a gorgeous species and ought to succeed somewhere in North America. G. C. 15:724; 23:371.—*R. parnasifolius*, Linn., is a white-flowered European mountain plant in fls. high, procurable from Dutch bulb dealers. J. H. H. 111:30-31. L. B. 224, p. 326. — *R. pedatus*, Waldst. & Kit., a native of the Hungarian Alps, has yellow fls. nearly an inch across.—*R. pulchellus*, Linn., a native of the higher Alps, has yellow fls.; petals 8-10: claw orange, blotched or marbled yellow. Dutch dealers.—*R. septentrionalis*, Poir., is advertized. It is a native plant allied to *R. repens*.—*R. spinosus*, Desf., is figured in B.M. 455, with showy 5-petalled yellow fls. fully 2 in. across. It is an Algerian species but it is said to be perfectly hardy in England and of easy culture in any good garden soil.—*R. superbusissimus*, Hort., is used in some catalogues for the double French Ranunculus, known also as *R. Asiaticus*, var. superbusissimus.—*R. viridiflorus*, Hort. Van Tuhergen, is a scarlet and green-flowered variety of the Turanian class of *R. Asiaticus*.

K. C. Davis.

RAPE (Brassica Napus), Fig. 2079. In recent years this has become an important forage plant. The name Rape includes several varieties which are grown for two purposes: (1) for seed from which oil is expressed; (2) for the purpose of furnishing animals with succulent feed during late summer and autumn, when pastures become bare. Varieties used for the latter purpose usually do not produce seed in this climate the same season, though they are usually classed with annuals. Dwarf Essex is an example of the kind used for soilling (green feeding) purposes and is a good winter pasture for the fruit grower as a cover-crop. The seed germinates readily, will often grow where a clover catch is impossible, and furnishes excellent sheep pasturage late in the season. When grown strictly as a soilling plant the tops are cut and hauled to the feed-fot or stable. Dwarf Essex Rape much resembles a rutabaga turnip at first. It is like a rutabaga with an exaggerated leafy top and without a swollen fleshy root. Rape is a cool weather plant and may be grown in almost any part of the United States by sowing it at the proper time. As a cover-crop in the orchard in the East it may be sown as late as September 15 with good results. It is an excellent pioneer plant in the work of renewing humus in worn-out lands. In the Middle West, where shade is needed, Rape is used as a nurse plant for clover when the latter is sown in orchards in midsummer. Turnips may be used for the same purpose.

John Craig.

RAPHANUS (classical name, from the Greek). Cresser, Radish. Charlock. Annual biennial and biennials. All are common garden herbs, of about 6 species in Europe and temperate Asia, of which one, *R. sativus*, is the Radish (which see). They bear small but rather showy slender-pedicellated flowers in rose-red or white, or in some species yellow, in open terminal racemes. Leaves various and variable, the radical and sometimes the cauline lvs. purplish, variegated. Stems 6, free. Sepals erect, the lateral ones somewhat saccate or pouch-like at base. Pod a
Plate XXXIII. Raspberries

Center, commercial Raspberry field in New York; top left, *Rubus strigosus*, the Wild Red Raspberry; top right, *Rubus occidentalis*, the Wild Black Raspberry; lower left, *Rubus occidentalis*, improved, of same relative size as the picture of the wild; lower center, *Rubus neglectus*, hybrid of the Red and Black
RAPHANUS

long cylindrical, fleshy or soft-corky, silique, with spongy tissue between the globose seeds, indehiscent. The genus is divided into two natural groups, one (Raphanus) with the pod longitudinally grooved and contracted between the seeds, the other (Raphanus proper) with the pod not grooved nor prominently contracted. To the former group belongs R. Raphanistrum, Linn., the colored or White Charlock (sometimes, but erroneously, known as Rape). It is an Old World annual weed, now naturalized in fields and waste places in the easternmost states. It is an erect, sparingly hairy, herb, with slender root and radish-like lvs., growing 2-3 ft. high; fls. rather showy, yellowish, turning white or purplish; silique 1-3 in. long, few-seeded, with a long beak. It is from this species that Carrière produced Radishes by means of plant-breding (see Erophyt.). To the latter section belongs R. sativus, Linn., the Radish, generally considered to be native to Europe and Asia, but unknown in an aboriginal wild state. It is usually an annual, although commonly spoken of as biennial, because the roots can be kept over winter and planted the following spring. The winter Radishes are truly biennial in northern climates. Radish has plump, lillac or nearly white fls., and short, thick, spongy, taper-pointed pods. Sometimes it runs wild in waste places, and then bears a long, hard tap-root like that of R. Raphanistrum. The Radish is extensively cultivated for its thick roots, which have been developed into various shapes and colors. The Chinese types of Radish that have a hard root little more than 1 in. in diam., and sometimes becoming nearly 1 ft. long. Some forms are scarcely distinguishable from short turnips. The Madras Radish (India) is grown for its soft, large pods, which are eaten raw or in pickles. The Rat-tailed or Serpent Radish, var. caudatus (R. caudatus, Linn.), has enormously long pods (see Fig. 2066), which are eaten either pickled, or raw as Radish roots. Frequently the pods are 1 ft. long. The root is slender and hard. This is a cultural variety, coming true from seed.

L. H. B.

RAPHIA. See Raffia.

RAPHIDOPHORA. See Rhaphidophora.

RAPHIOLEPSIS (Greek, raphe, needle; and lepis, scale; referring to the subulate bracts). One species, Raphiopelis Rosaceae. Ornamental evergreen shrubs, with alternate or obscurely whorled, usually serrate lvs., white or slightly pinkish fls. in terminal racemes or panicles and small peaberry-sized black fruits. None of the species are hardy north, but all are handsome broad-leaved evergreens for cultivation in the southern states and California. They will thrive in any good, well-drained soil, and if cultivated in pots, a compost of sand, loam and leaf mold or peat will suit them. Prop. by seeds or by cuttings of ripened wood under glass late in summer; also by layers, and sometimes grafted on hawthorn. Two species in southern Japan and China, allied to Sorojas and Photinia, but fls. in racemes or panicles, with deciduous calyx; stamens 13-20; styles 2-3, connate below: fr. small, bluish or purplish black, blanzy, with one globose seed.

JAPONICA, Sieb. & Zucc. (R. odava, Briot). Shrub, to 12 ft., with stout, upright branches: lvs. short-petiolated, broadly oval, the pod enclosed, growing the base, crenate-serrate, dark green and lustrous above, pale beneath, flaccose-tomentose when young, thick, ½-3 in. long; fls. white, ⅞ in. across, fragrant, in dense, corymbose panicles or racemes; petals obovate, obtuse; fr. to ½ in. across. May, June. Japan and adjacent islands. S. Z. 1:85. R. H. 1870, p. 318. Gn. 22. p. 43; 32, p. 30; 31, p. 158.—Var. integerrima, Hook. Lvs. entire or nearly so, to ¾ in. long. B.M. 5510.

INDICA, Lindl. (R. rubra, Lindl. Crataegus Indica, Lindl.). INDIAN HAWTHORN. Shrubs, to 5 ft., slender, spreading branches: lvs. obovate to oblanceolate, acute or acuminate, gradually narrowed at the base, serrate, glabrous or slightly pubescent when unfolding, 1½-2½ in. long; fls. white or pinkish, about ⅛ in. across, in glabrous or somewhat tomentose, rather loose panicles; sepals lanceolate, acute, usually red like the filaments; petals acute: fr. ¾-¾ in. across. May, June. S. China. B.M. 1726. B.R. 6:468; 17:1490.

A very variable species; several forms have been described as distinct species, as R. Phaeostemon, rubra and salicifolia, Lindl. The last named, which is var. salicifolia, Nichols., is the most ornamental: lvs. oblong-lanceolate, acuminate; panicles rather large and many-flowered; stamens white or purplish, shorter than sepals. B.R. 8:622. R. H. 1874:270. Gn. 9:26. R. rubra, advertised by the S. Calif. Acclim. Ass., is Pyracantha crenulata, which see. A hybrid between the two species is R. Delavayi, André, forming a compact shrub with rather large panicles of blushed fls. and the foliage intermediate between the two parents. R.H. 1900:698.

ALFRED REDDER.

RASPBERRY is a name applied to those brambles in which the fruit separates from the receptacle when ripe. The species are all hardy North American fruit-growing. Rubus Idrus, the European Raspberry, has been longest in cultivation and is least important now in this country. Though brought to America by our forefathers among their earliest fruits, and the parent of many varieties here produced, the species has never fully adapted itself to the American climate. Owing to this fact, the work of Brincklé and others in improving it, in the early part of the century, proved of little permanent value. The fruit is of superior quality and continues to ripen through a long period, but the plants are deficient in hardiness and productiveness. Rubus strigosus, the American red Raspberry, is very like its European congener. Though slightly inferior in quality of fruit, its greater hardiness and productiveness have sufficed to confine the commercial growing of red Raspberries in America almost wholly to this species. It has been under domestication only within the last half of the century. Cuthbert, the leading variety, is shown in Figs. 2980, 2981. Rubus occidentalis, the black Raspberry, is commercially the most important Raspberry in the United States at the present time. It lends itself readily to cultural methods, the plant is hardy and productive and the fruit is better able to meet the exigencies of market demands, though relished less by most persons, than that of the reds. The growing of black-caps in field culture for evaporating has added greatly to the importance of the species. This can be done where
RASPBERRY

conditions would not warrant the growing of fruit to be
sold fresh. Hybrids of *R. strigosus* and *R. occiden-
talis*—known as *R. neglectus*—have given the purple-
cane class, of which Shafter (Fig. 2082) is a leading ex-
ample. For further notes on species of Raspberry, see
*Rubus*.

Raspberries are extensively grown in the northeastern
states. They thrive best in deep, moist soil. The lighter
loams are preferable for reds and the heavier loams for
blacks. The prime essential is that the land shall be
able to withstand drought well; but it must not be over-
water. Much may be done to improve the drought-resist-
ing quality of soils. If the subsoil is hard and impervi-
os it may be improved by underdraining or subsoiling.
This will provide a deeper reservoir for the storage of
moisture. Still more important is the proportion of
vegetable matter. A soil rich in humus admits water more
readily and in larger quantities, retains it longer

![Box of Cubbert Raspberries (X 1/2).]

and therefore resists drought better than one that is de-
ficient in humus. Humus may be increased by the ap-
lication of stable manure and by plowing under green
crops, but the process must be gradual. Undecayed
vegetable matter is not humus, and its addition in
large quantities may augment the difficulty which the
increase in humus is designed to correct. Thorough
soil preparation must therefore begin several years pre-
vious to planting, if the land has been improperly
handled therebefore. Other important offices of humus
are the holding of nitrogen to prevent its loss, and
the unlocking of mineral elements from the soil. The well-
known fact that brambles thrive so well in virgin soil,
is, no doubt, largely due to the abundance of humus
which such soil contains.

Stable manure is permissible as a fertilizer, except
for red Raspberries when growing on moist, rich soil, in
which case it forces growth too much. Leguminous
crops may furnish all the nitrogen needed. Floats,
ground bone or basic slag will supply phosphoric acid,
and potash may be obtained from wood ashes or muriate
of potash. Upon the soil of the Rhode Island Experi-
ment Station, which is a light sandy loam with gravelly
subsoil, the addition of nitrogen does not increase the
yield, although the soil is not naturally fertile and ni-
trogen has been applied annually for a series of years.
Other crops have been upon the land until recently.
Even plots from which mineral elements have also been
omitted do not fall far behind those which have been
liberally dressed with the three essential fertilizing el-
ments for a series of years, judging from the first crop
only. No one can tell the grower how to fertilize his
plants; the question must be settled upon his own farm.
Cover-crops have not yet been extensively and success-
fully used. They are more likely to receive more attention. Where crimson clover
will thrive it is well adapted to the purpose, although
somewhat difficult to uproot in spring.

Plants may be set in fall or spring, but spring is to
be preferred for black caps. Plants from young plantations are preferable, since they possess
greater vigor and are less likely to carry disease. The
vigor of the parent-plant, while generally dis-
regarded, may be a determining factor in the resis-
tance of the offspring. Black-capped plants are obtained by
burying the tips of the growing canes, late in summer,
when they begin to thicken and throw out roots. When
thoroughly rooted, the tips are severed (Fig. 2083) and
are marketed.

Thorough tillage should be given till midsummer,
when a cover-crop should be sown. In especially dry
climes, as upon the Plains, tillage should be continued throughout the season. Plow-
ing between the rows in spring is undesirable and is unnecessary if tillage has been
adequate. With reds some form of cultivator with square-pointed teeth
or cutting blades is advantageous in de-
stroying suckers.

Tender varieties may be protected in winter
by laying them down and covering them
with earth. To do this lay the plant at
one side of the root and bend it in
that direction. The plants are usually bent in
the direction of the row so that the tops
will lap over the crowns.

The young shoots of black-caps should be
nipped off as soon as they reach a height of eighteen
to twenty-four inches, that a well-branched self-supporting
bush may be obtained. In spring following, the branches
should be shortened to one to two feet.

Pruning is the fruit-thinning process of the year
and should be done with judgment. The poorer
the soil or the less able it is to withstand drought, and the less
invasive the culture, the more severe should the prun-
ing be. Anthracnose may give less trouble, and the
plantation will last longer, without summer pinching,
but the yield will be much lower. With reds summer
pinching is undesirable after the year of planting,
unless with exceptionally vigorous varieties on strong
soil. The older canes are best removed as soon as fruit-
ing is over. They are more easily cut then and their
removal gives a good opportunity for cross-cultivation
(in case the check row system is used) and a thorough
cleaning-up before the season's tillage is abandoned.
Early removal may also help to check the spread of
certain enemies. Plantations may be kept in bearing
many years if desired, but it is seldom profitable to
so do.

The fruit demands care in picking and in handling
thereafter. It should never be picked when wet. Red
raspberries are especially difficult to ship and are
usually marketed as frozen or frozen cubes.
Reds yield less than blacks and usually sell at a higher
price.

Enemies are numerous. Crown- and cane-borers must be
controlled by thorough and destroying them in
spring. Some rusts sometimes sweep away plantations
of black-caps. A plant once attacked can never be cured
and should be rooted out and burned at once. Anthrac-
nose is especially troublesome. Only plants free from
it should be set, and the plantation should be aban-
doned before it becomes badly diseased. Spraying will reduce it but is not entirely satisfactory. Crown-gall, due to the growth of a specific organism of a very low order, belonging to the slime-molds, is often serious, particularly with reds. Neither affected plants nor

apparently healthy ones from a diseased lot should be planted, as the trouble is readily communicated to other plants and trees.

FRED W. CARD.

RAT-TAIL CACTUS. Cereus flagelliformis.

RATTAN. See Calamus.

RATTLE-BOX. The species of Crotonaria; also Ludwigia alternifolia.

RATTLE-SNAKE WEED. See Hieracium venosum.

RATTLE-SNAKE PLANTAIN. Goodyera.

RATTLE-SNAKE ROOT. Prenanthes.

RAUWÖLFIA (Leonhart Rauwolf, physician of Augsburg, published a book in 1583 on his travels in the orient; often erroneously stated to be of the eighteenth century), Apocynaceae. About 40 species of tropical trees and shrubs with lvs. in whors of 3 or 4, rarely opposite, and small lvs. often borne in dichotomous or trichotomous clusters. Calyx 5-cut or 5-parted; lobes obtuse or acute; corolla funnel-shaped; tube cylindrical, dilated at the insertion of the stamens, usually constricted at the throat, devoid of scales; lobes 5; disk cup-shaped or ring-shaped; carpels of the ovary 2, distinct or considerably grown together; style short or long; ovules in each carpel 2; drupes 2, distinct or connate into a 2-stoned fruit, the stones 2-grooved or 2-cut; stones 1-seeded; seeds ovate; albumen fleshy, smooth, not ruminate, rarely wrinkled. These plants are little known horticulturally. The only species in the American trade, apparently, is R. Chinensis, Hort. Several years ago the undersigned received from the Botanical Garden at Hong Kong a few seeds of this small evergreen shrub. The seeds germinated well and the plants grew rapidly, attaining a height of about a foot in a year. During the summer of the second year the rather bushy plants flowered well and bore a crop of shining red berries which were very conspicuous throughout the winter. When well grown and bushy the plant is quite ornamental, its habit being dense and the color of its leaves dark green. The flowers are white, and are borne in dense trusses at the extremity of each shoot. Though an individual flower does not make much show, the plant is very ornamental when covered with masses of blossoms. The plant needs a rich, light soil, much water when in full growth and protection against the fierce rays of the sun. Every spring the old soil should be shaken out and replaced by a rich compost. In the writer's garden at Gotha, Orange county, Florida, the Rauwolfa flourishes with great luxuriance in the shade of other shrubs in rather moist spots. Although it is easily winter-killed, it sprouts readily in spring from the roots. When covered with numerous trusses of shining red berries the plant is an object of beauty.

H. NEHRING.

RAVENALA (the name of the plant in Madagascar), Selturninaeacea. A genus of 2 species, 1 from Brazil and Guiana and I from Madagascar. Musa-like plants becoming 20-30 ft. high, with a palm-like trunk; lvs. exceedingly large, crowded in 2 ranks, thus forming a fan-shaped head of foliage; pediades long, with conca bases scarcely sheathed; sepals or peduncles in the upper axis longer or shorter than the leaves; bracts spine-like, many, boat-shaped, acuminate; fls. many, large, in a spathe or bract; petals long-exserted; sepals free; fr. a 3-valved capsule.

A. Lvs. shorter than pediades.

Madagascarriénsis, J. F. Gmel. TRAVELERS' TREE, so called from the clear watery sap found in the large box-like cells of the leaf-stalks and which affords a refreshing drink. Fig. 2081. Lvs. often 30 ft. high, musa-like, very large, fibrous; fls. white, in spathes about 7 in. long. G. 5:153. V. 23, p. 136. F. S. 21:2254. A.F. 12:535. R. H. 1890, p. 152. G.C. III. 2:693. A.G.

RAVENALA 1503
RAVENALA

29.876. —Cult. in Fla. and S. Calif.; also rarely under glass in the northern states.

AA. _Lvs. as long as the petals._

Guyanensis, Stend. Becoming 15 ft. high; lvs. oval, entire, glossy green, arching; whites, spathe 1-1½ ft. long. Offered 1893 in S. Fla.

F. W. BARCLAY.

RAVENA. See Rancea.

RAVENIA (name not explained). Rutaceae. A genus of 2 species of tender shrubs from Cuba and Brazil: lvs. opposite, 1-3-foliolate; lfts. lanceolate, entire; fls. red or white, borne on rather long axillary peduncles; sepals unequal, the 2 outer being somewhat foliaceous; corolla-tube straight, rather long; the limb nearly regular.

spectabilis. Engl. (_Lemonia spectabilis, Lindl._). Tender shrub; lfts. 3: fls. purplish red, about 1 inch across, solitary or in few-flowered clusters on axillary peduncles as long as the lvs. Cuba. B.R. 26:99. R.H. 1844:23.—The plant offered in Fla. as _Lemonia spectabilis_ apparently belongs to some other genus.

F. W. BARCLAY.

RAY GRASS. Lolium perenne.

REANA. Consult Teosinte.


REED. See Arundo and Bamboo. Reed Canary Grass is Phalaris arundinacea. Reed Mace or Cat-tail is Typha.

REED, INDIAN. See Canna.

REEVESIA (John Reeves, English botanist, who resided for a time at Canton). Sterculiaceae. A genus of 3 species of trees from tropical Asia, with coriaceous, entire leaves and terminal corymbose panicles of white fls. _Calliandra_ club-shaped or campionate, irregularly 3-5-lobed; petals 5, oblong, furnished with a claw; staminal column long, adnate to the gynophore; anthers 15, sessile, in a globular head; ovary 5-loculed, usually 10-seeded; capsule woody; seeds winged.

thryseoides, Lindl. A small, graceful tree: lvs. evergreen, 2-6 in. long, petioled, ovate-lanceolate to lanceolate, entire, rounded at base; fls. white, in terminal, sessile corymbs shorter than the lvs.; calliandra 3 lines long; petals somewhat longer; capsule oblong-beard-shaped, 1 in. long, 5-angled.


F. W. BARCLAY.

REINECKIA (J. Reineck, a German gardener). Liliaceae. A genus of a single species from China and Java, a tender perennial herb, with attractive foliage in tufts 1-1½ ft. high from a thick, creeping rootstock. Lvs. rather long, channelled; sepal leaves; fls. sessile, in a loose spike; perianth-tube cylindrical; lories recurved, spreading; ovary 3-5-loculed, with a few seeds to each cell; berry globular, usually with one seed to each cell. The following is procurable from Dutch bulb-growers.

carnéa, Kunth. Fls. dull flesh or pink; bracts rather large, flushed red; fr. red, 2-4 lines in diam. B.M. 759. —Var. variegata is also offered. I.H. 9:323.

REIN ORCHIS. Habenaria.

REINWAERTIA (Kaspar Georg Karl Reinwardt, 1773-1822, scientist of Leyden; traveled in East Indies 1815-1822). Liliaceae. A genus of two species of subshrubs from India with handsome yellow, 5-petaled fls. borne in midwinter. They are old favorites in conservatories. They require warmhouse treatment. The genus is closely allied to the flax (Linum), and _Reinwardtia trigyna_ is known to this day as _Linum trigynum_ by the gardeners, who usually accent trigyna on the second syllable instead of the first. Reinwardtia is distinguished from Linum by the yellow fls., 3-4 styles and unequal or deficient glands; Linum has mostly blue, rosy or white fls., 5 styles, and equal glands. Other generic characters: sepals 5; petals 5, contorted, fugacious; stamens 5, alternating with as many staminodes; glands 2-3, adnate to the staminal ring; ovary 3-5-loculed.

Reinwardtias are showy subshrubs about a foot high with bright yellow flowers. They are useful for the decoration of the conservatory or the winter garden, to a season when yellow is scarce. To have presentable plants, it is necessary to give them a good deal of attention. It is difficult sometimes to get suitable cuttings; the strong growths which start away from the base when the plants are cut down make the best plants. Top-shoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for a season may be planted out in the early summer, and these will make good plants and furnish cuttings. They will have to be topped frequently and carefully lifted. Young stock is better kept in pots, as the plants do not lift well. Sunshine is essential during the winter season to get the best development of Reinwardtias. They thrive best in a temperature of 55-60°.

A. _Lvs. entire; styles 3._

trigyna, Planch. Fig. 2085. Lvs. elliptic-obovate, entire or minutely toothed, tip rounded or subacute. B.M. 1100. Gn. 29, p. 279. —Grows 2-3 ft. high in the wild.

AA. _Lvs. toothed; styles 4 or 5._


T. D. HATFIELD and W. M.

2085. Reinwardtia trigyna (X ½).

RENANTHERA (named from the reniform anther). Orchidaceae. Tall, climbing epiphytes, with branched stems sometimes 12-14 ft. high; lvs. distichous on the stem; fls. in large, drooping racemes or panicles; sepals and petals spreading, similar or the lateral sepals often larger and of a different color; labellum small, movable, joined to the column, spurred or spurless, often with small, erect, lateral lobes. Culture is similar to that of _Eridae and Vanda._

coccinea, Lour. Stems 8-10 ft. high, branched, climbing by means of white fleshy roots; lvs. in 2 rows, oblong, notched at the end, 4-5 in. long; fls. open, 2-3 in. across, in loose, branching racemes 2-3 ft. long, very brilliant; petals and dorsal sepal linear-spatulate, deep red, blotched with orange; lateral sepals larger, oblong, broader toward the apex, undulate, deep crimson, with pale transverse lines; column ¼ in. long; Autograph. Cochín China. B.M. 2997, 2998. B.R. 14:1131. P. M. 4:49. F.S. 7, p. 163. G.C. 1845:491.—Does not flower readily in cultivation, but is very showy.
Störich, Reichh. f. Stem slender, climbing. 10-12 ft. high; Ivs. alternate, oblong to linear-oblong; pedicels about 1 ft. long and nearly as broad: fls. 2½–3 in. long; petals and dorsal sepals erect, linear-spatulate, orange-red, mottled with crimson; lateral sepals pendulous, obvolute-spatulate, undulate, crimson with large blood-red blotches; labelium very small. B.M. 7357. Gn. 53, p. 119. G.M. 39:659.


HENRICH HASSELBRING.

RESÉDA (from the Latin to calm; said to allude to supposed sedative properties). Resédaceae. Mignonette. The family Resedaceae includes between 60 and 70 species of small, not showy plants, mostly herbs, widely distributed in warm-temperate regions. These species fall into 6 genera, of which only Reseda is cultivated to any extent. This genus contains 33 species (Müller, DC. Prodr. 16, pt. 2), most of which are native to the Mediterranean basin, Arabia and Persia. They are herbs (sometimes partially woody at the base) with alternate, simple or compound Ivs., and terminal spikes of inconspicuous perfect flowers. The flowers have 4–7 small greenish toothed or cleft petals and 8–40 small stamens; pistil 1, ripening into a 3–6-horned capsule that opens at the top at maturity (Fig. 2087), and contains several to many seeds. Only one species, the common Mignonette (R. odorata), is generally known, but two or three other species are sometimes grown. Two other species are occasional weeds in the East,—R. nutelloides, Lindl., the Dywel Weed, 1–2 ft. tall, with entire Ivs., or 4 or 5 greenish petals of which the lowest one is entire; and R. ëlecta, Linn., with pinnatifid Ivs. and petals usually 6.

A. Ivs. entire or only notched.

odorata, Linn. Common Mignonette. Figs. 1401, Vol. II, 2857. Branching annual herb, at first upright but becoming cespitose, 1–3 ft. tall; Ivs. narrowly linear, entire or very minutely serrate, usually less than 1 ft. tall, with many spreading stems, Ivs. narrow-linear, entire, or 2–toothed near the base; petals 5 or 6, the upper ones 3–lobed; stamens about 14. Pyrenees.—Recommended for dry places, as a border plant. See Mignonette.

glacera, Linn. Glabrous and somewhat glaucous perennial, less than 1 ft. tall, with many spreading stems: Ivs. narrow-linear, entire, or 2–toothed near the base; petals 5 or 6, the upper ones 3–lobed; stamens about 14. Pyrenees.—Recommended for dry places, as a border plant. See p. 737.

AA. Ivs. usually prominently lobed or pinnatifid.

Alba, Linn. (R. suffruticosa, Loef.). White Upright Mignonette. Fig. 2088. Straight-growing erect glabrous annual or biennial plant, 1–3 ft. tall, weedy: Ivs. numerous, long-linear, closely and irregularly pinnatifid, the segments usually linear and sometimes toothed; fls. white, in a very long, slender spike. S. Eu. G.C. III. 20:43.—A good plant for growing as an ornamental sub-

RESEDA 1505

Notes on Reseda odorata.—In the improvement of the Mignonette less attention has been paid to the individual flower than to the spike as a whole. What the florist has desired is a large spike as possible. The color and form of the flower and habit of the plant were secondary in importance when compared to size and abundance of spikes. Under such circumstances we can expect comparatively little change to have taken place in the individual flower. In fact, we find that all the floral parts, with the exception of the color and size of the anthers, have changed little. In the double-flowering varieties, the character of the flower has been changed by the replacement of the stamens with petal-like organs. In some cases traces of the anthers still remain. These double varieties are usually characterized by the smallness of their spikes, the pungency of their odor (being in some cases even unpleasant), and the tendency of the flowers to produce monstrosities. In the more improved varieties, and especially in those plants that have been highly fed, the size of the flowers is sometimes considerably larger than in the average specimen. The average size of the individual flowers is undoubtedly larger in improved varieties than in the unimproved varieties; this increase in size is no peculiarity of the petals alone, but is shared by all parts of the plant alike.

The peculiar and characteristic fragrance for which the Mignonette is chiefly cultivated has undergone marked changes during the improvement. It is stated by some writers that the odor of the old garden form was sweeter than that of the more improved forms. This seems to be true. All questions of odor, however, must be left to the discrimination of the individual observer. The old garden form has a sweet, pleasing odor, which is not so strong as that of the improved varieties but has a more penetrating and yet a light and agreeable quality. It reminds one somewhat of the wild sweet-scented blue violets. Philip Miller compared it to the odor of ripe raspberries. The odor of such improved varieties as Allen Defiance, White Diamond, Urania, etc., is heavy, strong and less delicate than...
that of the old forms. It reminds one, when the flowers are fresh, more of the fragrance of ripe nectarines or apricots than of violets. It is only after the spikes have been picked and begin to dry that the pleasant smell is noticeable. It is sweet violet-like scent. The modern improved varieties are likely to have very little scent when forced or fed high, and in cases of excessive forcing they become nearly or quite scentless. But if you cut them when young or on sunny days after the moisture has dried up, the powerful odor becomes very apparent.

Old forms seem to have the power of volatilizing the typical oils freely under normal conditions, while the more highly bred only attain this power, to its fullest extent, when the root pressure is reduced.

Gardners frequently assert that Mignonette if grown in given kinds of soil will be less fragrant than when grown in certain other soils. Thus Henderson, in his "Handbook of Plants," states that "Mignonette should always be grown in light, sandy soils, if possible; as when grown in a rich loam it loses its fragrance." To test this matter, a number of plants of the same variety (Improved Victoria) were grown in soils varying in proportion of sand and clay and amount of manure as follows: Soil 1, 3 parts sand, ½ loam, ½ dungh; Mortar; Soil 2, 2 parts sand, 1 loam, ½ dungh; Soil 3, 1 sand, 2 loam, 1 clay; Mold; Soil 4, 1 sand, 2 loam, 1 clay; Mortar, 1 dungh; Soil 5, 2 loam, 1 mortar, ½ dungh; Soil 6, Clay loam and some dissolved bone, NaNO₃ and charcoal; Soil 7, Loam, clay and K₂SO₄ (NH₄)₂SO₄, P₂O₅ and charcoal. The plants varied considerably in the rapidity and amount of their growth. The difference in fragrance was difficult to estimate on account of the difference in the state of maturity of the various spikes. By making independent estimates on different days as long as all the plants were in bloom and trying to strike an average, the conclusion was reached that the plants grown in the lighter soils had a stronger and more pronounced fragrance than those grown in the heavy clay soils. The amount of fragrance given by wilting flowers on the heavy clay soils is very perceptibly less than that given off by flowers from the lighter soils. In plants grown in a heavy clay loam richly manured, the fragrance was hardly perceptible and very faint even on wilting. The influence of the different proportions of manure and soil used was not measurable, as the difference, if any, in the strength of the odor given off by the different spikes was too slight to measure.

Heavy manuring seems to have a deleterious effect on the fragrance of Mignonette. Two plots of the same number of plants growing in a solid bed were taken. One was manured weekly with liquid manure; the other was left unmanured. The manured plants made more growth and produced less but larger flowers than the unmanured plants. As long as the manuring was continued, the unmanured plot was the most fragrant. After discontinuing manuring for two weeks, the difference became imperceptible and ultimately the plot which had been manured became more fragrant than the unmanured plot. The plants in the unmanured plot were first to bloom.

It has been asserted that Mignonette is most fragrant when grown at a low temperature, which loves a cool atmosphere. In order to test the effect of temperature on the fragrance of Mignonette, plants of the same varieties were grown in houses whose mean temperature was 50° F., 65° F., and 75° F. The plants had the same soil. Those in the house whose temperature was 50° were grown in flats and benches, while those in the other two houses were grown in 5-inch pots. All were cut November 16. Those in house of 75° were cut two days ahead of those in house of 65° and three days ahead of house of 50°. In relative amounts of growth the plants stood as follows (May 15): Hot house, first; cold house, second; moderate, third. But in fragrance there were the following: Medium house, first; hot, second; cold, third, until the outside temperature became high enough to raise the temperature of the cool house to that of the medium house. In this last experiment the cool house began to equal if not surpass those of the medium house in fragrance. At certain stages of the spike-development, the fragrance seemed stronger in the hot house than in the medium house, but did not last nearly as long as in the cool house. The house surpassed both in lasting power of the fragrance, due to the spike lasting longer and not volatilizing its etherial oils so fast. The fact that the plants grown in the cool house were less fragrant at first than those grown in the warmer houses brought up the question whether this difference in fragrance was permanent or temporary and dependent on the temperature in which the plants were grown. Plants were taken from the cool house to the temperate (65°) house and left there for some time, with the result that after a time no difference in the fragrance between the cool house plants and those grown in the medium house could be detected, although there was a difference at first. Plants taken from the temperate house into the cool house, on the other hand, apparently did not lose their fragrance until the old spikes had been replaced by new one. It would appear that the influence of temperature is not permanent either as far as the flowers that came immediately under the temperature influence is concerned or those flowers that became evident at a later date. But the effect of temperature on the fragrance is of longer duration in the case of flowers taken from a warm house into a cool house than from a cool house into a warm house. The difference in odor between plants grown in a warm and a cool house is probably due to the more rapid volatilization of the etherial oils in a warm temperature. This volatilization, when once set up, is probably less easily checked or accelerated above a normal rate, whatever that rate may be; hence the hardness of the plants to react with the cooler temperature.

R. L. JENKINNS.

RESTREPIA (Joseph Emanuel Restrepo), a student of natural history in the tropics. Orchidaceae. A genus of very interesting little plants, allied to Masdevallia and not unlike that genus in habit and appearance. The stems are tufted on creeping rhizomes, each bearing a single leaf and the bud below. Petals, sepals, and flower-stems appear from the axil of the leaves. They are perennial, producing flowers for several years in succession. Dorsal sepals free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, held only at the apex by the petals like the dorsal sepal, but smaller; labelllum oblong or ovate, often with 2 small teeth near the base. About 12 species, few of which are cultivated for their curious flowers. They are easily grown at a temperature of from 50° to 55°. They thrive well planted in a mixture of peat and sphagnum in baskets, which are usually suspended near the glass. They have no definite resting period, but do not require a large quantity of water in winter as during their active growth. Pot moderately firm, and rest in a cool house.

antennifera, H.B.K. Stems slender, clustered, 4-6 in. high, clothed with fibrous-scaled, and bearing one (rarely more) ovate cordate pectidated leaf: peduncle from the axil of the leaf, slender, 1-fl. dorsal sepal 1½ in. long, lanceolate-acute, with the upper keeled, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antennula-like, purplish, 3 in length. From La Colonia, Venezuela. B.M. 6288. 1 H. 16:601. A.F. 6:631.
Dayana, Reichh. f. A small plant growing in dense tufts: lvs. roundish, acute, cordate; dorsal sepal and petals liliform, clavate, shining, violet-brown; lower sepals united into a broad, bilobed blade, yellow and brown. Costa Rica.

elegans, Karst. Tufted, epiphytic, 2-3 in. high: lvs. 1-3/2 in. long, elliptic; peduncles usually in pairs; fls. 1-1/2 in. long; dorsal sepal erect, lanceolate, white, streaked purple, with a tail as long as itself, which is clubbed at the tip and yellow; lateral sepals connate into an oblong, emarginate, concave blade, yellow, spotted purple; petals like the dorsal sepal, but spreading and only half the size; lip half the size of the connate lateral sepals and of the same color but edged with red. Venezuela. B.M. 5660. F.S. 7:743.

HENRICH HASSELBERG.

RESURRECTION PLANTS are great curiosities, because they seem to "come to life" after being apparently dead. The commonest ones, shown in Figs. 2099-92, are members of the mustard family and the club moss family. Others are Asteraeas, a composite, and Mesembryanthemum, of the fig-marginal family. These are described below.

1. The Rose of Jericho is properly Anana	ica Hieracanthica, Linn., which name means "Resurrection Plant from Jericho." The plant is a native of the sandy deserts from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall off and the branches become woody and roll up into a ball, reminding one of wicker-work or lattice. Inside the ball are the seeds, or, in botanical language, the fruits, which are borne in a protected position near the tips of the innoted branches. The plants are then uprooted by the winds and are blown about on the deserts. These balls were thought by many to be the rolling thing before the whirlwind "mentioned in Isaiah, and were brought to Europe by the crusaders. The shape of these balls might be fancifully compared to that of an unopened rose. When the winter rains descend or when the balls are blown into the Mediterranean the branches at once open back and stretch out straight, the fruits open, and the seeds germinate very quickly, "often in the fruit," according to Warming. The dead plants do not, of course, "come to life," but they retain their hygroscopic properties for many years. They may be dried and wetted alternately many times. The vitality of the seed is doubtless considerable, but it is a question whether there is any good scientific record on this point. The balls are often sold by fakirs and dealers in novelties and attempts are often made to grow the plants at home.

Botanically, Anastatica is highly distinct by reason of its short and broad fruit or siliqua, which has 2 carpel-like appendages at the top. The siliqua is divided by a transverse partition into 2 cells, each of which contains a seed. There is only one species. The genus belongs to the Arabis tribe of the Cruciferae, but is exceptional in not having a long, slender siliqua. The growing plant has obvate lvs., the lower ones entire, upper ones toothed, and the fls. are small, white and borne in spikes in midsummer. Excellent pictures of Resurrection Plants may be found in Kerner and Oliver's "Natural History of Plants," together with reliable accounts of the behavior of the various kinds. See also B.M. 4400. G.C. 1872:1068. Gn. 4, p. 111. These plants have much folk-lore.

2. The Bird's-nest Moss, Selaginella lepidophylla, is a native of Mexico and reaches into western Texas. Many Selaginellas will curl up if allowed to dry, and several of the Mexican species do so in their native places during the dry season, but this species is said to make a tighter mass than any other. When placed in lukewarm water the fronts loosen and roll back into a flat position. The plant may become green and grow, and it is also said that it may be dried and revived an indefinite number of times. Selaginellas are beautiful moss-like plants. What appear to be the leaves are really the branches, and the true leaves are scale-like. See Gn. 17, p. 409. F. 1871, p. 141.

3. Asteriscus pygmaeus, a member of the composite family, is also called Rose of Jericho, has the same range as No. 1, and was also brought to Europe by the crusaders. The branches do not roll up, but the in-
plant could be grown in a window-garden. For his special purpose the writer has been accustomed to sow seeds in Feb. in 4-inch pots, using a light, sandy soil, in a house with a temp. of 60° F. As soon as the seedlings are large enough they are carefully planted in 4-inch pots, 3 plants to a pot. As to the vitality of the seed the writer can only say that the seeds of Cruciferæ, being not only, often retain their vitality for five years or more.

Selaginella lepidophylla is a perennial plant. It is rarely cultivated in greenhouses for ornament, like the evergreen kinds. It is chiefly cult. in botanic gardens or by fanciers of forms and selaginelas, as it is the most beautiful member of the genus. The writer planted a lot of it for four years, and once saw at one of the botanical gardens a plant which through long cultivation had developed a stem almost a foot high. It looked like a miniature tree-fern, except of course that the fronds were arranged in a dense rosette, which gave the fronds a flat rather than a pendulous appearance. Whether the plants received directly from Texas have a crop of spores on them is a question.

The spores do not discharge when the plants are wet. Many extravagant statements are made about the Bird's-nest Moss. The dried plants offered by the trade will turn green and grow even when they are too cold to have been kept dry too long. They would probably not grow if kept over more than one season. They cannot be dried again and again indefinitely.

If a plant has been grown in a pot for three or four years and is then dried off it will die. Most people who grow these plants as curiosities place them in a bowl of water with perhaps a little sand and a few pebbles. The water causes them to turn green and they will grow for a time. Then if taken out of the water they may be kept dry for a time and the process repeated, but each time the plant loses its lower or outer circles of fronds much faster than when new ones are made and at about the third time the plant is used up.

The writer has a fern which could just as truly be called a Resurrection Plant. The fern is Polygodium incarnatum. It is a native of the southern states, where it grows up the trunks of trees and over rocks and stones. At certain times it is dried up and disappeared, but as soon as moisture conditions are restored it looks as fresh as ever. The plants are growing on the branch of a house plant in a cool house and has been tested several times. It seems that Selaginella lepidophylla is a little outside the region in which Selaginellas are most at home and that it has learned to adapt itself to different conditions. In warm, dry countries there are ferns of various genera that dry up and then are resurrected quickly when wet weather comes.

Edward J. Canning.

RETAILING is the opposite of forcing, and consists in keeping plants in cold storage, thereby preventing them from growing during their natural season. Its object is to supplement natural methods and forcing in order to provide the same thing the year round. At present the Lilly-of-the-valley is the only plant of the first importance which is retarded in commercial establishments. There is sufficient demand for these flowers all the year round to justify the expense of cold storage. Lily-of-the-valley"pipe may be broken from cold storage and forced in bloom in three weeks. Plants that have been retarded need very little heat when they are allowed to grow; they are eager to start, and a temp. of 45° is sufficient. Liliums will bloom in 10-12 weeks from cold storage; Azalea mollis in 3-4 weeks; spireas in about 5 weeks. Scillas and lilacs have also been retarded with profit. Goldenrods has been kept in an ice-house all summer and flowered for Christmas with happy results. The art of retarding plants is making great progress at present, and with the growth of popular taste for flowers the list of retarded plants may be greatly extended in the future. See A. P. 16:664, 665 (1900).

RETIOSPORA. Often but not originally spelled Retinospora. A genus of conifers founded originally by Siebold and Zuccarini of Japan, and the two species of Chamaecyparis, chiefly distinguished from the American species by the resinous canals of the seeds (from Greek retin, resin, and spora, seed). Afterwards the name was used by the Chamaecyparis, and in botanical nomenclature the name is applied to a number of juvenile forms of Thuya and Chamaecyparis chiefly introduced from Japan. As these juvenile forms all resemble each other very much and do not do the typical forms to which they belong, it is not strange that they should have been considered to be distinct species and even to belong to a separate genus. Even botanists who recognized the true relation of these forms and went as far as to place one of them in the genus Junipers. With the exception of Retinospora ericoides, which L. Koch recognized as the juvenile form of Thuya ocealitatis, the origin of these juvenile forms remains doubtful. Beissner undertook to study them in Japan and Japan, but he has not published any results. He has studied the relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedling which in their primordial foliage, and he also published cases in which larger plants of these doubtful forms had been observed accidentally to develop branches with the foliage of the typical form. See also, cit. 1879, pp. 199 and 172, 1881, pp. 210 and 290, and 1885, p. 152.

There are 4 of these juvenile forms generally in cultivation, each of them with an intermediate form showing either one kind of foliage approaching that of the type or the form is intermediate between the two forms, it seems to be no doubt that all these forms have been secured by propagating branches of seedling plants. All seedlings of Chamaecyparis, Thuya and other genera of the Cupressaceae produce in their juvenile stage a kind of primordial foliage very different in appearance from that of the adult plants. The first leaves are always linear and spreading, passing gradually into acicular and at last scale-like leaves. In some plants, especially in those which have not sufficient nourishment, the primordial foliage is retained longer than usual and these have probably been selected for perpetuating the juvenile state, by means of cuttings. By continuing through two or three generations the foliations show which show the juvenile state most distinctly, these forms have become well-fixed varieties and even sometimes bear seeds without changing the foliage on the fruited seedlings. The young foliage of the typical form and only a few of the contain the primordial foliage somewhat longer than usual.

The juvenile forms very much resemble some species of Junipers in habit and foliage. They bear linear spreading leaves in pairs, changing in winter to a brown, reddish, violet or steel color, and do not show the regular frond-like branching of the typical forms. The leaves, however, are much softer and not sharply pointed as in Junipers. They are mostly marked with whitish or grayish green lines beneath, which is never the case in Junipers. Only Thuya orientalis, var. decussata and some intermediate forms, with acicular, alternate leaves, show whitish marks on the upper side of the leaves like Junipers.

Though these Retinospora-forms are described under the genera and species to which they belong, where also references to illustrations are cited, descriptions may be given here to afford a closer comparison with the similar and much confused forms. The two forms of foliage in the common red cedar are well shown in Fig. 1203, Vol. II. For other pictures of Retinospora-forms see Chamaecyparis and Junipers.

Chamaecyparis pisifera, var. squarrosa, Beissm. & Hochst. (Retinospora squarrosa, Sieb. & Zucc.,) Fig. 419. A dense, pyramidal or round-headed bush or sometimes small tree, with light bluish green foliage almost silvery white when young, usually coloring violet in
winter: tips of branchlets nodding: lvs. crowded, spreading, very soft, bluish green above, silvery white below. The most ornamental and graceful and the best known of these juvenile forms. The intermediate form var. plumosa, Beissn. & Hochst. (Retinispora plumosa), has sparse, subulate and suberect lvs. oval is much planted, especially in its golden variegated form. See Fig. 418, Vol. I.

Chamaecyparis sphaeroideas, var. ericoides, Beissn. & Hochst. (Retinispora ericoides, Zucc.). Fig. 2894. Dense stipe of stiff, pyramidal or almost columnar habit, with upright branches and bright green foliage, changing to violet-red or brownish red in winter: lvs. bright green above, with 2 bluish lines below. This form is very distinct with its stiff, columnar habit, but is less so in cultivation. The intermediate form var. Andelyensis, Carr. (Retinispora leptoflata, Hort.), shows also a stiff, pyramidal habit and bears chiefly small, suberect or almost scale-like lvs., and occasionally branchlets with ovate lvs. Fig. 2894.

Thuja occidentalis, var. ericoides, Beissn. & Hochst. (Retinispora ericoides, Hort. R. dubi, Carr.). Dense broadly pyramidal or round-headed bush, with upright branches and dull green foliage, changing to brownish green in winter; lvs. linear, soft, grayish green. The intermediate form, var. Ellwangeriana, Beissn. (Retinispora Ellwangeriana, Hort.), has usually two kinds of lvs., but the linear lvs. are smaller than those of the preceding form.

Thuja orientalis, var. decussata, Beissn. & Hochst. (Retinispora juniperoidea, Carr. R. decussata, Hort. R. squarrosa, Hort.). Fig. 2894. Dense, round-headed bush, with bluish green foliage changing to violet or steel color in winter: lvs. rather rigid, bluish green, spreading, concave and with a white line above. But rarely cult. and not quite hardy north. The intermediate form, var. Meldensis, Laws. (Retinispora Meldensis, Hort.), has mostly secundar suberect lvs. of the same color as in the preceding var. Andelyensis.

Of Chaumeyparis obtusa no juvenile form seems to be in cultivation, but it is highly probable that the recently introduced Juniperus Sonderi belongs here. In a list of Japanese conifers from Yokohama, the same form is called Chaumeyparis obtusa, var. ericoides. It is a dwarf and dense, globose bush, with bluish green spreading linear, obtuse leaves. M.D.G. 1906, 1:489. Chaumeyparis obtusa, var. leptoflata, Hort., is a form of sphaeroideas.

These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually become unattractive when older. They are readily prop. by cuttings. See also Chaumeyparis and Thuja.

R. decussata, Hort.—Thuja orientalis, var. decussata. —R. dubi, Carr.—Thuja occidentalis, var. ericoides. —R. Ellwangeriana, Hort.—Thuja occidentalis, var. Ellwangeriana. —R. ericoides, Zucc.—Chaumeyparis sphaeroideas, var. ericoides. —R. ericoides, Hort.—Thuja occidentalis, var. ericoides. —R. Kilioides, Carr.—Chaumeyparis obtusa, var. breviflora.—R. filifera, Stand.—Chaumeyparis pisifera, var. filifera.—R. juniperoidea, Carr.—Thuja orientalis, var. decussata.—R. leptoflata, Zucc.—Chaumeyparis pisifera, var. squarrosa.—R. leptoflata, Hort.—Chaumeyparis sphaeroideas, var. Andelyensis. —R. hypoploides, Gerd.—Chaumeyparis obtusa, var. hypoploides.—R. Meldensis, Carr.—Thuja orientalis, var. decussata.—R. sieb. & Zucc. —Chaumeyparis obtusa.—R. pisifera, Sieb. & Zucc.—Chaumeyparis pisifera.—R. rosea, Carr.—Thuja orientalis, var. decussata.—R. squarrosa, Sieb. & Zucc.—Chaumeyparis pisifera, var. squarrosa.—R. squarrosa, Hort.—Thuja orientalis, var. decussata.

ALFRED REIDEN

REYNOSI (Dr. Alvaro Reynoso, 1830-1888, Cuban agricultural chemist and inventor of a machine for in- creasing crops, a yacht. The popular species of tender shrubs or small trees, all native to the West Indies. One of them is also native to Miami and the Florida Keys, and was offered by Reasoner Bros. presumably for its edible fruits. The lfs. are minute and devoid of petals, but the berries are half an inch long, oval and purple or nearly black in color. Generic characters: lfs. perfect; calyx 5-lobed, the lobes deciduous: ovary 2-3-loculed; ovules solitary, erect: fr. a 1-seeded drupe, with ruminant albumen. This genus is not in Bentham and Hooker’s Genera Plantarum, but technical accounts may be found in the Synoptical Flora of North America, Sargent’s Silva and Chapman’s Flora of the Southern United States.

Rhamnus (its ancient Greek name). Including Frangula, Rhamnus. Buckthorns. Ornamental deciduous or evergreen, sometimes spiny shrubs or rarely small trees, with alternate or opposite simple vs., inconspicuous greenish lfs. in axillary clusters appearing in spring shortly after the lvs., and berry-like usually black, rarely red, fruits. The Buckthorns, except R. cathartica, are but rarely cult., and the hardiness of several of the species is therefore not yet fully established; but R. cathartica, Daurharia, alpina, Frangula and alchiba can be depended upon as hardy, while the northern deciduous forms of R. Rhamnus and R. lanceolata are hardy at least as far north as Mass. R. Lithaniata and Caroliniana are somewhat more tender. The handsome foliage are R. alpina and Lithaniata, R. Rhamnus, Caroliniana, alchiba and Daurharia and Frangula are also noteworthy on account of pretty foliage. Of the evergreen species which are not hardy north, R. cratera is to be recommended for its ornamental bright red fruits. Buckthorns are useful for planting in shrubberies; they like a rather moist soil, especially R. lanceolata, alchiba, Caroliniata and Frangula, and grow well in shaded or partly shaded situations, but R. Cathartica and its allies prefer dry soil. R. Cathartica is a valuable hedge plant, though it is now not used as extensively as in the past. The species are propagated by seeds stratified or sown in fall, and by layers. Some, as R. lanceolata, alchiba and alogusa, are also prop. by cuttings. The evergreen species are prop. by cuttings of ripened wood under glass. Rarer kinds are sometimes grafted, those of the Frangula groups usually on R. Frangula and the true Buckthorns on R. Cathartica or allied species.

Rhamnus is a genus of more than 60 species, native chiefly to the temperate regions of the northern hemisphere. A few species are found in the tropics and as far south as Brazil and Africa. The Rhamnus group is an isolated group of genera and species of tender shrubs or small trees, all native to the West Indies. One of them is also native to Miami and the Florida Keys, and was offered by Reasoner Bros. presumably for its edible fruits. The lfs. are minute and devoid of petals, but the berries are half an inch long, oval and purple or nearly black in color. Generic characters: lfs. perfect; calyx 5-lobed, the lobes deciduous: ovary 2-3-loculed; ovules solitary, erect: fr. a 1-seeded drupe, with ruminant albumen. This genus is not in Bentham and Hooker’s Genera Plantarum, but technical accounts may be found in the Synoptical Flora of North America, Sargent’s Silva and Chapman’s Flora of the Southern United States.
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The oblong-ovate leaves are seen as white, with smooth edges. The plant is typically found in tropical and subtropical regions, including Brazil and other parts of Latin America. The leaves are usually glossy and have a distinctive shape, with a pointed tip and a rounded base. The plant is often cultivated as an ornamental due to its attractive appearance.
RHEUM (Rheum was the old Greek name for rhubarb), Polygonaceae. RHEUM. Twenty species of robust perennial herbs, according to Meehan ([DC. Prodr. 14], pp. 32-37), natives of Asia and Russia. Lvs. mostly radical, very large, entire or divided, on stout, thick petioles: fls. perfect, small, greenish or whitish, pedicellate, in numerous panicked fascicles or racemes, the inflorescence elevated above the lvs. on stout, mostly hollow scape-like stems, which are provided with sheathing stipules or ocrea (Fig. 2098); the perianth 6-parted and spreading; stamens 9 or 6; ovary 3-angled and bearing 3 styles, ripening into a winged or sometimes nearly succulent akene.

Aside from the common Rhubarb, Rheum Rhaponticum, which is grown for the edible leaf-stalks, the species are little known in general cultivation. Few plants are more useful, however, for bold and striking foliage effects; and these effects are heightened by the towering flower-panicles. Most of the species are hardy and easy to grow, but they profit by a liberal winter mulch. Rheums are usually seen to best advantage against a heavy background of foliage or of rock (Fig. 1045, p. 733). Even the common Rhubarb is a useful ornamental subject when well placed. In order to secure large and long foliage, the soil should be rich and moist. The species are propagated by dividing the roots, preferably in spring, leaving as much root as possible with each strong bud.

The dried rhizomes of Rhubarb are used medicinally. Several species afford the officinal product. It is now believed, however, that the larger part of the dried Rhubarb imported from the Orient is made from the crown or short stem (not the flower-stem) of R. officinale. R. Rhaponticum is sometimes grown for its roots.

A. Foliage undivided, the margins of the lvs. nearly or quite entire.
B. Lvs. (at least on the flower stalks) acute or acuminate.

Rhaponticum, Linn. (I. e., Punicic Rhea, "Rhubarb of Pontus," a province of Asia Minor). RHUBARB. PIE-PLANT (in the U. S.). WINE-PLANT. Fig 2098. Strong perennial, with thick clustered roots: petioles semi-cylindrical, plane above: fls. blades suborbicular, deeply coriaceous at base, undulate, about 5-ribbed, glabrous above and shining above, pubescent on the veins beneath: panicles tall and narrow, somewhat leafy, deeply flowered, the pedicels jointed below the middle, the fls. whitish: above oblong-ovate. In deserts and subalpine parts of southern Siberia.—Native grown in this country for the succulent acid petioles, which are used in early spring for pies and sauces. Wine is sometimes made from the juice. In France, known usually as an ornamental plant. There are several garden varieties. See Rhubarb.

undulatum, Linn. Petioles semi-terete, lightly channeled above, the leaf-blades ovate-cordate and strongly undulate (basal sinus not so deep as in the last), 5-7-ribbed, glabrous above and puberulent beneath, the upper ones long: panicle narrow and leafy below, the pedicels jointed near the base: akene ovate or oval. Siberia.—Small plant, earlier than R. Rhaponticum.

Emodi, Wall. Stem tall and leafy: petioles semi-terete, somewhat concave above, the margins obtuse: leaf-blades large, ovate, cordate, obtuse, somewhat undulate, 5-7-ribbed, the under surface and the margin pubescent: panicles fastigiatly branched, the fls. dark purple, pedicels jointed below the middle; akene large, ovate or oblong-ovale. Himalaya, in alpine and subalpine regions. B.M. 3508 (this figure is questioned by Meissner, who thinks it may represent R. austrole).—Foliage has a coppery hue.

AA. Foliage more or less lobed, the margins of the lvs. or segments usually toothed or notched.
B. Lvs. shallowly or obscurely lobed.

compactum, Linn. Stem tall: petioles sulcate, plane above; leaf-blades thickish, broad-ovate, cordate, undulate and obscurely lobed, very obtuse, somewhat andulate, 5-7-ribbed, the under surface and the margin pubescent: panicles fastigiatly branched, the fls. dark purple, pedicels jointed below the middle: akene large, ovate or oblong-ovale. Siberia.—Small plant, earlier than R. Rhaponticum.

Var. Tsaunghtiticum, Hort. (R. Tsaunghtiticum, Hort.). Lvs. more elongated and not so deeply lobed.

hybridum, Murr. Petiole long, canaliculate above and sulcate beneath: leaf-blades ovate, 3-5-ribbed, the base cuneate or scarcely cordate, incise-dentate, puberulent beneath; panicle lax, leafy: akene large, ovate.—Seems to be unknown wild. Perhaps a hybrid series between R. palma- tum and R. Rhaponticum. Perhaps R. officinale is concerned in it. This name does not occur in the American trade, but it is not unlikely that the plant is in cult. in this country.

Colliniánum, Ball. Probably one of the R. hybridum series, with much-eut broad lobes that extend half the depth of the leaf-blade: fls. red. China.

officinale, Baill. Figs. 1045, 2099. Robust, with a short branching stem or crown 4-10 in. high: lvs. very large, 1-3 ft. across, round-ovale, more or less pointed or acuminate, hairy, 3-7-lobed, the lobes extending one-third or one-half the depth of the blade and sharply angled-notched: flower-stems 3-5 ft., much branched,
bearing numerous greenish fls. that give a feathery effect to the plant; scape red, winged. Thibet and W. China, on high table-lands. B. M. 6155. R. H. 1874, p. 95. Gn 33, p. 243; 48, pp. 199, 208. - Probably the best plant of the genus for general cultivation, making a most striking foliage plant. It is from the short, thick, branching stem or caudex of this plant that most of the true official Rhubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1725. Fig. 2009 is adapted from The Garden.

R. acuminatum, Hook. & Thon. "Probably only a small form of R. Emodi, with acuminat leaves, but the fls. are considerably larger, and though long under cultivation it does not attain the size of that plant, or vary in its character." - Hooker, Himalayas. B. M. 4577. - R. nobile, Hook. & Thon. Stem simple and densely clothed with lubricated downward-pointing bracts that conceal the short auxiliary peduncles; lvs. ovate-oblong or rounded, entire. When the fruit is ripe, the shingled bracts are torn away by the winds, leaving the long panicled expanse of fls. 3 ft. Himalayas. R. H. 1876, p. 226. J. H. 22:209. G. C. I. 13:793. A remarkable alpine plant. - R. Ribes, Linn. 3-5 ft.; lvs. 1 ft. across, cordate to reniform, the margins crisped or undulate, the blade punctured or blistered; fls. green, drooping; frs. about 1 in. long, oblong-cordate, narrowed at the base, downy. Asia Minor to Persia. B. M. 7361. "Rivas" or "Ribes" is its Arabic name. - R. speciosum, Royle. Dwarf: lvs. thick, orbicular or broadly ovate; fls. white, in a dense spike rising about 2 ft. Western Himalaya.

L. H. B.

RHEUMATISM ROOT. Jeffersonia binata.

RHÉXIA (Greek, rupture; referring to its supposed properties of healing). Melastomáceae. Meadow Beauty. A genus of about 10 species of N. American perennial herbs, with opposite leaves or short-petioled, 3-5-nerved lvs., and showy flowers borne in late summer. Fls. terminal, solitary or in cymes; calyx-tube urn- to bell-shaped, narrowed at the neck, 4-lobed; petals 4, obolate; stamens 8, equal, the connective being thickened at the base, with or without a spur at the back. Rhéxia Virginica is found wild in company with side-saddle plants (Seracenia purpurea) and cranberries in the low meadows of Massachusetts. It is what we should call a bog plant. It is a pretty, low-growing, tuberous-rooted plant blooming in summer and chiedy interesting as being one of few species of a genus belonging to a family almost wholly composed of shrubby plants from tropical countries, such as Cordia, Pseudobalanus, and Medinilla. It increases by means of tubers and seeds, and under suitable condi-


tions soon makes large clumps. Tubers potted in the autumn and kept in a coldframe force nicely in springtime.

A. Stem cylindrical.

Mariana, Linn. A slender, erect, usually simple-stemmed plant with reddish purple fls. about 1 in. across, in loose cymes; lvs. short-petioled, oblong to lanceolate, 3-5 ft. long, 2-5 ft. wide, 2 ft. high. Pine barrens, N. J. to Fla., west to Ky. B. B. 2:474. - Grows in drier places than R. Virginica.

RHIPSALIS. See Aco.

RHÍPIDODÉNDRON. See Aco.

RHÍPIDÓPTERIS is under Acerostichum.

RHÍPSALIS (Greek, rípsis, wickerwork). Cactácea. A mixed assemblage of lengthened epiphytic forms; brought together by a common character of small fls., with the tube short or wanting; here including Hariota, Lepismium and Pfeiffera. Fls. white or greenish white, except R. cereiformis, rosy, and R. salicornioides, R. pachypetra and R. rhomboea, yellow. Fruit without spines or wool, except in R. cereiformis. For culture, see Cactus. (X3/4).

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A. Brances round or nearly so in cross-section: fls. white except in the first species: berry small, white, round.

B. The branches of two kinds.

1. salicornioides.

2. Sagílonis.

3. mesembranethioides.
richly branched; long or cereiform branches $\frac{3}{4}$-1 ft. long; secondary or fruiting branches oblong-elliptic or short-cylindric, rounded at the ends, spirally or rarely verticillately arranged, sometimes weakly grooved, not more than $\frac{3}{4}$ in. long; areoles with very scanty wool and 2-4 short bristles, which on the end branches project as a little brush: fls. near the tops of the short branches, flat, $\frac{3}{4}$ in. in diam., with 12 white leaves with yellowish midstripe: berry white. Uruguay and Argentina. B.M. 4639 (R. brachiata).

3. mesembrianthemoides, Haw. (Harriota mesembrianthemoides, Lem.). Upright, the ends drooping, richly branched: long branches 4-8 in. long; 1 line in diam.; fruiting branches 3-5 lines long, not more than 2 lines in diam., spirally attached, thickly crowded: areoles sparsely woolly, with 1-2 bristles which project from the ends of the branches: fls. near the top of the joint, about 5 lines in diam., formed of 90 white with yellow midstripe leaves: berry white. Brazil. B.M. 3078. - Hardly more than a slender variety of the preceding.

4. grandiflora, Haw. (R. funalis, Salm.). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diameter of more than $\frac{3}{4}$ in.; branches short, often verticillate: areoles depressed, bordered by a red line, sometimes in old branches bearing a bristle: fls. wheel-shaped, lateral on the branches, nearly 1 in. in diam. Brazil. B.M. 2740.

5. Cassytha, Geertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1-1$\frac{1}{2}$ lines in diam., pale green; ultimate branches spirally attached: areoles with sparse woolly hairs and frequently 1-2 minute bristles: fls. lateral on the terminal joints, 2-3 lines in diam.; berry like that of the mustelen, 1-2 lines in diam. Widely dispersed in Central and S. America, West Indies, Mex., Mauritius, Ceylon and Africa. B.M. 5080.

6. virginia, Web. Richly branching, pendulous, becoming a yard long; terminal branches hardly more than a line thick, spirally attached: areoles bearing sparse woolly hairs, with an occasional bristle: fls. lateral, 3-4 lines in diam.; berry only $\frac{3}{4}$ lines in diam. Brazil. Very much like the preceding.

7. lanthothle, Web. (Pfitzera ianthothle, Web. R. cereiformis, Forst. Pfitzera cereiformis, Salm.). Stems pendent, 1-2 ft. long, branching, less than 1 in. in diam., 4-, rarely 3-angled; ribs tuberculate; areoles at summit of tubercules short-woolly, soon naked, bearing 6-7 short bristles; fls. with very short tube, but the fl. bell-shaped, purple-red without, white within, nearly 1 in. long, little more than half as much wide; fr. the size of a cherry, rose-red, with bristles like those of the stem. Argentina.

8. trigo, Pfeiff. Richly branched, becoming a yard long: branches $\frac{3}{4}$ to nearly 1 in. in diam., 3-angled: areoles sparsely woolly and bristly, the blooming areola much more copiously so: fls. greenish outside, white within, 4 or 5 lines long. Brazil.

9. paradoxa, Salm. Sparingly branched, 1-2 ft. long; branches 1-2 in. long and $\frac{3}{4}$-1 in. in diam., twisted at the joints, so that the angles alternate with the sides: fls. $\frac{3}{4}$ in. long, white. Brazil.

10. pentaptera, Pfeiff. Richly branched, 1-2 ft. long, 4-5 lines in diam.; branches 2-5 in. long, 5-6-angled or almost winged: areoles in eburneum of the angles with scanty wool and an occasional bristle: fls. greenish white, 3-4 lines long; fr. white, bright rose-red above crowned by the withered flower. South Brazil, Uruguay, Argentina.
RHIPSALIS

11. squamulosa, Schum. (Lepismium comminie, Pfeiff.). Somewhat branched, reaching 2 ft., leaves very unequal in length, 1/2-1 in. thick, triangular, the angles winged: fls. 1-2, from the deep areole, 5 lines long, greenish without, yellowish within. Brazil, Argentina. B. M. 3763.

12. myosurus, Schum. (Lepismium myosorus, Pfeiff.). Somewhat branched, a yard long: branches 3-6 lines thick, 3-4 angled, the angles not winged, the terminal branchlets generally acuminate, often tipped by a pencil of bristles: fls. solitary in the deep areole, 4-5 lines long, rose with fr. red. Brazil. B. M. 3755.

13. rhombae, Pfeiff. (R. Swartzi (1). Pfeiff.). Branching, reaching a yard in length; joints green, leaf-like, crenate-oblong or rhombic, 1-5 in. long, 1/2 in. broad: fls. yellow, about 5 lines long. Brazil.

14. pachyptera, Pfeiff. (R. alata, Steud.). Erect, branching, reaching a height of nearly 1 yard; joints flat, rarely 3-winged, rather thick, usually somewhat concavo-convex, 3-8 in. long, blunt, 2-5 in. broad, often purple-red: fls. about 8 lines long, yellow with reddish tips. Brazil. B. M. 2829 (Rudia alata).

15. Rouletia, Lem. (R. Houttii, Lem.). Stem richly branched, becoming 3 ft. or more long, 1-1/4 in. broad, often tapering to the round midrib for a considerable distance, then becoming again broad and leaf-like: fls. 8-9 lines long, yellowish white to yellow: berry red. Brazil. B. M. 6080.

RHIZOPHORA is discussed under Mangrove. The plant is now offered for sale in S. Calif.

RHODANTHE. See Peltotrum.

RHODEA. See Rockea.

RHODE ISLAND, HORTICULTURE IN. Figs. 2102, 2103. Rhode Island, the most thickly populated state in the Union, is distinctly a manufacturing center. This condition of things, which brings the larger portion of the population together into the cities and villages, together with the steadily increasing popularity of its famous summer resorts and the rapid transportation both by rail and water which place the New York and Boston markets within easy reach, affords opportunities for horticultural developments which are equalled by few and excelled by none of the eastern states.

At present the growing of vegetables, both in the field and under glass, is the most highly developed horticultural industry. The towns of Cranston and Warwick are the center of this industry, where the soils are light sandy loams which are capable, under the skilful management they receive, of producing large crops of excellent quality.

The following figures, which are taken from the State Census for 1895, give some idea as to the extent of the market-garden industry for that year: Green corn, 1,138,983 doz.; tomatoes, 164,229 bushels; cucumbers, 68,598 bushels; lettuce, 2,832,294 heads; beans, string, 49,795 bushels; peas, green, 53,458 bushels; celery, 579,016 heads; melons, 624,980.

The greater portion of the lettuce grown is of the hard-heading type, which is produced during the months from October to May. Over $100,000 is invested in glass for the production of this crop within a radius of five miles of the city of Providence. The greater portion of the muskmelon crop is produced upon the sandy plateau of Warwick. The early crop is grown from plants which are either started in pots in the glass-houses and transplanted to the field or planted under sash in the field. The earlier varieties are used for the presence of the small Gem type, which always finds a ready sale at fancy prices, while the main crop, which is planted the last of May, is largely shipped in car-loads to Boston. For the main crop the large oblong type of melon is the most popular. Besides the large market-gardeners who are located near the cities, many of the farmers who live within a short distance of the manufacturing villages find there a ready and profitable market for the many vegetables as the people found in these villages are good buyers who consume large quantities of vegetables when they have work.

During the past decade the floriculture of the state has been revolving rapidly, not so much, however, in the number of establishments as in the area of glass. Where ten years ago the figures were given in hundreds, to-day they are increased to thousands of square feet. This development is especially noticeable in the towns which have a population of from 2,000 to 3,000. The carnation is still the most popular flower, although many fine roses are grown, with a steadily increasing demand for rare flowers, as orchids and forced stock, during the winter months.

There are in the state nine local nurseries. The greater part of the business is the growing of specimen plants for use in localities where immediate effects are desired, rather than the propagation and sale of young nursery stock.

The fruit-growing industry is but poorly developed, only a very small proportion of the fruit consumed being produced within the state limits. Apples are grown more than any other fruit, the largest orchards being located in the northern part of the state, the fruit being more highly colored than that grown in the orchards along the coast. Baldwin, Rhode Island greening, Roxbury Russet and Spy are planted more than other varieties. Many of the old orchards are past their prime, and there are excellent opportunities offered for the planting of profitable orchards upon the hilly and desirable farms. Among the enemies of fruit, the following are the most troublesome: apple scab, codlin-moth, curruclio and maggot. The original Rhode Island greening apple tree, still standing in the town of Foster, is shown in Fig. 2103, as it looked in 1900.

Peaches are receiving much attention at present. From orchards which are favorably located, crops are obtained two out of three years; the average for the state is about three out of five. Aside from the winter-killing of the buds, the most serious trouble is the rotting of the fruit. This trouble causes much greater losses in the towns bordering upon the salt water.

2102. County map of Rhode Island.
Rhododendron (Greek, rhodon and dendron, rose-tree; alluding to the beautiful flowers and the habit; the Rhododendron of the ancient writers is Nerium). *Ericaceae.* Highly ornamental evergreen shrubs or trees, with alternate persistent, entire leaves, and clusters of large, showy, lvs., varying in all shades of purple, scarlet, pink, orange, yellow and white. None of the evergreen shrubs suitable for cultivation in colder climates are more effective in bloom than the Rhododendrons. The large clusters of showy flowers are often nearly cover the entire plant, while the handsome foliage is attractive at every season (Fig. 2104).

**Hardiness of the Various Species.**—Although most of the species are hardy only in warm temperate regions, there are many which are hardy at least as far north as Massachusetts. They are *R. maximus,* *Catalbienii,* *Caesius,* *Carthaginum,* *frilly* *liliatum,* *Dahuricum,* *Lappicum,* *ferugineum,* *hirsutum,* *punctatum,* and probably also *chrysanthum,* *Przewalskii,* *campanulatum,* *Callicur* *nicum,* *Ungernii,* and *Kotschyi.* Somewhat more tender are *R. ponticum,* *nicaeum,* *Hodgsonii,* *Thomsonii,* *Anthophorum.* South of Philadelphia such species as *R. eisei,* *hirsutum,* *liliatum,* *F. ventricu* *lum,* *liliatum,* *Colletti* *anum,* and the *Yunnan* species, as *R. devorum,* *iroreadum* and *racemosum* are probably hardy; also *R. arboreum,* *barbatum,* *ferrugineum,* *Kyoji,* *mittellianum,* and *Wulfenii.* Some species are limited in their distribution. Species like *R. dathumia,* *Edge* *worthii,* *Griffithianum,* *formosum,* *Maddeni,* *Nuttalli* and *pendulum* stand only a few degrees of frost. The *Javanese* species, as *R. davurianum,* *jasminiform* *um,* *Brookeanaum* and *Lobbia* grow and bloom continually and stand no frost at all.

**Variation in Height.**—Most of the species are shrubby; a few are low, and these mostly *Himalayan* species, grow into small trees, 20 to 30 ft. in the case of *R. barbatum,* 40 ft. in *R. grande* and *arboreum,* 30 ft. in *Falcoceri* and *maximunm.* A number of north* ern* and alpine species always remain dwarf, as *R. fer* *rugineum,* *hirsutum,* *Lappicum,* *virgatum,* *liliat* *um,* *racemosum,* and others. A few Himalayan and Malayan species are often epiphytic and often grow on branches of large trees like orchids; e.g., *R. Dal* *housiae,* *pendulum,* *Nuttallii* and most of the Malayan species.

**Their Place in Ornamental Planting.**—Rhododen* drons are equally effective and desirable for single specimens on the lawn or when massed in large groups, and are especially suitable where evergreens are used. It is easier to integrate a mass of green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and flower at a different time, should not be grouped with the large-leaved ones, as they do not harmonize with them; however, they are exceedingly charming plants for rockeries or in groups with other smaller evergreens. It is certainly true that the Rhododendrons have not yet received the attention they deserve. They are still far from being as popular as they are in England. The beautiful Himalayan species and their numerous hybrids especially are still almost unknown in this country, although without doubt they could be grown as well outdoors in the southern Atlantic States as they are in England, if the right situation were selected. Formerly it was considered impossible to grow the beautiful hybrid rhododendrons in this New England state, but now it has been shown by such splendid collections as those of Mr. H. H. Humewell at Wellesley, Mass. (see A. F. 13:24-31 and 14:3:575-577), that, even in a trying climate, they can be grown to perfection. In the right situations are selected and the right kind of cultivation is followed.

**Outdoor Cultivation.—**The selection of a suitable situation is of foremost importance. If possible the beds should be sheltered against drying winds and the sun, by tall shelter shrubs. In the open they are always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open, well-drained soil which does

having curious, distinct purplish red lvs. over 2 in. long on red peduncles; lvs. about 3 in. long. B.M. 3367. B.K. 21:1755. I.H. 42:351. —Blooms the first season from seed and may be treated as a tender annual. F. W. BARCLAY.

**Rhododendron** (Greek, rhodon and dendron, rose-tree; alluding to the beautiful flowers and the habit; the Rhododendron of the ancient writers is Nerium). *Ericaceae.* Highly ornamental evergreen shrubs or trees, with alternate persistent, entire leaves, and clusters of large, showy lvs., varying in all shades of purple, scarlet, pink, orange, yellow and white. None of the evergreen shrubs suitable for cultivation in colder climates are more effective in bloom than the Rhododendrons. The large clusters of showy flowers are often nearly cover the entire plant, while the handsome foliage is attractive at every season (Fig. 2104).

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**Outdoor Cultivation.—**The selection of a suitable situation is of foremost importance. If possible the beds should be sheltered against drying winds and the sun, by tall shelter shrubs. In the open they are always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open, well-drained soil which does
not contain limestone or heavy clay and has a moist and fresh subsoil will prove satisfactory. Where limestone or heavy clay prevails, beds must be specially prepared and filled with suitable soil. They should be at least 2 to 3 ft. deep, or deeper where the subsoil is not porous, and six to eight layers of 1-2 ft. high with gravel or broken stones for drainage. A mixture of leaf-mold or peat and sandy loam will make a suitable soil. In dry spells during the summer, when this is the case, the bottom should be watered freely and the soil should consist mainly of good fibrous peat broken into pieces, with a liberal addition of sand and broken charcoal. The soil should never be allowed to become dry. They are readily propagated by cuttings with bottom heat in the warm propagating house. The Javanese Rhododendrons are especially valuable for their continual blooming during the winter and the brilliant color of their flowers. A number of beautiful hybrids have been raised; the following are a small selection of them: Balsaminiflorum, with double white, yellow or pink fls. Gt. 37, p. 265. G. C. II. 18:230; III. 12:769; Brilliant, brilliant scarlet; Cass, tawny yellow. Gt. 41:845; Diadema, orange-scarlet; Duchess of Connaught, vermilion-red; Duchess of Edinburgh, scarlet with orange-crimson. F. M. 1874:115; Eos, scarlet-carmine. G. C. III. 19:327; Exquisite, large light fawn-yellow fls. Gt. 56:2322; Fucatite, saltny rose; Jasminoidorum cimavina, deep crimson, Gt. 41:832; Little Beauty, fls. small, but bright carmine-scarlet. Gt. 56:1241; Lord Wolseley, bright orange-yellow, tinted with rose at the margins; Maiden’s Blush, blush with yellowish eye. Gt. 16:204; Princess Alexandria, white, faintly blushed; Princess Frederica, yellow, faintly edged rose; Princess Royal, pink; Rose Morn, bright pink. Gt. 42:571; Taylori, bright pink with white tube. F. M. 1877:242; Triumpha, crimson-scarlet.

**Propogation.**—All Rhododendrons are easily propagated by seeds, which are very small and are sown in spring in pans or boxes well drained and filled with sandy peat. Pots should be well watered previous to sowing. The seeds should be covered only a very little with fine sand or finely cut sphagnum, or merely pressed in and not covered at all. To prevent drying a glass plate may be placed over the pan or some moss spread over the surface; this, however, must be taken off as soon as the seeds begin to germinate. The seeds also germinate very readily if sown in fresh sphagnum, but in this case they must be pricked off as soon as they can be handled. In any case, it is of advantage to prick off the young seedlings as soon as possible, but if they are not sown too thickly they may remain in the seed-boxes until the following spring. The seedlings of hardy Rhododendrons should be hardened off; those of greenhouse species remain under glass.

Rhododendrons are also sometimes increased under glass by cuttings of half-ripe wood taken with a heel.

2104. A good plant of Garden Rhododendron in bloom.
and if gentle bottom heat can be given after eaulishing it will be of advantage. They root, however, but slowly, except those of the Japanese kinds, which are mostly propagated in this way, since they grow very readily from cuttings.

Layering is sometimes practiced, especially with the dwarf and small-leaved species, but the layers usually cannot be separated until the second year.

For the propagation of the numerous varieties and hybrids of hardy and half-hardy Rhododendrons grafting is most extensively employed. "Rhododendron Catawbiense" or seedlings of any of its hardy hybrids may be used as stock; R. maximum is also probably as good. In English and Belgian nurseries R. Ponticum, which is inferior in hardiness, is mostly employed as a stock, but this often proves fatal if the grafted plants are transferred to colder climates. R. arboreum may be used for strong-growing varieties intended for cultivation in the greenhouse or south. Veneer- or side-grafting is mostly practiced, and sometimes eleftand saddle-grafting (see G.C. III. 24:425). The leaves should be removed only partly and the stock not headed back until the following year. The grafting is usually done late in summer or early in spring in the greenhouse on potted stock without using grafting wax, and the grafted plants kept close and shaded until the union has been completed. If large quantities are to be handled the plants are sometimes not potted, but taken with a sufficient ball of earth, packed close together and covered with moss. Covering with moss to keep the atmosphere moist is also of much advantage if the plants are potted. See Figs. 2107, 2108.

Distribution of Species.—About 200 species are known, distributed through the colder and temperate regions of the northern hemisphere; in tropical Asia they occur in the mountains and extend as far south as New Guinea and Australia, the greatest segregation being in the Himalayas and E. Asia; several species closely allied to those of the Malayan Archipelago are found in the Philippine Islands, but are not yet introduced; 7 species occur in N. America. The species, with few exceptions, are evergreen.

Generic Description.—Lvs. lepidote, sometimes lepido- dote and plicate, or quite glabrous or tomentose beneath; fls. pedicelled, in terminal umbel-like racemes, rarely lateral in 1- to few-fl. clusters; calyx 5-parted, often very small; corolla rotate-campanulate to funnel-shaped or sometimes tubular, with 5-10-lobed limb; stamens 5-20, usually 10; ovary glabrous; fruit is a 5-10-loculed capsule separating into 5 valves containing numerous minute seeds. The Rhododendrons possess few economic properties. The hardy close- grown wood of the arboreum is used for fuel; also for construction and for turbery work. The leaves of some species are sometimes used medicinally; those of R. arboreum are believed to be poisonous to cattle. The flowers of various species are sometimes made into a subacid jelly. Some authors use Azalea with Rhododendron, but the two groups are very distinct horticulturally, however closely they may be allied botanically. Azaleas are chiefly deciduous plants (A. indica, mostly evergreen), usually with 5 exserted stamens. Fig. 2105, Azalea Sinensis, also known as "Rhododendron Sinense," shows the difference in looks between the two groups.

Hybrid Rhododendrons.—Many hybrids have been raised and they are now more extensively cultivated than the original species. The first hybrid was probably the one raised from R. Ponticum, fertilized by a hardy Azalea, probably A. nudiflora; it originated about 1850, in the nursery of M. Millet, London, and was first described and figured as R. Ponticum, var. deciduum (Andrews, Bot. Rep. 6:379). Many hybrids of similar origin were afterwards raised. The first hybrid between true Rhododendrons and a species of Azalea was probably a cross between R. Catawbiense and R. Ponticum, but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan R. arboreum introduced in 1820 that the first plant was raised which became the fore-runner of a countless number of beautiful hybrids. From the appearance of this cross about 1826, at Highclere, in England, and therefore called R. Altaclarensis, the era of Rhododendron hybrids is to be dated. Figs. 2104 and 2106 are common hybrid forms. A second era in the history of the Rhododendron may be dated from the introduction of a large number of the beautiful Sikim hybrids about 1850 and the Javanese species shortly afterwards. A third era will perhaps be traced from the recent introduction of the Yunnan Rhododendrons.

Alfred Rehder.

Hardy Rhododendrons.—Rhododendrons, in this article, mean the evergreen sorts, more particularly R. maximum and the hybrid varieties of R. Catawbiense; in the main, however, the directions for the various operations apply to the Azalea group and to many other members of the heath family.

Propagation.—Rhododendrons are increased by seeds, layers and grafts, and occasionally by cuttings. Seeds should be sown under glass, between January 1 and March 15, in soil one-half peat, one-half fine sand, with good drainage. The seeds may be sown in a wooden box, without covering, the usual watering after sowing being quite sufficient. A thin layer of sphagnum over the surface of the seed-pan is good protection from the sun and keeps the soil evenly moist; it should be removed when germination begins. Seeds may also be sown on growing sphagnum, a thin layer being compactly spread above the seed soil and drainage, and an even surface being secured by clipping. Seed-pan or flats of convenient size are used and they should be plunged in sphagnum still further to insure even moisture; the temperature of the house should be 45°-50° F. Seedlings are prone to damping off and should be pricked off into fresh soil as soon as they are big enough to handle; wooden pincers, made from a barrel hoop, are handy for this work. They are slow growers and must be tended carefully. Keep under glass, well shaded until the weather is settled. Frames with lath screens make good summer quarters. When in pits and plant out in frames in peaty soil when large enough. Never let them suffer from dryness, it has been suggested that the seed of R. maximum might be planted on living moss under high-branched trees in swamps where the water does not collect in winter, as in the Jackson Dawson, on the "Propagation of Trees and Shrubs from Seeds," Trans. Mass. Hort. Soc., 1885, part 1, p. 145.

Layers probably make the best plants, and in the best English nurseries layering is the common method
of propagation. With us layering in spring is preferable, but abroad it is practiced in both spring and autumn. It is a slow process, but desirable for the hardy hybrids of *Rhododendron*. Roots form on wood of almost any age; when removed the layers should be treated as rooted cuttings and carefully grown in well-prepared soil where water and shade are easily furnished. See *Layering*. See, also, G.F. 6:63 (1899) for an interesting account of layering large plants by burying them to the top.

Grafting is the common method of propagation, and is employed almost universally in continental nurseries. *R. Ponticum* is the usual stock, a free grower and readily obtained from seeds. Attempts have been made to use *R. maximum* in American nurseries, because of the tenderness of *R. Ponticum*, but no great progress has been made. It is asserted that the rate of growth is somewhat slower than that of the hybrids; this seems hardly possible, and it is to be hoped that further experiments will be made. *R. Ponticum* should be established in pots in spring and grafted under glass in autumn and early winter, using the veneer-graft (see *Grafting*, p. 664, Vol. II). Graft as near the root as possible and plant the worked parts below the surface when planting in the nursery or permanently. With these precautions, and an extra covering of leaves until the plant is established on its own roots, the defect of tenderness in this stock can be overcome. Nurse carefully the young grafted plants in frames until of sufficient size to be planted in the nursery rows. Figs. 2107 and 2108 illustrate two common methods of grafting Rhododendrons and other woody plants. The details of the unions are shown in Fig. 2107, and the completed work in Fig. 2108.

Statements are made that cuttings of half-ripened wood will strike, but it is not likely that this will ever prove a practical method of propagating *R. maximum* or the *Catawbiense* hybrids: it might be worth while to experiment with wood grown under glass, particularly with some of the smaller-leaved evergreen kinds.

*Cultivation.*—The point upon which the successful American growers of Rhododendrons now insist is that the water supply shall be sufficient. See H. H. Hunnewell, in G. F. 3:301 (1890). To effect this: (1) make the soil deep and fine, using materials like peat, leafmold, well-rotted manure and yellow loam, all of which are retentive of moisture; (2) plant in masses, at any rate while young, so that they may protect each other and prevent evaporation; (3) give the bed a northern exposure or a situation where the force of the midday sun is broken; (4) do not plant under or near trees like elm, oak or maple which make undue inroads on the natural water supply, nor so near buildings that the border is sheltered from rain or overdrained by cellar walls; (5) mulch with leaves summer and winter, protect from wind and sun with evergreen boughs in winter and in summer give heavy watering whenever the weather is excessively hot or dry.

*Soil.*—The bed should be prepared by excavating to the desired dimensions and at least three feet deep. The poor material should be discarded, but the good soil can be replaced, adding enough peat, etc. (see above) to make good that which was rejected: all should be thoroughly and carefully mixed. Peat, although excellent, is not necessary. Yellow loam or hazel loam, if not too sandy, is equally good and is improved by additions of humus. To nearly pure peat an admixture of sand is beneficial; the essential point is that all soils for these plants must be fine. The beds should be prepared in autumn and left to settle all winter, due allowance being made for shrinking. In spring level off to the grade of the adjacent land and do not leave "rounded up." A bed higher at the center than at the sides perhaps makes a better display of the plants, but it is more likely to dry up and does not catch all the water possible from occasional showers. It is generally conceded that lime soils and manures containing lime, e.g., wood ashes and bone meal, are injurious to Rhododendrons; in limestone regions it is undoubtedly advisable to substitute, for the natural soil, others which are free from this objectionable element.

*Planting.*—Plant in spring when the weather is settled and the March winds have passed. If the ball of roots is dry, soak well before setting. Plant closely, so that the tops are only 10-12 in. apart and pay particular attention to "facing" them, i.e., see that the best side is facing the most important point of view and that all are faced alike. Grafted plants should, if possible, have the worked portion below the surface. Do not plant in autumn. Plants grown on the premises may be transplanted in favorable weather in summer if great care is taken to prevent the roots suffering from dryness. In planning the original border it is well to leave room for extension; when planted, as described above, the beds can be enlarged at intervals of four or five years, or new beds made from the old stock. Place the beds so that the glare of the midday sun is screened both summer and winter, and avoid situations where there is any interference, owing to trees or buildings, with a naturally good condition of the soil in respect to moisture. If permanent protection is desired, use confiers, particularly the hemlock, in preference to deciduous trees. Good positions for beds may be found along the edges of ponds and streams, and in reclaimed meadows, with their cool moist soil, but keep aloof from any ground where the water collects in summer or winter. Beds, or even single plants, if sizable, may be introduced into open spaces in woodlands if the precautions noted above are observed and plenty of air and light are obtainable. It is somewhat difficult to combine Rhodo-

![2107. Grafting of Rhododendron. Saddle-graft at A; veneer-graft at B.](image)
Rhododendrons and many deciduous shrubs, among which are the Azaleas, their near relatives. A background of dark green conifers seems most appropriate. Mountain Laurels, Pieris floribunda, Leucothoe Cataracta and Daphne Cneorum are proper companions, but at times these seem better apart. Our native lilies, L. superbum and L. Canadense, are good associates and thrive under the same conditions.

In hot, dry weather water should be given, not daily in dribs and drabs, as lawns are sprinkled, but in quantity, enough at one time to soak the border to the depth of the soil, but at comparatively infrequent intervals, once a week or so. The bed should also be mulched with leaves, or other material, to prevent evaporation; grass clippings are serviceable, but should not be used in large quantities at any one time or else they will heat. Leaves make good winter protection, which should be given just before cold weather, here, in eastern Massachusetts, between Thanksgiving and Christmas. Let the bed be covered to the depth of 10-12 in., well worked in beneath the foliage but not over it. In spring dig as much as possible of this material into the ground, reserving a part for the summer mulch. Shelter the tops with evergreen boughs, the butts driven into the earth a foot or more deep; in very windy positions a temporary board fence is useful. Neither boughs nor fence should be removed until all danger from high winds has passed.

Rhododendrons require no pruning unless injured or when ill-grown plants must be made shapely; they break easily when cut back, even if the wood be aged. As yet no insect pest or fungous disease of importance has appeared.

Varieties.—The following Hardy Rhododendrons, hybrids of R. Catawbiense, were sent to the Arnold Arboretum in 1891 by Mr. Anthony Waterer, Knaph Hill Nursery, Woking, Surrey, England. Their hardiness has been proved by a ten years’ test. In flower, foliage and growth they leave nothing to be desired: it is impossible to give them too great praise. For additional lists, see Garden and Forest as quoted above and in other articles in the same journal. The brief descriptions are taken from Mr. Waterer’s catalogue, from which further details can be obtained; almost all these varieties originated in his establishment.

Album elegans, blush changing to white, one of the best; Album grandiflorum, blush, fine truss; Alex. Dencer, bright rose; Atrosanguineus, intense blood-red; Bicolor; Bluebell, blush; Caractacus, purple-crimson; Catawbiense album, white; Chas. Bagley, cherry red; Chas. Dickens, dark scarlet; C. S. Sargent, bright scarlet, fine truss; Cordescens, blush; Cornelcume, white; Denticulatum, white; Edw. Armstrong, pink; F. K. Hand, scarlet; Everetustainum, rosy lilac, fringed, one of the best; F. D. Godman, crimson, fine truss; F. L. Ames; Gilianum; Giganteum, bright rose; Greta Chablot, rose, late; Henriette Sargent, pink; H. H. Hunnewell, dark crimson, fine truss; H. W. Sargent, crimson; Jas. Botman, rose scarlet; J. C. MacIntosh, Album, purplish crimson; King of Purples, fine habit; Lady Armstrong, pale rose, beautiful; Lady Grey Egerton, splendor blush, splendid truss, exquisitely grown; Marion, M. C. Clark, rose, fine; Maximus Wiliamianum, blush, late; M. T. Masters, rose crimson; Melton, rich purple; Miss Mary Ames, fine habit, crimson; Mrs. A. Hunnewell, pink; Mrs. C. Clark, rose, dark crimson; Mrs. H. Ingersoll, rose lilac; Mrs. Milton, crimson; Norma; Purpuracea elegans; Purpureum grandiflorum; Ralph Sanders, purple-crimson; Rosaceus elegans; R. S. Boardman, dark maroon, extra.

Rhododendrons near Boston.—In the vicinity of Boston there are many notable instances of the successful use of Rhododendrons in greater or less quantity. The estate of the late Francis B. Hayes, of Lexington, Mass., and that of H. H. Hunnewell, at Wellesley, Mass., are perhaps as notable examples as any, although other examples could be cited by the score of fine estates in which plantings of Rhododendrons have been prominent features. The success that has attended these plantings has been brought about very largely through most expensive experiment whereby a great number of named varieties have been originally imported on the basis of experiment with a view to proving what the hardy kinds might be. The hybrids of Rhododendron Catawbiense and R. Ponticum are the principal varieties that have been planted, and extensive trials with their consequent numerous failures have established the fact that the following eighteen varieties can well be stated to be the hardy varieties for the climate conditions peculiar to this vicinity: Album elegans, Album grandiflorum, Atrosanguineus, Caractacus, Charles Bagley, Charles Dickens, Delicatissimum, Everetustainum, Giganteum, Hannibal, H. H. Hunnewell, James Reagan, Lee’s Purple, Old Port, Purpureum, Purpureum grandiflorum, Roseum elegans.

The list noted above constitutes the iron-clad varieties for the vicinity of Boston. The expression “iron-clad” does not, however, indicate that these varieties can be promiscuously planted without proper attention to their requirements. That Rhododendrons do succeed under conditions of comparatively poor soil and exposure is not an indication that they are happy under such conditions. Rhododendrons must have the proper conditions of soil, exposure and moisture in order to give the most satisfactory returns in growth and flower. Soil conditions do not necessarily involve an extended outlay in preparation, provided the original soil is of a good, ordinary composition such as would maintain common garden products to good advantage, but it is desirable to add 25 per cent of well-rotted leaf-mold, thus providing that peculiar humus that the Rhododendron seems best to thrive in. On the other hand, care must be taken that this percentage is not largely increased, as frequent instances arise where beds have been prepared with too much leaf-mold, with the result that where the beds have once dried out the texture of the soil becomes like that of a very dry sponge. When the soil is in such condition it is impossible to wet it down artificially in a satisfactory manner. The exposure need not necessarily be confined to shel-
tered locations, provided soil conditions are sufficiently favorable to maintain a vigorous and healthy growth. Fertilizers can be applied to Rhododendrons to increase the after-growth, although it is not desirable that they be applied directly to the roots. Stable manure should perhaps never be worked through the soil until it has been thoroughly moistened, and then a mulch of leaves should be applied as a mulch on the surface of the ground. Here, again, it is essential that care be taken in working in such fertilizer so that no damage is done in such a manner that the surface of the ground is exposed, with the consequent injury so close to the surface of the soil be not seriously disturbed. It is perhaps better to leave the fertilizer as a mulch on the surface of the ground without attempting to work it generally into the soil. During the winter months a raking of the leaves should be worked through the beds to a depth of six inches to a foot, and it is better that the gardener be not over-particular in raking away these leaves in the spring, leaving the bare surface of the ground exposed, with the consequent injury to the surface roots of the Rhododendron through drought conditions. Where it is possible to provide a somewhat shaded location with an eastern or northern exposure the Rhododendron will succeed better than under conditions of southern or western exposure.

A southern exposure necessitates careful shading of the plants throughout the winter in order to prevent injury from freezing and thawing in the winter months or by blasting of the flower-buds through too early growth with its consequent injury from late spring frosts. When massed against a background of evergreens the Rhododendron perhaps shows to its best advantage, and with the taller-growing varieties they make tall, showy banks of Rhododendrons alone. The greatest cause for disappointment in the use of the imported Rhododendron occurs through lack of discrimination in the selection of varieties and also in the manner of propagation of these varieties. Rhododendrons grafted on Rhododendron Ponticum, a native of southern Europe and Asia Minor, cannot be depended upon, as no matter how hardy the top of the plant may be, unless the junctions of the graft are below the surface of the soil so that the stalk itself is protected, nothing but disappointment can result, since the roots of the plant are killed and there is nothing from which the top can draw nourishment. So far as possible varieties must be selected that are either grown from layers or worked on some perfectly hardy stock, such as Rhododendron maximum or R. Catawbiense. R. Catawbiense and R. Ponticum have constituted the main part of the plants that have been imported, while the R. maximum has until lately been practically lost sight of, though the fact remains that for many years R. maximum has contributed to the establishment of a class of hardy forms such as the variety Delicatissimum, in which one finds the vigor of growth and size of foliage indicative of the Maximum parentage, while the abundance of bloom and color can be traced to that other parent, R. Catawbiense. Some other varieties are in commerce that have had similar hardy parentage, and some seedlings are known in this country which combine great merits but which up to the present time have not been offered or propagated largely. Among these could be mentioned the variety "James Comley," a seedling originated by James Comley on the estate of Francis B. Higginson, of Lexington, Mass. The Massachusetts Horticultural Society awarded a silver medal in 1898. The great objection to the use of Hybrid Rhododendrons has been their cost and the length of time that was necessary to work them up to a marketable stage. The maximum taken from various localities have proved that this plant is practical for such purposes; and the outcome of such experiments has been that such large public estates as those of William Rockefeler, Mrs. E. Elkins, Mrs. Eliot F. Shepard, and others, have very largely been stocked with collected plants of R. maximum, supplied in car-load lots and in sizes ranging from 8-foot bushy specimens down to small plants that could be grown on foot, flower and foliage effects. These plants are to be found from localities where the plants are growing either in the open or under moderate shade conditions and have been pruned by the natural process of fire, resulting in a vigorous growth of a more or less bushy and compact nature and growing in soil of sufficient richness to assure their digging with a large amount of chinking earth. With proper care in transportation and after-cultivation the results show a surprisingly small loss of the plants. Plants collected under these ideal conditions give entirely satisfactory results, but so far as these conditions of careful digging, packing, transportation and after-cultivation are violated, the results are correspondingly less satisfactory.

The areas from which the plants can be collected under the conditions mentioned above are very restricted and soon become exhausted of the plants. There seems to be no limit to the size of the plants that can be transplanted with success, as broad masses 12 feet high and as much in diameter frequently are moved and show practically no set-back in the transplanting.

J. WOODWARD MANNING.

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For many other names, see supplemental list.

A. Foliage and ovary not tepaloid; buds with many imbricate scales. Rhododendron.

B. Leaves glabrous beneath or only pubescent when young.

C. Plants with coriaceous persistent leaves.

D. Pedicels glabrous.................. 1. California

E. Under side of leaves whitish.

F. Calyx-lobes much shorter than ovary. 2. Catawbiense

G. Calyx-lobes about as long as ovary. 3. maximum

H. Under side of leaves green. 4. Ponticum

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J. Young branches and ovary matured in summer.

K. Shrub attaining 25 ft. in height, or tree becoming 40 ft.; plant half-hardy. 6. arborescens

L. Shrub, 2-5 ft. high, rarely 10 ft. high; plant hardy. 7. Catawbiense

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N. The ves obtuse at both ends. 9. Metternichi

O. Corolla 5-lobed, spotted purple. 10. campanulatum

P. Young branches, pedicels and ovary glabrous. 11. campanulatum

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R. Young branches and ovary matured in autumn.

S. Shrub, 2-5 ft. high, rarely 10 ft. high; plant hardy. 6. arborescens

T. Shrub, 2-5 ft. in height, or tree becoming 40 ft.; plant half-hardy. 6. arborescens

U. Leaves persistent, deciduous in winter. 7. catawbiense

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1. Califonnicum, Hook. Shrub, 5 ft. high, sometimes to 20 ft., glabrous; lvs. oblong, shortly acuminate, pale green beneath, 3-6 in. long, sometimes crowded beneath the fls.; clusters many-fld.; calyx minute; corolla broadly campanulate, with ovate lobes, rose-purplish or pink; pedicles towards the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers; ovary with appressed silky hairs. May, June. Calif. to Ore. B.M. 4963.—Var. Wallisii, Hook. (R. Wallisii, Hort.).

2. Catawbiense, Pursh. Figs. 2109, 2110. Shrub, 6 ft. high, rarely 20 ft.; lvs. rounded at base, oval to oblong, usually obtuse and mucronulate, glaucous beneath, 2-3 in. long; clusters many-fl.; pedicels pubescent; corolla broadly campanulate, with broad roundish lobes, lilac-purple, about 1½ in. across; ovary rusty tomentose. June, Va., to Ga., in the nts. B.M. 1671. L.B.C. 12:1176.—One of the most beautiful of native shrubs, covering extensive tracts of land in the southern Alleghanies. Hardy as far north as New England.

3. Maximum, Lind. (Great Laurel). Fig. 2111. Shrub or small tree, attaining 25 ft. high; lvs. mostly acute at base, narrow-oblong or lanceolate-oblong, acute or shortely acuminate, whitish beneath, 4-10 in. long; clusters many-fl.; pedicels viscid; calyxlobes ovate, as long as ovary; corolla campanulate, deeply 5-lobed with oval lobes, usually rose-colored, spotted greenish within, about 1½ in. across; ovary glabrous. June, July, N. and Ont. to Ga. B.M. 931. Fls. on 2:435. Mn. 1:1 and 3, p. 22. D. 16.—This is one of the hardest species, being hardy as far north as Quebec and Ontario. Three var. have been distinguished: var. album, Pursh (R. Pachichi, Don), with white fls.; var. purpureum, Pursh (R. purpureum, Don), with purple fls., and var. roseum, Pursh, with pink flowers. This species and the former are now often extensively used in park-planting and taken by the car-loads from the woods. If properly handled and taken from a turfly soil with a sufficient ball of earth around the roots, they are usually successfully transplanted.

4. Penticum, Lind. Shrub, 10 ft. high; lvs. elliptic to oblong, acute, pale green beneath, 3-5 in. long; clusters many-fl.; pedicels longer than fls.; calyx-llobes as long as ovary, the lower ones half as long; corolla campanulate with oval lobes, purple, spotted brownish within, about 2 in. across; ovary glabrous. May, June. Spain, Portugal, Asia Minor. B.M. 656.—This species is less hardy than the two preceding and now rarely found in cultivation in its typical form. Var. album, Hort., has white flowers.

5. Azaleoides, Desf. (R. frigens, Hort. R. odoratum, Hort.). Hybrid between R. Penticum and Azalea undiflora. Shrub, a few ft. high; lvs. leathery but thin, elliptic to oblong, acute at both ends, dark green above, paler beneath, sometimes pubescent when young; fls. funnel-form-campanulate, pinkish or white, fragrant, 1½-2 in. across; calyx with ciliate lobes. May, June. Of garden origin. There are many allied forms of similar origin described under different names. The name Azaleodendron has been proposed as a generic name for the hybrids between Azalea and Rhododendron.


7. Caucasicum, Pall. Dense low shrub, 2½ ft. high, often with procumbent branches; lvs. oblong-oblong or narrow-elliptic, dark green above, ferrugineous-tomentose beneath, 2½ in. long; calyx short: calyx minute; corolla funnel-form-campanulate, with maragine rounded lobes, pink to yellowish white, spotted greenish within, 1½ in. across. June, July. Caucasus. B.M. 1145. A dwarf, quite hardy species; late-flowering. Var. Davidii, Regel. Fls. straw-col-
ored, spotted greenish within. Gt. 16:560. Var. stramineum, Hook., is similar, but with fulvous spots. B.M. 34214. Var. paniculatum, Brit., with deep pink fls., changes to white, and var. splendens, Brit., with deep pink fls., are said to bloom very early and may be hybrids. R.H. 1808:311.


12. ferrugineum, Linn. Shrub, 2 ft. high, glabrous: lvs. elliptic to oblong-lanceolate, usually rounded at both ends, ferrugineous-tomentose beneath, 1-2 in. long: clusters many-fl.; pedicels short: calyx minute: corolla almost salver-shaped, with the tube 2 in. long and spreading limb, fragrant, white, blushed outside below the limb, the anthers forming a red eye; style shorter than stamens, included. Winter. Java, Malacca. B.M. 4524. I.H. 6:233.—A distinct species, very unlike other Rhododendrons; it requires a warm greenhouse.

13. hirsutum, Linn. Shrub, 3 ft. high, with hirsute branches: lvs. oval to oblong, ciliate, light green and glau-.mulit-tomentose beneath, ½-1 in. long: clusters many-fl.; calyx-lobes long as ovary; corolla similar to that of the preceding, lobes shorter. June. July. Alps. B.M. 5:479. B.M. 1833.—Much like the preceding, but usually thrives better in cultivation and does not dislike limestone soil.


15. arbuliflorum, Hort. (R. daphnoides, Hómmondi, and pleurophyllum, Hort. R. Wilsoni, Hort., not Nutt.). A hybrid of R. ferrugineum and punctatum. Dense shrub, 4 ft. high: lvs. elliptic to elliptic-lanceolate, acute at both ends, 1½-3 in. long: lvs. similar to those of R. ferrugineum, but larger. June. July.—Of garden origin. Handsome hardy shrub, perhaps best known under the name R. Wilsoni; this name, however, had been given previously to another hybrid between two Himalayan species and should not be used for this form.

1121. Rhododendron maximum (N. 35).

RHODODENDRON

RHODODENDRON (Greek, rose and smooth; alluding to rose-like and smooth stems), *Hemathraceae*. A genus of 2 species of small tender trees, one from China and the other from Java and Sumatra. Lvs. evergreen, glabrous, long-stalked: ft. about 5 together in a compact head, having the appearance of a single flower surrounded by bracts: pedicels short, often inserted below the bracts, curved toward the circumference of the head; stamens 7-10: ovary of 2 carpels united at base; capsule several-seeded.

**Championi.** Hook. A tender tree: lvs. shining, coriaceous, usually ovate, 4 in. long: ft.-heads resembling a semi-doublé Camellia, 1½ in. across, bright pink, each head surrounded by several rows of imbricate bracts; petals 15-20 to each ft.-head. China. B.M. 1409.—Cult. in S. Calif.

F. W. BARCLAY.
RHODOMYRTUS (Greek, rose-myrtle; from the rose-colored fls. of some species and the myrtle-like foliage). Myrtaceae. Five species of tender trees or shrubs, one of which is a promising fruit-plant known in the South as Downy Myrtle, and in India as the Hill Gooseberry. This is a handsome evergreen shrub growing 6 ft. or more high and covered with broad, glossy lvs. of great beauty. The pink, 5-petaled fls. are borne through several weeks in greatest abundance, and are larger than those of the peach. They resemble small single roses. The fruits are as big as cherries and taste like raspberries. The color of the berries is dark purple and the flesh is sweet and aromatic. The fruits are produced in quantity and ripen for weeks, beginning in late summer. They are eaten raw or made into jam. The Downy Myrtle is recommended as a fruit-plant for Florida by the American Pomological Society and it is being tried in S. Calif. In the South it is generally known as Myrtus tomentosa. The distinction between Rhodomyrtus and Myrtus rests in the number of locules of the ovary. Myrtus is normally 2-3-loculed, with many ovules in each; Rhodomyrtus has 1-3 locules with spurious partitions, making the ovary appear 2-6-loculed, or it is divided into numerous 1-ovuled, superposed locules. Myrtles have feather-veined foliage; the Downy Myrtle has 3-nerved lvs. The Downy Myrtle is a native of India, Malay and China; the four other species of Rhodomyrtus are Australian and not in cult. Other generic characters: Lvs. opposite, 5- or 3-nerved; fls. axillary; calyx lobes persistent; petals 5, rarely 4; stamens numerous, free; berry globose or ovoid, with few or many seeds.

tomentosa, Wight (Myrtus tomentosa, Ait.). Downy Myrtle. Branches downy above; lvs. elliptic or obovate, short-stalked, hoary below; peduncles shorter than the lvs., 1-3-fl.: berry 3-kerneled; seeds compressed, forming 2 rows in each cell. B.M. 230, 15: 1491. F.S. 19: 1936. ALFRED REHDER.

RHODORA. See Azalea Canadensis.

RHODORHIZA (Greek, rose root; the root and wood furnish the fragrant powder known as bois de rose). Convolvulaceae. R. floridensis is a tender subshrub, 6-9 ft. high, which bears white fls. something like a morning-glory. The blossoms are about an inch across and last only a day, but a succession is maintained (in southern France) from early June till August. A striking feature of the plant is its terminal, panned inflorescence. These panicles are often a foot high, 10 inches wide at the base and contain at one time as many as 20 full-blown flowers and 100 buds. It is a native of Tenerife, and has been introduced into southern California in 1901.

Rhodorchiza is a group of about 7 species, all from the Canary Islands, which Bentham and Hooker regard as a section of the genus Convolvulus. The Rhodorchizas differ from typical Convolvulus in having the capsule by abortion usually 1-seeded, and rupturing irregularly at the base instead of dehiscing by 4 valves. They are prostrate or climbing herbs or erect subshrubs, sometimes spinescent; lvs. entire, dentate, or dentate-toothed: corolla broadly or narrowly bell-shaped; limb 5-angled or 5-lobed: ovary 2-loculed, 4-ovuled.

florida, Webb. (perhaps more properly Convolvulus floridus, Linn.). Erect subshrub; lvs. persistent, alternate, lanceolate, stalked, entire; fls. long-peduncled, funnel-shaped, white, sometimes pinkish white. B.H. 1892: 156. W. M.

RHODOTHAMNUS (Greek, rhodon, rose, and thamnos, shrub; small shrub, with rose-colored flowers). Ericaceae. Dwarf evergreen shrub, with alternate, small, entire lvs. and rather large pink fls., usually solitary at the ends of the branchlets. Charming little alpine shrub, hardly more than somewhat difficult to cultivate. It thrives best in peaty, porous soil of constant, moderate moisture in a partly shaded situation, and is best suited for rockeries. Prop. by seeds or layering also by cuttings of ripened wood under glass. Monotypic genus, allied to Kalmia, but anthers not in pouches: lvs. alternate; sepals 3, half as long as corolla; corolla rotate, deeply 5-lobed; stamens 10, slightly longer than corolla: fr. a 5-celled, many-seeded dehiscent capsule.


RHODOTYPUS (Greek, rhodon, rose, and, typos, type; alluding to the resemblance of the flowers to those of a single rose.). Rosaceae. Ornamental deciduous shrub, with opposite serrate lvs. and large white fls. solitary at the end of branchlets, followed by black and shining berry-like drupes persistent. These are a rose-like shrub and have some and distinct shrub, hardly as far north as Mass., with bright green foliage, conspicuous by its white fls. in spring and by its shining black fr. in autumn and winter. It thrives well in any good soil. Prop. by seeds and by greenwood cuttings under glass early in summer, also by hardwood cuttings. Monotypic genus, allied to Kerria: lvs. stipulate, opposite; fls. solitary, short-pedicelled; sepals large, half as long as petals, outside with 4 small alternate bracts; ovary 4-lobed; the fruit, stamens numerous; carpels usually 4, developing into black, dry, one-seeded drupes, surrounded by the large persistent calyx.


ALFRED REHDER.

RHEO (name unexplained). Convulcaneeae. One species, from Mexico and the West Indies. R. discolor, Linn., known also as Tradescantia discolor, L. Her., T. zapharensis, Swartz, and Epipremnum bicorne, Mocnath, B.M. 1192. From Tradescantia the genus is distinguished by having 1 ovule (rather than 2) in each locule.
of the ovary, R. discolor is a short-stemmed erect-growing long-leaved plant, not unlike a broad-leaved small Pandanus in habit. Its white, small and many in the lower spathe-like structure arising from the axil of the leaf and which is sessile or nearly so; leaves 3, free, more or less petal-like; petals 3, soon withering; stamens 6. Var. vitellata, Hook. (Trudscenta discolor, var. vitellata, Hook. T. verticilata, Hook. T. verticilata, Hort.) is the common form in cult. The leaf is 8-12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the open for the open in the South. B.M. 5079. F.S. 11:1169-70. Cult. as forwarding. Tra descentias.

L. H. B.

RHOPALÁ. See Ropala.

ROPHALÓSTYLIIS (name refers to the club-shaped spadix). Palmaeae. Two species of pinnate palms, both of which are of choice conservatory palms and nearly always sold as species of Areca or Kentia. However, Rhopalostylis belongs to the large group in which the ovule is borne on the side and is more or less pendulous, while in Areca and Kentia the ovule is at the base and erect. From the 5 cultivated genera listed under Hedyscepe, which see, follows: sepal of staminate fls. awl-shaped to lanceolate, not imbricated; stamens 6-12; pistillate fls. with short style, valvate at the apex. The two species are spathes of spadix and a spadix; apex terminal, equiangular; leaves of staminate, equidistant; numbers, narrowly sword-shaped, acuminate, the margins not thickened, recurved at the base, the midveins prominent, with 3-4 nerves on each side; rachis concave above, scurfy; petiole very short; sheath elongated; spadix short, spreading, with a very short, thick peduncle, and, fringed, rather thick, densely-fil, branches: spathes 2, symmetrical, oblong, flattened, the lower 2-winged; pro-ducts adnate to the lower-bearing branches: the apex; bractlets: frs. medium; fr. small or medium, ellipsoid, smooth.

sápida, H. Wendl. & Drude (Areica sápida, Soland. Kentia sápida, Mast.). Stem 6-10 ft. high, 6-8 in. in diam., cylindrical, green; lvs. 4-6 ft. long, pinnate; segments very narrow, linear; margin replicate; nerves, midrib and petiole covered with minute scales; fls. pale pinkish; fr. brown. New Zealand. B.M. 5139.


RAED G. SMITH.

RHUBARB, or Pie-plant (see Rheum), is commonly grown by division of the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, often proves satisfactory, and always interesting, as the seedlings vary greatly. The seed germinates easily, and it started early the plants become fairly large and strong the same season. Although the crop is so easily produced, and so certain and regular after a plantation has once been started, it is one of the most profitable of market-garden crops, even in small places and neighborhood. A large number of home gardeners are still growing it on their premises, although everybody seems to want Rhubarb as soon as the plant is grown giving the first available material in the year for plantings. Rhubarb delights in extremely rich soil. Very large and bountiful leaf-stalks cannot be secured except from soil which is strongly enriched with manure to overfertilizing. The seedlings, however, may be started in any ordinary clean garden soil. Sow seed in early spring, in rows a foot apart and not over an inch deep. Thin the plants promptly and a few inches apart in the rows, and give the same thorough culture allowed to large garden crops. In the following fall or spring take the seedlings up, and set them in the well-prepared permanent patch, not less than four feet apart each way, and cultivate frequently during the entire season. Ten to twenty plants will supply the demands of one house-
lings are likely to be of weak vitality. Not more than 15 per cent can be counted on to be fairly true to the varietal type. In the writer’s experiments 4 ounces of seed was sown each season. The seed was selected from ideal plants that had been propagated by division.

As to varieties, the writer has had best results with Linnaeus and Victoria.

FORCING OF RHUBARB.—The forcing of Rhubarb has now become quite a profitable industry in the vicinity of many of the large cities. It may be forced either in the field where the roots are growing or lifted and placed in hotbeds, under greenhouse benches or in a dark cellar. See Fig. 2113.

Much the larger part of the Rhubarb which is offered for sale during the winter months is grown in rough forcing houses which are built over the plants in the field. Fig. 2114. These houses are simply and cheaply constructed, the sides usually being about five feet high, of rough boards, which are covered with cheap building paper. The roof is formed of hotbed sash. These buildings are usually from 24 to 36 feet in width and of any desired length. Artificial heat is generally provided, steam being the most popular, although the sun is at times depended upon, the required heat. The soil moisture is usually sufficient, so that no water is given. Plants for forcing should be set not more than two by three feet apart and should be fertilized annually with liberal dressings of compost, that made from cow and hog manure being considered the best. The sash should be placed upon the house during the first part of February, and may be removed for use on hotbeds and coldframes in from four to six weeks. The stalks are usually pulled twice, the returns being from $1.25 to $2 per sash, depending upon the season at which it is placed upon the market. The cost of production is often greatly reduced by growing a crop of spinach or dandelions between the rows, the price obtained for these fillers usually being sufficient to pay for all cost of labor and maintenance.

RHUS (ancient Greek name). Anacardiaceae. Su- mach. Trees or shrubs with alternate, usually odd-pinnate lvs. and no stipules: fls. in axillary or terminal panicles, small, white, greenish or yellow; calyx 5-parted; petals 5 or sometimes 4 or 6; stamens 4-10: fr. a small dry drupe or berry, usually 1-seeded. Plants with resinous or milky juice, wood often yellow; bark and foliage abounding in tannin, and for this reason used in dressing leather.

All the species are beautiful and have been apparently much neglected by planters. Any one who has observed our native Sumacs covering rocky hillsides or barren railway banks with their rich fern-like verdure during summer or when autumn has given them colors of fire, should appreciate their value as subjects for ornamental planting. Some species, too, retain their crimson fruit throughout the year, and help to make bright spots amid the snows of our northern winters. Some of the stronger-growing species answer very well in subtropical planting and may be cut to the ground every winter. The species of the genus give the most ample foliage. Some are admirable as single specimens, having a picturesque character that is quite refreshing. When grown as standards, however, they are likely to be short-lived, and so the success must be due. Many strains of the brilliant varieties of two of our native species seem to give more leafage than the types and are very useful in mass-planting. All the species are easily propagated by seed, layers, root-cuttings, and some of them by top-cuttings. The tendency that some of them have to spread by suckering is a disadvantage where they are used in fine lawns.

Of over one hundred known species only about sixteen have been in cultivation in this country, and these all species of temperate regions; none of the tropical
ones having appeared in the trade, so far as the writer knows.

In the following enumeration, two species of Cotinus (Nos. 3 and 4) are included.

INDEX.

a. aromatica, 5.
    atropurpurea, 3.
    Canadensis, 5.
    copallina, 15.
    Coriaria, 11.
    cotinoides, 4.
    Cotinus, 3.
    diversiloba, 7.

b. glabra, 8.
    integrifolia, 1.
    laciniata, 8, 11.
    Osbeckii, 16.
    ovata, 2.
    pmilla, 12.
    radicans, 6.
    semialata, 16.


An evergreen species.

2. ovata, Watson. Another Californian species resembling the last, but with larger and smoother leaves.

3. Cotinus, Linn. SMOKE BUSH. VENICE SMOCH. A bush 10-12 ft. high, with simple obovate lvs. and brown bark: fls. purple, in ample loose panicles and on very long pedicels, which become profusely pubescent, giving the plant the smoky appearance from which it derives its common name. Early summer. Eu., Asia. Var. atropurpurea, Hort., is distinguished by the darker color of its inflorescence.—This species used to be common in cultivation, but it does not seem to reproduce itself as readily as some species, and in many cases when killed by hoers or other causes, it has not been replaced. Gng. 5:118. Gn. 34, p. 162; 34, p. 565.


5. Canadensis, Marsh. (R. aromatica, Ait.). Spreading shrub, 3-8 ft. high, with 3-foliate, crenate, pubescent, petiolate, aromatic lvs.: fls. yellow, small, in clusters or short spikes, either axillary or sometimes terminal: fr. globular, coral-red, sparingly hairy, and comparatively large. Flowers in spring before the lvs. appear. Rocky woods, especially N. Amer. Vari. trilobata, Nutt., has the lfts. deeply cut or 3-lobed.—This is one of our best cover plants or under-shrubs and spreads naturally by layers. Will flourish in any soil and is especially adapted to dry, rocky banks.

6. Toxiodendron, Linn. POISON OAK. POISON IVY. A small deciduous shrub or climbing plant: lvs. smooth or often pubescent on veins, ovate, sinuate, or lobed, petiolate: panicles short-stalked: fr. ribbed when dry. June. N. Amer. V. 10:103.—Care should be taken in planting this species, as it is very poisonous to many, and for this reason it should be excluded from our ornamental plantations, rather than added to them. The autumn color is attractive. As here understood, it includes R. radicans, Linn.

7. diversiloba, Torr. & Gray. A Californian species closely allied to the preceding, equally poisonous, and therefore not to be recommended for planting.

8. glabra, Linn. SMOOTH SUMACH. Fig. 2115. Smooth, glaucous, 10-15 ft. high: lfts. many, green above, white beneath, narrowly oblong, with serrated edges: fls. in terminal panicles: fr. crimson, hairy. July. N. Amer.—One of the best species for mass or other planting. Var. laciniata, Carr., has the lfts. deeply cut, giving the lvs. a very fern-like appearance. Like the type, it colors in autumn. R.H. 1863, p. 7. V. 10:101.

9. venenata, DC. DOGWOOD. POISON SUMACH. Usually taking the form of a tree, 10-20 ft. high: lfts. 7-13 on a red petiole and midrib, smooth, shining green above, pale beneath: fls. in a narrow panicle, drooping: small, flattened, white. June. Moist ground, eastern N. Amer.—One of the most beautiful, but unfortunately

2115. Rhus glabra (X 1/2).

2116. Young plants of Rhus typhina, var. laciniata.
the most poisonous of the Sumachs. The name *R. Vernix*, Linn., is used by some authors for this species and by others for *R. vernicifera*; in order to avoid confusion, it seems best to drop the name and to substitute those proposed by De Candolle.


**RHYNCHOSPÉRUM** jasminoides, a fine shrub of the dogbane family, is referred to *Trachelospermum*. There is, however, a good botanical genus named *Rhynchospermum*, and it belongs to the composite family. It has only one species, *R. verticillatum*, a plant not in cultivation.

**RHYNCHOSTYLS** (Greek, beaked column). *Oreídaeae*. This genus includes a few species closely related to *Succcolumbus* and usually sold under that name. Epiphytic herbs with monopodial stems and 2-ranked, crowded, leathery or fleshy lvs.: fls. in dense racemes from the axis of the lvs., medium-sized; dorsal sepal and petals sub-similar, lateral sepals broader, decurrent on the foot of the column; labelium firmly joined to the base of the column, obvolute, inclosed at the apex, not 3-lobed, spurred, the spur straight or curved backwards. For culture, see *Succcolumbus*.


**violaceum**, Reichb. f. (*Succcolumbus violaceum*, Reichb. f.). Lvs. 10-12 in long: racemes 1 ft. or more: fls. 1 in. across, white, spotted with pale mauve; labelium dark violet. Jan. Philippines. B.R. 33:36.—The blossoms are said to have a disagreeable odor. Var. Harrissonianum, Hort. (*Succcolumbus Harrissonianum*, Hook.). Lvs. distichous, oblong, obliquely bilid at the apex: raceme dense, cylindrical, pendulous: fls. white, fragrant; sepals ovate-oblong, somewhat incurved; petals narrow, oblong-spatulate; labelium oblong-ovate, with a thick blunt apiculus, sessate toward the apex; spur blunt; disk with a single thickened line. Malay Islands. B.M. 5434. F.S. 23:2412. The racemes grow to a length of 2 feet.—HEINRICH HASSELINETER.

**RIBBON GRASS.** *Phalaris arundinacea*, var. variegata.

**RIBBON TREE.** *Plagianthus*.

**RIBBES** (said to have come from the German riebe, a vernacular name for currant). *Saxifraga densa*, Currant and Goosmerry. Shrubs, usually spiny and prickly, with simple, alternate, palmately veined lvs.: fls. 5, rarely 4-petalled, borne singly or in racemose clusters; calyx-tube equal in length to the ovary; lobes commonly colored petals; usually small, borne on the calyx, alternating with stamens: fr. a berry, tipped with remains of calyx. Fig. 2118. Largely North American, although well represented in Europe, Asia and South America.
Species 60 to 70. For culture, see Currant and Gooseberry. Cuttings of hard wood in autumn or spring; mound-layers in summer; new varieties by seeds. See Thory, Monographie ou Histoire Naturelle du Genre Grosselhier; Card. "Bush-Fruits" (from which Figs. 2119, 2122, 2124-6 are taken).

Aside from domestic Currants and Gooseberries (which see in Vols. 1 and 2), Ribes contains few plants that are generally prized for cultivation. The most popular ornamental species is the Buffalo Currant, Ribes aureum, which is hardy and of the genus everywhere. The hybrid R. Gordonianum is also popular for its long clusters of bright pink flowers, its vigorous habit and its hardiness. R. sauguinum is also fairly well known, and is hardy in the northeastern states. There are horticultural forms with white, very dark red, and purple flowers. Some of the species are useful in shrubbery masses for their foliage and habit.

INDEX TO SPECIES IN AMERICAN TRADE.

1. speciosum, Pursh. Fuchsia -flowered Gooseberry. Fig. 2119. Branches covered with fine reddish prickles and glandular-tipped hairs: thorns long, slender, commonly in 3's: lvs. small, thick, shining, partially evergreen: peduncles slender, drooping, 2-4-flowered: fls. showy: calyx cylindrical, 4-5-lobed, shorter than the stamens; berry sometimes prickly. (Gooseberries).

- F1s. red and showy, 4-parted: stamens long, exserted.

2. rotondifolium, Michx. Thorns mostly single, very short: lvs. wedge-shaped, smooth or slightly downy, ciliate on margins and veins: calyx-lobes narrow or oblong, greenish or dull purplish, shorter than the stamens; berry small, agreeable. Along the Alleghany mountains. L.B.C. 11:1094 (as R. trifolium). - Sometimes offered by dealers in native plants.

3. oxyacanthoides, Lindl. Fig. 2120; also 926-9, Vol. II. Branches slender, reclining, but often crooked: thorns single or triple, slender, very finely pointed, 1/4-1/2 in.

2119. Ribes speciosum, the Fuchsia-flowered Gooseberry (X ½).

2120. Ribes oxyacanthoides (X ½).

Parent of the American garden Gooseberries.

4. Grosselhier, Lindl. (R. Uva-crispa, Lindl.). European Gooseberry. Figs. 922-3, Vol. II. Bush stocky, rigid: branches thick: thorns mostly triple, heavy and thick at base, the central one 1/2-3/4 in. long; lvs. thick, very glossy, pubescent: calyx strongly pubescent; lobe broadly ovate, thickish, leaf-like, longer than the stamens; petals ovate, reaching to base of anthers: ovary pubescent or glandular: berry generally oval, large, green, yellowish green or red, ultimately but roughly pubescent, often with glandular hairs or prickles. Eu., northern Africa and western Asia.

5. Cynocephali, Lindl. Fig. 2121. Thorns commonly single, slender, fine-pointed; peduncles and pedun- cles pubescent and glandular; peduncles long, filiform: calyx-lobes narrow, oblong, acute, half as long as tube: ovary glan- dular - blispod: berry large, prickly or rare- ly smooth, reddish purple. Eas en North America. - Fruit edible, varia- ble; sometimes cult. for its fruit, and worthy the atten- tion of the plant-breeder.

6. lacustre, Poir. Swamp Gooseberry. Upright shrub, with many slender and straight prickles, and weak solitary or whorled thorns: lvs. cordate, with 3-5
212. Ribes Lobbii. Natural size.

deeply cut or notched lobes, the stalks glandular: peduncles long and filiform: fls. small, reddish, open and the tube nearly wanting; berry small and bristly. Cold bogs, N. Eng. to Calif. B.M. 692. L.B.C. 9:884.—Offered by dealers as a bog shrub. Intermediate between Currants and Gooseberries. Fls. in short racemes.

7. Lobbi, Gray. Fig. 2122. Upright shrub, to 5 ft., the young shoots glandular-pubescent, without prickles, but provided with slender, mostly triple thorns: lvs. small (rarely 1 in. across), round-cordate, 5-7-eleft and notched, glandular on both surfaces; peduncles drooping, 1-2-fld.: fls. showy, with purple tube and reflexed lobes, the small, erect petals white, the anthers exserted: berry glandular-hairy. N. Calif. to B. C. B.M. 1931 (as R. subveutillum). G.C. II. 19:11. —Showy.

aa. Stems thornless and prickleless. (Currants.)

b. Fls. small, wide open, greenish white or yellowish.

c. Lvs. without resinous dots: fr. red.


9. prostratum, L'Her. Fetid Currant. Stems trailing and rooting, bearing erect branches: lvs. cordate, 5-7-lobed, the stalks long and slender: racemes erect, bearing flattish greenish white or greenish purple fls.:

2121. Ribes Cynosbatii (X 1/2).

fr. glandular hispid, red, fetid. Cold swamps, eastern United States and Canada.—Offered as a bog and rock-work plant. Lvs. bright colored in the fall.

10. rubrum, Linn. Garden Currant. Fig. 2123; also Fig. 610, Vol. I. Branches thick and stocky: lvs. pubescent when young, becoming glabrous: racemes drooping: fls. small, yellowish green or purplish: calyx saucer-shaped: fr. thin-skinned, shining, bright red, yellowish white or striped. Eu., Asia and N. Amer. R.H. 1861: 191. —Parent of all the domestic red and white Currants.


12. fasciculatum, Sieb. & Zucc. Very like R. alpinum. Plant reaching 4 ft.: fls. all green, often imperfect, the male fls. somewhat larger than the female by reason of the longer sepals: lvs. firmer than those of R. alpinum, bright green, the lobes and serratures more obtuse, the young ones pubescent below and on the nerves but becoming glabrate: fr. sweetish musky, scarlet. Japan.—Var. Chinense, Maxim., from N. China, with lvs. soft pubescent, is offered by Franceschi. S. Calif. M.D.G. 1895:571.

cc. Lvs. bearing resinous dots on the under surface: fr. black.

13. bracteosum, Doug. California Black Currant. Strong, erect bush, often several feet high, glabrous or nearly so, the young growths resinous-dotted: lvs. large (sometimes 9 in. across, 5-7-eleft, coarsely and doubly serrate, hairy and resinous: racemes erect or ascending: 4-8 in. long, many-fld.: fls. small, greenish or purplish: berry ⅛ in. in diam., black and resinous-dotted, edible. N. Calif. to Alaska. B.M. 7419.

14. nigrum, Linn. European Black Currant. Fig. 611, Vol. I. Stem upright: branches thick, grayish: lvs. sprinkled with minute bright yellow resinous dots beneath: racemes drooping, 5-10-fld.: fls. greenish white; calyx-tube broadly urn-shaped; lobes small, thick and greenish; ovary and calyx pubescent and resinous-dotted: fr. black, mawkish. Eu. and Asia.—Parent of the domestic Black Currants.

16. **sanguineum**, Pursh. **Red-flowered Currant**. Fig. 2124. Branches red, smooth; young parts pubescent or glandular-hairy; lvs. 2–4 in. broad, round-cordate; racemes long, pendulous; bracts ovate, membranous, as long as the pedicel; fls., purple-red or rose-colored; calyx, ovary and peduncles beset with short, glandular-tipped hairs; fr. bluish black, rough, glandular-hairy, dry and bitterish. British Columbia, through California and Mexico to South America. B.M. 3333. B.R. 16:1349. Gn. 51:1110.


cc. **Racemes leafy.**

18. **aureum**, Pursh. Missouri, Flowering, Golden or Buffalo Currant. Fig. 2125; also Fig. 643, Vol. 1. Plant free-growing, sprouting from root; lvs. cuneate or truncate, smooth, shining, when very young densely covered with brown or yellow resinous beads, which disappear with age; peduncles short, few-fl.; bracts large, leaf-like; fls. spaly-scented, yellow and showy; calyx-tube 3/5–5 in. long; petals red: fr. dark brown or black, with bluish bloom. Mississippi valley to Rocky Mts. B.R. 2:125.—Much grown for its yellow fragrant flowers. It has given rise to the Crandall and some other fruit-bearing sorts.


19. **céreum**, Doug. Fig. 2126. Upright branching shrub, reaching 3–4 ft., the young parts minutely pubescent and more or less glabrous: lvs. nearly orbicular to reniform, rather small (seldom more than 1 in. across), 3–5-lobed and crenate-toothed, waxy-dotted; racemes short and drooping, glandular-hairy; fls. 3/5 in. or less long, narrow tubular, white or pinkish: fr. bright red, rather small, sometimes glandular, sweet but mawkish. Rocky Mts. and west. B.M. 3086. B.R. 15:1263; 17:1471 (as *R. lucidus*).—Sometimes grown for ornament.

20. **viscosissimum**, Pursh. Branchy, upright, to 6 ft., the young growths viscid: lvs. round-cordate, 3 in. or less wide, 2-5-lobed with obtuse doubly crenate somewhat out divisions: racemes erect, viscid: fls. large, fragrant, yellowish or whitish green, the calyx-lobes not

!!2123. Ribes rubrum, the common Currant. Natural size.

reflexed, the petals small and white: berry black, mostly glandular-hairy, scarcely edible. Rocky Mts. and west.


RICCI A (P. F. Ricci, Italian nobleman, patron of the botanist Micheli). Ricci iccer. Ricci a lillatoris, Linn., is one of the few flowerless or cryptogamous plants in cultivation aside from the ferns, mushrooms and se-laginellas. It is cultivated by one specialist in aquatics presumably for the benefit of students of botany. It is not generally advertised among aquarium plants. In this family of plants the plant-body is a thallus (i.e., a green, flatish body not differentiated into root, stem and leaves). The thallus of Riccia spreads out in green patches which are at first radiately divided, and the center of the plant often decays quickly. R. lillatoris is distinguished from other species by the linear, dichotomous, floating thallus, with the capsule protuberant from the lower surface. For full description, see Gray’s Manual.

RICE. See Oryza.

RICE FLOWER. Pimelia.

RICE, MOUNTAIN. Orygopsis.

RICE PAPER. The Chinese rice paper is made from Patia daponica, which see.

RICHARDIA (L. C. Richard, 1754-1821, French botanist). Arthedon, CALLA LILY. Perennial herbs with many long-petioled leaves from a thick rhizome; peduncles appearing with the leaves; petioles spongy, often bristly below; blade sagittate or lanceolate, the numerous primary and secondary nerves ex-current; peduncle as long or longer than the leaves; spathe large, open, with a flaring, pointed, recurved tip; spadix stamineate above and pistillate below (Fig. 2127). Differs from Peltandra in floral characters. So. Africa. Species 10-12. See Gn. 46:446; R.B. 23:15; Engler, DC. Monogr. Planer, vol. 2. The true Calla is not of this genus; see Calla. For the Black Calla, see Arm.

When grown for the flowers only, Richardias may be planted out permanently on a bench, using very rich soil and giving an abundance of water while growing. They may be kept growing continually or given a season of rest as desired. Plants in pots are usually started late in summer from dry tubers. The species having yellow and pink spathes seem to do best when grown without a resting period.

A. Leaves lanceolate.

B. Leaves sagittate or cordate.

AA. Leaves sagittate or cordate.

B. foliage spotted.

albo-maculata, Hook. SPOTTED CALLA. Fig. 2128. Petioles short; blade 12-15 in. long, white-spotted all over, hastate, three to four times longer than broad, acute, the basal lobes widely spreading, triangular, ob-tuse or acute, 3-4 in. long; spathe trumpet-shaped, 4-5 in. long, 2 in. wide, dull creamy yellow with a blotch of crimson at the base. B.M. 1340. I.H. 7:225. F.S. 21:2258. — Will stand in the open with good protection for the roots. Not of much value except in botanical collections.

Nelsonia, Hort. Allied to R. albo-maculata: very vigorous and floriferous, reaching 3-4 ft., the scape overtopping the foliage; lvs. sagittate, bright green, sprinkled with pellicid dots or spots, as in R. Elliotiana: spathe scarcely spreading, the limb short, very pale yellow with a purple blotch at the bottom. One of the most recent species.

melanoleuca, Hook. f. BLACK CALLA. Fig. 2129. Petioles short; blade light green, with a few white or translucent spots, broadly sagittate, with undulate margins, about as large as those of R. Africana: spathe a rich lustrous yellow, lasting about two weeks, becoming greenish with age. Tubers prolific. S. Africa. 1890. Gn. 46:299.

BB. Foliage without spots. A. Base of the leaf-bi-nate.

Africana, Kunth (Calla Ethiopica, Linn. R. Ethio-pica, Hort.). COMMON CALLA. LILY-OF-THE-NILE. Fig
RICHARIA

2127. Blade about twice as long as wide, cuspidate at the apex, cordate-sagittate at the base, both leaves and spathes varying greatly in size: spathe 3-10 in. long, white, creamy inside at the base, flaring outwards and narrowing to a cuspidate tip. S. Africa. B.M. 832. Gr. 33:654.—Fragrant. Sports with double and triple spathes often occur. A.F. 5:83. Gn. 46, p. 447. See Fig. 2129.

Var. nama compacta, Hort. (R. nama comperta, Hort.). LITTLE GEM. Fig. 2130. Like the type, but only 12-16 in. high; spathes 3-4 in. long. Var. Devoniensis, Hort. (R. Devoniensis, Hort.). Dwarf; freer bloomer than Little Gem, and more fragrant.

There are many forms of the Calla Lily in cultivation, a number of which have received Latin names. Some of these horticultural names are: candidissima, spathe large, pure white; gigantea, plant very large; Godefreyana, dwarf, white; grandiflora, spathe large.

Pentlandii, Whyte. Erect perennial: lvs. ovate-cordate, acuminate-cuspidate, with an open sinus, basal lobes rounded; midrib thick; spathe golden yellow, broadly trumpet-shaped, its lower margins convolute one-third, flaring above, the subulate tip abruptly recurved, margins recurved, slightly wavy and with a black-purple blotch at the base within. Basutoland, S. Afr. B.M. 7397.—Hooker writes (in B.M. 7397) that "R. Pentlandii is much the largest-leaved species, and is the only one with a deeply gambose yellow spathe within, which is much the largest and broadest of any." First flowered in 1892 by R. Whyte, Pentland House (Lee, England).

cc. Base of the leaf-blade hastata.

hastata, Hook. f. (R. Lutwigschei, N. E. Br.). PRIDE OF THE CONGO. YELLOW CALLA. Petioles bristly below: blade dull green, hastate-ovate, wider than wide, rather falcate, 8-16 in. long, cuspidate at the apex, basal lobes separated by a narrow sinus: spathe cup-shaped, 5 in. long (with a tail 1 in. long), greenish-yellow, the blade bright green, and somewhat exceeding the scape: spathe short and rather open, creamy white with a black or purple throat. S. Afr. Distributed by Max Leichtlin (Germany) in 1898. There are hybrids of this and R. Elliotiana.—R. augustaloba, Schott. Leaf-blade hastate, narrow, the basal lobes one-fourth the length of the apical one, 20 in. long; 3 in. wide at the base; peduncle 4-6½ ft. long. Angola.—R. augustaloba, Hort., said to be a hybrid of hastata and albo-maculata, but better regarded as a variety of hastata: leaves spotted; spathes large, yellow. Said to be a hybrid of R. albo-maculata and R. hastata.—R. suffusa. A distinct dwarf-habitat plant with a creamly white spathe, the base in the inside of a rich violet-purple shade. It is apparently a plant of good constitution." Gn. 55, p. 468.

JARED G. SMITH.

Culture of Callas.—Richardia Africana has been known for generations as the Calla Lily. Though often grown as a window plant, it is very unsuitable and seldom blooms under house treatment. When grown for winter flowers, it is customary to give the roots a rest during summer time. They may be dried and stored if necessary. It is in this condition that we get Californian Callas. It is the opinion of the writer that summer-resting would be the best treatment for those grown as house plants, as well-grown dried roots are more likely to bloom. But rest must be enforced, for Callas will grow all the year round, increasing in size and numbers when planted out. We always get the largest blooms from summer-grown plants. They are taken up in the autumn, given good food and plenty of root-room, with a liberal allowance of liquid fertilizer when well established. They thrive best under good light, and in a minimum temperature of 55°.

There are several varieties, all differing only in size, from those which grow six feet to "Little Gem"—one foot. Some are said to be more odorous than others, though all are fragrant. Besides being invaluable pot-plants, they can be used with good effect in indoor winter gardens, growing luxuriantly when partly submerged; and also in "band" gardens, and on the margins of ponds, to give sub-tropical effects.

R. Elliotiana, although introduced to cultivation about ten years ago, is yet rare. It is undoubtedly an acquisition. It is a South African species, about which we know comparatively little. From what scraps of information we have gathered regarding it from time to time, we conclude it is rather an upland species, and our experience with it would indicate that frost may occasionally visit its habitat, or at least that it will endure a lower temperature than Richardia Africana and succeed. When introduced, we thought it difficult to grow. It was first grown in this country by William Robinson, gardener to F. L. Ames, North Easton, Mass., Mr. Harris, gardener to H. H. Hunnewell, Wellesley, Mass., and Mr. Joseph Tailby, of Wellesley. The last named is a commercial grower, who looked upon his importation as an investment. The bulbs (corms or roots) were expensive,—a guinea.
or thereinabouts—and about as big as marbles. Mr. Taiby now has bushels of them, and some as large as turnips, anyway, four inches in diameter. Taiby’s experience is interesting and it may be valuable to the reader. He can’t near losing his whole stock by cutting out the eyes, with the object of getting separate plants. There had been no sign of natural division, nor has there since; though Mr. Taiby is still of the opinion that by proper manipulation they may be increased by division, as we now do potatoes, but the wounds must be given time to heal over. The roots are kept over in a cellar at a temperature of 55° F., or thereabouts, until April, when they will show signs of starting. They should be potted then, but kept in another room or runners, so that the spadix may not be disturbed. The pots will be fairly well filled with roots before much growth shows, and we can keep them under benches in a cool house, or even in the cellar, for two weeks after potting. With the first frost well started, they come along quickly, coming into bloom in 10–12 weeks. A good bright, intermediate house suits them best, and some liquid fertilizer will help them when the flowering-appears. The blooms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully; and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when we know it.

Seeds germinate quickly. Those sown in November come up strong, but the plants are difficult to handle and liable to go off when very young. It is the safest way to let them stay in the seed-boxes, ripen there, and plant them farther apart next season. This is what we have been doing and we cannot complain of the results. Taiby has sown seeds outdoors with very good results. The seeds, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when we know it.

T. D. Hatfield.

The Richardia in California.—In considering the Cultus in California, it is necessary to treat it under two general heads: first, as an ornamental; and second, as an article of commerce. The popular and growing demand for Calla bulbs (or tubers) speaks much for the plant as an ornamental. Many, indeed, and in several uses to which it is put. It is, perhaps, most commonly used as a belt along fences, and not infrequently as a hedge between two properties; or nearly as often is found along one side of a house in a long, narrow bed common to both. For effective planting it is necessary to group around hydrants and unsightly objects in damp places, at watersides; sometimes as a border around a fish or lily pond, oftentimes growing in bunches or masses in the water itself; or massed on a slope near water, mixed with other tropical vegetation; or as a border to tropical jungles; and very effective, indeed, is it in the lower tiers of basins around a large fountain with Myriophyllum hanging down. For all of these purposes the foliage is of even more importance than the flowers. As it grows luxuriantly here in almost any location, it is very seldom seen as a pot-plant either in the dwelling or on sale at the nurseries. In the most favored places only is it entirely secure from the frost, though the damage to it from this source is not serious in or around Los Angeles. Though in the clear sun, our summers are too hot and dry for it to attain its greatest beauty and luxuriance wholly without protection, and it may therefore only be seen in perfection when grown in partial shade of water, and humus is also an important factor in its proper development.

The spadix is subject to many variations in form, both in size and shape, some being long, rather narrow, and pointed, ending in a distinctly curved or otherwise circularly, with the sharp point almost wanting and standing upright the same as the balance of spathes. It frequently happens that the spadix is double and even triple, sometimes in its entirety but often only partially so. In the latter case it often assumes some very strange forms. The spadix is not so variable and seldom departs from the type, though an occasional double or abnormal spadix is found. Other species or varieties than R. Africana are found, but sparsely in California gardens, the most common ones being the spotted-leaved and the dwarf form known as the Little Gem.

Commercially, the growing of the bulbs for eastern and foreign markets is a sure source of revenue, and is carried on extensively throughout southern California. The local market for the so-called flowers is of course limited, but if grown in a practically dry-growing manner for the production of the winter field, as in that season of the year flowers of all kinds are scarce. The average retail price for good blooms in midwinter is 56 cents per dozen; the wholesale price about $1 per 100. Bulbs at retail cost about one-half, or even less, what they do in the East. Our commercial growers get at present (January, 1901), $25 to $30 per 1,000, according to size, the market calling for tubers 1½ to 2½ inches in diameter. Larger sizes are quoted as "fancy" and command extra prices. Though they can be grown in almost any soil with some success, a free, cool, blackish loam is best, and they do not thrive in a hot, gravelly or stony soil. The lands near the coast, where swept by the cooling sea breeze, are productive of the best results, both in bloom and tuber. Land containing sufficient alkalai to prevent the growth of many common crops will produce good Callas if other requirements are present. In field planting it is much better to put in small bulbs about 4 inches apart than to sow the offsets promiscuously in the row; when the sets are thus sown, they should be thinned up the following year and the smaller ones discarded. Offsets as grown as above and left 4–6 years (the usual time for a good crop) have never produced satisfactory results. No pest seriously attacks foliage or bloom, but in dry years more especially, Calla bugs eats into the flowers and roots. The United States Bureau of Agriculture is in California, and has much assistance from millipede. Both these pests are quite a nuisance to the California nurseryman and gardener. The much-photographed "Acres of Callas in Bloom," so familiar to visitors and much used to illustrate articles on California, fancy stationery, etc., was grown by Capt. M. E. Walker, of Los Angeles, to whom the writer is indebted for many of the leading facts in this article regarding the culture of the Calla for the general market.

ERNST BROWN.

RICINUS (Latin name, from the resemblance of the seeds to certain insects). Euphorbiaceae. Herbiaeous or becoming tree-like in the tropics, glabrous: tvs. large, alternate, peltate, c. 8; to many-lobed, the lobes serrate, monocious: fts. without petals or disk, in terminal and apparently lateral racemes, large, the upper shorter pedicelled or sessile and staminate; calyx 3–5-parted, valvate; stamens many, erect in the bud.

FRUIT OF CASTOR BEAN, SHOWING THE SEEDS INSIDE.

Natural size.
Ricinus

2132. Ricinus communis.

Filaments much branched, each with very many anthers; rudiment of pistil none; the lower fls. longer pedicelled, pistillate; sepals very deciduous; styles 3, plumeose: capsule 3-loculed, 3-seeded, explosively separating into 2-valved cocci when ripe; seeds ovoid, with a large calyx.

2133. Clump of Ricinus communis.

ROBINIA

1537

R. Robinis, Hort. Dwarf, 5 ft., lvs. bronzy purple. R. livida, Jacq. (R. sangui-


J. B. S. NORTON.

RIGIDÉLLA (Latin, somewhat rigid; referring to the pedicels, which after the petals fall become erect and stiff). Irídácæae. A genus of 3 species of Mexican halfdhardy bulbous plants allied to the well-known Tigrídas and distinguished by the inner perianth-segments; these are incommensurable in size, one being very small, ovate and erect, while in Tigrida they are larger, fiddle-shaped and spreading. Lvs. broad, plicate, with channelled pedicle; fls. fugitive, bright red, pedicelled; perianth-tube none; segments very unequal, outer oblong, connivent in a cup in the lower third, then spreading or reflexed; inner very small, erect, ovate, with a narrow claw. Baker’s Irideae, Baker, p. 70.


F. W. BARCLAY.

RIVINA (A. O. Rivinus, professor of botany, etc., at Liepsig, 1641-1725). Pyrólácæae. A genus of 2 or 3 species of shrubs with herbaceous branches bearing usually axillary racemes of small flowers, followed by red berries the size of peas. Lvs. ovate, ovate-lanceolate or obovate-ovate; perianth-segments 4, small, equal; stamens 4-8; style short; stigma capitate. The species are natives of tropical America. The following makes a good pot-plant for a warm greenhouse, and it is also useful for growing as a summer annual in the open.

Humilis, Linn. R. Rovina Plant. Fig. 2134. Stem with spreading branches, ½-2 ft. high; lvs. 1-3 in. long; racemes slender, pendulous, many-fl., as long as the lvs.; fls. white, 1-1½ lines long; calyx pale rose: fr. 1-1½ lines long; S. Florida. B.M. 1781. V. 5:755. S.H. 2:111. Gc. 22, p. 68 (as R. livida).

F. W. BARCLAY.

ROAN or ROWAN. Sorbus Aucuparia.

ROBINIA (in honor of the two early French botanists Robin). Legumínosæ. Trees or shrubs, with odd-pinnate leaves and often spines for stipules: lfts. stipu-

late: fls. in drooping axillary racemes: fr. a 2-valved pod or legume, with several bean-like seeds. A genus of plants of much merit for ornamental planting, and in one case for its enduring timber. All are of rapid growth when young, reaching effective stages in a short time. The facility with which they increase, both by seed and by suckers, is sometimes a disadvantage. Varieties are propagated by cuttings or by grafting. The
beauty of *R. Pseudacacia* was early recognized and it was extensively planted, but the attacks of the borers have caused great loss and checked the planting of a beautiful tree.

2134. *Rivina humilis* (X ½). *(See page 1337.)*

**Pseudacacia, Linn.** *Locust. False Acacia. Black Locust.* Fig. 2135. This species is the largest of the genus, growing to a height of 80 ft. Ifs. short-stalked, 9-19, 1-2 in. long, oval or ovate, smooth, often emarginate or mucronate; bark on young wood brown and glandular; stipules glandular, enlarging with age and becoming strong thorns on the 2-year-old wood: fls. white and fragrant, in drooping racemes; fr. a broad, brown, many-seeded pod or legume. May, June. Eastern N. A.—Wood very lasting, and adapted to many uses. Many varieties of this species are in cultivation, the following being sold in this country: *äurea*, Hort., has pale yellow lbs.; *bella-rosea*, Hort., rose-colored lbs., and is probably a hybrid of *R. Pseudacacia* and *R. viscosa*; var. *inermis*, DC., is a thornless variety, with large dark foliage; *bullata*, Hort., is much like *Bessoniana* (below), but more compact; *Decaisnea*, Carr., is a form with handsome rose-tinted lbs. *R. H. 1863: 151. F. S. 19:2927. 1 H. 12:427. Gt. 34, p. 174; spectabilis, Du Mont Cour., is a strong-growing thornless var.; *monophylla*, Petz. & Kirchn., is the Single-leaf Locust, and of this there is a slightly pendulous sub-var.; *pendula*, Loud., is a form with broad, spreading, somewhat drooping branches; *semperileurosa*, Hort., is said to flower throughout the summer; vars. *globula*, *stricta* and *mimosaefolia* are horticultural forms, which are sufficiently described by their names; *pyramidalis*, Petz. & Kirchn., is a distinct narrow-growing form; *umbellifera*, DC. *Umbrella Locust.* Thornless, the glabrous branches densely crowded: lbs. ovate.Vars. *rubra*, *stricta* and *Bessoniana* are forms of this. Very distinct.

**Hispidia, Linn.** *Rose Acacia.* Fig. 2136. A shrub 2-8 ft. high, all parts of the plant except the lbs. bristly or hairy: lbs. 9-13: racemes loose: lbs. on long pedicels, rose color. May, June. Va. to Ga., in mountains. *B. M. 311. Gt. 34, p. 175.—Like the next species, it spreads from the root and should be planted where it will not interfere with other plants. Seldom matures seed.


**Neo-Mexicana, Gray.** A shrub 5 or 6 ft. high, with stout stipular prickles: peduncle, raceme and calyx glandular-hairy; lbs. in drooping axillary racemes, rose color. *Southwestern N. Amer. S. S. 3:114. Gt. 41:285.*

*R. Keilty* is "a new species discovered and introduced in 1901, by Harlan P. Kelsey. The bark much resembles *R. Pseudacacia* and the plant is sparsely pubescent." It is *R. Egmonti*, Ashe.

place to induce perfect and early maturity. During winter the plants may be kept in a sunny frame or cool, light greenhouse, with only sufficient water to prevent shriveling.

A. Clusters usually 2-flowered.

jasminea, DC. (Crásua jasminea, Ker-Gawl.). Stem herbaceous, 4-12 in. high, decumbent, branched, flowering part erect: Ivs. fleshy, oblong-oval, 1/2-1 in. long, neat, porous. Here, growthing and ferns are strong-growing and exquisite mer. bright and sunny. See Crasula falcata. F.W. Barclay.

ROCK-ROSE. See Crasulla falcata.

ROCK-CRESS. Arabis.

ROCK GARDENS. Figs. 2137-40. Nature in time will make a garden even on the unbroken surface of a rock, by clothing it with lichens, algae and mosses of many exquisite forms having much variety and often striking brilliancy in coloring. If there are soil-filled cracks and pockets then ferns and flowering plants will find a place. At low elevations, however, these flowering rock-plants are comparatively few, for soil accumulates rapidly and strong-growing herbs, shrubs and trees, aided by favorable climatic conditions, soon cover the rock surface or furnish so dense a shade that only mosses, lichens and ferns will thrive.

The ideal rock or alpine gardens are within that region on mountain summits between the limits of tree growth and the edge of perpetual snow, and in the corresponding regions toward the poles, where the plants are protected from the rigors of a long winter by blankets of snow and are quickened into a short period of rapid growth by a comparatively low summer temperature. Here, where there are deep, cool, moist rock crevices and pockets filled with fragments of broken stone and porous decayed vegetable matter, are the favorable conditions wherein the real alpine plants can multiply their neat and dainty cushions, tufts and rosettes of dense and matted foliage and their abundance of exquisitely formed and brilliantly colored flowers. A successfully grown collection of these plants in contrast with ordinary garden flowers would be like a collection of cut gems as compared with one of rough minerals and rocks, for they have an exquisiteness of finish and depth of coloring that gives them a unique place in the vegetable kingdom as they have in the plan of nature. Surely there are men and women who, if they knew these plants well, would be fired with an ambition to excel in their cultivation; and in so doing they may enter a comparatively un trodden path if they will limit their work chiefly to the alpines of this continent. They are represented in the New England mountain region by such species as Arenaria Groenlandica, Loiseleuria procumbens, Silene acaulis, Diapensia Lapponica, Acróstaphylos alpina, Vaccinium corymbosum, Sazífraga rivularia, Veronica alpina, Geum radiatum, var. Peckii, Sibbaldia procumbens, Rhododendron Lappionicum, Bryanthus breweri, Saxífraga oppositifolia, Alcaon and alioseides, Aster polyphyllus and Woodsia gigabala; and in the Rocky Mountains and Pacific Coast Ranges by Erygeron uniflorus, Ixias and waringii, Actaea Brandegei and grudillifora, Artemisia borealis, scoparia, caucasica, Scèveo Solandra, Fremontii, petraeus, uniflorus and alpenrose, Crepis num, Campanula uniflora, Primula Parryi and septentronics, Gentiana prouta, frigida, Newberryi, Parryi and simplex, Phöz bryoides and cespitosus, Polemonium confertum, Cassiope Mertensiana, Bryanthus brevfi, Craba streptocarpa, Parryi and nudicaulis, Arabis Lyallii and platysperma, Suetorskiá calsecienia, Lycium montana and Kingii, Càlandrína pygma, Claytonia megalorhiza, Spraguea umbellata, Dryas octopetala, Genia Rossii, Saxífraga chrysantha and bryophora, Cystópsis alpina, Aploppus pygma, Lyallii and acaulis, Omphalodes num, var. arctoides, Chioniphia Jamesii, etc. (Not all of these names are accounted for in this work. They may be found in the Current Manuals of North American Plants.)

The unutilized American plants in this class are quite as numerous and attractive as are the European species that have been long cultivated there. Here alpines have been but little cultivated. A very few easily grown European kinds, like Aubrieta deltoidea, Achillea tomentosa, Campanula Carpathica and Arabis albida, are offered by American nurserymen and cultivated in the open border. On a few private places small rock gardens have been established, or advantage has been taken of favorable local conditions to cultivate some additional species, and in one or more botanic gardens considerable collections have been at times maintained, chiefly in frames. Generally what have passed for rock gardens have been rockeries—mere piles of cobbles raised from the surface of turf or piled against dry banks in such a manner as rapidly to disperse instead of slowly conserve all soil moisture. Even the most

2137. A rockery bordering a lawn.
the arrangement of our rock gardens. Every precaution should be taken to secure the full advantage of rainfall and any natural water supply, and there should also be a liberal and constant artificial water supply. It must be kept in mind, too, that at low elevations the long, hot summers do not allow the period of rest that such plants require. This condition must be met by devices, methods, and locations that will retard the growth in spring, check it at an early period in summer, and keep the plants fully dormant in winter, as shade, mulching, and, in the case of particularly difficult plants, the protection of frames. It is essential that conditions be provided that will enable the roots to extend for a long distance, often many feet, in narrow crevices and pockets between rocks to depths where there is a uniform temperature and uniform moisture supplied by moving water, for frequent freezing and thawing and stagnant water are fatal. These cavities should be filled with such loose material as fragments of rock mixed with decayed vegetable matter, without manure, and arranged to provide for the free passage of hair-like roots, for perfect drainage and the free access of air. To provide these unusual conditions on the average private place in a large way would be so difficult and so expensive that it is not to be recommended. A small collection comprising a few easily cultivated alpines and the similar rock plants referred to in a later paragraph may, however, be successfully grown on reconstructed stone walls, on ledges, in small rock gardens and in the open borders of almost any country or city place. Persons who desire to cultivate a large collection of true alpines should seek a situation where favorable natural or existing conditions can be taken advantage of. Such locations are likely to be found at the seashore and in rocky and hilly regions such as New England, for example, as are selected by many people for summer homes. A ledge, a natural mass of boulders or an abandoned quarry will often provide them. Pockets and crevices of ledges can be cleared of unsuit- able material, and if they are not deep enough to hold moisture and have an equable temperature their depth may be increased by the judicious use of wedges, bars and explosives. Boulders can be arranged in such a manner as to secure suitable deep pockets and crevices of soil, springs or locations that will supply to a constant flow of water, underground pipes can be supplied from an artificial source of supply to various points where conditions require them. However, favorable the conditions are, it will be found that much can be done to advantage in different localities to meet the special requirements of different groups of plants. In such work, however, it should be kept constantly in mind that these are plants that will grow in all sorts of surroundings, and that it will often be much better to seek such as are adapted to existing conditions than to go to the expense of radically modifying such arrangements.

If an artificial rockery is to be constructed, it should be borne in mind that it is not for the purpose of displaying a collection of various rocks that it was originally arranged, but to provide a suitable situation for growing a class of plants that cannot be as well grown elsewhere. It would be better never to think of securing mountain, valley and rock effects in the disposition of rocks but only to think of providing many varied conditions and situations as regards exposure to sun and shade, depth of pockets and crevices, the character and depth of soils, subterranean and surface water supply, and whether it be warm or fluctuating. In deciding where and arranging the rocks freshly broken raw faces should not be exposed, but rather such faces as are already covered with a growth of lichens for sunny places and with mosses for shady spots.

To take full advantage of surface water, pockets and crevices should have a decided downward direction from the exposed surface and not be sheltered by overhanging rock. That this does not apply in all cases, those who are familiar with the habits of rock-plants know well. The natural habitat of _Poa glaseri_ in the upper Missoula bluffs, as well as pockets well back from the edge of the overhanging rock, where it is absolutely protected from all surface water. It fails sufficient moisture in the horizontal seams. _Pelius atropurpureus_ will grow in narrow cracks and small pockets on the face of dry limestone boulders where there can be no possible internal supply of moisture. These instances show that the general principles that will apply to such plants as a class will not apply to all species, and that, if simply given an emphasis to the importance of trying a plant under all sorts of conditions before assuming that it cannot be grown. The writer remembers well an attempt to grow the most exquisite alpine flower, _Gentiana_ _verna_, in the open border on a little pile of rocks to give it suitable drainage. It was transplanted a number of times to places where its environment appeared to be the same, and finally a situation was secured, where, instead of merely holding its own, it increased and produced a number of its great deep blue flower-cups.

The importance of protection from drying and cold winds and of securing shade in many situations must not be overlooked. Sometimes advantage may be taken of an existing deciduous or evergreen tree or shrub growth, or rapid-growing varieties can be planted to make a screen. While shelters of this character show value about the outer limits of a rock garden, they can hardly be used for separating its smaller compartments. For this purpose slow-growing, dense-foliaged evergreens with a restricted root range are best. This would include the _Yuccas_, a few of the dwarf forms of _Thuja_, _Juniperus_, _Pinus_, _Retinispora_ and practically all the broad-leaved evergreens. The latter, especially the _Rhododendrons_ (of which _Rhododendron monogynum_ can be secured in large plants) are at low cost and are particularly useful owing to the habit of growth, restricted root area, and the facility with which they can be moved from place to place as desired. As these shelter-belts and groups form the background and setting of the rock garden and are the dominating landscape feature in views from a distance, their composition and disposition is a matter of much importance. The disposition must be governed, however, by the general nature of the grounds, but to this is added the need for an agreeably varied sky-line and composition of plant forms and of shades of green should be sought for. In the composition of the background, and in the planting of rock garden as well, a decided character should be given to the whole and to each distinct compartment by using some few effective plants in quantity rather than a great number of varieties in small quantities. Variegated and distorted garden freaks should be excluded, for
they would only distract the attention from the rock garden, the primary object. Even more inappropriate are stationary fountains and vases.

For more specific instructions as to the construction of rock gardens and the care and propagation of rock-plants (for European conditions) see Robinson's "Alpine Flowers," London, 1875, and Sutherland's "Hardy Herbaceous and Alpine Flowers," Edinburgh and London, 1871.

Up to this point reference has been made for the most part to distinctly alpine plants; that is, plants that are confined exclusively to the region on mountains above the rice gardens and the care and propagation of rock-plants (for European conditions) see Robinson's "Alpine Flowers," London, 1875, and Sutherland's "Hardy Herbaceous and Alpine Flowers," Edinburgh and London, 1871.

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Up to this point reference has been made for the most part to distinctly alpine plants; that is, plants that are confined exclusively to the region on mountains above the rice gardens and the care and propagation of rock-plants (for European conditions) see Robinson's "Alpine Flowers," London, 1875, and Sutherland's "Hardy Herbaceous and Alpine Flowers," Edinburgh and London, 1871.
large-leaved saxifrages, such as S. erassifolia, S. ligulata, S. Stracheyi, and S. purpureascens. Quite as ornamental and just as hardy are primulas, auriculas, and cyclamens. There were Iceland poppies, Himalayan poppies (Meconopsis Wallilakei and Xepañtus), gentians from the tiny blue Gentiana verna to the tall G. sep- tentrionalis, and plants of every kind of Epimedium, Cypripedium, Orchis, Lilium, Erythronium, Allium, Alysium, Ajuga, Achillea, Armeria, Sagina, Sempervivum and creeping Veronica, besides other noir and white plants, to mention only po- sition, as on top of the rocks, or at a turning point in the path, were occupied by some stately plant, such as Rheum palmatum, Acicthys mollis, or Quarella munita, or scabious, each with blue flowers would fill up the recesses in the shrubs on the top of the rockery. One end of the rockery beneath the shade of overhanging trees was devoted to hardy ferns, which grew with wonderful luxuriance. With the variety of rare and interesting plants, together with the artistic yet natural appearance of the whole rockery, a more beautiful place it would be difficult to conceive.

With these pleasant remembrances in mind the writer built a rockery in 1896, in the Botanic Gardens of Smith College, Northampton, Mass., somewhat after the pattern of the one at Kew, but at present on a very much more limited scale. The position chosen (the one-time cave slide) is near the outskirts of the garden proper, on what was formerly a grassy southern slope. A Cutting was made through the slope in much the same manner as the one at Kew, but to secure good new soil the soil was hauled from the southern side. The path, which is quite level, varies in width from 3 to 6 feet. The height of the banks in which the rocks are placed ranges from 2 feet at the entrances to some 8 or 10 feet at the highest point. For rocks we used large, water-worn boulders collected from the vicinity. One shaded recess, with a northern aspect, is devoted to na- tive ferns, which at the present time, 1901, number some 40 species. The whole rockery outside is banked with flowers, and in the southern side we have planted some trees, chiefly catalpas, for the purpose of shading the southern aspect of the rockery, as well as for ornament. Water is laid on so that the plants might not suffer in dry weather. The writer has not been successful with alpine primulas, mossy saxifrages, tufted gentians, and several other subjects which delight in a cool, moist climate, perhaps from his not having provided the ideal conditions for such plants, he has, however, probably done his utmost. Still there is a large variety which does well here. The writer has found most of the low-growing veronicas, sedums, sempervivums, arabisles, alysiums, scabious, auriculas, as well as clubmosses, cair- stellarias, pachysandra, the beautiful shrubby little Daphne Coccum, and many others, do very well in the more sunny or southern aspects of the rockery, while on the northern aspects erasiums, iberises, ajugas, Ice- land poppies, rosette and large-leaved saxifrages, mossi- pink, epimediums, hernarias, arenarias, cardamine, armerias, dianthuses, native orchises, cypripediums and many other plants do well. On the top of the rockery, to fill in recesses in the shrubbery, are planted fox- cloves, verbascums and tall veronicas, while at conspicu- ous points are planted clumps of Bocconia cordata, Tiberia spectosa, Arum in Syulcre, or any herbaceous plant which looks well as an isolated specimen. Among the plants in irregular colonies are planted hardy bulbs, such as crocuses, scillas, ornithogalums, nac- cissi, snowdrops, chionodoxas, and grape hyacinths; these come up the first thing in the spring and blossom before the other plants get well started into growth, and are a decided acquisition to a rockery.

Almost all alpine plants may be readily propagated by seed, cuttings or division of the plants. The writer raises some of each every year, from seed sown in the spring. He plans to sow the seeds in 4-inch pots early in February in a finely-prepared loamy soil, and place the pots in a moderately warm greenhouse; here they soon germinate, and as soon as large enough to handle are pricked into other, similarly prepared, or into small, shallow boxes. They grow vigorously through the early spring months, and by the first of May they may be planted out permanently. Seeds may also be sown in some shaded frame in spring and the plants transferred to the rockery in the fall. All the plants in the rockery should have a light covering of leaves or light strawy material to protect them from excessive freezing and thawing during the winter, especially those planted on the southern exposure, or they may be protected with a few hemlock branches laid lightly over them. These should be re- moved as soon as the weather becomes too warm for any spring. In planting a newly made rockery it is a mistake to plant too thick. Each plant should be allowed room to develop so as to show its true character, and the plants should then be transplanted to a more favorable position, especially if a much more rampant grower than its neighbors. As in other parts of the garden, weeds will insinuate themselves wherever they can gain a foot- hold. These must be removed as soon as they appear, and the whole rockery should be gone over at least once in ten days to keep each plant from encroaching on its neighbors, and to keep all in good order.

ROCKET. See Hesperis.

ROCKET CANDYTUFT. See Iberis coronaria.

ROCKET, YELLOW. Barbarea vulgaris.

ROCK ROSE. See Cistus; also Helianthemum.

ROCKY MOUNTAIN BEE PLANT. Cleome integrifolia

RODGERSIA (Commodore Rodgers, U. S. Navy). Saxifragaceae. A genus of one species, a hardy herba- ceous perennial for which the following names have been proposed: Rodgers' Bronze Leaf, Bronze Leaf of Japan, and Statice Five-Leaf. It grows 3-4 ft. high, and the leaves are finger-shaped, the 5 lobes being bold in outline, angulated and serrate. In the spring the foliage is light green; in summer it assumes a metallic bronzy hue. The plant is a vigorous grower, and under favor- able circumstances has been known to make a clump 9 ft. in diameter, the largest Ivs. being a yard across and borne on stalks 3 ft. long. The Ivs. are borne in mid-summer on stalks 4-5 ft. high. The general style of inflorescence is that of the popular Astilbe, to which it is closely allied. The Ivs. are very small, but make a feathery spray of fluffy white bloom. The panicle is a foot or more long and as wide at the base. Technically the Ivs. have no petals; what seem to be petals are the white calyx-segments. As a flowering plant it has been said by enthusiasts to be superior to Astilbe, but the bloom is scutent, rather greener at first, and perhaps does not last as long. It may not be so amenable to force; Rodgersia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardeners. Although any deep, rich garden soil will do, it is said to prefer a moist peaty soil. It should be placed in a sunny position, with plenty of room, where high winds cannot damage the foliage. Easily propagated from rhizomes, which are cut 3 ft. long. There is a close relation to the Astilbe, having 10 stamens and no petals; it differs in having coniate carpels, scirpioid inflorescence and 5- cut rather than three ternate foliage. Other generic characters are: ovary lobes 3; ovary 3-lobed; styles 2 or 3; stigmas capitate; ovaries many.


RODRIGUEZIA (Emmanuel Rodriguez, Spain botan- and apothecary). Orchidaceae. A small genus of South American orichids, a few of which are cultivated for their graceful flower spikes. Of dozen or dozen of flowers are nearly always fragrant. The plants vary somewhat in habit. Some species form neat, compact
tufts, while others, like R. decoræ, have long, straggling rhizomes difficult to keep within the limits of a block or a basket. Pseudobulbs small, compressed, 1-2 lvd., and bearing sheathing lvs. at the base; racemes erect or pendulous; dorsal sepal and petals similar, free; upright, lateral sepal united, concave but scarcely saccate: labellum spurred or saccate, with a long claw parallel to the column, and a spreading blade usually exceeding the column: slender. Robert Brown's genus Gomesa (sometimes written Gomeza), found on G. recurva, is now referred to Rodríguezia. G. recurva is K. planifolia.

Grow Rodríguezias in very shallow pots filled with leafmold, mix plenty of potting material in baskets; they do well wired on tree-ferns. During season of growth, syringing is necessary.

A. Fls. large, white, spotted or rose.
B. Raceme erect
BB. Raceme pendulous

1. fragrans
2. decora
3. venusta
4. candida
5. pubescens

AA. Fls. small, deep rose or spotted red
AAA. Fls. greenish

fragrans, Reichb. f. (Burlingtonia fragrans, Lindl.). Lvs. tufted; racemes erect; fls. pure white, except the middle of the lamina, which is stained with yellow, very fragrant; lower sepals united, entire; dorsal sepal acute; labellum cuneate, with a 2-parted, pubescent appendage on the disk. April, May. Brazil. G.C. III. 1:757. (The plant is here figured with a pendulous raceme).
decora, Reichb. f. (Burlingtonia decoræ, Lem.). Plant with a long, slender rhizome, with ovate, 1-lvd., pseudobulbs; scape nearly erect, 9 in. high, bearing 5-10 blossoms in a loose raceme; sepals and petals ovate, acute, convolute, white or pale rose spotted with red; labellum twice as long as the petals, white; middle lobe rounded, bifid, contracted into a broad claw which has several fringed lamellae; column with falcate hairy ears. May, June. Brazil. B.M. 4824. F.S. 7:76. Var. picta. Hort. (Burlingtonia decoræ, var. picta, Hook.). Pseudobulbs obovate, compressed; fls. short, acute; sepals and petals spotted with deep purple-red. B.M. 5419.

venusta, Reichb. f. (Burlingtonia venusta, Lindl.). Lvs. linear-oblong, forming compact masses; fls. in drooping racemes, large, white or tinged with pink and giving a yellow stain on the lip; dorsal sepal acute, the lateral pair entire; labellum transversely plicate near the middle. Flowers at various seasons. Brazil. I.H. 5:185. — Very near R. candida.
candida, Batem. (Burlingtonia candida, Lindl.). Lvs. oblong, firm: racemes pendulous, 4-6 fls.: fls. white, with a light stain of yellow on the lamina, 2 in. long; dorsal sepal obovate, emarginate, the lower pair united into a concave, bifid blade, saccate at base; petals obovate, with the apex recurved; labellum with a broadly cuneate, bifid middle lobe, longer than the sepals and petals; base and lateral lobes parallel to the column, transversely veined with many lamellae. April, May. Guiana. B.R. 26:1917. F.S. 1:538.
pubescens, Reichb. f. (Burlingtonia pubescens, Lindl.). Lvs. tufted, dark green, keeled; racemes many, pendulous, from the tuft of lvs.; fls. pure white; labellum 2-lobed, hastate; lateral lobes erect, furnished with laminae on the column, pubescent, in which it differs from the other species.
secunda, HBK. Fig. 2141. Pseudobulbs bearing several thick, linear-oblong lvs.: raceme erect, 6 in. high; fls. deep rose; sepals erect, ovate, convex, the lower pair rolled and gibbous; petals like the dorsal sepal; labellum obvate-oblong, emarginate, undulate, scarcely longer than the sepals. Ang. Trinidad, Guiana. B.M. 3324. B.R. 11:930. L.B.C. 7:60 (as L. recurva)

crispa, Lindl. Pseudobulbs elongate-ovate; lvs. oblong-lanceolate, spreading, undulate, raceme pendulous, rather dense; fls. green, with yellowish borders; sepals all free, undulate-crisp; petals similar; labellum lanceolate, sigmoid. Brazil. B.R. 26:154.

planifolia, Lindl. Pseudobulbs clustered, compressed; lvs. lanceolate; racemes pendulous; fls. greenish yellow, fragrant; sepals oblong, waved, acute, the lower pair united except at the end; petals like the dorsal sepal; labellum broadly oblong, acute, reflexed, shorter than the lower sepals. Feb. Brazil. B.M. 1748, 3504. L.B.C. 7:660 (as Gomesa recurva).

HEINRICH HASSELBRING AND WM. MATTHEWS.

ROGIÉRA. See Rougëtia.

RODEA (Nich. Rohde, physician and botanist of Bremen). Lilitéea. A monotypic genus from Japan, essentially a tender foliage plant with luxuriant radical lvs. 1-2 ft. long. The lvs. are borne among the lvs. in short, thick, dense spikes a few inches high; perianth globular-bell-shaped; anthers sessile; stigma peltate; style nearly wanting; fr. a globular, usually 1-seeded berry. Redbeads are excellent plants for dwelling-house decoration, doing well in the cooler positions. They are perfectly hardy at Washington, the foliage being but slightly browned during the coldest weather.

Japónica, Roth. Root a long, nearly cylindric rootstock with fleshy fibers; lvs. typically green, 9-12 in a rosette, erect, oblanceolate: berry about the size of a small olive, with a red pulp. B.M. 898. Gn. 30, p. 541. — The following varieties, which differ in shape and color of the lvs., are offered by Dutch bulb growers: Var. aureo-striática. falcata. falcata var. latimaculata. macrophylla.-marginata minor. pygmæa. zehrina.

G. W. OLIVER and F. W. BARCLAY.

ROLLINIA (Charles Rollin, of Paris, 1661-1741, aged Tournefort). Anonóideae. About 20 trees and shrubs of tropical America, differing from Anona in having the petals united into a 3-6-lobe tube, the exterior lobes wing-appended, the interior small or none; fr. sometimes of separate carpels: fls. 1-5 on peduncles that are terminal or opposite the lvs. The general remarks under Anona will apply to these plants.

Sibéri, A. DC. (Aronía sibérica, Jacq.). Low tree, the young growth nearly or quite smooth; lvs. oblong, taper-pointed, smooth: exterior petals oblong and blunt (½-1 in. long), greenish, the interior smaller but prominent, reddish; fr. about 4 in. in diameter, greenish, somewhat globose, the surface bearing tubercles. Native in the islands of Guadaloupe and Martinique, and in Guiana; probably in various West Indies islands. — Introduced into southern Florida as a fruit plant, but it is yet very little known within our limits. L. H. B.
ROMNEYA (after the astronomer T. Romney Robinson, friend of T. Coulter, who discovered it about 1845). Papaveraceae. The California Tree Poppy (Fig. 214) is a somewhat shrubby plant with splendid 6-petaled white fls. measuring 6 in. or more across. Botanically the genus is unique, having only one species and being distinguished from the other members of the poppy family by the fact that the numerous stigmas are connate at the base into a little ring, and are divergent at the apex. It is one of the few long-known plants that has acquired no synonym. Generic characters: sepal 3, with a broad, membranous, dorsal wing; petals 6, all alike; stamens very numerous, free; filaments filiform but thickened above; stigmas free; capsule 7-11-seeded, dehiscing to the middle, the valves separating by their margins from the firm persistent placenta.

Coulter, Harv. California Tree Poppy. Matilija Poppy. Lvs. glaucous, 3-5 in. long, pinately cut; petals broadly obovate; seeds black, a line or less long. On. 15:1328; 20:485; 29, pp. 207, 211; 46, p. 405; 55, p. 208; 56, p. 239; 57, p. 263. G.F. 10:535. F.M. 1877:252. A.P.--3:397. A.O. 19:314 (sup. Apr. 16, 1898).—Ever since 1889 and 1890, when it was one of the leading novelties, the California Tree Poppy has been a much-talked-of plant, owing to its extraordinary beauty and the difficulties of cultivation. It has the largest flowers of any member of the poppy family, except possibly Popaver orientale. Though not considered hardy in the eastern states, it has been successfully grown in the open in northern New Jersey.

Romneya grows wild in California from San Diego to Santa Barbara county; also in Mexico. In the wild it blooms chiefly during June and July, but in cultivation from May to August. It is one of the characteristic features of California floriculture. Ernest Braunton writes from Los Angeles: "It should be grown here on dry, rocky soil; it will positively not grow in a wet or heavy soil. It needs no water here except the winter rains. It is very hard to grow either from seed or division."

W. M.

Rondeletia (Rondelet, fabled as one of the founders of Rome). Rubiaceae. A genus of about 35 species of coccus-like bulbs from the Mediterranean region of Europe, the Cape and tropical Africa. They are small and slender plants with fls. an inch or so across, varying from crimson and purple through rose and lilac to white and brownish yellow. They are found in dry soil that is not too heavy, well drained, and subject to persistent drought and short flower-tube. Generic characters: lvs. linear, radical, with a few similar but smaller ones on the stems, fls. solitary in the axils, ascending peduncle; perianth-segments oblong, much exceeded by the short tube; spathes herbaceous. These bulbs seem to be unknown to the American trade.

a. Fls. rose or crimson.

rōscō, Eckl. (Tricenōnā rōscā, Ker.). Corm gobose, 1½-5 in. thick, up to 1 ft. long, peduncle 1-6 in. long, 1-3 fls.; outer spathe 3½ in. long; perianth with a short funnel-shaped tube with a yellow throat and a red-flame-like limb, about 1 in. long, the outer segments with 3 faint purple stripes outside. S. Africa. B.M. 1205 (as T. roseum). F.S. 8:599 (as R. Orelli). Var. speciōsa, Baker (T. speciōsām, Ker.), has a larger perianth and outer segments, with 3-5 dark purple stripes of which the outer are feathered. B.M. 1470.

b. Fls. yellow or white.

Clusiana, Baker (Tricenōnā Clusianā, Lange). Lvs. bright yellow, tipped with lilac. Spain. A white var. has been int. by Barr, of England. F. W. Barclay.

RONDELETTIA (Rondelet, 1597–1666, physician and naturalist of Montpellier, France). Rubiaceae. About 60 species of tropical American shrubs and trees, with small 5- or 4-lobed, salver-shaped fls. of red, yellow or white, generally borne in showy terminal corymbbs. The whole family is noted as furnishing numerous dessert and stovc plants, and Rondeletia is a highly esteemed genus. The following species are shrubs growing 4 ft. or more high. The flowers are generally fragrant, and the clusters 4 in. or more across. In the favorite species (R. odontola) the flowers number 10–30 in a cluster, each flower being fully an inch across; in the other species the flowers may number 150–200 to a cluster, each flower being less than ½ in. across. Known also as Rosiera.

Generic characters: to 1 ft. or more in height; corolla-tube usually slender, swelled or not, throat glabrous or bearded, mouth with or without a ring; limb 5-lobed (in some species 4-lobed); stamens inserted in the throat included; ovary 2-loculed; capsule loculicidal, R. anuana is the only species described below that does not have opposite lvs. R. cordata is often said to have a 4-lobed flower, a mistake that dates back half a century to a typographical error.

W. M.

Rondeletia anuana is a half-shrubby plant standing out when given root-room, but when confined to a pot it makes a compact mass of shoots, about two feet high, which bloom in the winter time, in terminal, flat-topped clusters of rose-purple flowers. It is not particular as to soil, and continues in full bloom for three months. An additional good feature is handsome foliage, so that it is always presentable. Cuttings root
RONDELETTIA

easily at any time, and these may be grown in pots for a season. Barring the tendency to stooling, they do well planted out. Sandy loam and leaf-soil is the best compost, and a warm greenhouse, with sunshine, furnishes the best conditions.

T. D. Hatfield.

A. Fls. red.
B. Lvs. opposite.


BB. Leaves in 3's.

anomala, Hort. Figured in J.H. III. 35:251 with 8 fls. in a cluster, the fls. ¾ in. across, with roundish lobes. The color is said to be coral-red or deep scarlet and the throat is presumably yellow. Habitat (?). Imperfectly known.

AA. Fls. pink to white.
B. Base of lvs. more or less cordate.

cordata, Benthi. (R. cordata, Planch. R. thyrsiflora, Hort., not Roth). Fig. 2143. Lvs. ovate, acuminate, cordate; generally said to have pink or flesh-colored fls. with a yellow throat (as in F.S. 8:754, page 13), but in R.H. 1878:230 they are shown as pure white. Guatemala. Francech says it is native to Mexico.

BB. Base of lvs. not cordate.

c. Corolla-lobes ovate; stipules broadly ovate.

amena, Hems. (R. amena, Planch.) Lvs. elliptic, broader than in R. gratissima, and shorter acuminate, 2-5 in. long; fls. rose-pink, with a conspicuous yellow throat. Guatemala. F.S. 5:442. See also R. versicolor in supplementary list.

c. Corolla-lobes obturate; stipules subulate.

gratissima, Hems. (R. gratissima, Linden.) Lvs. oblong-elliptic, 1-2 in. long, short-petioled, mostly rounded at the base; fls. with a bright rose tube, the lobes fading from pale rose to white; throat not conspicuously yellow. Trop. Amer. 1.H. 28:424. F.S. 15:1570 (corolla-lobes often obsolete; stipules narrowly ovate). Bt. 490 (as R. elegansisima).

The following species would probably be desirable additions, as they represent other colors than the above: R. Americana, Linn. White-fl. West Indies and S. Amer. R. Backhousei, Hook., a pink-fl. species from trop. Amer., is easily distinguished from those mentioned above by the much longer calyx-lobes, which are pink. B.M. 290; R. Purdiei, Hook., a beautiful pale yellow-fl. species from Colombia, has a great pyramidal cluster 5 in. across and 4 in. deep, with an astonishing number of fls., perhaps 150-200 in B.M. 5699; R. versicolor, Hook., is referred to R. amena by Index Kewensis but seems distinct. The fls. are said to be "remarkable for their play of colors; the tube is yellow; the limb in deep red-orange, changing when they expand to pale rose and then to white, with a yellow disk, and having a two-lobed green spot in the center from the color of the stigmas, which protrude a little beyond the mouth." B.M. 4578.

W. M.

ROOT CELLARS. See Storage.

ROOT-GALLS. Abnormal enlargements often appear on the roots of plants. These enlargements are much more frequent than is generally supposed, but from their position under ground are rarely observed. From an economic standpoint they have not received the attention that they merit.

Although the term root-gall is usually applied to the abnormal enlargement of roots due to insects and other animal organisms, it has a much wider application as used by most plant-growers. The presence of nodules or local enlargements on the roots of plants has been discussed by different authors under the names root-galls, root-knots, root-swellings, etc. In cases in which the cause of the nodule of hypertrophied tissue is known, special names have been assigned to the enlargements. Thus the gall formed by the eel-worm (Heterodera radicicola) is known as the nematode root-gall (Fig. 2141); the enlargement on the roots of cabbages and related plants by the myxomycete (Plasmadiaphora Brassica) is called club-root; the swellings on the roots of the peach, apricot and many other plants, which are of characteristic appearance and usually appear at the crown of the plant, are known as crown-gall. Root tubercles are small gall-like bodies found on the roots of many leguminous plants. They are symbiotic in nature, the organism causing them being helpful to the plant. See Legumes.

Abnormal root enlargements are due to the following causes: (1) animal parasites, as in the nematode root-gall (Fig. 2141), the galls formed on the roots of the grape by the phylloxera, and the galls frequently observed on the roots of our indigenous ceanothi; (2) vegetable parasites, as in the club-root and the crown-gall (Fig. 2145); (3) mechanical injury, causing excessive callous development, root-bursts, etc.

In addition to the above, the causes of these enlargements are oftentimes obscure or unknown. The form

of crown-gall on the apple, blackberry and a large number of other plants is as yet unknown so far as cause is concerned. It may be caused by a similar organism as that causing the crown-gall on the peach.
and apricot in the Southwest, but as yet it remains to be investigated.

Swellings on the roots of the mulberry are said to be due to the hypertrophy of the lenticels. Some investigators have attributed this root-growth to some instances to the hypertrophy of adventitious buds.

The root-galls caused by the nematode (Heteroder a radicicola) may usually be readily recognized from other forms of hypertrophy by the numerous knobbed enlargements on the smaller roots infected by the worms. By careful search, in most instances, the distended female worms may be found in the infested tissue, whereas they appear as small, nearly spherical, pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called exeworm, feeds on the roots of a great variety of cultivated plants and is particularly destructive in the South. It is only injurious in the northern states to plants growing under glass. The most effective remedy in the case of field crops is the removal of all rubbish that would harbor the worms during the winter. In greenhouses, the soil can be forced through the infested soil. When potted plants are badly affected they may be severely root-pruned and repotted in new tree from worms. These are not troublesome in soil that has been frozen since an infested crop was grown in it.

The root-swellings caused by the grape-vine gall-house (Phylloxera sativastriata) may be readily recognized from other root-galls by the presence of the insects. The young insects, puncturing the epidermis of the roots and sucking the sap, cause the galls to develop. The insect is found on the diseased roots in all stages of development during the summer.

The most effective method of holding the insect in check appears to be in the use of resistant roots, i.e., the grafting of the more tender varieties on roots of those that are stronger and better able to resist the attack of the insect. Bisulphide of carbon in some instances has proved effective in killing the live. The crown-gall appears to be the most harmful of root diseases affecting cultivated plants in this country. These galls have been reported upon the roots of the peach, apricot, almond, prune, plum, apple, pear, walnut, grape, raspberry, blackberry, cherry, poplar and chestnut, and without doubt further investigation will find it upon other plants as well.

As yet it is not known whether the crown-gall as at present known always arises from the same cause. The galls vary considerably on different plants and the cause has been definitely ascertained only in a few instances. The fleshy outgrowths so abundant in the Southeast on the roots of the peach, apricot and allied plants, known under the name of crown-gall, are caused by a slime-fungus (Dendrophiagus globsosus), which is parasitic in the infested roots.

Seedlings from one to six months old appear to be most susceptible to this disease, hence it is particularly destructive to nursery stock. When the galls appear on young trees they almost always occur on the side of the main root a few inches below the surface of the soil, or in the region of the crown. With more mature trees they are likely to occur at greater depth on lateral roots. At first the gall has a uniform outer appearance, but later it becomes warty from unequal growth. The tissue of the developing gall is soft and succulent, with nodules of woody tissue scattered through it. The galls vary much in size and may reach a diameter of ten inches.

But little is known as to remedies for crown-gall. As the disease is primarily a nursery disease, the most effective remedy is in securing stock free from a non-infested nursery. The disease can be held in check to some extent in infested orchards by cutting off the galls that appear on the tree boles at the surface of the soil and applying to the wounds a paste made from bluestone and lime.

J. W. Touhey.

ROQUETTE or ROCKET-SALAD (Eruca sativa, Mill.), a low-growing hardy annual from southern Europe, whose leaves resemble those of radish and turnip, have been used by the French as a spring or autumn salad and pot-herb. The flavor of the young, tender leaves, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown.

The first sowing may be made in early spring, the seed being dropped thinly in shallow drills a foot apart, with successor plantings each second or third week throughout the season. The soil must be rich and well supplied with moisture, the leaves to be kept free from weeds. There are probably no other flowers more popular and better known than the Rocket. From time immemorial poets have sung its praise, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarkable to note, however, that the Rocket has played a far inferior part in the horticulture of the Chinese and Japanese. It is probably the first flower known and cultivated in a double state, and it is one of the double-flowered Garden forms whose image the word "Rose" almost invariable brings to our mind, while to the wild single-flowered Roses much less attention has been given. The ornamental value of single Roses is rarely fully appreciated. The Wild Roses have a simple charm which is almost as valuable as the double. The grace of their beauty is so perfect that no doubt the bold and dominating beauty of the double Roses has eclipsed the modest attractions of the single Roses. The longer blooming season of the Garden Roses is also a factor in their favor. Though the Wild Roses cannot, perhaps, be compared with their more noble sisters of the garden, they are nevertheless fully able to rival other ornamental shrubs for the adornment of park and plot. According to the habit peculiar to each species, they can be used for a variety of purposes. Most of the species are shrubby, rarely exceeding 6 or 8 ft., and may be used for borders of shrubbery or for covering slopes and rocky ridges, especially R. rugosa, R. humulis and various American species. Some kinds, like R. rugosa and R. lucida, make handsome ornamental hedges. The climbing species are used for covering walls, trelliswork, arbor work or pillars, but perhaps display their beauty to the most advantage when allowed to ramble over shrubs or rocks. The half-evergreen R. Wichuraiana makes a beautiful ground-cover, which may also be used for edging groups and flower beds.

The fruits of most species are decorative and often remain on the branches all winter. The red stems of most of the species of the Carolinas and Cinnamonum groups are effective in winter against the green leaves of the American species turns purple-orange or yellow in autumn, and so does that of R. rugosa, which is in
Plate XXXIV. A Rose Garden. Madame Plantier, one of the standard white garden Roses.
regard to the foliage the handsomest of the hardy
Roses, with its dark green leathery and glossy leaves.
Most of the species are hardy or almost hardy north,
as R. rugosa, setigerà, Carolina, Virginiana, lucida,
humilia, canina, rubiginosa, spinosissima, alpina, ar-
vensis and multiflora. Some species, as R. Wichura-
iana, sempervirens, sericea, microphylla, Chinensis and
Eglanteria, require protection north. Others, as R.
Banksia, bracteata, hevegata and gigantea, are hardly
only south.
With few exceptions the Roses are of easy cultivation
and grow in almost any kind of soil except in a loose
and very sandy one. They are readily transplanted.
The Wild Roses need little pruning; they should only
be thinned out and the weak and old wood be removed;
and vigorous shoots should not be shortened, es-
specially in the climbing varieties, as these shoots are
the most floriferous.
All true species can be propagated by seeds. The
hips should be gathered as soon as ripe, the seeds
washed out and sown at once or stratified and sown in
spring. They germinate the first year, but if kept in
the hips during the winter and allowed to become dry,
they usually do not germinate until the second year.
Mice are very fond of the seeds. Almost all species
grow readily from cuttings of nearly ripened wood in
summer under glass. Many species, especially the
climbing Roses, can be propagated by hardwood cut-
tings taken in fall and planted in spring. Layering is
less often practiced, except with a few species, like R.
utea and R. hemispherica, which do not grow readily
from cuttings. Some species, especially those of the
groups of Cinnamomeae, Carolineae and Gallicae, can be
increased by root-cuttings; the roots are taken up in
fall, stored during the winter in sphagnum or sand in a
frost-proof room, and sown in spring in drills and
covered about 2 inches deep. The species of the last-
named groups and some others are also often increased
by suckers and division. Budding and grafting is less
often done with the Wild Roses and should be avoided
for Roses in shrubberies where the individual plants
cannot be carefully watched; the stock usually throws
up suckers and outgrows the elon, often in a short time.

2146. A 5-foliate Rose leaf.

Rosa is a widespread genus, easily distinguished by
well-marked characters from allied genera, but in the
limits of the genus itself the characters are exceedingly
variable and it is very difficult to group into sections
and species the innumerable forms which often pass
gradually into each other. In no other genus, perhaps,
are the opinions of botanists so much at variance in
regard to the number of species. While some, as Bentham
and Hooker, estimate the number at about 30,

2147. A 9-foliate Rose leaf.

the French botanist Gandoger actually describes from
Europe and western Asia alone 4,266 species. The
majority of botanists recognize over 100 species. The
Roses are almost equally distributed through the colder
and temperate regions of the northern hemisphere, in
America extending to North Mexico, in Africa to Af-
chasina, and in Asia to India. They are all shrubs of
upright habit, or climbing or ramaceous, with usually
prickly stems: lvs. stipulate, alternate, odd-pinnate,
with 5 to many lfts. (Figs. 2146, 2147), rarely simple:
the lfts. are mostly large and showy, pink, purple, white
or yellow, and appear usually solitary or corymbose at
the end of short branchlets; petals and sepals 5, rarely
4; stamens numerous; pistils numerous, rarely few, in-
closed in an urn-shaped receptacle, which becomes fleshy
and berry-like at maturity, containing several or many
bony akenes, usually erroneously called seeds; the fr.
itself is called a "hip." Fig. 2148, 2149. The lfts. show
a remarkable tendency to become double, and such
forms have been known and cultivated from time im-
memorial. These innumerable garden forms, increas-
ing every year, are almost exclusively of hybrid origin
and are therefore omitted in the botanical classifica-
tion of the genus.

Many attempts have been made to subdivide the
genus with more or less satisfactory results; the more
important are those by A. DeCambolle, Lindley, Regel
and Baker. Nowadays the arrangement proposed by
Crépin is considered the most natural and satisfactory
and has been followed in the account given below. No
good general monograph has been published since
Lindley’s Monographia Rosarum (1826), except a rather
short one by Regel in 1877. Of the more recent publi-
cations the most important are those of Crépin, espe-
cially his “Primitive Monographie Rosarum.” In con-
sulting his publications one has to bear in mind that the
author changed his opinion somewhat respecting the
value of the species during his studies of the genus.
In his later publications he takes a broader view in
regard to the specific value of the Rose forms and
units under one species many forms which he for-
merly considered as distinct species. An illustrated
monograph valuable for the knowledge of the older
garden forms and species is Thory and Redouté’s “Les
Roses, with 160 colored plates (1817-1829). It is quoted below as Red. Ros. As the first edition in folio is found in only very few libraries, the smaller edition is cited in parenthesis by volume, groups and the sequence of the plates, neither pages nor plates being numbered continuously in this edition.

The economic properties of the Rose are of little importance. The most valuable product is oil of Roses, a highly fragrant essential oil. It is chiefly manufactured in southeastern Europe and western Asia from Rosa alba and R. Damascena, and of late this industry has been successfully transplanted to Germany. See *Phlomma Gardener*, Vol. III. The fruits of some species, especially of *R. villosa* and *R. canina*, are made into preserves.

For general notices on culture, see *Rosae*.

INDEX.

| Alyssinica, 8 |

KEY TO THE GROUPS.

(For a horticultural classification of Roses, founded primarily on garden values, see the article Rose.)

| A. *Les, simple, without stipules, *Fls., yellow... |
| AA. *Les, pinnate, stipulate.........| Subgenus Helianthus (Species Nos. 1) |
| b. *Styles exerted beyond the mouth of the receptacle...| Subgenus Eurosa (Species Nos. 2-50) |
| c. *Exserted styles connate into a column...| Climbing or creeping: style about as long as stamen...| SECTION I. SYSTYLE (Species Nos. 2-8) |
| | Upright, with arching branches: styles shorter than stamens...| SECTION II. SYSTOYE (Species No. 9) |

SECTION III. INDEX (Species Nos. 10-13)

Lifts. usually 2-5; petals 5 or more

SECTION IV. LEVIGATA (Species No. 49)

DD. *Branches tomentose or pubescent: fls. 7-10; petals 5; sepals 1 or more, white, with large bracts at the base of the short pedicel; receptacle tomentose...|

SECTION V. GALICIC (Species Nos. 16-19)

DD. *Lvs. of flowering branches 3-5 folio late, large and firm; stems usually with prickles and bristles; *Fls.* up-right, on long pedicles; receptacle bracteoles sepals inserted in the receptacle...|

SECTION VI. CANINAE (Species Nos. 20-23)

FF. *Stems, at least at the base, with usually straight often slender prickles and numerous bristles gradually passing into prickles...*

Sepals after flowering spreading, usually entire, caducous: *fr. usually hispid...|

SECTION VII. CAROLINAE (Species Nos. 24-28)

Sepals after flowering upright, usually entire, rarely caducous: *fr. usually smooth, with the akeves at the bottom and wale...|

SECTION VIII. CINNAMOMEAE (Species Nos. 29-41)

2149. A spray of Rose hips.

SUBGENUS EUROSA. A group of about 12 species (one of them American), well marked by the styles being connate into a slender exserted column. Stems sarmentose or climbing, with hooked prickles: fls. in corymbs, few or many; outer sepals persistent, rarely entire, reflexed after flowering, caduus.

KEY TO SPECIES OF SECTION I.
A. Stipules pinnate; prickles usually in pairs ........................................2. multiflora
AA. Stipules entire or denticulate; prickles scattered.

B. Lvs. of flowering branches 2-5-foliolate, pubescent beneath. 3. Watsoniana
BB. Lvs. of flowering branches 9-7-foliolate. 5. Wichuraiana
CCC. Sepals ovate, abruptly acuminate: fl-buds broadly ovate, abruptly pointed: corymbs usually few-flowered ........................................6. sempervirens
DD. Sepals lanceolate, gradually acuminate: fl-buds elongated: corymbs usually many-flowered ........................................8. moschata

SUBGENUS HULTHEMIA. Only one Asiatic species, distinguished from all other Roses by the simple, cespitulate leaves.

1. **Pérsica**, Michx. (*R. simplicifolia*, Salisb. *R. berberiflora*, Pall. *Lowe* berberiflora, Lindl.). Low straggling shrub, 2 ft. high, with slender, prickly branches: lvs. short-petioled, oval to oblong, acute at both ends, serrate, bluish green, pubescent, 2½-1½ in. long: fls. solitary, yellow, with red eye, about 1 in. across: fr. prickly. June. N. Persia to Siberia. B.M. 7096. B.R. 15:1251. G.C. III. 6:8, 9, 78. -This peculiar Rose is very rare in cultivation, since it is very difficult to grow. It has been successfully cult. in a cool greenhouse, exposed to the full sun, kept moist during summer and dry from October to March. The only way to propagate it seems to be by suckers; seeds are occasionally introduced from its native country. A hybrid of this species with *R. involucrata* is *R. Hártili*, Cels., with 5-7-foliolate lvs. and large yellowish white fls., with a deep orange eye. *G.C. II. 21:499. Gn. 19, p. 473 (as *R. simplicifolia*). P.M. 10:215.

SUBGENUS HALOTHRUMA. Only one Asiatic species, distinguished from all other Roses by the simple, cespitulate leaves.

1550

**ROSA**
crimson fls. A.G. 16:232. Hybrids with *R. setigera* and *R. Wichuraiana* have also been raised.

3. **Watsontiana**, Crép. Deciduous shrub, with sarmentose or recurring branches; fls. 3-5, linear-lanceolate, with entire wavy margin, pubescent beneath, 1½-2 in. long; fls. in many-fld. pyramidal coryumbs, ½ in. across or less, white; style glabrous: fr. small. June, July. R.B. 14, p. 183. G.F. 3:477.—A very curious Rose of unknown origin, supposed to have been introduced from Japan, but not known in a wild state. Not quite hardy north.

4. **setigera**, Michx. **PRAIRIE ROSE.** Figs. 2124-2. Shrubs with prickly branches retaining 6 ft., with long and slender recurring or climbing branches: fls. 3-5, oblong-ovate to lanceolate, shortly acuminate, saccate, tomentose beneath, 1-3 in. long; fls. in rather few-fld. coryumbs, deep rose, fading to white, about 2 in. across, almost scentless; pedicles and receptacle glandular-hispid; style glabrous: fr. globular, ½ in. across. June, July. From Ontario and Wis. to Tex. and Fla. M. 8:465. G.F. 13:196, 197; 16:229. Gug. 1:225. M.D.G. 1900:423.—Var. **tomentosa**, Gray (R. rubitilia, R. Br.). Lvs. more tomentose beneath; coryumbs with more, but smaller fls. A valuable hardy climbing Rose. Several varieties with double fls. are in cultivation; some are probably hybrids with *R. arvensis*, *multiflora*, and other species.


6. **semplérvirescens**, Linn. Evergreen shrub with long and slender sarmentose, somewhat reddish branches:


Var. **capreolata**, Neill. **AVBURY ROSE.** Lfts. usually 5, larger: fls. double, white to deep pink. It may be a hybrid with *R. Gallica*. Hardy.

8. *moschata*, Mill. (R. Brunii, Lindl.). **Musk Rose.** Deciduous shrub with sarmentose or climbing branches: fls. 5-7, oval or oblong, mostly acuminate, saccate, usually pubescent beneath, 1-2½ in. long; fls. white, fragrant with the odor of musk, 1½-2 in. across, single or double; styles pubescent: fr. ovate, small. July. S. Asia, Abyssinia, B.R. 10:829. F.S. 3:366-367. B.M. 40:39.—Naturalized in some localities in Ala., in a form with rather broad, acute or obtuse lvs. Var. **Abyssinica**, Crép. (R. Abyssinica, Lindl.). More prickly, flowering branchlets shorter; inflorescence more compact; sepals with smaller lobes. Var. **Leschenaultii**, Crép. (R. Leschenaultii, Wight & Arn.). Lvs. larger, in few-fld. coryumbs; pedicels and receptacle glandular-hispid. *K. Pissardii*, Carr., a vigorous-growing Rose with numerous white fls., figured in R.H. 1988, p. 244, 245, is also a form of the Musk-Rose. Several hybrids are known; the most important is *R. Noisettiana* (See No. 12). The Musk Rose is a handsome free-flowering climbing Rose, but is not hardy north.
section ii. stylos-e. contains only one European species, with the exception of a hybrid between R. arvensis and R. canina.

9. stylos, Desv. shrub, with long, arching branches, pricky: lfts. 5-7, ovate-oblong, acute, serrate, pubescent-beneath, 1/4-2 in. long; fls. in few-fld. corymbs, white or light pink, 1/2-2 in. across; styles glabrous. June, July. W. Europe. Red Ros. (115, 2).—of little ornamental value.

section iii. indice. Few Asiatic species with upright or procluent stems; prickles scattered, hooked, few: lfts. 3-5, rarely 7; inflorescence 1-many-fld.; sepals entire or the outer ones sparingly pinnate, reflected after flowering; bracts and stipules narrow, the latter with small, divergent auricles.

10. gigantea, Collett. procluent: flowering branches usually unarmed: lfts. usually 5, oval to broadly elliptic, serrate, glabrous, firm, 1 1/2-3 in. long; fls. solitary, usually without bracts, white, 5-6 in. across; pedicels and receptacle smooth; sepals long, acuminate. Burma. G.C. III. 6:123.—Hardly only south. It is possible that Fortune’s Double Yellow (Beauty of Glazenvood), with large, double, salmon-yellow fls., figured in B. M. 4079, is a var. or hybrid of this species.

11. Chinensis, Jacq. (R. Indica, Lindl., not Linn.). CHINA ROSE. BENGAL ROSE. low, upright shrub, with slender branches, sometimes almost unarmed: lfts. 3-5, sometimes 7, ovate to oblong, acute, finely serrate, coriaceous, shining and dark green above, pale beneath, glabrous, 1-2 1/2 in. long: fls. usually few or solitary, crimson, pink, white or yellowish, sometimes 3 in. across, fragrant; fr. usually obovate. flowering all summer and fall. CHINA. from this species and R. Gallica, its forms most of the Garden Roses have originated. Several vars. are known.

Var. Devoniensis, Hort., is probably a hybrid: it is of vigorous growth, almost climbing, and has large, yellowish white, double flowers. P. Ml. 8:163.

Var. fragrans, Thory (R. Indica, var. odoratissima, Linn.). Tea-scented or Tea Rose. similar to the following but fls. more fragrant, salmon-pink or light rose: fr. ovate. B. R. 10:894. More tender than the other vars.


Var. longiflora, Thory (R. longiflora, Willd.). lfts. lanceolate; fls. single, deep pink. Red Ros. (3:25, 8.1).

Var. minima, Curt. (R. Laurenzi., Hort. R. Indica, var. pimpina, Thory). dwarf shrub, usually not over 1 ft. high, with small rose-red fls. about 1/4 in. across; petals often pointed. There are single- and double-flowered forms. The Fairy Roses belong to this variety. B. M. 1762. Red Ros. (3:23, 6.7).

Var. semperflorae, Nichols. (R. semperflorae, Curt. R. Bengaliensis, Pers.). CRIMSON CHINESE ROSE. low shrub, with slender, prickly or almost unarmed, dark green branches: lfts. rather thin, mostly stained with purple: fls. usually solitary on slender pedicels, crimson or deep pink. B. M. 261.

Var. viridiflora, Dipp. GREEN ROSE. with monstros green fls.; the petals are transformed into small, narrow green lfts. 1:8. S. 1:1136.

Var. Manetii, Dipp. (R. Manetti, Hort.). Fig. 2156. of vigorous growth, upright; pedicels hispid-glandular: fls. deep pink, single or semi-double. This variety has been recommended as a stock for forcing Roses; grows readily from cuttings, but is not quite Hardy.

12. Noisettiana, Thory. NOISETTE ROSE. CHAMPNEY ROSE. Supposed hybrid of R. Chinensis and R. moschata. stems upright to 6 ft., with hooked reddish prickles: lfts. 5-7, usually oblong-lanceolate or oblong-ovate, glabrous: fls. usually in corymbs, light pink to red, sometimes yellow; styles glabrous. Blooms in summer and fall.—Numerous garden forms. The Noisette Rose was raised about 1817 by John Champney, of Charleston, S. C., from seed of the Musk Rose fertilized by a blush China Rose. From the seed of this hybrid Philippe Noisette, a florist at Charleston, obtained a Rose which was afterwards distributed as Blush Noisette by his brother Louis Noisette, of Paris.

13. Borbonica, Morren. BOURBON ROSE. Supposed hybrid of R. Chinensis and R. Gallica. Upright shrub, with prickly and often glandular-hispid branches: lfts. usually 5, ovate or ovate-lanceolate, acute, shining: fls. double or semi-double, usually purple, blooming in summer and fall. The Bourbon Roses are harder than the Noisette, China and Tea-scented Roses, but require protection north. R. Chinensis and its varieties and hybrids (hybridizing with the hardier Roses of the Gallica group) have given rise to the Hybrid Perpetual or Remontant class. See Nos. 11 and 16.

Section IV. Banksiae. Contains one Chinese species with climbing, sparsely prickly or unarmed stems; stipules quite free, subulate, caducous; sepals entire, reflexed after flowering, caducous.


Section V. Gallicae. Contains only one very variable species, native of Europe and W. Asia. Low, upright shrub; the stems with usually hooked prickles mixed with bristles: lfts. few and often with narrow bracts or solitary on a usually bristly pedicel: sepals reflexed after flowering, caducous, the outer ones pinnate; upper stipules not dilated.

A. Lfts. doubly and glandular serrate. 16. Gallica

AA. Lfts. simply serrate, not glandular. Supposed hybrids of R. Gallica... 17. Damascena

18. alba

19. turbinata


17. Damascena, Mill. (R. blanda, Pers. R. calendura, Borkh.), Baltic Rose. Attaining 5 ft.: stems usually with numerous stout and hooked prickles, sometimes mixed with glandular bristles: lfts. usually 5, sometimes 7, ovate-oblong, serrate, more or less pubescent beneath, 1-2½ in. long; stipules sometimes pectinate; pedicels prickly: lfts. usually corymbose, double, red, pink or white, sometimes striped; pedicels and receptacles glandular-hispid: fr. obvolute. June, July, and again in autumn. Origin unknown; introduced to Europe from Asia Minor in the sixteenth century.—Var. trichtipetala, Dieck, with semi-double red lfts., is considered to be the Rose chiefly cultivated in southeast Europe for the manufacturing of attar. Gl. 38, p. 129. G.C. III. 7:45.

18. alba, Linn. Upright shrub, becoming 6 ft. high: stems with scattered hooked prickles and sometimes with bristles: lfts. usually 5, broadly ovate, serrate, pubescent beneath, 1-2 in. long; upper stipules dilated:

fls. single or double, solitary or several, white or blush, fragrant; pedicels glandular-hispid; receptacle usually smooth: fr. oblong, scarlet. June. Probably hybrid of *R. Gallica* and *R. canina*.

19. **turbinate**, Ait. (*R. Franciscana*, Borkh.). Upright shrub, attaining 6 ft.; stems with straight or hooked prickles; flowering branches almost unarmed: flts. 5-7, oval, serrat, pubescent beneath; upper stipules much dilated; flts. 1-3, single or double, purple, 2-3 in. across, slightly fragrant; pedicels and receptacle glandular–hispid only at the base; sepals erect after flowering, entire or nearly so; fr. turbinate. June. Supposed hybrid of *R. Gallica* and *R. cinnamomea*. Red Ros. (3:25, 1).

### SECTION VI. **Caninae**

Many species in Europe, N. Africa and W. Asia. Upright shrubs, with scattered or hooked prickles; flowering branches almost unarmed: flts. 5-7, oval, serrat, pubescent beneath; upper stipules much dilated; flts. 1-3, single or double, purple, 2-3 in. across, slightly fragrant; pedicels and receptacle glandular–hispid only at the base; sepals erect after flowering, entire or nearly so; fr. turbinate. June. Supposed hybrid of *R. Gallica* and *R. cinnamomea*. Red Ros. (3:25, 1).

#### A. Foliage pubescent on both sides or densely glandular

- **villosa**
- **rubiginosa**
- **canina**
- **ferruginea**

20. **villosa**, Linn. (*R. pomifera*, Herrm.). Upright shrub, attaining 8 ft., with almost straight spines: flts. 5-7, oval to ovate-oblong, acut or obtuse, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, ½-1 in. long; flts. 1-3, on hispid short pedicels, bright pink, 1½-2 in. across; receptacle usually glandular–hispid; fr. subglobose or ovoid, orange–red to scarlet, with upright–spreading, usually caducous sepals. June. Europe; naturalized in some localities.—Much used as a stock for grafting.

21. **rubiginosa**, Linn. (*R. Eglantaria*, Mill., not Linn.), *Sweetbrier*. Eglantine. Dense shrub, attaining 6 ft., with hooked prickles often mixed with bristles: flts. 5-7, orbicular to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, ½-1 in. long; flts. 1-3, on hispid short pedicels, bright pink, 1½-2 in. across; receptacle usually glandular–hispid; fr. subglobose or ovoid, orange–red to scarlet, with upright–spreading, usually caducous sepals. June. Europe; naturalized in some localities in the East. B.R. 2:222.—A handsome Hardy Rose of compact habit, with bright green foliage exhaling a very agreeable aromatic odor. There are some double forms and hybrids with other species.

22. **canina**, Linn. *Dog Rose*. Upright shrub, attaining 10 ft., with often recurving branches: prickles stout, hooked: flts. 5-7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, ¾-1½ in. long; flts. 1-3, light pink, on usually glabrous pedicels; sepals reflexed, caducous: fr. ovate, orange–red or scarlet, glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities.—Much used as a stock for grafting.

23. **ferruginea**, Vill. (*R. rubrifolia*, Vill.). Upright shrub, attaining 6 ft., with slender, purplish branches covered with glaucous bloom; prickles few, hooked or straight; flts. 7-9, elliptic to ovate-lanceolate, simply serrate, bluish green and more or less tinged with red, ¾-1½ in. long; flts. 1-3 or more, pink, 1½ in. across, on usually hispid–glandular pedicels; sepals long, with dilated apex, upright spreading, tarsly caducous: fr. subglobose, scarlet. June. Montains of M. and S. Eu. B.R. 5:430.—Effective by its reddish foliage: fls. less conspicuous. Hardy.

### SECTION VII. **Carolinae**

Contains only American species. Upright, mostly low shrubs; stems slender, with usually straight prickles, placed in pairs and often mixed with bristles; upper stipules usually narrow; corymba generally few-flod.; sepals spreading after flowering, caducous, the outer ones entire or with few erect lobes; acneus inserted exclusively at the bottom of the usually depressed–globose receptacle.

#### A. Pedicels rather long: flts. 5-9

- **caroliniana**, Michx. (Fig. 2157). Upright shrub, attaining 8 ft., with slender stems: flts. usually 7, elliptic to narrow-oblong, acute at both ends, usually pubescent beneath, ¾-2 in. long; stipules narrow; fls. usually corymbose, pink, about 2 in. across; fr. depressed–globose, glandular–hispid, about ½ in. high, like those of the following species. June–Aug. Nova Scotia to Minn., south to Fls. and Miss., preferring swampy and moist ground. G.W.P. 35. Em. 2:488. Mn. 1, p. 86.—Var. **Nuttalliana**, Hort., has larger fls. appearing later and continuing until September.

- **lucida**
- **humilis**
- **nitida**


- **fissa**

25. **Manetti Rose**.* See No. 11.

26. **Moss Rose**.* See No. 16.
22. *lucida*, Ehrh. (R. *hinnul*, var. *lucida, Best). Shrub, 6 ft. high, with few or no suckers; prickles sometimes hollow; fls. 7-9, elliptic to obovate-elliptic, dark green and shining above, thickish, often slightly pubescent beneath, ½-1½ in. long; stipules somewhat dilated: fls. usually few or solitary, about 2 in. across; sepals usually entire: fr. like that of the preceding. June, July. Newfoundland to N. Y. and Pa. B.B. 2:231. Gn. 55, p. 426. -Well adapted for borders of shrubberies, handsome in summer with its shining foliage and bright pink flowers; ornamental in winter with the brownish red stems and red fruits, remaining plump until the following spring. Var. *alba, Hort., has white fls. and green stems. A.F. 13:1998. Gug. 5:306. Var. *plena, Hort. With double fls. *R. *Rapa, Bose, is also supposed to be a double-flowered var., or perhaps hybrid of this species.

26. *hinnull*, Marsh. (R. *parviflora, Ehrh. R. *Ljou, Pursh). Fig. 2148 c. Shrub, 3 ft. or sometimes 6 ft. high, spreading by means of numerous suckers, with slender prickles and usually numerous bristles: fls. 5-7, resembling those of the former but narrower, thinner, not shining, usually pubescent beneath: fls. often solitary; outer sepals lobed. June. Maine to Ga., west to Wis., and Ind. Terr. Much resembling the preceding, which is often considered a var. of this species.—Var. *villosa, Best. Ves. villosus-pubescent beneath, thickish.


28. *foliolosa*, Nutt. Low shrub, ½ ft. high: stems with rather few slender prickles, sometimes almost unarmed: fls. 7-9, narrow or linear-oblong, bright green and shining above, glabrous or pubescent on the midrib beneath, ½-1 in. long: fls. solitary or few, pink, about ½ in. across; pedicels and receptacle smooth or sparingly glandular-hispid; fr. globose, with rather few achenes. May, June. Ark. and Ind. Terr. To Tex. G.F. 3:101. 3-2; preceding, a handsome dwarf shrub with graceful foliage.

SECTION VIII. CINNAMOMEAE. *Many American, Asiatic and European species. Erect shrubs, with usually straight prickles, in pairs or scattered, and often with numerous bristles: fls. 5-9; upper stipules dilated; corymb usually many-fl., with dilated bracts; sepals generally entire, upright after flowering and persistent, rarely deciduous; receptacle usually smooth.

A. Prickles in pairs at the base of pedicels: branches glabrous.
B. Sepals deciduous: fr. about ½ in. across, with very few achenes...29. *gymnocarpa*
BB. Sepals persistent, erect after flowering.
C. Stipules flat.
D. Fls. in usually many-fl. corymbs, usually ½ in. across (larger and sometimes solitary in Nos. 31 and 32); fr. about ½ in. across; stipules usually entire and narrow.
E. Fr. globose, with no or very short neck, about ½ in. high (sometimes ovate in No. 31).
F. Sepals quite entire...30. *pisocarpa*

31. *Fendleri*
FF. Sepals with low lobes on the outer margins...32. *Woodsi*
EE. Fr. globose - ovate, with prominent neck, ½ in. high

DD. Fls. usually solitary, 2 in. across or more: fr. ½ in. across: stipules dilated, glandular-ciliate...34. *Nutkana*
CC. Stipules convolute, dilated...35. *cinnamomea*

AA. Prickles scattered, sometimes in pairs in No. 21.

BB. Stems and branches almost unarmed, without bristles...36. *pendulina*
37. *reclinata*
38. *Virginia*


32. *Woodsi*, Lindl. Stems 3 ft. high, with slender, straight or recurved prickles, often prickly: fls. 5-7, oblong to oblong-obovate, cuneate at the base, simply saccate, usually glaucous, finely pubescent beneath the glandular bracts, ½-1½ in. long: fls. often solitary, pink, ½-2 in. across, on very short, smooth pedicels: fr. globose, with short neck. June, July. Saskatchewan to Colo. and Mo. B.B. 12:976.—The two preceding species may be only vars. of *R. *Woodsi*.

33. *Californica*, Cham. & Schlecht. Stems 8 ft. high, with stout, hooked or straight prickles, often prickly: fls. 5-7, broadly elliptic to oblong-obovate, simply or
doubly glandular-serrate, pubescent beneath or on both sides, often glandular, rarely glabrous, ½-1½ in. long; fls. on slender, usually smooth pedicels, over 1 in. across. June-Aug. Brit. Col. to Calif. Fls. pink.

2159. Rosa cinnamomea (x ½). One of the old-fashioned hardy Roses. No. 35.

34. Nutkana, Presl. Stems stout, 5 ft. high, with usually straight prickles and sometimes bristly; fls. 5-7, broadly elliptic to oblong-lanceolate, generally rounded at the base, usually doubly glandular-serrate, almost glabrous, often glandular beneath, ½-2 in. long. June, July, Alaska to Ore. and Utah. G.F. 1:449. -Has the largest fls. of the western species; pink. Var. hispida. Fernald, has the receptacle glandular-hispid.


36. pendulina, Linn. (R. alpina, Linn.). Fig. 21498. Stems slender, 3 ft. high; fls. 7-9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ½-1½ in. long; fls. pink, usually solitary or 2-5, to 2 in. across; pedicels and receptacle usually smooth: fr. usually nodding, oblong or ovate, with elongated neck, scarlet. May, June. Mts. of Europe. B.R. 5:424. -Handsome free-dowering shrub. Var. Pyrenica, W. D. Koch (R. Pyrenica, Gouan.). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gn. 27:496.

37. reclinata, Thory (R. Bourgeaudi, Hort.). Supposed hybrid of R. pendulina and R. Chinensis. Climbing to 12 ft., with slender, sparingly prickly branchlets; fls. 3-7, oblong-ovate, glabrous; fls. in corymbs, purple, double or semi-double, nodding: fr. subglabose, smooth. Red. Ros. (3:26, 3). -Varying with lighter and deeper colored and more or less double fls.

38. Virginiana, Mill. (R. blanda, Ait. R. traxiniiololia, Borkh.). Stems slender, 5 ft. high, with few slender prickles or unarmed; fls. 5-7, elliptic to obvate-oblong, usually acute, simply serrate, glabrous or pubescent beneath, ½-2½ in. long; stipules dilated; fls. usually several, pink, 2-3½ in. across, on smooth peduncles: fr. globular, sometimes elongated. May, June. Newfoundland to N. Y., west to Wis. and Illi. B.B. 2:206.

39. Arkansana, Porter (R. blanda, var. setigera, Crép., and var. Arkansana, Best). Stems low, sometimes 6 ft. high; fls. 7-9, broadly elliptic to obvate, usually cuneate at the base, simply serrate, more or less pubescent beneath, ½-2 in. long; stipules usually entire: fls. corymbose, rarely solitary, pink, sometimes white, 1½-2 in. across; outer sepals with one or few lobes. June, July, Minn. and Brit. Col. to New Mexico. B.B. 2:236. Mm. 3:116. -Adapted for covering dry slopes and barren places. According to E. L. Greene, the true R. Arkansana is restricted to Colorado and perhaps New Mexico, while the form common in the regions north and west of these localities is a different species, for which he proposes the name R. periclinata; this form is described above. The true R. Arkansana, Porter, differs by its glabrous foliage, glandular and bristly stipules and reflexed sepals. At the same place (Fitzonia, 4:10-14) Greene describes four other new species belonging to this section.

40. acicularis, Lindl. Stems low, densely prickly: fls. 3-7, broadly elliptic to narrowly oblong, rounded at base, simply or doubly serrate, pubescent beneath, ½-2 in. long; fls. solitary, deep rose, 1½-2 in. across, fragrant; sepals entire and nearly glabrous: fr. globular to oblong, ½-1 in. long. May, June. Alaska to Ontario and Colo., N. Eu., N. Asia, Jap. -A very variable species.


41. rugosa, Thunb. Figs. 2148, 2162-4. Upright shrub, attaining 6 ft., with stout stems densely beset with prickles and bristles: fls. 5-9, oval to obvate-oval, rugose, shining and dark green above, glanscent and
pubescent beneath, thick and firm, ¾-2 in. long; pedicels tomentose and hirsutly; stipules dilated; fls. solitary or few, purple or white, 2½-3½ in. across; bracts large; pedicels prickly; receptacle smooth; fr. depressed-globose, brick-red, to 1 in. across. May-Sept. N. China, Corea, Jap.—Very variable species. Vars. ferox, C. A. Mey. (var. Thunbergiana, C. A. Mey, R. ferox, Lawr. R. Regeliana, André & Lind. R. Andrées, Lange). Stout and densely armed: lvs. thick, very rugose and shining: fls. large, 3½ in. across; fr. 1 in. across. S. Z. 1:28. B. R. 5:420. Gt. 30:1049; 42, p. 537. G. C. H. 14:572. Gn. 46, p. 324; 52:1144; 55, p. 434. I. H. 18:47. Gen. 1:17; 5:339. A. H. 12:342, 344; 18:567. Var. Kamschaticia, Regel (R. Kamschatica, Vent.). Less densely armed: lvs. thinner, less rugose: fls. and fr. smaller. B. R. 5:419. B. M. 3:49. Besides these the following forms are often cultivated: Var. alba, with large white fls. Gn. 9:20; var. alba piena, with double white fls.; var. rosea, with pink fls.; var. rubra, with purple fls.; var. rubra piena, with double purple fls. Gn. 24:846. R. rugosa is one of the most ornamental single roses, especially for shrubbery; it is very handsome on account of its dark green shining foliage, large fls. appearing during the whole summer, bright red conspicuous fruits, and its beautiful orange and scarlet fall coloring. It is also attractive in winter by reason of its stout, densely armed stems. Large numbers of hybrids have been raised. By crossing with double-fld. Garden Roses R. rugosa has given rise to a new race of hybrid roses remarkable for their hardiness and long blooming season; one of the best known is Mme. George Bruant (Fig. 2165), with double white fls., a cross of R. rugosa and the Tea Rose Sombreuil. Another cross with a form of R. Chinensis is R. rugosa, var. calocarpa, Bruant, with single rose-colored fls. and handsome fr. produced very abundantly. Gn. 46, p. 548; 52, p. 384. R. H. 1895, p. 416, 447. I. H. 42, p. 15. Hybrids are also known with R. multiflora, R. cinnamomea, R. microphylla, R. spinosissima, R. Wichurana and R. humilis, and there are probably others.

Section IX. Pimpinellifolia. Few Old World species. Upright shrubs, usually low; prickles straight, scattered, usually numerous and mixed with bristles; fls. very small, usually 5; stipules narrow, with divergent and dilated auricles; fls. solitary, without bracts; sepals entire, erect and persistent.

42. spinosissima. Linn. (R. pimpinellifolia, Linn.). Scotch Rose. Low shrub, with upright recurving or


Var. myrlacantha, W. D. Koch (R. myrlacantha, DC.). Branches very prickly; lvs. doubly glandular-serrate, very small: fls. small, white, blushed. Red. Ros. (1:67). There are also vars. with double or semi-double, pink, white or yellow fls. (Gn. 29:544). Several hybrids are known. R. Hibbertica, Smith, a low shrub with glaucous green foliage and small pale pink fls., is a hybrid with R. canina. R. rubella, Smith, with dark green foliage, red fls. and sepals, pendulous ovate-oblong fruits, is a hybrid with R. pendulina. R. reversa, Waldst. & Kit., is similar and probably of the same parentage.

Section X. Lutesc. Two Asiatic species. Upright or somewhat sarmentose shrubs, with scattered, straight or hooked prickles; stipules usually narrow, with divergent and dilated auricles; fls. yellow, without bracts; sepalis entire, persistent, upright.

43. Eglantina, Lindl. not Mill. (R. lutea, Mill.). Shrub with long, slender often sarmentose or climbing stems.
47. stellata. Wooton. Similar to the preceding: Hts. 3-5, broadly cuneate-obovate: fls. 1½-2½ in. across, deep rose-purple. New Mex. Bull. Torrey Bot. Club 25:235.—This and the preceding would be handsome shrubs for rockeries, especially the latter, on account of its larger fls. Both are probably tender and probably are not yet in cult.

Section XIII. Bracteata. Two Asiatic species. Shrubs with erect or sermentose and tomentose or pubescent stems; prickles in pairs; stipules slightly adnate and peltate; inflorescence with large bracts; sepals reflexed after flowering, entire; receptacle tomentose.

48. bracteata, Wendl. (R. Macrditea, Dunn.). Macartney Rose. Stems usually procumbent or sermentose, villous-tomentose, with stout hooked prickles: Hts. 5-9, oval to obovate, crenately serrulate, bright green above and somewhat shining, almost glabrous beneath, ½-2 in. long; fls. one or few, short-stalked, white, 2-2½ in. across; sepals and receptacle densely tomentose. June-Sept. S. China, Formosa; naturalized in Fla. and La. B.M. 1377.—Handsome half-evergreen climber, not hardy north.

Section XIV. Levigata. One Asiatic species. Climbing shrub, with scattered hooked prickles: Hts. generally 5-6; stipules almost free; fls. solitary, without bracts, large, white; sepals erect, entire, persistent.


Section XV. Microphylla. One Asiatic species. Upright spreading shrub, with the straight prickles in pairs: fls. 1½-3½ in. diameter; stipules very narrow, with subulate divergent auricles; fls. usually several, with small and quickly caducous bracts; sepals broad, erect and persistent, the outer ones pinnate; carpels only at the bottom of receptacle.

50. microphylla, Roxb. Much-branched spreading shrub 6 ft. high, with straight or ascending prickles: Hts. 1½-3½ in. diameter, elliptic to oblong-elliptic, acute, sharply serrate, glabrous or pubescent beneath; fls. pale pink, often solitary, 2-2½ in. across, short-pedicelled; sepals and receptacle prickly: fr. depressed-globose, 1½-2 in. across, very prickly. June, July. China, Japan. B.M. 6514.—Var. plena, Hort. With double fls. B.M. 3490. B.R. 11:919. Not quite hardy north. Sometimes hybrids with R. Chinensis and with R. rugosa are cult. under the name of R. microphylla. The hybrid with R. rugosa has large single purple fls., handsome bright green foliage and very prickly branches; it is of vigorous growth and will probably make a good hedge plant.
ROSACEAE (Wm. Roscoe, founder of the Liverpool Botanic Garden). Seillinucia. A genus of 6 species of half-hardy perennial herbs from the Himalayas, with

ROSCOEIA (Wm. Roscoe, founder of the Liverpool Botanic Garden). Seillinucia. A genus of 6 species of half-hardy perennial herbs from the Himalayas, with
**ROSE** (see also **Rosa**). The article **Rose** will probably be consulted oftener than any other in this Cyclopedia. Therefore, the subject is presented from many points of view, even at the risk of repetition. Every pain has been taken to procure reliable information and advice from specialists in the different parts of the subject. It has been said that the garden **Rose** does not thrive in North America as it does in Europe; but however true this may have been, it scarcely holds to-day. The success of the **Rose** in this country is very largely a question of the selection of adaptable varieties. These varieties are mostly the compounds of various types and species. In most garden **Roses** it is now impossible to trace the original species with accuracy. For horticultural purposes, a purely botanical classification is of minor consequence, although, in the main, the leading garden-groups follow old specific lines. For a garden classification that follows botanical lines closely, see Baker in Gardener's Chronicle, 11, 21, p. 190 (1855).


Following are the equivalents of some of the common names of **Roses**:

**Ayshire** .................................. **R. arvensis**, var. capreolata
**Banks Rose** .................................. **R. Banksiae**
**Bengal** .................................. **R. Chinensis**
**Bourbon** .................................. **R. Bourbonica**
**Champney** .................................. **R. Noisettiana**
**Cherokee** .................................. **R. lavitaga**
**Cinnamon** .................................. **R. cinnamomea**
**Damask** .................................. **R. Damascena**
**Dog** .................................. **R. canina**
**Eglantine** .................................. **R. rubiginosa**
**Memorial** .................................. **R. Wichurana**
**Moss** .................................. **R. Gallica**, var. muscosa
**Musk** .................................. **R. moschata**
**Noisette** .................................. **R. Noisettiana**
**Prairie** .................................. **R. setigera**
**Provence** .................................. **R. Gallica**
**Scotch** .................................. **R. spinosissima**
**Sweetbrier** .................................. **R. rubiginosa**
**Tea** .................................. **R. Chinensis**, var. fragrans.

**L. H. B.**

**Horticultural Classification of **Roses**.** The garden classification of **Roses** presents considerable difficulty, as the several groups have been so much mixed that the original characteristics of each overlap at nearly all points. This is particularly true of the Perpetuals, of which any close classification is impossible. The difficulties increase as one advances. Certain clear-cut characteristics may be taken to mark certain distinct groups in the summer **Roses**, with which the horticulturist has not busied himself so much. Nearly all of these char-

acters are reproduced in the Perpetuals, and, being blended together, give rise to endless confusion; thus the following scheme is merely suggestive and should be studied in connection with the botanical classification (see page 156).

American **Rose** culture, so far as garden varieties are concerned, can hardly be said to have found itself as yet. Our growers are to-day striving to overcome the short-lived character of the blooms, so as to import into our gardens something of the **Roses** beauty of Europe. The **Wichurana**, **Rogosa**, and **Multiflora** **Roses**, combined with our native species and blended again with the best representatives of the garden groups already grown, seem to offer the solution. The beginning has already been made. The hot sun and trying climatic conditions of our summers are fatal to the full beauties of the **Roses** of France and England. The flower is developed so quickly that it has no opportunity to "build" itself; and once developed it fades as rapidly. What has been done for other florists' flowers remains yet to be accomplished for the **Rose**, and the American **Rose** of the future will have to be developed to suit the circumstances in the same way that the American carnation has been produced. A special society has been formed to foster this work and is now in its third year of existence.

**Class I. Summer-flowering Roses, blooming once only.**

A. Large-flowered (double).
B. Growth branching or pendulous: leaf wrinkled............ 1. **Provence**
   Moss Pompon Silphurea
B. Growth firm and robust: leaf downy........ 2. **Damask** and **French**
   Hybrid French Hybrid **Provence** Hybrid **Bourbon** Hybrid China

BBB. Growth free: leaf whitish above, spineless generally, except in Alpine........... 3. Alba
AA. Small-flowered (single and double).
B. Growth climbing: fls. produced singly........ 4. **Ayrshire**
B. Growth short-jointed, generally in clusters........... 5. **Pincard**
   Austrian Scotch Sweet Penzance Prairie Alpine
BBB. Growth free: foliage persistent (more or less, shiny)........ 6. **Multiflora**
   Polyantha
BBB. Growth free: foliage wrinkled........ 7. **Evergreen**
   Sempervirens **Wichurana** Climbing **Banksian**
BBBB. Growth free: foliage persistent (more or less, shiny)........ 8. **Ponpon**

**Class II. Summer- and autumn-flowering **Roses**, blooming more or less continuously.**

A. Large-flowered.
B. Foliation very rough........ 9. **Hybrid Perpetual**
   10. **Hybrid Tea**
   11. **Moss**
BB. Foliation rough........... 12. **Bourbon**
   13. **Bourbon Perpetual**
BBB. Foliation smooth........... 14. **China**
   & **Banksian**
   **Tea**
   **Lawreneana** (Fairy)
Plate XXXV. A Tea Rose.—Bridesmaid
ROSE

AA. Smaller flowered.
  1. Foliage deciduous.
  c. Habit climbing ... 15. Musk
      Noisette
  16. Ayrshire
  17. Polyantha

cc. Habit dwaré, bushy. 18. Perpetual Briers
      Damask
      Pompon
      Scotch
      Rugosa
      Lucida
      Mierophylla
      Berberidiolia

BB. Foliage more or less persistent .. . . 19. Evergreen
      Macartney
      Wichurainia

Garden-group 1. *Provence*. Fragrant: branching or pendulous; fls. generally globular; foliage bold, broad, wrinkled, deeply serrate; prickles uncertain; sometimes fine and straight, sometimes coarse and hooked. Rich soil. Prune closely unless very vigorous. Types are Moss Rose, a crested form of the Provence (Fig. 2157). Pompon, a dwarf group; cupped flowers. See also No. 8. Sulphurea, an undesirable yellow form of difficult cultivation.

Garden-group 2. The Damask and French. Damask Roses are fragrant: growth robust; spinous; lvs. light green, downy, coriaceous. Hardy: free-flowering; scent destroyed on drying.

French Roses: Fragrant (moderately): more upright and compact in growth than the Provence; prickles smaller and fewer: fls. generally flat. Very hardy, growing in any soil; petals bleach in strong sunlight; makes abundance of wood, which should be thinned out; perfume develops in the dried petals.

Hybrid French or Hybrid Provence, a less robust group with smoother, short-jointed wood and generally light-colored flowers. Type Princess Clementine. Other subdivisions include hybrids with nearly all of the Perpetual group. Madame Plantier is a Hybrid Noisette. Coupe d'Hebe is a Hybrid Bourbon.

Hybrid China (China x French and Provence, partly taking more of those parents). Growth more diffuse than the French Rose; foliage smooth, shining and remains on the bush late in the year; thorns numerous and strong. Vigorous of growth; very hardy, and generally well adapted to poor soil; requires but little pruning.

Garden-group 3. Alba, or White Roses. A very distinct group; all light-colored flowers of moderate deep crimson. Type, Queen of the Belgians. Dundee Rambler, Ruga is a hybrid between this group and one of the Teas; fragrant.

Garden-group 4. Ayrshire. Climbing Roses; very hardy; slender shoots suitable for trellises and trunks of trees; fls. produced singly. Useful for pot cultivation when trained over a frame; fls. vary from white to


Probably the most famous Rose now cultivated in America.
One of the Hybrid Perpetual class.

2169. Paul Neyrion (X 3/4).

A popular rose-colored variety of the Hybrid Perpetual type.

size: leaf whitish above, deep green below: spineless (some hybrids with other groups are very thorny), of free growth; prune closely. Type, Pellets de Parmentier and Malden's Blush.
quisitions, especially in hybridization with other groups: Type, Baltimore Belle. Fig. 2154.

Alpine or Bourgault. Native of the Swiss Alps; semi-pendulous, long, flexible, smooth shoots: flowers in large clusters; mostly purple or crimson flowers. Good for pillars, very hardy, especially suitable for shady places; should be well thinned in pruning, but the flowering wood left alone: type Anisios. Produced by crossing Teas and R. alpinus.

Garden-group 6. Multiflora. The Multiflora group divides itself naturally into the Multiflora true and Polyantha. R. multiflora, the parent type, is characteristic of the varieties here, the flowers being produced in large corymb and continuing over a comparatively long time. This group is particularly well adapted to the wild garden. There are many hybrids, which are known in cultivation under the general term of Rambler Roses.

The Polyantha section has given a fairly hardy variety in Crimson Rambler. Useful as pillar and trellis Roses and respond to high cultivation. In pruning remove only the old canes, leaving the young new growth to carry flowers next season. Some cluster Roses of the Indica or Tea alliance popularly called Polyanthas do not belong here.

Garden-group 7. Evergreen. The so-called Evergreen Roses hold their foliage until very late in the year and in hybridization appear likely to yield varieties which are practically evergreen.

Sempervirens, useful as pillar Roses, producing flowers in corymbs; very hardy: vigorous growth; free bloomer: requires considerable thinning in pruning. Types, Felicite perpetuella.

 Wichuraiana (Fig. 2155), most popular of all the rampant Roses: very hardy; growing in any soil; this promises to be the basis of a very valuable race of American Roses; flowers in the type white. Hy-

brides have been raised from Hybrid Perpetual and Tea varieties giving large flowers, scented; such are Gardenia and Jersey Beauty.* Several hybrids are now working on this species, and the next few years promise remarkable developments. W. A. Munda in New Jersey, M. H. Walsh in Massachusetts and M. Horvath in Ohio are thus engaged.

Cherokee (R. lavollea) of the southern states can be grown satisfactorily away from its native regions only in a greenhouse. Figs. 2152-4.

The Banksian (R. Banksia). Two varieties of this are known, the yellow and the white. Requires greenhouse treatment: evergreen; needs very little pruning, merely shortening the shoots that have bloomed. Yellow variety scentless, white variety possessing the odor of violets: flowers are produced in graceful drooping clusters.


Garden-group 9. Hybrid Perpetual, or Hybrid Remontant. A large and comprehensive group of unchinned origin. The mixture with other groups has become so involved as to render separation practically impossible. The characteristics may be described as stiff, upright growth, sometimes inclined to pendulous; fls. of all types: foliage dull green, wrinkled, not shiny; enumerating generally the characteristics of the Provence, Damask, French and the Chinese groups: fls. large, inclined to flat, generally of dark colors. By far the largest and most comprehensive division. Figs. 2108-9.

Garden-group 10. Hybrid Teas. The Hybrid Teas form a section of the Hybrid Perpetual group crossed back on to the Tea-scented China, gradually losing all identity. They differ from the pure Hybrid Perpetuals by having foliage of a darker green and less wrinkled. Some of the best forcing Roses are in this group, which promises the greatest development for American rosarians; Robert Scott is a type of this class and is raised from Mer- veille de Lyon, H. P., and Belle Siebrecht Hybrid Tea. The late France type belongs here. Fig. 2116.

Garden-group 11. Moss. A perpetual flowering group of the Provence. See Summer Roses and Fig. 2157.

Garden-group 12. Bourbon. Dwarf and compact growth, with rounded, more or less shining leaflets: very floriferous; brilliant colors; good outline; in perfection late in the season: requires close pruning. Type, Hermosa (or Armora).


Garden-group 14. China. The China or Monthly Rose is characterized by its positively perpetual nature of flower. Its blooms become much darkened in color from the action of the sun's rays: fls. small and irregular in shape. Somewhat tender. Chiefly interesting as the parent of the true Teas. The Tea-scented China or Tea Rose. Fig. 2171. Large, thick petals, with the characteristic tea scent: flowers generally light colored, pink and creamy yellow; growth free; the best for forcing. The group has been hybridized with all other sections and the Tea influence is seen throughout the Rose family. Some of the varieties are climbing. Type, Bon Sieno and Homer.

Lawrenceana. Dwarf forms, requiring the same treatment as the Teas. Commonly known as the Fairy Rose.

Garden group 15. The Musk. Very fragrant; rather tender: derived from Rosa moschata: fls. of pale color. This group has been much hybridized with a section of its identity is lost as a garden plant in that of its derivatives, especially the Noisette. The flower buds are elongated and the flowers produced in clusters.

Noisette. Fig. 2172. Larger flowered than the true Musk Roses: flowering very late; free growth; more hardy. The group bears a certain superficial resemblance to the Teas and requires moderate pruning; will grow in any soil. This sub-group has been largely blended with the Teas and with a loss of hardiness. In consequence it has fallen into disuse.

Rose

Garden-group 17. Polyantha. Perpetual-flowering varieties of the Multiflora group. The term in gardens is taken to mean a large cluster of the ever-climbing Roses, and is particularly important in American Rose culture, as the basis of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichurana and Teas. M. H. Walsh in Massachusetts and W. J. Jackson in Ohio, and Mathiasson in Massachusetts have accomplished important work in this field. Some of Walsh’s recent introductions, as Deboutante and Sweetheart, not as yet fairly tried and the Dawson Rose may be classed here. They are valuable as trellis and pillar Roses for garden decoration.

Garden-group 18. Perpetual Briers. Of this group there are also a few important types. The Rugosa or Japan Rose, a low-growing bush; hardly; useful as a hedge plant, and specially adapted for exposed situations near the seashore. Figs. 2162–4. Hybridos have been made with other Perpetual groups, especially Teas and H. P.’s. Mme. Georges Brunet is a type. The Rugosa blood is strongly seen in all cases. Lucida, a small insignificant group, having some connection with the Macartney.

Microphylla has minute leaves. Berberidifolia has leaves somewhat resembling barberry. Perpetual Scotch, a perpetual-flowering form of *Rosa spinosissima*, probably a hybrid from the Damask.

Garden-group 19. Evergreen. Two types, as follows: Macartney, slender: sweetly scented and very floriferous throughout the season. Is derived from *R. lanata*. Wichurana. The Wichurana hybrids already referred to in the Polyantha group may dubiously be included here. They have not yet been sufficiently tested.

Leonard Barron.

Rose Gardens for Rose Lovers. — The Hybrid Perpetual or Hybrid Remontant Rose (hybrids of *Rosa Damascena*, *Bourbonica*, etc.) is the largest and most important group of hardy Roses. The common varieties are crosses of Provence and Damask Roses upon Bourbons, Bengals and Teas, and vice versa. Of all Roses, Hybrid Perpetuals, in regions of severe winters, offer the amateur the greatest promise of success.

A warm sunny spot shielded from strong or bleak winds should be chosen for the Rose garden. A piece of woods or a hedge offer good protection if they are far enough away from the hedges so that they do not shade them or rob them of nourishment. Dean Hole says, "The Rose garden must not be in an exposed situation. It must have shelter, but it must not have shade. No boughs may darken, no drip may saturate, no root may rob the Rose." A hillside is less exposed to late frosts than valley and is therefore better. The ground must be well drained. If nature has not provided such a spot the Rose-grower must make one.

The ideal soil for the Hybrid Perpetual Rose is a strong rich clay or loam. Though Tea Roses sometimes do well in gravel or sandy soil, Hybrid Perpetuals never do. The ground should be spaded up to a good depth and all stones, grass and roots carefully removed.

Late autumn is the best time for setting out hardy Roses. The writer has set out over a hundred Hybrid Perpetuals and Hybrid Teas when he was compelled to shape a large bush of dogwood to the frozen crust of the earth with crow-bar and pickaxe before he could dig the trench in which he planted them, and yet he did not lose one of them. Put out late in the fall with the earth well firmed around them and properly protected, hardly and half-hardly Roses are almost sure to come through the winter all right and make a good bloom the first summer. In no other way can Roses be set out so quickly and so well as in a trench dug the proper depth, is prized wherever known. It owes its popularity not to its flower but to the perfume of its foliage. The attempts made to develop the flower and still retain the fragrance of its foliage have not yet been successful. No better Rose can be found for hedge-making.

Austrian Brier (*Rosa Eglanteria*): This Rose has 7 or 9


The Moss Rose (*Rosa Gallica*, var. muscosa) is a universal favorite. The best varieties are Crested, Grailli and Common Moss. Fig. 2157. Seven leaflets are found on most of them. They must be closely pruned.

The Perpetual Moss Rose (*Rosa Gallica*, var. muscosa): These are like the Moss Roses except that they are autumnal bearers. Mme. Edward Ory, Sallet and Souupert-et-Notting are the best of this class. The best result can be secured only by close pruning.

Sweetbrier (*Rosa rubiginosa*): Eglantine is a name given to a Rose found in a wild state in various countries. One variety known as Common Sweetbrier, a native of England, and of the middle ages, is prized wherever known. It owes its popularity not to its flower but to the perfume of its foliage. The attempts made to develop the flower and still retain the fragrance of its foliage have not yet been successful. No better Rose can be found for hedge-making.

Austrian Brier (*Rosa Eglanteria*): This Rose has 7 or 9
leaves and single flowers of a coppery yellow color. It is so hardy that it can brave the most rigorous climate where man tills the soil. Persian Yellow, Harisonii and Copper are the most valuable varieties which should be pruned sparingly.

Hybrid Climbing Roses. These are especially useful as pillar Roses. The most valuable are Climbing Jules Margottin (See Fig. 2173, page 1567) and Glory of Cheshunt.

The Prairie Rose (Rosa setigera) is the hardest of climbers. This quality, with the rapidity and vigor of growth, has given them a wider popularity than any other group. The stem of the Prairie is the only fragrant Prairie Rose. Baltimore Belle (Fig. 2154) is the least hardy but most beautiful. Other valuable varieties are: Queen of the Prairie, Anna Marie and Triumphant. The pruning knife should be used sparingly.

In the Hybrids: Bourbon Rose (Rosa Bourbon-ica): This group for the most part is composed of autumnal bloomers. They are popular as garden Roses, Hermosa is the freest bloomer. Appolone is the most beautiful. George Peabody and Mainaigeon are also deservedly popular. The moderate growers of this group should be pruned closely.

The Hybrid Noisette (Rosa Noisettiana, var. hybrid) has made several contributions to the rosarian. The least hardy but the most beautiful members of this group are Madame Romaine, Mile. Bonnaire and Eliza Boelle. Rivals in beauty and more hardy are Coquett des Alpes, Coquett des Blanches. The pruning knife should not be spared with this class.

The Hybrid Tea Rose (Rosa Chinsensis, various forms) is more hardy than the Tea Rose and less hardy than the Hybrid Remontants. It is a group destined to have many additions in the not distant future. La France, Captain Christy, Kaiserin August Victoria, Caroline Testout and Liberty are the best of this class.

Some persons like to train Roses to a few canes and tie them to stakes (Fig. 2173). Another practice is to bud them high on brier stocks and to grow them as standards. Most Americans prefer the free growth, blooming from near the ground (Fig. 2174).

EDMUND M. MILLS.

Another View of Garden Rose-Growing. Roses may be successfully grown in any soil that will produce fair crops of grain, vegetables or grass. Certainly the best results will be obtained in the more favorable soils and situations, but every one who loves a Rose and possesses a few feet of ground with plenty of sunshine can have his own Rose garden and find pleasure and health in cultivating the queen of flowers. Of course the ideal soil is a rich, deep loam, but a good Rose bed can be made in clay, sand or gravel at little expense and labor. Even the city resident, whose house has been erected on the site of an exhausted brick-yard, can at a small expense secure sufficient good soil from the outsitks and manure from the adjacent stables to make a Rose garden that will grow as good plants and flowers as those of his more favored friends who have acres at their disposal, provided always that the sunlight can reach the beds for at least half of the day.

The preparation of the ground is the first step of importance. Roses abhor wet feet, and if the soil is wet it must be thoroughly drained. This can be accomplished by digging out the bed to a depth of three feet and filling in one foot with broken stone, bricks, cinders or anything that will allow a free passage of the water through the soil. If this is not sufficient and the water is not carried away, provision must be made for this by tile-draining; but, except in very extreme cases, the drainage before mentioned will be found amply sufficient. The composition of the soil should depend on the class of Roses to be grown. The Remontants do best in a heavy soil containing clay, while those having Tea blood prefer a lighter, warmer soil.

The beds may be made of any desired shape, but a width of 4 ft. will usually be found the most satisfactory, as a double row can be planted at intervals of 2½ ft., which will be all that is necessary for the strongest growing varieties, and the blooms can be gathered from each side without the necessity of trampling on the soil. Space may be economized by planting as in the following diagram:

![Diagram showing planting of roses](image)

The plants will then be 1 ft. from the edge and 30 in. apart, and each plant will be fully exposed to the light and air and will not interfere with its neighbors.

In preparing a bed on a lawn, the soil and soil should first be entirely removed and placed apart; then the last of the subsoil may be taken out and placed on the other side of the trench, and, lastly, the portion to be discarded, making in all a depth of at least 2 feet. The floor is then loosened to the full depth of a pick-head, the good subsoil replaced and mixed with a generous dressing of well-decomposed stable manure; lastly the surface soil and sod well broken up and also thoroughly enriched with manure, and the bed filled to the level of the adjoining surface with enough good soil added to replace the discarded earth. When the bed has settled the surface should be at least one inch below that of the adjoining sod, in order that all the rainfall be retained. The writer believes it to be a serious mistake to make any flower bed higher than the adjacent surface, as in hot weather the soil dries out and the plants suffer for want of moisture.

If the bed is intended for the hardy Hybrid Perpetual or Remnant class, it should contain a fair proportion of clay well mixed with the soil. A sufficient amount is always present in what is known as a heavy loam. If
the soil does not contain this naturally, it should be added and thoroughly incorporated with the other ingredients. If the soil is intended for Hybrid, Teas, Bourbons or Noisettes, the soil should be lighter, and if naturally heavy should have added to it a proper amount of sand or leaf-mold, and be thoroughly mixed as before. Roses are rank feeders; therefore be liberal with manure for every class.

Garden Roses can be obtained from the dealers grown in two ways; on their own roots, and budded on the Manetti or brier stock. Figs. 213, 215. There is much difference of opinion as to the relative value of the two sorts, and it must be admitted that some of the stronger varieties will do equally well either way; but the opinion of the writer, based upon the experience of nearly a quarter of a century, is that all of the less vigorous varieties are far better budded than on their own roots, and some are utterly worthless unless budded; notably, Reine Marie Henriette and Viscountess Folkstone, both charming Roses when well grown. The budded plants are mostly grown in Europe, taken up as soon as the wood is ripened in the autumn, and shipped to us in the dormant state in time for planting in the latitude of Philadelphia before the ground is frozen. They naturally received in such excellent condition that rarely one in a hundred of the hardy sorts fails to make good growth and a fair bloom in the following season.

With the tender sorts, dormant planting out of doors in late autumn is attended with much risk, because the hardiness of these plants to endure the rigors of our winters before becoming established. Consequences they were given much more protection than the hardy varieties. It is really much better to have the planting deferred until the early spring, if the plants can be safely housed throughout the winter. After they have become successfully established their safety is assured, and they will repay in vigor and excellence the extra work expended upon them. Few amateurs, however, have the conveniences for caring for a number of plants under cover throughout the winter. Therefore they must take the risk of planting in the autumn or cultivate plants grown on their own roots. The best budded stock the writer has yet found was obtained from nurseries in Ireland, and it has been the uniform testimony of all who have examined them that they had not seen finer out-of-door Roses grown in this section. (For further discussions of budded and grafted Roses, see page 1574.)

Planting Budded Roses.—Holes at least 1 ft. in depth and 15 in. wide should be made for each plant, the collar or point where the bud was inserted and upwards which the new growth starts placed 2 in. beneath the surface of the soil, the roots spread out and downwards (care being taken that no roots cross each other) and all roots covered with fine soil free from lumps of manure. Fig. 215. Manure should never come in contact with the roots, but near at hand, where the new feeding roots can easily reach when growth begins.

The remaining soil should then be packed in firmly, the surface leveled and covered with about 3 inches of cow manure and manure, and the long wood cut back to about 18 inches to prevent the plant being whipped and loosened by high winds.

This extra wood is left to encourage root action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to a strong outside bud, without injuring it, to develop an open and free head admitting light and air.

If the uppermost bud is on the inside surface of the shoot, the new growth will be directed inward, dwarfing and hampering the plant and preventing proper development. The deep planting above described is necessary to prevent suckers from being thrown out by the roots, as these will spring up as soon as the choice and kill the less vigorous wood which we are endeavoring to develop. From the writer's point of view the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded Roses who cannot distinguish the brier should it appear, or who is too careless or indifferent to dig down at once and cut the wild shoot clean off at the root, rubbing it smooth and putting no moss on the shoot. Do this just as soon as you discover it.

A very little experience will enable any one to distinguish the brier. The canes are covered with minute thorns and bear seven leaflets, instead of the usual number of five. Should any doubt remain, follow the shoot down through the ground and if it starts below the collar it is a brier. Remove it. These wild shoots usually appear a foot or more inches outside of the regular growth, rarely inside; consequently there is little difficulty in detecting and removing them.

Planting Roses from Pots.—Should Roses grown on their own roots be preferred, they should be planted as soon as the spring weather has fairly settled and all danger of frost is over, that the plants may be firmly established before the heat of summer. Roses planted late in the season never do well, as they cannot attain sufficient vigor to withstand the burning heat of our summer sun. The holes need only be made a little larger than the pot in which the plant is growing. Choose a cloudy day, or the time just before a rain, or late in the afternoon, and, after making the hole, knock the pot off by inverting the plant and striking the edge sharply on a firm substance (the handle of a spade which has been firmly planted in the ground in an upright position, will answer nicely). Press the ball of earth firmly between the hands to loosen the earth without injuring the roots, fill the hole with water, insert the plant a very little deeper than it stood in the pot, fill in with soil and pack the earth around firmly.
grown plants will always require staking if the varieties are of upright growth.

Tea Roses.—Where the climate is too cold to winter out Tea Roses successfully, a charming effect can be obtained by planting in a bed 6 ft. in width, the rows one foot from the edge and 2 ft. apart, and the bed of any desired length or any multiple of 3 ft. A cast-iron frame made from tongued and grooved white pine fencing, 2 1/2 ft. in height at the back and 2 ft. in front, facing east or southeast and fastened together with hooks and eyes or screws, the whole covered with a coldframe sash (6 x 3 ft.), will preserve the tender varieties through a severe winter. The sash should be freely opened when the temperature is above 30° F. and air admitted during the day when it is 10 or 15° lower. Always close before sunset and open as soon as the sun shines each morning. Opening the sash to keep the plants cool and prevent growth is just as essential as covering to protect from cold, if abundance of flowers is desired. A few days' neglect in opening the sash when the temperature is above 30° will destroy most of the buds for the coming June, as they will be forced out, and one cold night will kill them. Protect from rains, snows, and do not water. Sufficient moisture reaches the roots from the outside to keep the plants in a healthy condition.

The writer has a number of Teas that have been grown successfully in such a bed for many years. They give hundreds of fine blooms from May until November and remain so vigorous that many of the newer species are half an inch in diameter.

Climbing Roses.—These make a very effective background, and if trained on a high wire fence give a beautiful display. The strong-growing varieties should be planted 8 ft. apart and will each easily fill a trellis 9 ft. high. They also look well trained on the porches. Both canes are usually attacked by insect enemies there than when planted in the open, where the birds have free access to them, with no fear of disturbance. The birds will not do good work where they are in constant danger of interruption, on the canes grown on porches are usually attacked by aphides and slugs, the leaves becoming riddled and skeletonized, which rarely occurs when they are planted in the open.

If Roses are planted around porches the Microphylla, white and pink, and the Crimson Rambler can be safely planted, as they are not attacked by the slug, but the blooms do not compare favorably with many other Roses of their habit. The other varieties can also be grown around porches, provided that they can be planted where the drippings from the roof will not fall upon them and are kept free from slugs. This can be accomplished by free syringing with the hellebore infusion to be described later on.

Only a few of the climbing Teas can be grown successfully in the latitude of Philadelphia. Many of the finer varieties are worthless here, in spite of all the protection that can be given them unless they are covered with glass. Lamarque, Bouquet d'Or, Cloth of Gold, Triomphe de Rennes, Marchal Niel and Rêve d'Or have, in the writer's experience, all perished in the first winter, but Reine Marie Henriette, Claire de Dijon, William Allen Richardson and Colline Forestier will grow well and yield satisfactory results. The finest climbing Tea for this latitude is Reine Marie Henriette. It blooms finely and makes a magnificent growth, as may be seen in Fig. 2177. The trellis is 10 ft. wide and 9 ft. high.

These varieties should be pruned sparingly by simply shortening in the too vigorous shoots and cutting the laterals back to two eyes. Tie all to the trellis in a fan shape until the space is as evenly as possible. Fig. 2178 shows the same Reine Marie Henriette pruned and trained on trellis. These continue in flower until November, the early bloom in June being the finest, but many good fleurs may be obtained throughout the summer and autumn. With the hardy June-flowering varieties the writer has not had much experience and can only recommend Crimson Rambler and Cheshunt Hybrid from actual cultivation. Both of these are effective in their masses of bloom for about three weeks in each year. Space has been so precious in the garden from which these notes were made that only the most but many good fleurs may be obtained throughout the summer and autumn as Baltimore Belle and Prairie Queen do not compare favorably with others that occupy no more room and give much more gratifying results.

Hybrid Teas.—The recent introduction of the Marquis of Pencance Hybrid Teas is a valuable addition to our collection. All of the 16 varieties given in the accompanying list are desirable. The foliage is abundant, healthy, vigorous and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. It would be difficult to choose among them, for all are worthy of a place in any garden where there is sufficient space for them to revel. They should have a high trellis and be planted fully 8 ft. apart. The only pruning necessary is to shorten back over-vigorous growth and occasionally remove some of the oldest shoots to prevent overcrowding.

Pruning the dwarf-growing Hybrid Perpetuals may be commenced late in March and can be regulated by the quantity or quality of the blooms desired. If the effect of large masses be wanted, 4 or 5 canes may be left 3 ft. in height and all very old or weak growth entirely removed. This will give a large number of flowers, effective in the mass but small and short, weak foot-stalks scarcely able to support the weight of the heads and not effective as cut-flowers, as this sort of pruning is entirely for outside show. After the bloom is entirely over, the long shoots should be shortened back, that the plant may make good and vigorous wood for the next season of bloom. But if quality be desired, all weak growth should be removed, every remaining healthy cane retained and cut back to 6 or 8 inches. Always cut just above an outside bud, to make an open head that will admit light and air freely. After the first season's growth, there may be about three canes to be retained, but with good care and cultivation the number will increase until after 15 or 20 years there will be at least as many canes to be utilized. The writer has a bed over 20 years from planting, in which each plant, after close pruning, will measure from 15-18 inches in diameter, each cane throwing up from four to six shoots 1 or 2 ft. in length and sufficiently vigorous to hold up the largest flowers and to give magnificent specimen flowers for cutting. Roses grown in this way do not
need stakes. They are sufficiently strong and vigorous to hold erect any weight they may be called upon to bear; but late in the autumn, before the high gales of November arrive, they should be cut back to about 2 ft. to prevent their being whipped by the wind; this would loosen the plant and break the newly-formed feeding roots. The plant should not be cut back to the point suggested for spring pruning, as in the hot Indian summer the upper eyeholes will surely be killed out and the promised blooms for the ensuing season destroyed; so in pruning for protection from November blasts, enough wood should be left to avoid all danger of the loosening of the roots. The young shoots forced out to develop earliest. Some varieties will not produce large footstalks under any method of treatment, notably Prince Camille de Rohan, La Rosarie and Rosierste Jacobs; but almost all the other kinds do better under this method than any other, if quality is desired.

Pruning Dwarf-growing Tea Roses.—Tea Roses will not endure such vigorous cutting back as the Hybrid Remontants. All good strong shoots should be retained unless they form a very close head, when it is better to remove a few from the center. The canes should be shortened about one-third of their length, the branches cut back 1 or 2 eyes, and after each period of bloom the longest shoots should be trimmed back sparingly. Roses need even less trimming. Souvenir de Malmaison, Mrs. Paul and others of this class should have only the weak ends of each shoot removed, and no more wood cut away than is necessary to remove weak and unhealthy portions; otherwise very few flowers will be produced.

Cultivation.—Just before growth commences in the spring, the surplus rough manure should be removed from the beds and all the remaining fine particles forked in. Deep cultivation is not desirable, as the roots are likely to be injured or broken. Three inches in depth is quite sufficient to cultivate a bed that has not been stamped upon, and this should be done with a 4-tined digging-fork, which is less likely to cause injury to roots than a spade. The beds should then be neatly edged and the surface raked off smooth and even. Frequent stirring of the surface with a sharp rake is all that is necessary afterwards, until the buds begin to develop. Then half a gallon of weak liquid manure applied around the roots of each plant just before a shower will be eagerly appreciated and assimilated. The manure water should be prepared beforehand, and as soon as a good promise of rain appears, all hands should be called into service and every plant given a full ration. One person should dig a shallow trench with a good trowel around each plant, the next follow and fill with the liquid manure, being careful to avoid be-mirching the leaves; afterwards the bed can be raked over level and the rain will wash the bulky food to the eager roots, and thirst and glory will result. This feeding may be repeated weekly until the season of bloom is over, after which stimulation should cease and the plants be permitted to perfect the new wood for the next season's growth. Little pruning is necessary with "cut-backs." So much wood has been removed in gathering the blooms that but little more is left than is needed to keep the plants vigorous and healthy. There is another advantage from the system of close pruning; all growths are so strong and vigorous that they are better able to resist any inroads either of insects or disease. The greenfly seldom appears, but when detected may be readily kept down by repeated syringing with tobacco-water or Quassia infusion.

The belief that Roses exhaust the soil in a few years and require to be changed into new ground is generally accepted, and is true in most cases; but when beds are formed as previously described and budded Rose-planted, the vigorous feeding roots find sufficient nutrient in their far-reaching growth to support a healthy development of wood and flowers for many years, especially if a generous top-dressing of manure be applied each autumn and liquid manure supplied liberally during the development of the buds. A top-dressing of wood ashes after the first spring cultivation will restore the soil to a condition materially to increase the vigor of the wood and flowers.

**Insect Enemies.**—The most formidable is the Rose beetle, which revels in the petals and buds of our choicest plants, usually selecting the light-colored varieties and working havoc and ruin wherever he appears. Hand-picking is the only effective remedy, and a quart can half filled with kerosene oil is a good place into which to drop the offender. He is easily caught when discovered, as he may readily be upon examination of each bud and flower.

The aphis or greenfly is found on the extreme ends of the shoots and young buds. This is the cow of the ants and is tended and milked by them. The aphis increases with enormous rapidity, and unless destroyed robs the plant of its vitality by sucking out the sap. A decoction of tobacco stems is made by half filling a barrel with refuse stems from a tobacco factory and filling the barrel with water. After this has been incubated, syringe the plants every day with the decoction until the enemy is defeated. In extreme cases, where the aphis has become firmly established, the remedy proposed by Mr. B. K. Cant, an English rosarian, may be required. He says: "Take four ounces of Quassia chips and boil them ten minutes in a gallon of soft water; strain it and while cooling dissolve in it four ounces of soft soap (or whale-oil soap). To this may be added another gallon or two of water. The plants should be syringed with this and all badly infested shoots dipped into it. Pure water should follow the next day to cleanse the shoots." If, at the first appearance of these pests, the finger and thumb are used to rub them off and destroy them, much subsequent trouble will be saved.

Slugs are usually found on the under side of the leaves and may be discovered by the skeletonized appearance of the leaf. To destroy them, make a decoction of powdered white helichore, with one heaping tablespoonful to a pint (about four gallons) of boiling water. After cooling, apply with a syringe or, better, with a whisk broom. Push the top of the plant away with the left hand and, with the broom dipped in the solution, throw the drug up and against the leaves. If the thorough application of the broom will usually suffice, but if the slug has appeared in previous years, anticipate his com-
ing and apply the heliobore solution before any mischief has been done and repeat later, should any evidences of his presence be detected. This aggressive offender is the larva of a small winged moth, and the presence of any insect of this sort in the vicinity of a Rose should always be regarded with suspicion.

The bark louse, or white scale, survives the winters and is usually found on old wood. It can best be treated before the growth begins in the spring. A solution of fifteen grains of corrosive sublimate to one pint of water, brushed over the stalks wherever the lice harbor, will speedily destroy all. As corrosive sublimate is a very powerful poison, great care should be taken in its use.

List of Roses that have been tested by the writer and can be recommended for gardens:

**Hybrid Perpetual Roses.**—Alfred Colomb, Alfred K. Williams, Annie Wood, Baroness Rothschild, Captain Hayward, Caroline d'Arden, Charles Lefebvre, Cho, Countess of Oxford, Dinsmore, Dr. Andry, Duke of Edinburgh, Duke of Teck, Etienne Loval, Eugenie Verdier, Fisher Holmes, Francois Michelon, General Jacquinot, Giant of Battles, Heinrich Schnithels, Her Majesty, James Brownlow, Jeanne Dickson, John Hopper, James D. Paul, Lady Helen Stewart, Mabel Morrison, Madame Gabriel Laizet, Magna Charta, Marchioness of Lorne, Margaret Dickson, Marie Baumann, Marie Verdier, Merville de Lyon, Mrs. John Lane, Mrs. K. G. Sharman Crawford, Paul Neyron (Fig. 2169), Pride of Waltham, Prince Arthur, Prince Camille de Rohan, Roslyon, Rev. J. B. M. Camu, Suzanne Marie Rodocanachi, Ulrich Brunner, Xavier Olibo.

**Hybrid Teas.**—Augustine Guindoscau, Captain Christy, Caroline Testout, Ghoire Lyonnaise, Kaisertin Augusta Victoria, Madame Joseph Combet, Miss Ethel Richardson, Souvenir du President Carnot, Souvenir de Madame Eugenie Verdier, Viscountess Polkstone.

Mr. Alexander B. Scott recommends the following additional H. T. varieties: Antoine Rivoire, Baldwin, Bessie Brown, Grass an Teplitz, Killarney, Lady Clamoroin, Madame Jules Groves.

**Tea-scented Roses.**—Aphelone Karr, Comtesse Riza du Pare, Duchesse de Brabant, Etoile de Lyon, Francea Kruger, Innocente Pirolo, Isabella Sprunt, Madame Lambard, Madame Moreau, Mamou Cochet, Madame Joseph Schwartz, Marie van Houtte, Papa Gentier, Sarfrano, Souvenir d'un Ami, The Queen, White Maman Cochet.

**Moss Roses.**—Comtesse de Murinels, Blanche Moreau, Crimson Glove, Lanelli, Princess Adelaide.

**Climbing Roses.**—Crimson Rambler, Cheshunt Hybrid, Ghoire de Dijon, Celine Forestier, Reine Marie

2180. The old-fashioned yellow upright Rose (X 5/2).

Henriette, Pink Microphylla, White Microphylla, Madame Alfred Carrere.

**Hybrid Souvenir.**—Amy Robsart, Annie of Gierstein, Brenda, Catherine Seylon, Edith Bellenden, Flora McVor, Green Mantle, Jeanie Dean, Julie Mannerings

Lady Penzance, Lord Penzance, Lucy Ashton, Lucy Bertram, Meg Merrills, Muna, Rose Bradwardine.

The Hybrid Wichuraeaus look promising, but have not been tested by the writer.

It is not intended that this list is by any means complete. There must be many good Roses that will do well under favorable conditions of which the writer has no personal knowledge. The collection is sufficiently large, however, for a beginning, and any one who has the time, energy and means may add to it, if he can bear disappointment cheerfully. If one in a dozen of the highly lauded varieties in the dealers' catalogues prove satisfactory, the experimentor should be well satisfied. He can dig out and throw away the other eleven and try it again, in the hope that he may find a new queen worthy of his homage.

Much of the charm of growing Roses is derived from the accurate knowledge of each variety by name. Yet few amateurs ever accomplish this, chiefly because the labels have been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been misplaced, and replaced on the wrong plant. To obviate this a record should be made in a book kept for the purpose, with a chart for each bed. This should be done at once after the plants are set out and before the labels have become detached. Many vexations might be prevented by some such plan as the following:

![chart]

1 to 6. Her Majesty, 8 to 15. Gloire Lyonnaise, 7 to 12. Margaret Dickson, 16 to 20. White Baronesse.

ROBERT HICKY.

Garden Roses near Chicago.—Climatic conditions surrounding the bluff lands bordering Lake Michigan, some twenty miles north of Chicago, are not congenial to the successful cultivation of outdoor Roses as a class, and only those possessing the most robust constitution among the Hybrid Perpetuals should be grown. Ample winter protection must be given along the lines indicated in the article in this work entitled Winter Protection. The soil is all that could be desired, being a rich yellow clay loam. The trouble seems to be in the severity of the winters, where heavy falls of snow are infrequent, and the springs late and fickle, warm winds from the southwestern prairies alternating with chilling moisture-laden breezes from the lake.

The beds are excavated to a depth of 2 ft., good drainage given, and then filled with a compost of rotted
sed and cow manure. Each spring following, some manure and bone meal is forked into the surface. Liquid manure is given in June when the Roses are in full bloom, and a few times thereafter. The Roses are thoroughly sprayed with Bordeaux mixture when the leafage is fairly out, and once every three or four weeks afterwards. Hand-picking seems the best method of destroying the worms affecting the buds, and frequent drenchings with the hose abolish the other enemies. In the fall the canes are bent down and fastened to the base of their neighbors, and remain procumbent until the spring cutting is, which is delayed as late as possible in order not to incite too early a start and to force the buds to "break" low down. After the leaves used in the winter protection have been removed, and the board roof also, the sides of the "box" are allowed to remain a short time in order to shield from the winds.

The winter of 1898-9 was unusually severe and did more damage to the Roses and other material than any other winter which the writer has experienced at Highland Park. Following is a list of the so-called Hybride Remontants (H. R.) that wintered then—under protection—and came out in good condition. These varieties may therefore be considered the most suitable for this and kindred climates: Prince Camillo de Rohan, H. R.; Magna Charta, H. Ch.; Mrs. R. G. Shanaman Crawford, H. R.; General Jacqueminot (Rousselet), H. R.; Captain Christy, H. T. (Hybrid Tea); La Rosiere, H. R.; Captain Hayward, H. R.; Mrs. Paul, Bour.; garden Favorite, H. R.; Louis Van Houtte, H. R.; Paul Neyron, H. R. (Fig. 2169); John Hopper, H. R.


The list of those that winter-killed is too numerous to give, but it is a singular fact that the first list contains forms classed among the Teas and Bourbons. Of the climbing forms that were unprotected, Rosa setigera and its offspring, Prairie Queen, were somewhat injured; but Groville (Seven Sisters), Crimson Rambler, Thalís, Paul's Carmine Pillar, Multifora, and the Dawson Rose were in fairly good condition when wintered under protection. The failures even when protected were Aglaia, Alister Stella Gray, Euphrosyne, Russell's Cottage, Baltimore Belle, Tennessee Belle. The typical Sweeth Briars proved hardly unprotected, but the hybrids of them were killed. Protected R. Wichmanniana and its hybrids killed back to the roots; R. rugosa and most of its hybrids, especially those of Jackson Dav-son and Prof. J. L. Budd, unprotected, were all right; Mme. Georges Bruant (Fig. 2165), protected, was killed. Most of the Moss Roses stood well unprotected, especially Crested Moss.

Clothilde Soupert and Hermosa are the best bedders for permanent planting when protected, and the so-called Fairy Roses stand fairly well, especially Mile. Cecile Brunner. Papa Couturier and Kaiserin Augusta Victoria are among the best of the more tender class that require the protection of a pit in winter. They seem to stand the biennial root disturbance well. La France browned in the bud under our sun, and, strange to relate, the writer cannot grow that splendid Rose Mrs. John Laing successfully, either on its own roots or budded. R. rubrifolia (or ferruginea), R. spinotis, var. Alatina, R. violacea, and R. nivea from Russia is were hardly without protection.

W. C. Egan.

Future Roses for the Prairie States.—West of Lake Michigan, and north of the 42d parallel, the fine Roses grown in the open air in the eastern and southern states can be grown only by systematic pruning and winter covering. Of well-known old varieties hardly enough to winter without protection, the list is short. Madame Plantier, White Harison, and Rosa rugosa with some of its hybrids, are hardy between the 40th and 45th parallel, and still farther north the East European R. rugosa and such of its hybrids as Snowlight; Empress of the North and Rosa morjasit pt. ft., are grown successfully. Figs. 2181 and 2182 show forms of Rosa rugosa; also Figs. 2162-64.

Of the newer hybrids of R. rugosa now quite widely tested, the most desirable are I. A. C. (Fig. 2183), Ames, Madame Georges Bruant (Fig. 2184), Madame Charles Frederick Worth, and Thunfeld; Kaiserin (Fig. 2185) is also to be commended. It is suggestive that these have come from crossed seeds of what is known in Europe as Rosa rugosa, var. Regelianæ (p. 1556), and which we know as the Russian Rosa rugosa. The first two named came from seeds of Rosa Regelianæ introduced by the writer in 1883 crossed with pollen of General Jacqueminot, and the last three were developed from seeds of R. Regelianæ in Germany as stated by L. Späth, of Rixdorf near Berlin. They are all fine double Roses of the class shown in Fig. 2183, of the two produced at Ames, and all have retained to a large extent the foliage and habit of blooming of R. rugosa. The Russian R. rugosa as introduced from Russia by the writer is divided into two very distinct classes. The one from the Amur valley in

2182. Russian form of Rosa rugosa (X ½).

2183. The I. A. C. Rose (X ½).

One of the best hybrids of Rosa rugosa for the prairie states. (I. A. C.—Iowa Agricultural College.)

North Central Asia is a very strong, upright grower with lighter colored bark, stronger thorns, thicker and more rugose leaves, and larger flowers than the Japan type, var. Alatina, superior. The one from Russia in Europe is spreading and pendent in habit. When 4 ft. in height it has a spread of top of fully 6 ft. Its leaves
also have a darker shade of green than the Japanese type, and its buds are longer, more pointed, and show between the narrow petal shades of bright red and crimson. Its clusters of flowers also differ, as it has four to five flowers on each wood, while the Japanese type has only two to three. In addition, we now know by trial that both these Russian types may be grown successfully two degrees farther north than the Japanese Rose.

The work of crossing the Russian *R. rugosa* began at the Iowa Agricultural College in June, 1892. The pollen of over a dozen of the best garden varieties was used, but only one of these, *Jacqueminot*, proved as successful as possible, as it produces pollen most freely. The final result was quite unexpected, as no double variety with *rugosa* leaves was produced when the pollen of any variety was used except that of General Jacqueminot. Further, this crop of *rugosa* flowers was produced with pollen from General Jacqueminot, we grew 255 plants. From these we were able to select over 20 varieties with double flowers ranging in number of petals from 15 to 150, with handsome *rugosa* foliage and surprising vigor of growth. Nearly all showed the crimson color of petals of the male parent.

At the same time we pollinated the blossoms of our native species *R. blanda* and *R. Lutea*, with pollen of General Jacqueminot and other Hybrid Perpetuals, but wholly without valuable results, as the crosses seemed too violent. Most of the hybrids showed modified foliage and habit of growth, but all except those with *blanda* flowers. They have developed blossom-buds freely, but in no cases have the blossoms expanded into perfect flowers. When apparently ready to expand they began to turn black in the center and drop off. It is also well to state that the pollen of White and Yellow Harison used on *Rosa rugosa*, var. *Regeliana*, developed remarkably vigorous hybrids which gave clusters of promising buds, but up to the present not a single flower-bud has fully expanded. The work of E. S. Case, however, reported better results with this cross of Harison's Yellow and *rugosa* (A. G. 1899, p. 663), and a picture of one of his hybrids is shown in Fig. 2186. As in Europe, our marked success has been with the pollen of General Jacqueminot, which seems to show a near affinity to all the types of *R. rugosa*.

With increased experience other cultivated varieties will be discovered that will cross in a profitable way with *R. rugosa*, and still others will be found that will cross profitably with our native species. At present, however, the east European *R. rugosa* seems to be the most promising progenitor of the future Roses of the North-west. We have many of the varieties of *R. rugosa* with 60 petals, such as the *I. A. C.*, with the rich color of General Jacqueminot and the fine leaves of *R. rugosa*. The main trouble at present is in propagation. As with the varieties of *blanda*, the hybrids of *rugosa* often grow from cuttings. We find that they can be budded readily on strong seedlings of our native species.

It may be in the near future that the seeds of the large-growing Wild Roses of the Black Hills will be used by propagators for stock-growing. When that time comes we already have varieties hardy enough for the North that compare favorably with the best varieties of more equable climates. Strong-growing stocks are advisable as the more valuable buds of some of our existing ones are remarkably slow. On the writer's lawn is a bush of the Ames variety three years old that stands 7 ft. high, with several stems three-fourths of an inch in diameter.

J. L. Boco.

Roses in Southern California.—In many localities in southern California the Queen of Flowers attains a perfection probably found nowhere else. That this perfection is not general throughout southern California is partly due to the wide range of temperature during each twenty-four hours, heavy fogs at critical periods, etc., but as a rule, failure in whole or in part is due to the lack of intelligent treatment. The chief obstacle to successful culture is the alternating of blooms and withered flowers. Although this practice is quite an impossibility with any Rose, the evil is still persisted in by ninety-nine in every hundred possessors of a garden. While Roses are grown in great profusion in Los Angeles, few, if any, do as well here as in Pasadena, which, although only nine miles distant, has the advantage of being several hundred feet higher than Los Angeles, and therefore less subject to great range in daily temperature. In some places a certain few Roses will produce an astonishingly fine crop of bloom, when but a mile or two distant, with no change of soil and very little difference in altitude, they will fail entirely; while a like number of other varieties will give as good returns as those first mentioned. Consequently the common inquiry at a nursery as to "What are the best dozen Roses I can grow?" is usually met by the equally pertinent query: "In what part of the city do you live?"

Many Roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a complete flower-bush than any other. It is believed to be a thing of good fortune that it ever happened to be available to American gardeners, as it is a study in itself and is as rare as it is valuable. It is as hybrid a Rose as can well be expected. No one grows a dozen Roses! It is usually met by the equally pertinent query: "In what part of the city do you live?"

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found among a hundred varieties, and this is particularly the ease in places visited by heavy frosts, Laurette remaining unscathed, while all others are more or less blasted. The great Rose of the eastern United States, American Beauty, is almost a complete failure here and is not worth growing except in a very few, well-favored gardens, and even there it is far from being perfect.

Many Roses, too, are of little value here unless budded or grafted. Of this class Marechal Niel is the most striking example. Instances may be found where this Rose has thrived unusually on its own roots, but such cases are marked exceptions. Some few people maintain that all Roses are best on their own roots, but such opinions are easily refuted by consulting any of our veteran rosarians. The undersigned does not advise the purchase of any such stock, no matter how much is claimed for it, or how widely advertised it may be. The best Roses he has ever seen were root-grafted, but of course this procedure is too expensive for the general nurseryman, and the bulk of our local

ROSE

stock is budded on Manetti or Maiden’s Blush, though the Dog Rose (Rosa canina) and even the Banksia are often used. Those Roses grown on their own roots are usually propagated from hardwood cuttings, grown out of doors, and December is usually the best month, though the writer has successfully rooted them from October to May, according to the variety.

Rust bothers us but little; likewise scale, though in many neglected gardens the bush and climbers alike may be found covered with both the rose scale and the red scale of the orange. Fuller’s rose beetle is a nuisance only in small areas, but green aphis is quite a pest in

winter and spring. La France for many years was the leading Rose in California and grew well, budded or on its own roots, in almost any locality, but is now rapidly becoming a thing of the past, though it can never be wholly discarded, for it is still, in a few gardens, the queen of the family. Its involuntary retirement from our Rose gardens is due entirely to a “die back” (anthuracose), which affects many other plants than the Rose, but seems to have a special liking for La France. Thus far no cure has been found.

Below will be found a list of the best dozen bush and half dozen climbing Roses for southern California, compiled from lists furnished the writer by the best six nurserymen and growers in Los Angeles. An increasing demand for Maman Cochet is quite marked, and the few White Maman Cochet yet grown here seems to mark it as the coming white Rose for this section.

The following lists place the varieties in the order of their desirability for either florist or fancier, when grown out of doors:


Climbers—Lamarque, Marechal Niel, Climbing Souvenir de Wootton, Rose d’Or, Rose Marie Henriette, Gloire de Dijon. This list will be found to be the best for Los Angeles and vicinity in general. The intelligent nurseryman or careful purchaser should be able to make the slight changes required by peculiar conditions.

To Mr. Frank Huston, nurseryman of Los Angeles, the writer is indebted for many valuable points contained in this article; also to Mr. Wm. S. Lyon, whose little booklet, “Gardening in California,” contains the best practical treatise on Rose-growing ever published on this coast.

ERNST BRUXTON.
Some Recent Rose Hybrids (Rosa multiflora, R. rugosa and R. Wichuraiana crossed with various types).

It is now about sixteen years since the undersigned became interested in hybridizing Roses, especially salmon, red and purple flowers. Attempts have been made in crossing the Yellow Harison Rose with the Dawson and R. multiflora, but so far with no encouraging results. The writer now has about 500 hybrids, three years old, made with differing varieties of Hybrid Teas and Yellow Harison on the Dawson, with results still to be determined. All these were crossed out of doors with every precaution possible, but the results are not so likely to be as good as when the work is done under the more perfect control of the greenhouse. A cross between the Dawson and Crimson Rambler has so far resulted in a single deep pink flower borne in clusters.

In crossing R. rugosa with Jacqueminot every conceivable form was obtained, some with narrow pointed petals, some semi-double and others single, dark and light colors. One had a deep rich crimson flower, darker if anything than Jacqueminot, very fragrant, with strong, heavy foliage, showing the influence of both parents. This seemed like a promising foundation for a line of hardy Roses, but for five years all efforts to get a single hip to mature when fertilized with others have been in vain. This is the Arnold Rose and received the silver medal of the Massachusetts Horticultural Society in 1893. In this batch of seedlings was one that was very double and in color like Magna Charta, but unfortunately some one else wanted it and one day it disappeared from the nursery. The writer has also crossed R. rugosa with Yellow Harison, but as yet has obtained no yellow Roses of the Rugosa type. On the contrary, they are the biggest lot of mongrels one ever saw, in both foliage and flower. The Rugosa foliage is completely obliterated, and the Harison retained, while the flowers are small and generally a dirty salmon color. The writer was so disgusted with the lot that he threw them all away after working more than four years on them.

Attention was next given to R. Wichuraiana. The possibilities of crossing this seem to be unlimited. No Rose that the undersigned has ever tried yields so readily to hybridizing. The first attempt was with Jacqueminot, always using R. Wichuraiana as the mother plant. The results were excellent. While some plants were nearly R. Wichuraiana they were entirely different in shape and color; they had the clusters.

2185. A Rugosa hybrid—Harison’s Yellow × R. rugosa (X %).
but the habit was half-scandent instead of prostrate. The first to bloom was single, delicate rose with a nearly white center, a rampant grower, attaining 6-8 feet in a season. This vigorous, bushy form is similar to the Wichuraiana hybrids, but it is not the same plant. W. C. Egan, and received the silver medal of the Massachusetts Horticultural Society in 1896. This is, without doubt, one of the finest hybrids of R. Wichuraiana at present. The flowers are in large clusters, with double purplish pink flowers, and are supported on long stems. The foliage is also like Malmaison but brighter. It is perfectly hardy in the nursery and will be a good grower once established. The best to use is R. Wichuraiana, and the growth prostrate as in R. Wichuraiana, but shorter in habit. The plant is very hardy. R. Wichuraiana was next crossed with R. rugosa, with more than pleasant results; Lady Duncan, silver medal from the Massachusetts Horticultural Society in 1900, having the prostrate, long, rampant growth of the mother, while the Rugosa blood shows in the foliage spines and flowers, these last being a warm, lively pink, and belonging to a distinctly different variety. Another is somewhat deeper in color but of less vigorous growth. A curious fact concerning these extreme crosses is that not one of the Wichuraiana hybrids have well developed half-scandent spines. From R. Wichuraiana impregnated by Crimson Rambler has been obtained thus far only single, pale pink bloom and foliage intermediate between the two, but with the creeping habit of the mother. R. Wichuraiana fertilized by Belle Siebrect loses its character except to a slight degree in the foliage; the habit is erect, strong and with stout spines; the flowers are single, rosy pink. This plant, if well set, may produce an entire new strain. R. Wichuraiana crossed with Clitheld Souptet makes plants less vigorous than itself; the foliage recalls both parents and the double flowers are in color like Souptet. R. Wichuraiana crossed with Triomphe de Luxembourg (hyb. China) has given several distinct forms, one with double rosy purple flowers; others are distinctly single, and one is double, light pink with shining leaves. R. Wichuraiana crossed by Bardon Job has given a single-cluster Rose similar to Carmine Pillar, and the writer has many other crosses between R. Wichuraiana and different Tea Roses and R. repens (eressian) with double and single flowers ranging in color from white to rosy pink and salmon; there are few of these seedlings which do not have some merit, and all can probably be improved. The crosses between R. Wichuraiana, Jacquinot, R. rugosa and Belle Siebrect will not bear seeds, but those with varieties of R. Indica bear seeds freely. Attempts will now be made to cross those of satisfactory color with the Hybrid Perpetuals and Hybrid Teas.

Several seedlings of crosses between Crimson Rambler and Wichuraiana have recently flowered. The result was expected to be being alike, but a fact of interest was a different shade of color, ranging from a pale rose to a deep rosy purple and from single to double. The best of this cross is a very double Rose, larger than Crimson Rambler. Compared with the clematis Melba and Malmaison, the flowers are larger, while the flowers of a week old are nearer to Marquis. They are so near the color of these two clematis that put in the midst of the two flowers it is almost impossible to distinguish between the two, the clematis and the Rose. The habit is of Wichuraiana, and the foliage is more brilliant. The plant grows 5 to 6 feet in a season, lying close to the ground. There is no doubt that this is one of the best hybrids of Wichuraiana and is well to say that possibly more highly colored Roses might have been produced, but it would have been at the expense of their hardiness.

In making these crosses the writer has always carefully removed the stamens before there were any signs of anthers opening, cutting through the petals while in bud. A gauge covering was placed over the flowers both before and after impregnation, to guard against insects. To keep the record of double and date the flowers were marked clearly and carefully attached to the cluster. Sometimes the yield in seeds is poor enough, only one in a hop and many times none. The writer is always doubtful of the cross when the fruit is too small. The seedlings that open after the other Roses have passed, it is a good plan to pot up a few and bring them into the greenhouse in March; they will then bloom at the same time the Hybrids, and others, are in flower out of doors. All Roses can be prepared and pollinated in the greenhouse more easily and with better results than in the open air. When the plants are protected from bad weather there is less danger that rain or dew will interfere with one’s labors. A sharp knife, a pair of forceps, some fine gauge and a good hand-lens are sufficient tools for the work. Always examine the stigma to see if it is ripe, and, after applying the pollen, look again to see that there is plenty and date the flower. Rose-petals, which are to furnish the pollen are gathered early in the morning and then placed on a pane of glass in a warm greenhouse, the anthers can be opened much easier than if left on the plant. There is less risk of the pollen having been contaminated by insects.

Propagating Roses. The Rose is propagated by seeds, cuttings, grafting or budding, by layers and by division. The genus is so large and diversified and our requirements are so many that the whole art of the propagator is needed to satisfy the claims of the Queen of Flowers.

Seeds. Roses are grown from seeds not only to obtain new varieties but also because many true species are economically procured in this way, e. g., R. canina, R. multiflora, R. ferruginea, R. rugosa, R. rubiginosa, etc. The seeds should be gathered in autumn and at once stratified with moist sand or allowed to ferment in tubs, with a little water and kept in a fairly warm place. When well stratified the Rose seeds will have been washed clean and should be planted at once, either in carefully prepared and well-manured beds out of doors or in pans or flats in a cool greenhouse. It is sometimes advisable that the seeds should be stratified for a longer period for germination, a matter sufficiently troublesome without additional complications. Whether they are planted under glass or in the garden it is difficult to forecast their coming up. It may be within a few weeks, e. g., R. multiflora under glass; or at the beginning of the second growing season after planting, e. g., Sweetbrier seed, planted out of doors in November, 1898, may be expected to germinate in the spring of 1900, while R. rugosa sown at the same time may come up the following spring, i.e., in 1899, or, a season intervening, it will appear with the Sweetbrier in 1900. Stratifying or forcing the seeds to tend is to secure uniform germination within a reasonable time. It has also been suggested, and many things confirm the idea, that early gathering helps to hasten germination; in other words, the seeds should be sown as soon as the seeds harden, some time before the fruit is deep red. Until these matters are better understood, all Rose seed sown out of doors, either in autumn or in spring, should be mulched 2 in. deep with pine needles or other leaf materials and should be carefully watered, and the covering once removed when the seedlings appear; if they do not appear let the mulch remain to keep down weeds and retain moisture in the seed-bed. Seed flats in which the seedlings have been sown should be kept at least 18 months before discarding, with the soil always moist. Notwithstanding the difficulties of ger-
mination, the young seedlings make most satisfactory growth and can generally be transplanted into nursery rows when one year old. When two years old they are fit for permanent planting. A winter protection of pine boughs is helpful to the young plants. Some seedling Roses are extremely precocious, blooming before they are one year old, e.g., some Hybrid Perpetuals and Polyantha Roses. The first flowers of seedling Roses do not always indicate their real character; in hybridizing it is well to wait for the second or third season before discarding.

**Cuttings.**—These are a common means of propagation, both under glass and out of doors. Under glass short cuttings 2-3 in. long can be made in November and December from wood of the current year's growth. They should be planted in sand, in flats or pans, and kept in a cool greenhouse. They root in February or March, and can either be potted in thumb-pots or kept on in flats until May or June, when they should be planted out in rich beds; salable plants are obtained in October. This is a good way to strike _R. setigera_ and its varieties, Crimson Rambler and its allies, _R. multiflora, R. polyantha_, and their offspring, _R. Wichurana_, Madame Plantier and doubtless many others. _Rosa Indica_, in all its forms, all tender species and many Hybrid Perpetual Roses are propagated by cuttings of hardened wood grown under glass; Peter Henderson says the wood is in the best condition when the bud is "just open enough to show color." Blunt eyes can be used, and the smaller wood is better than the strong rampant growths. Plant in sand in a warm house; bottom heat and a close frame are often used but are not necessary. The cuttings are from 1½-2 in. long; single eyes strike readily.

In the open air cuttings of ripened wood can be planted in spring in V-shaped trenches in carefully prepared and well-manured ground. They make strong plants in autumn. Wood of the season's growth is gathered before severe frost, cut into 6-in. lengths, tied in bundles, and stored through the winter by burying in sand. When planted, one eye only should show above ground. This method is recommended for the hardy varieties named above for propagating from short cuttings under glass.

2187. Short hardwood cuttings of _Rosa setigera_.

A single cutting is shown at the left.

but will not give such a large percentage of rooted plants. It is highly probable that some Moss Roses, _R. lucida, R. Carolina, R. spinosissima_, etc., _Rosa_ which sucker, could be propagated by cuttings of root or rootstock, but no systematic attempt has been made in this direction.

**Budding and Grafting.**—These are old and well-established methods of propagation. Budding in foreign nurseries is practiced in the open air in June and July, with us in July or August. A dormant shield bud is employed. The stock is _R. Manetti, R. canina_ or any good brier, or _R. multiflora_; in Holland _R. Carolina_ is esteemed. In European nurseries _R. canina_ is used for standard, _R. Manetti_ for dwarf stocks. Under glass Roses are budded also, with a shield-bud, at any season when the bark slips. At least two eyes of growth should be left on those budded. About Boston the yellow and white Banksian Roses once had high local repute for stock for Tea and other tender kinds.

**Grafting** Roses in the open air in this country is not often employed, but in the South Hybrid Perpetual and other hardy Roses are said to be root-grafted in winter (very much as apples are root-grafted), tied in bundles, stored in sand and used the next spring; the worked portion being set well below the surface. Root-grafting is an easy and convenient method of propagation under glass. Jackson Dawson's practice is to use the whip- or splice-graft, but the veneer-graft is also employed, with bits of stock around 2-3 in. long for the stock, the cion being somewhat longer but of equal diameter. They are firmly tied with raffia and waxed; made into bunches they are covered with moist moss in an open frame in a coolhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface. A specimen of Mr. Dawson's work is shown in Fig. 2186, the stock being a bit of _R. multiflora_ root; its age is about three months. _Rosa multiflora_ is an excellent stock for garden Roses, since it does not sucker; this great advantage, too, is also obtained by using the root-graft as above described. Sometimes florists use _Manetti_ stock planted in thumb-pots. Cut back to the root, this is splice-grafted and kept in a warm, close frame until united; they are afterwards grown on in pots until large enough to be set out in the beds, in which they will flower the following winter. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants; just now many of the foremost growers prefer the latter for forcing. It is a perplexing question and could only be settled by a series of exact experiments costing much time and money. It is also quite possible that matters of temperature, soil, moisture and food are equally important to be considered.

**Layering.**—This method is employed only when few plants are required; it is cumbersome and wasteful. Layer in spring, using wood of the last year's growth wherever possible; the bark of the buried portion should be abraded.

**Division.**—This is an easy means of increasing _R. lucida, R. nitida, R. Carolina, R. spinosissima_, Crimson Moss and many other varieties which sucker. Plant thinly in good soil and let them grow from three to four years, then lift and tear apart. It will be found that the increase is large and that plants so obtained are salable after one year's growth in the same frame. The nursery may be omitted with the quicker-growing kinds which are to form new plantations on the same estate.

B. M. WATSON.

**Budded Roses vs. Roses on their own Roots.**—For the average amateur Rose planter, we cannot too strongly recommend the desirability of own-root plants. Scarcely one planter in a thousand is observing enough to notice the difference between "suckers" or sprouts from the stock of a budded Rose and the variety that is budded in. Indeed, upon some varieties too grown in good soil, it is not to be noticed even by those familiar with Rose-growing. In consequence many purchasers of budded Roses allow these suckers or sprouts from the roots to grow up and, being usually of much more vigorous habit than the variety budded in, they in a short time quite run out the bud, and the purchaser is left with nothing upon his hands but a natural Rose of whatever variety the stock may have been. For further use in forcing and also for the use of planters, who are thoroughly familiar with such things, budded Roses answer equally well and in some varieties are perhaps superior; in that they will produce a larger quantity of flowers and force more easily. The stock most used in western New York for budding Roses is _Rosa Manetti_, and that seems to be about the best adapted for the purpose. _Rosa multiflora de la Gritiaria_ is also used more or less, but is generally considered not so desir-
Rose

We shall presume that a propagating house is to be prepared for starting the young stock. This is a greenhouse in which a bottom heat of not less than 60° can be maintained as long as the cuttings are in the sand during the winter; the mean temperature of such a house should be about 55 or 56°. The style or position of the house is of no great consequence if the above temperature can be maintained. Start, then, by making a bench having space for sand 2½-3 inches deep. Take a clean, sharp, gritty sand, without any coarse stones in it, and spread it evenly all over the bench; then heat it with a brick or block of wood until it is firm; water it with a fine rose watering pot, and all will be ready for the cuttings. The best time to start propagating for the coming season's planting is about the middle to end of January. Having the above all ready, select good, clean, healthy shoots of 2 or 3 eyes in length, preferably those just below where a bud has been cut; cut the bottom leaf clean off close to the eye; make a clean cut diagonally across the shoot just below the bottom eye. If the leaves are large and heavy, remove the end or fifth leaflet. Then, with a lath about 2 inches wide laid straight across the bench and held firm by the left hand, and with a thin knife in the right hand, draw a line about ½ inches deep in the sand; in this place the cutting, pressing each down to the bottom of the opening, leaving just enough room between each cutting so that the leaves do not overlap each other. As soon as the row is full, press the sand as firmly as possible around each cutting; then give a good watering with a fine rose watering pot. Repeat the same operation on each successive row till the whole are put in. Shade from bright sun and never allow the cutting to suffer for want of water. If the weather should be at all warm, a light syringing overhead daily will greatly benefit the cuttings; never use very cold water on them, but water of about the same temperature as that of the air. Treated as above, the cuttings should be fairly rooted in about 30 days; and as soon as they have made roots about ½ in. long they should be carefully lifted from the sand with a flat stick to avoid breaking their roots, and potted in 2- or 2½-inch pots using a good loam and sand, with only a little manure added—not more than 1 part manure to 8 of soil. As fast as potted they should be placed in a

able, since it is not as hardy as the Manetti and is still more likely to throw up suckers from the roots, in which respect the latter, Rosa canina (Bliss Rose), and Rosa polyantha are largely used in Europe as stocks upon which to graft Roses. They have never been largely used in this country, the Manetti seeming to be the favorite here. All of them, however, are extensively grown in France and elsewhere. The Rosa Manetti and Rosa multiflora de la Grifferie are grown from cuttings in France, and are shipped from there at the end of the first season, when rooted and trimmed back closely, both as to the roots and the branches, and planted the following spring. They are budded the following summer, usually the latter part of June or early part of July, whenever the stocks are in such condition that the bark peels readily. The bud, of course, remains dormant during that season, but the spring following the top of the stock is cut off just above the bud, and it is allowed to grow. With a good season, the buds usually make sufficient growth to be salable the following fall. The foregoing is written solely in connection with the outdoor growing of Roses. Except to provide good rich deep soil of fairly heavy quality, there are no special cultural directions that the writer cares to insist upon.

Rose plants are not often attacked by any fungous disease, save perhaps mildew, which occasionally makes its appearance consequent to sudden climatic changes, such as occur toward fall, when the temperature may be at 80-90° one day and 40-45° the next. An application of Bordeaux mixture is of value in checking mildew.

The greater proportion of Roses handled by the undersigned are propagated from cuttings, and consequently are from their own roots. In growing Roses in this way, it is customary to take into the greenhouses about the first of December the best and strongest plants that are in stock; then cut them back so as to leave only two or three eyes upon each shoot, pot them and place them in a cool house, where they are allowed to stand two or three weeks without a great deal of heat. They soon begin to make roots; and when the white roots show through the soil about the edge of the pot, they are given a little more heat and brought on more rapidly. They are then forced until just ready to flower, and before the wood has become too hard the plants are cut back and the severed wood made up into one-eye cuttings, which are placed in propagating beds of sand and given gentle bottom heat, where they take root in the course of two to four weeks, according to variety and the condition of the wood. After thoroughly rooted, they are potted into 2- or 2½-inch pots and grown on until late in the spring or early summer, when it is safe to plant them out in the fields. There they will remain two seasons, usually, and by that time attain sufficient size to be dug and marketed.

Jackson & Perkins Co.

ROSE FORCING.—There is no branch of floriculture in this country that in any way approaches Rose forcing in importance, when commercial and private practice are considered. The large number of private greenhouses erected for the cultivation of the Rose by wealthy people in this country within the last decade cannot be adequately estimated. But the great demand for choice Roses among all classes of buyers throughout the country has produced an enormous increase in commercial greenhouses specially erected for growing and forcing Roses, and each year sees some improvement in the style of construction as well as in methods of cultivation. The general principles of Rose-growing are practically the same now as they were twenty years ago, but the same-conditions and little items that term them, are constantly being improved. To make the method of successful cultivation quite plain to every one, the undersigned will endeavor to detail closely each operation, from the cutting to the full bearing plant. Types of forcing Roses are shown in Figs. 2189 and 2190.
greenhouse having a temperature of about 50° at night and shaded with sheets of newspaper or similar material from bright sun for a few days till they show some indication of starting into growth. The actual time that shading will be required will depend largely upon the weather and the season of the year. Do not over-water the young plants at any stage, but give just enough to moisten the whole soil nicely when first potted and then as required afterward. Do not put them in the shade of other plants, but place them where they will get the full benefit of all the sunlight and plenty of air as soon as shading can be dispensed with; such treatment will produce a clean, healthy, stocky plant, which means a good constitution. Should greedily appear on them, fumigate with tobacco stems immediately. Syringe overhead on all bright days. In about five to six weeks from the time of first potting, the plants will be ready for a shift into a larger size pot,—5-inch size will be large enough. The same class of soil can be used as for the first potting, or if the plants are to be put into their season quarters, i.e., planted into benches from this size, a little more manure can be added; but if they are to be grown in pots, some growers will prefer to give them a third shift, namely into 4-inch pots. The plants, if properly cared for, should be ready for this last shift in about six to eight weeks from the time they are planted into 4-inch pots. In this last shift soil considerably richer can be used. Keep off all the buds so as to have the plants sturdy, strong and vigorous.

Presuming that this method has been followed through till the end of May or beginning of June, the plants will be ready for benching out, or, in other words, to be put into their winter quarters. The benches should hold 4-5 inches of soil and the bottom slats of said benches should be placed not less than ½-¾ in. apart to allow for ample drainage. If plants have been grown in these benches previously, the benches should be thoroughly cleaned and scrubbed out so as to get all insects, eggs, etc., away. Also, all the soil or surface of the house underneath should be scraped very carefully and swept out clean, and the practically all the leaves of the house thoroughly cleaned. When this is done, take two or three lumps of stone sulfur or brimstone and burn it in the house, preferably in the afternoon while the sun is still strong. As soon as the fusel gas is removed, thoroughly shut up the house as tight as possible and leave it till the next morning. After this the benches should be thoroughly washed with hot lime over the entire inside surface. The house is then ready for the new soil to be put in. This should be composed of good fresh loamy soil, preferably of a rather heavy texture; to each part of manure add 3 or not more than 4 parts of soil, the whole thoroughly mixed and all lumps broken up. This compost should be prepared some time in advance and be turned over several times before it is wanted for the greenhouse. If this has been done, all that is necessary now is to bring in sufficient soil to fill the benches. Level it all over without treating in any form; then start to fill the house with plants. For the ordinary varieties such as Bride, Bridesmaid, in fact nearly all the Tea varieties, an average of 14-15 inches apart from plant to plant each way is about the right distance. When planting press the soil firmly around the ball of each plant and when the whole house is filled water the plants sufficiently to soak the soil to the bottom of the bench, but do not saturate the whole of the soil. It is far better to direct the water straight to each individual plant and then syringe the whole; this will moisten the other soil on the surface without making it unundly wet. Give all air possible to the plants day and night during hot weather. Syringe in very hot weather twice a day if it is necessary to keep humidity in the house and get the plants started into clean, vigorous growth. This treatment can be followed for four or five weeks until the plants begin to start their roots into the new soil; then go over the whole of the benches and press the soil as firmly as possible. Be careful not to break the plants in doing so, but it is absolutely necessary that the soil should be thoroughly settled and firm. After this, rake the whole surface over with a blunt-pointed rake so as just to make it level, water as before and as soon as the plants recover from this; in other words, as soon as they show they are starting new growths match the soil with a little more, but in putting on the mulch never exceed half an inch at a time, as the plants need air at the roots as they do at the tops.

If the flowers are not wanted early, it is better to pinch all the buds off the plants as fast as they appear up to the end of September. This gives the plants an opportunity to make strong, sturdy growth and build up a constitution equal to withstand the pressure of winter forcing.

As the fall approaches and cooler nights come on, the air should be reduced proportionately at night, although it is better to maintain a light night ventilation as long as possible, even if it is necessary to use a little fire heat to keep the plants from dying. After the plants begin to bloom, they will need careful watching, as the days will be getting shorter and somewhat cloudy. It is important to avoid overwatering, but, at the same time, they should never be allowed to suffer for the want of moisture. Syringing should be done more carefully at the ends of the year, black-spot and various other diseases may appear.

To obtain the best class of flowers during the entire winter, the average night temperature should be allowed to exceed 55° on bright warm days. Of course, with an abundance of air on, the temperature can be allowed to run up to 75°, 80° or even 90° on some very bright warm days.

Mildew, which is one of the worst pests of greenhouse-grown Roses in the fall of the year, can be largely avoided by an abundance of air at all times. Should it
ROSE

make its appearance, sulfur on the heating pipes is the best remedy that can be applied. Red spider will also be troublesome if the plants are allowed to dry in any spots, or too high a temperature is carried. This can be avoided by liberal syringing on all bright days, thoroughly soaking the under side of all the foliage.

If the greenhouses are constructed to grow plants on the solid bed instead of raised benches, the same method of cultivation should be followed and not more than 5 or 6 inches of soil should be used on the surface; have a thoroughly drained border; in all other respects cultivation would be the same as for bench system. After the plants get into thorough, strong, vigorous growth and producing abundance of flowers, say from Christmas onwards, a mulching of well-decomposed manure every five or six weeks in very limited quantities will be beneficial, and if the plants have made extra strong growth and all the soil is occupied with roots in the benches towards the end of February, liquid manure can be applied once in very three or four weeks with considerable benefit. This treatment should carry the plants successfully through to the end of their blooming season.

If the plants are kept in good, healthy, vigorous condition they could be carried through for a second season's work if necessary. To do this it would be necessary to dry them off somewhat, say through July and part of August for four to six weeks, so as to ripen the wood thoroughly without wilting the leaves completely. Then they could be pruned back to good, sound, plump eyes at the base of the strong shoots and all the small spray growth cut out. Then the plants can be lifted with a good ball of earth, so as to save as much of the roots as possible, replanted into new soil, and practically treated the same as young stock.

If grafted stock is preferred instead of own-root cuttings as above described, they can be treated according to regular instructions given by many authorities on grafting. Cultivation of these is in all respects identical with the above, except as to the rooting of the cuttings.

JOHN N. MAY.

ROSE ACACIA. Robinia hispida.

ROSE APPLE. Eugenia jambos.

ROSEBAY. Same as Oleander. See Nerium. Epilobium angustifolium is sometimes called Rosebay.

ROSE CAMPION. Lychnis Coronaria.

ROSE, CHRISTMAS. Helleborus niger.

ROSE, JAPANESE. Kervia japonica.

ROSE MALLOW. Hibiscus.

ROSEMARY or OLD MAN. See Rosmarinus.

ROSE OF CHINA. Hibiscus Rosa-Sinensis.

ROSE OF HEAVEN. Lychnis Cali-rosa.

ROSE-OF-JERICHO is Anastatica Hierochuntica. See Resurrection Plants.

ROSE OF SHARON. Hibiscus Syriacus.

ROSE, ROCK. Cistus and Helianthemum.

ROSE, SUN. Helianthemum.

ROSIN PLANT. Silphium.

ROSIN WEED. Silphium laciniatum.

ROSMARINUS (Latin, sea-deer; the plant is common on the chalk hills of the south of France and near the seacoast). Labiatae. Rosemary is a nearly hardy sub-shrub, with aromatic leaves which are used for seasoning. It has small, light blue flowers, which are much sought for by bees. Oil of Rosemary is a common preparation in drug stores. It is a volatile oil distilled from the leaves. The lvs. are also used in making Hungarian water. In northern herb gardens it lasts for years if given well-drained soil and some winter protection. Franceschi recommends it for hedges in S. Calif., especially for dry and rocky places near the coast.

Generic characters: calyx 2-lipped; posterior lip concave, minutely 3-toothed; anterior 2-cut; corolla with posterior lip erect, emarginate, anterior lip spreading, 3-cut, the middle lobe longest, concave, declinate: perfect stamens 2; style 2-cut at apex. The genus is placed near Salvia, being distinguished by the calyx being only shortly 2-lipped, not hairy in the throat and the connective of the anthers continuous with the filament and indicated only by a slender reflexed tooth.


W. M.

ROTHROCKIA (Prof. J. T. Rothrock, head of Pennsylvania forestry dept., and author of the botanical part of Wheeler's U. S. geological surveys of the region in which the plant was discovered). Asclepiadaceae. A genus of a single species, a perennial herb, with somewhat woody stems, spreading and twining; lvs. woolly; fls. in loose racemes, in axils of the lvs.; foliicles 4–5 in. long, glabrous, fusiform, often used as a vegetable where native; corolla rotate, deeply 5-cleft; crown simple, inserted at the junction of corolla and stamen-tube,
5-petaled; stigma abruptly produced from the top into a column having a 3-crested apex. Syn. Flora N. Amer., vol. 2, part 1, p. 405.

Cordifolia, A. Gray. Lvs. opposite, slender-petioled, coriaceous, acutely acuminate: Rs. white or whitish, in racemes; corolla-labes 3-4 lines long. Along water-courses near the borders of Arizona. Cult. in S. Calif. F. W. BARCLAY.

ROUGE PLANT. Rivina humilis.

ROUPALA (probably a native name in Guiana). Also spelled RupaLha, Rupala, etc. Proteaceae. A genus of about 40 species of the tropical regions of S. America. They are mostly woody plants, with handsome evergreen lvs., either simple or pinnate; Rs. usually inconspicuous, in axillary or lateral racemes, pedicelled in pairs, hermaphroditic, regular; perianth cylindrical, rather straight, but little dilated at the base; the limb somewhat globular: ovary sessile; ovules 2, pendulous, orthotropous.

A. Hairs rust-colored.

Palihi, Mein. (R. Cocoyadensis, Hort.). A tree, with branches clothed with rusty colored woolly tomentum; lvs. 1 ft. or more long, pinnate, with 5-8 pairs of lfts. which are 3-5 in. long, on stout petioles 1 in. or less long, ovate or oblongly oblong or oblongly ovate, usually scarious: Rs. ½ in. long, white or yellowish, in nearly sessile axillary racemes 3-5 in. long. B.M. 6095.

AA. Hairs golden.

aurea, Lindcnn. According to Belg. Hort. 1866:202, this species was named for the golden hairs covering the upper parts of the stem and petioles. Brazil. Rare and imperfectly known, but still offered in America.

R. Jöngheit, Hort., is a plant offered by Siebold & Zucc, which does not appear in botanical works.

F. W. BARCLAY.

ROWAN. Sorbus Aucuparia.

ROYAL CROWN. Euceus.

ROYAL FERN. Osmunda regalis.

ROYAL PALM. Oreodoxa regia.

ROYAL PEACOCK FLOWER. Poinciana regia.

ROYENA (Adrian van Royen, professor of botany in the Univ. of Leyden; died 1779). Ebeniacceae. Royena lucida is one of the old-time Cape shrubs formerly cult. under glass for ornament in England and lately offered in S. California. It has small white lfts., about ¾ in. across, with 5 or more or less reflexed lobes. Royena is a genus of about 13 species of evergreen shrubs or small trees, 2 of which are native to tropical Africa and the rest to the Cape. The genus is distinguished from the 4 or 5 other genera of the ebony family by the flowers being hermaphrodite instead of dioecious and the stamens in a single series. Other generic characters (taken from the Flora of Tropical Africa): calyx often acerose in fruit; lobes 5, rarely 4; corolla bell- or urn-shaped, 5-cren; lobes reflexed; stamens 5, inserted at the base of the corolla-tube: ovary conical; styles or style-branches 2-4: fr. globose to oblong, leathery, indischzeent.

lucida, Linn. Tender shrub; lvs. ovate, the younger ones silky; peduncles about a third as long as the lvs.; corolla bell-shaped. S. Africa. B. & K. 32:40.

221. To illustrate the fruit-bearing of the black Raspberry.

If the main cane or stem on the left grew in 1898, the fruit-bearing shoot (B) grew in 1900; and at the close of the season of 1900, the whole cane had died or become very weak. If the cane had been examined in the spring of 1900, the bud would have been seen (as above A) from which to grow the fruit-bearing shoot.

RUBUS (Latin name, ultimately connected with ruber, red). Rosaeeae. Bramble. Blackberries and Raspberries. A most variable and puzzling genus, containing perhaps 200 fairly well-marked species and numberless intermediate forms. As many as 1,500 species have been described. The genus is particularly strong in Europe, where the greatest number of species have been made (see Weise & Nees, "Rubi Germanici," 1822-7; Focke, "Synopsis Ruborum Germaniae," 1877; Babbington, "British Rubi," 1868; W. M. Rogers, "Key to the British Rubi," Journ. Botany, 1892.) Focke describes 72 species inhabiting Germany. There is also a large extension of the genus in the Himalayan region, about 50 species being recognized (J. D. Hooker admits 41 species in the "Flora of British India"). The species extend eastward into China and Japan. Hemsl. in his "Flora of China," admits 41 species. In Japan, Franchet and Savatier admit 22 species. In North America, about 40 species are now recognized, but they have not been studied critically, and it is probable that many more specific types will be recognized in the near future. No end of species could be made, but it is doubtful whether a great multiplication of species-names would contribute anything more than confusion to the literature and knowledge of the genus. There is no monograph of the American species. The species that are valuable for their fruits are reviewed by Card in "Bush-Fruits" and by the present writer in "Sketch of the Evolution of our Native Fruits," 1888. Rubus is widely distributed in the northern hemisphere, particularly in temperate and warm-temperate parts. Some of them are alpine and arctic. In tropical countries the genus is relatively poorly represented. Only 4 in the "Flora of Tropical Africa." Only 2 species are described in Grisebach's "Flora of the British West Indies." Baker admits 3 species in the "Flora of Mauritius and the Seychelles." Hillebrand describes 3 species in "Flora of the Malai.is Archipelago." The southern hemisphere has few species. Bentham's "Flora Australiensis" has but 5 species. Kirk's "Flora of New Zealand" mentions only 4 indigenous species. There are also 5 species described in Harvey and Sonder's work ("Flora Capensis") on the flora of the Cape of Good Hope region.

Rubus is closely allied to Rosa, from which it differs chiefly in the structure of the fruit. Rubus is a shrub, the torus is hollow (formerly said that the calyx is hollow or urn-shaped) and contains the dry fruits or akenes. In Rubus the torus is convex, conical or elongated, and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stamens (calyxes) that die.
after one or two years, but some of them have herbaceous tops. Most of them are evergreen or less persistently so. Many of the species are creeping, decumbent or half-climbing. Leaves simple or compound, alternate, the compounding on the pinnate order and the leaflets mostly 3 (several in some of the tropical and oriental species). The flowers are mostly white or rose-colored, usually in coryds or racemes but sometimes solitary; calyx 5-parted, the lobes persistent; petals 5, usually obovate; stamens many, in the calyx or to the 5-12-rose; pistils many, closely packed on the torus, usually becoming dropplets but sometimes dry when ripe. The dropplets are usually more or less coherent at maturity, the collective body forming the "fruit" or "berry" of horticulturists. In the Raspberries, the coherent dropplets separate from the torus at maturity, causing the berry to be hollow or concave on the under side. In the Blackberries, the coherent dropplets also adhere to the torus, which separates at maturity and forms the "core" of the berry.

Relatively few of the Rubi have horticultural merit, although none of them are of great importance. As ornamental subjects they are more important in North America than elsewhere in the world. Here we grow not only Raspberries, which are popular elsewhere, but also many other kinds of improved Blackberries, a fruit that is little known as a cultivated product in other countries. These Blackberries are the product of our native species, Rubus nigrovesis being the chief. Closely allied to them are the Dewberries or trailing Blackberries, which also have been developed from indigenous species, chiefly from Rubus viscosus and Rubus idaeus. Although the European Raspberry, the Torus, is grown in North America, it is mostly unreliable, and the leading commercial sorts are produced from the native Rubus occidentalis and Rubus striginosus and from hybrids of the two. Various Japanese species, recently introduced, also produce fruits of value.

A number of the species are useful as ornamental subjects, particularly the Rocky Mountain Rubus deliciosus, a native-Rose (R. roseus), Wineberry (R. phoebeous), and R. crataegifolius. For its graceful, finely cut foliage, and sometimes for its fruit, Rubus laciniatus is occasionally grown. Some of the unimproved native species are offered by dealers in native plants as worthy subjects for wild borders and rock gardens. The beauty of most shrubby Rubi depends largely on the removal of the canes after they have bloomed once. After flowering, the cane becomes weak or may die outright. It should be removed to the ground. In the meantime other canes have arisen from the root, and these will bloom the following year. That is, the stems of Rubi are usually more or less perfectly biennial: the first year they make their growth in stature; the second year they throw out side branches on which the flowers are borne; after fruiting, the entire cane becomes weak or dies (Fig. 219). Removing these canes will conserve the vigor of the plant, but it also adds to its appearance of tidiness. These remarks apply with particular force to the cultivation of Raspberries, Blackberries and Dewberries. For other accounts of Rubi, see Blackberry, Loganberry, Raspberry.

Section 1. 1. Rubus Chamaemorus. Natural size.

Section 2. 2. Rubus Austrinus. Rubus Chamaemorus.

Rubus Austrinus.

Section 3. 3. Rubus Americana. Rubus Chamaemorus.
2193. Rubus delicious, from the Rocky Mountains.

prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhombic-ovate, coarsely serrate lfts.: fls. 1-3 on each peduncle, small and white, the calyx reflexed: fr. small, reddish. Cold swamps, N. J. west and north.—Offered as a rock garden plant for moist places.

3. xanthocarpus, Bur. & Franchet (R. Polanini, Regel). Trailing, the stems dying back every year, the stems pilose and weak-spiny; lvs. pinnately 3-foliolate, the leaflets ovate, acute or obtuse, strongly and unequally dentate, the terminal one twice larger than the others: fls. solitary or twin in the axils of the upper lvs., the peduncle and calyx weak-prickly, the petals white: fr. large, ovate, bright yellow, fragrant and palatable, the calyx persistent. China; discovered in 1885 in the Province of Kansu, 46° north latitude, and later found in provinces Sze-Chu, and Yun-Nan.—Int. into the U. S. in 1898 by the Dept. of Agric. through Professor N. E. Hansen, to be tried for its edible raspberry-like fruit. At Brookings, S. Dakota, the plants suffered from the phenomenon of winter 1898-99, but mulched plants have subsequently endured the winters well.

SECTION 3. ANOPLOBATES.

A. Lvs. mostly 7-lobed.

4. trifidis, Thunb. Fire Raspberry. Strong-growing and erect, 7-10 ft. tall: lvs. large, palmately ribbed, 3-5-5 or even 7-7-7, serrate; fls. subsolitary, the peduncles villous: berry of medium size, scarlet, with pointed drupelets. Japan.—Sparingly introduced, and prized for its bright autumn foliage (whence the name "Fire Raspberry").

AA. Lvs. 5- or less lobed.

B. Peduncles mostly 1-fld.


BB. Peduncles several to many-flld.

6. odoratus, Lindl. Flowering Raspberry. Mulberry (erroneously). Fig. 2194. Strong-growing plant, with the shreddy canes reaching 3-6 ft.: lvs. very large, pubescent beneath, 3-5-lobed, the lobes pointed, margins serrate: fls. 1-2 in. across, rose-purple, several to many in the cluster, the sepals with a long point, the peduncles and pedicels glandular-pubescent: berry flatish and broad (½ in. across), rather dry, light red, edible but not valued. Nova Scotia, Mich., and Georgia (Fla.?). Gn. 34, p. 230. B.M. 323. J.H. III. 31:125.—Prefers rich shady woods and banks. It makes a bold subject in a foliage mass, and its lvs. are nearly as large as the single roses, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.


SECTION 4. BATHOTHAMNUS.

A. Lvs. simple, but more or less lobed.

8. microphyllus, Lindl. f. (R. palmaris, Thunb.). Spreading, often slender-stemmed plant growing 4 or 5 ft. tall, with many short, but stout nearly straight spines: lvs. rather small, 2-3 in. long as a rule, narrow-ovate-acuminate or sometimes nearly triangular-ovate-acuminate, rather deeply 3-5-lobed and the middle lobe long and acuminate, the margins very sharp-serrate: fls. white, nearly or quite ½ in. across, with broadly ovate petals: fr. small (red !), of little value. Japan.—Sparingly introduced as an ornamental plant, but little known here. The "Mayberry," introd. by Luther Burbank, is said to be a hybrid between this species and the Cuthbert Raspberry (R. atrigvisus). The Mayberry is described as producing a large yellow edible berry, ripening in advance of the Strawberry.

9. crataegifolius, Bunge. Fig. 2195 (after Card). Strong, erect or diffuse much-spreading plant (3-5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-ovate, acuminate, 3-5-lobed, and the margin closely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about ½ in. across; fr. small, orange-red, of no value. Japan.—An excellent plant for holding banks and for covering waste places, and giving fine deep reds in the fall. Perfectly hardy in central New York. Burbank's "Primus" is hybrid of this and R. vitifolius, the latter furnishing the seed.

10. Savatiéri (R. morifolius, Sieb., Franch. & Savat. Enum. Fl. Jap. (1875), not Muell. 1858). Differs from R. crataegifolius by its more numerous and longer, stronger prickles, the leaves villous beneath and deeply cordate at base, shorter pedicils and shorter and thicker pedicels. Southern Japan.—Offered by dealers in Japanese plants, who speak of its pretty fruit ripening in July.

2194. Rubus odoratus. (Flower × ½.)

SECTION 3. Ideobatus, or Raspberries.

12. roseolius, Smith (R. floribunda and R. Sinuæsis, Hort. R. roseolius, Roxbg.). STRAWBERRY-RASPBERRY. Figs. 2196, 2197. Erect and tall-growing, evergreen in warm countries, glabrous or somewhat pubescent-hirsute: lvs. odd-pinnate, the lateral leaflets 2-7 pairs, all the lfts. ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-serrate, more or less silky-hairy beneath: fls. solitary or in few-fld. clusters, white, 1½-2 in. across, showy: fr. erect, bright red, long thimble-shaped, usually about 1-1½ in. high, very showy, edible but insipid. Var. sorbifolius (R. sorbifolius, Maxim.) is a very hairy and hirsute form. Var. coronarius, Sims (R. grandiflorus, Hort.), is a double form, sometimes cult. as the “Brier Rose” and Bridal Rose” (B. M. 1733. G. C. H. 11:77).—Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan. B. M. 6790. F. S. 17:3714. A. G. 29:82, 87. A beautiful plant and worthy of general culture. In the North it usually kills to the ground each winter, but it throws up shoots 2-4 ft., and these bloom from summer until frost, usually ripening fruit at the same time. The fruit has some value for eating, but it is probable that it will never be greatly developed in this direction. The double-flowered form is often grown under glass and in pots.

A. Lvs. pedately 3-5-foliate.

B. Plant profusely red-hairy.

13. phænolius, Maxim. WINEBERRY. Fig. 2198. Canes long and recurving, furnished with straight, weak prickles and densely clothed with red-brown glanular hairs, propagating by “tips”: lfts. usually 3, broad-ovate to round-ovate, apiculate-toothed and sometimes indistinctly lobed at top, white-tomentose beneath: fls. in dense, small shaggy-haired clusters which spring from the uppermost axils and form a large, loose, leafy panicle; petals shorter than the long, briskly calyxlobes, the latter enlarging after flowering and inclosing the growing fruits in a bur but spreading apart as the fruit matures: fr. usually small and soft, cherry-red, acid or usually insipid. Japan and China. B. M. 6793. G. C. H. 11:265; 11:269; 28:137. J. H. III. 29:210. A. G. 12:205; 13:435. Gns. 3:263.—Interesting as an ornamental plant, and also recommended for its fruit.

In the North it often kills to the ground, but the strong young recurving canes and white-bottomed foliage make it a handsome plant.

14. ellipticus, Smith (R. Idaæus, Ham.). Fig. 2199. Tall and erect or nearly so (6-10 ft.), the canes stout and densely set with straight red-brown hairs and bearing a few stout, short, nearly straight prickles: fls. 3, the terminal one much the largest, ovate or orbicular-ovate, not lobed, evenly doubly serrate, thickish, soft pubescent and strongly veined and prickly on the midrib beneath: fls. white, ½ in. or less across, in small, many-fld. clusters: berry the size of a common Raspberry, yellow, of good quality. Himalayas.—Grown in southern Fl., where it is said to be the only Raspberry that perfects its fruit.

B. Plant not red-hairy all over.

c. Red Raspberries.

15. Ídæus, Linn. EUROPEAN RASPBERRY. An erect, mostly still grower, propagating by suckers, the canes light-colored and bearing nearly straight slender prickles: fls. ovate, white beneath, irregularly toothed and notched, usually somewhat plicate or wrinkled: flower-clusters mostly long and interrupted, most of the peduncles dividing into two or three pedicels, the pedicels, as also the flowering shoots, peltiles and midrib, finely pubescent, but not glandular, and sparsely furnished with firm recurved prickles: fls. small; white; calyx pubescent: fruit oblong or conical, dark red, yellow or whitish, produced more or less continuously throughout the season. Europe and Asia.—Named for Mt. Ida, in Greece. Early introduced into this country, but now nearly driven from cultivation by the harder native species. The Antwerp, Fontc, and Fastolff belong here. Rubus Ídæus itself is not known to be native to N. Amer., but a most interesting form of it (var. anomolus, A. C.) has been discovered recently in Vermont. See Pernald, Rhodora, 2, p. 195, with figure.

2195. Rubus crataegifolius. (X 2). See No. 9.

2196. Rubus roseolius. One of the best of the flowering Rubuses.
16. _strigosus_, Michx. ( _R. idaeus_, Linn., var. _strigosus_, Maxim.). Fig. 2200. Much like the last, but distinguished by a more slender and open habit, stiff prickles on the bearing bristly canes, which are brown and somewhat glaucous, thinner leaves, and gland-tipped hairs or bristles upon the flowering shoots, petals and calyx, the latter less pubescent or hirsute: flower-clusters more open or scattered: fruit bright light red, or rarely yellow or whitish, not produced continuously. Widely spread in the northern states as far west as Missouri, also in the mountains to Arizona and northward to Alaska, extending farther north than the Blackcap; also in Asia.—Under cultivation the glandular hairs usually disappear. The light red garden berries, like Curthbert, belong here. Var. _albus_, Fuller, has amber-white fruits.

17. _neglectus_, Peck. **Purple-Cane Raspberries.** Figs. 2082, 2200. A large and variable race of hybrids between _R. strigosus_ and _R. occidentalis_ occurs both naturally ( _Rubus neglectus_, Peck, 22d Rep. Reg. N. Y. State Univ. 53, 1890) and in the garden (Bailey, Amer. Gard. 11:721, 1890). These plants propagate either by "tips" or suckers, usually by the latter. The flower-clusters are open and straggling, and the fruit ranges in color from yellow to purple. As a rule, the fruit is aggregated at the end of the cluster but is scattering below. The Purple Cane type of Raspberry belongs here. Prominent varieties are Shaffer, Philadelphia (now nearly out of cultivation); Gladstone, and probably Caroline.

**cc. Black Raspberries (yellow-fruited forms are known).**

18. _occidentalis_, Linn. **Common Blackcap.** Figs. 2201, 2202. Strong, erect bush, the canes finally recurving and rooting at the tips, furnished with straight spines, glaucous, not bristly; leaf-bases, broadly ovate, dull green above and white beneath, finely and sharply serrate, and notched, the petals usually bearing short prickles: as, in small, dense, prickly clusters with sometimes a few scattering pedicels, the petals shorter than the long-pointed whitish waxy sepals: fr. rather small, hemispherical, firm or even hard, black or occasionally amber-white, dry and sweet. Plentiful in fields and clearings in the middle-western states to Oregon and British Columbia and southward to Ga. in the mountains, and to Mo.—In cultivation, known in many forms,

as Ohio, Gregg, etc. Var. _paillius_ has amber-yellow fr.; sometimes found in the wild.

Var. _leucodermis_, Card ( _R. leucodermis_ Doug.). Lfts. more coarsely dentate-serrate, sometimes nearly incise-serrate, the prickles strong and more hooked; fr. reddish black or black. Rocky Mts. and W.

**SECTION 6. EUBATUS, or Blackberries and Dewberries.**

The botany of the American Blackberries and Dewberries is incomparably confusing. If the kind of species-making that has been applied to the European Rubi were applied to the American, the number of species would straightway be quadrupled or trebled at the least. There is no difficulty in finding forms that are distinct enough to be described as species. The difficulty lies in the endless series of intermediate forms, that confound all efforts at limitation and make printed descriptions of no avail. This difficulty is greatly increased from the fact that the foliage often differs widely between the verdurous and flowering shoots of the same plant. There seems to be little utility in separating forms that cannot be distinguished in at least a fair proportion of the specimens that come to one's hand, however well marked they may be in their extremes. It is to be expected, however, that long-sustained studies in the field, as well as in the herbarium, will discover means of separating some of the forms that are now confused, but it is doubtful if there are any species in this section of Rubus, as the term species is commonly understood. The best one can do is to throw them into groups. For a history of nomenclatorial difficulties in American Rubi, see "Evolution of Our Native Fruits."

**A. Blackberries: Plant usually erect or essentially so (strong canes often recurving).**

Group 1. **Exotic Blackberries,** with mostly perennial canes and flowers usually borne on the ends of the main shoots.

19. _fruticosus_, Linn. **European Bramble.** Strong-growing, mostly pubescent or hairy on the young parts, usually with strong recurved prickles, the canes often

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**207.** _Rubus rosaeolus_ (×½). Sometimes known as Strawberry-raspberry.

**208.** _Rubus pharmericatus_ (×½). No. 13.
rubus

many feet long and recurving or half climbing but
sometimes erect: fls. 3-5, ovate or rhomb-ovate,
coarsely toothed, thickish, pubescent to white-dow
neath; pedicles and usually the midribs beneath bear
ning prickles: fls. in terminal panicles, white or pink,
showy, the buds white-pubescent: fr. black or dull red,

2199. Rubus ellipticus (× 2/3).
A yellow-fruited species from the Himalayas.
No. 44.

the calyx reflexed, edible but little prized. Europe,
where it is common in fields and hedges. As a cult
plant, known chiefly in the double-fl. form (as R. pom
itana). Gn. 34, p. 234. Sometimes known as R. spec
tabilis in gardens.

20. laciniatus, Willd. (R. fruticosus, var. laciniatus,
Hort.). CUT-LEAVED OR EVERGREEN BLACKBERRY. Fig.
2203. A tall, straggling bush with permanent or peren
nial canes in mild climates, and leaves more or less
evergreen, the stems provided with recurved prickles:
fls. 3, broadly ovate in general outline, cut into several
or many oblong or almost linear sharply toothed divi
sions, the ribs prickle below and the petioles strongly

apparently only a cut-leaved form of the common Euro
pean Rubus fruticosus. It is now widely scattered,
and seems to thrive particularly well in Hawaii and other
Pacific islands and on the Pacific slope. By some it
is supposed to be native to the South Sea Islands (see
Bull, 44, Utah Exp. Sta.). It is probable that the plant
has been introduced into the West from those sources,
but such fact does not prove its original nativity. It
has aroused considerable attention in Oregon and other
parts of the West, and is often known as the Oregon
Everbearing Blackberry. In mild climates the lower
parts of the canes often live from year to year until
they become as thick as one's wrist; and in such cli
mates the leaves persist for the greater part of the
winter. The plant has long been grown for ornament in
the eastern states, but it has not attracted attention as
a fruit-plant in this region. The fruits are of fair size
and quality, and ripen from midsummer or late summer
to October. The plant is a good

ornamental subject, although it
is likely to cause trouble by
sprouting at the root.

Group 2. Thornless Blackber
ries, with tall, nearly un
armed furred biennial canes,
and long, open flower-
clusters.

21. Canadensis, Linn. (R. Mill
spaughtii, Britt.). THORNLESS
BLACKBERRY. Very tall and
burst (sometimes reaching 10-12
ft. high), the canes nearly or quite spine
less; fls. narrowly ovate to ovate-lance
olate, long-acute, sharp and
nearly evenly serrate; stamens usually
prominent, narrow: fls. large, white, in
long, open, raceme
-like, nearly glabrous
clusters, on slender
spreading pedicles:
fr. black, almost globular to short-oblong, usually juicy
and good. Eastern Canada, through the high lands of
New England, New York and Michigan to mountains
of North Carolina.—Not in cultivation, except in botanic
gardens and amateurs' collections.

Group 3. Glandular Blackberries, with stout, thorny
biennial canes and prominently glandular-pubescent
inflorescence.

22. nigrohaceus, Bailey (R. villosus, Authors,
not Ait.). COMMON HIGH-BUSH BLACKBERRY of the
North. Figs. 2204-6. Canes tall, recurving
at the ends, furrowed, the young parts pro
minently glandular-pubescent, the spines usually
large and more or less hooked: fls. 3-5, ovate
acminate or sometimes lance-ovate, long
stalked (at least in the largest fls.), the ter
minal one often heart-shaped at base, the mar
gins nearly regularly strong-serrate, the under
surface glandular-pubescent: fls. white, showy,
the petals narrow, borne in a long, open rac
eme-like cluster of which the terminal flower is usually the old
est, each pedicel standing at nearly right angles to the racih:
fr. black, oblong (varying to
nearly globular), usually not very
juicy, sweet and aromatic. Ev
eywhere in old fields and clearings
in the northeastern states, at
common elevations, extending
south to North Carolina and west
to Iowa, Kansas and Missouri.—
Known in cultivation in the "Long-cluster Blackber
ries" as Taylor and Aeinent Briton. Var. albina, Bailey,
the "White Blackberry," is a state in which the fruits
are amber-colored and the bark yellowish green; occa
sionally as far west as Michigan, and probably farther.

2201. Rubus occidentalis (× 2/3).
The original of the cultivated Black Raspberries. No. 18.
Var. sativus, Bailey (R. sativus, Brainerd), Fig. 2207; also Fig. 237, Vol. I. Generally lower and the canes more erect; frs. broader (or at least shorter) and less prominently pointed; fl.-clusters shorter (usually from the elongation of the lower pedicels or the upper ones remaining short): fr. rounder, and the drupelets usually relatively larger and juicy. Dry, open fields.

2203. Rubus laciniatus (× 3g). No. 29.

Distinct in its extreme forms, but running into the species by all manner of intermediate gradations. From this plant the common "Short-cluster Blackberries" of the garden appear to be derived, as Snyder, Kittatiny, Erie, etc.

23. Allegheniensis, Porter (R. villosus, var. montanus and R. montanus, Porter, not Wirtg.). Very like R. nigrobaccus, and perhaps only a mountain state of a cosmopolitan type; plant smaller, usually less prickly: branches and leaf-stalks usually reddish, and all young growths very glandular-pubescent; lvs. mostly smaller, very long-pointed, closer-toothed: fl.-clusters usually smaller: fr. small, long and narrow, tapering towards the top, the drupelets many and small, not very juicy but of good flavor. In mountains and highlands, Ontario to Virginia.—Common on the higher elevations, affording much edible fruit. In its typical form, as seen in the wild, it is very distinct from R. nigrobaccus, particularly in its fruit.

24. heterophyllus, Wild. Fig. 238, Vol. I. R. nigrobaccus x R. villosus, in many forms both wild and cultivated. In cultivation this hybrid is represented by the "Loose-cluster Blackberries," as Wilson, Wilson Jr., and Rathbun. The plants are usually half-erect, thorny, mostly more or less glandular-pubescent on the young growths: frs. broad and jagged: fl.-clusters small and usually forking, with long pedicels: fr. rather loose-grained, with large drupelets. The plant is not infrequent in regions in which both R. nigrobaccus and R. villosus grow. It is usually easily distinguished by the half-erect habit and irregularly toothed and jagged frs., which are not long-acuminate. In some cases, the bushes naturally stand 3-4 ft. high.

Group 4. Leafy-cluster Blackberries, with little or no glandular pubescence and short flower-clusters that have more or less small lvs. intermixed.

25. argutus, Link (R. trondéus, Bigel. R. villosus, var. trondéus, Torr. R. swarfeus, Hook.). Fig. 2208. Very like R. nigrobaccus in habit, but usually stiffer in growth, the young parts and under surfaces of lvs. only rarely glandular though usually pubescent, the canes generally very thorny; lvs. often smaller and stiffer, the fls. short-pointed, the petals and stamens conspicuously thorny; fl.-clusters short and leafy: fr. globular or short-oblung, black, usually good. Mostly in open places, from New Brunswick to Lake Superior and south to the Gulf.—Our most cosmopolitan Blackberry, and presenting innumerable forms. The plants described by Link and Rigelow had rather few and straightish spines, but some forms bear very strong hooked spines, and between these two forms there are all gradations. The species is much in need of critical study. In cultivation it is represented in Early Harvest and a few other varieties.

26. floridus, Tratt. (R. argutus, var. floridus, Bailey). Canes armed with hooked prickles: pedicels and calyx pubescent, sometimes glandular: floral lvs. small, mostly wedge-ovate and obtuse: fl.-cluster small, with short (often very short) slender pedicels: fl.-buds small and globular, white-pubescent (particularly on the edges of the sepal): frs. large, with broad mostly overlapping petals. Evol. Native Fruits, Fig. 91.—While the writer takes to be this species seems to be common in southern Mississippi, and perhaps also in Alabama. How distinct it may be is only to be determined by careful studies in the field; but in its typical forms it is readily separated from R. argutus. It seems to be less erect (often climbing?) than R. argutus.

27. randii (R. argutus, var. Randii, Bailey). Fig. 2209. Low and wide-spreading (usually less than 3 ft.), sometimes becoming procumbent, with few or almost no prickles, the canes often almost herbaceous: lvs. very thin, usually becoming nearly or quite glabrous beneath, the teeth coarse, sharp and unequal, the lfts. on the young canes acuminate: fl.-cluster small and simple, commonly with a large simple leaf at the base, the pedicels long and slender and only slightly (if at all) pubescent: fr. small, usually rather dry, but sometimes juicy and good. Shady places, as in woods and thickets, New Brunswick to Lake Superior; to be looked for in the mountains of Carolina.—It impresses one as a weak woods form, sometimes seeming nearest R. Canadensis but oftenest suggesting R. nigrobaccus; but it seems to hold its characters better than most Blackberries. 2201. Cultivated form of Rubus occidentalis.—The Gregg Raspberry (× 3g). No. 18.
When

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teristic thorny Connecticut medium fld., larger, prickles prisckles for largely berry, presented be reddish escence: Peck). Section woody virens, slender arising canes white-tomentose and 30. thick, I

19

31. Escenini, Tratt. (R. villosus, var. humifusus, Torr. & Gray. R. Baileyanus, Britt.). Plant weak, with slender canes lying on the ground, the prickles small and relatively few or even none, the flowering canes sometimes almost herbaceous although having survived the winter: Ifts. small and thin, oval-pointed to nearly oval, irregularly and sharply serrate, nearly glabrous (or hairy on the margins and the veins): fls. of good, size, white, solitary (sometimes in 2’s) on short, leafy peduncles: fr. small and nearly globose, loose, black, often good. Sandy places, New York and Mich. to Miss. Evol. Native Fruits, Figs. 77 and 87.—Has been confounded with R. villosus, but, as Rubusse go, it seems to be well distinguished. Probably not in cultivation.

Group 2. Soft-caimed Dewberries, with the stems thin and little woody or even almost herbaceous and the peduncles L-2-fld.

239. Rubus, Ait. (R. Caanadensis, Authors, not Linn.). Figs. 2211,2212. Canes strong, often several feet long and usually armed with strong recurved prickles, not standing alone when full grown but often rising 2 feet from the ground, the shoots mostly glabrous or becoming so: lvs. of medium size or becoming very large on strong plants, firm and thick, the 3-7 leaflets oval or ovate pointed or acuminate and sharply double-toothed: fls. white, few to several on the ends of short, leafy shoots of the season: fr. usually globose or short-oblong, shining black, the drupelets usually large. Fields and roadsides, Ontario (and Newfoundlad?) to Fla. and Arizona.—The common Dewberry of the North, occurring in many forms in old fields, and often a troublesome pest. There are varieties cult. for the fruit. This is the plant named Rubus villosus by Alton in 1739, although it has been supposed that he had the High-bush Blackberry (R. nigrobacbus). When

2204. Rubus nigrobacbus (X ½). No. 22.

2205. Rubus nigrobacbus (X ½).

RUBUS

2.585

RUBUS

2206. Rubus nigrobacbus, a wild Highbush Blackberry (X ½). No. 22.

larger, often ovate-pointed or elliptic: fl.-clusters 4-10 fld., short, more or less leafy and thorny, the fl.-buds glo- bu lar and pubescent: fr. medium in size, firm, often sweet and good. Dry fields, Connecticut to the Gulf, and the common Blackberry in many places. —In cultivation this seems to be represented by the viciously thorny Topsy or Tree Blackberry, although the characteristic white tomentum largely disappears under domestication. Were it not for this tomentum, the species would be difficult to distinguish from R. florid- dus.

Section 6. Swamp Blackberries, with weak hispid canes and reddish fruits.

29. setosus, Bigel. (R. himpid, var. suberetus, Peck). Mostly erect, sometimes ascending 2-3 ft., the slender canes clothed with many weak mostly recurved prickles and sometimes conspicuously hispid also, the prickles generally extending to the petioles and inflorescence: lfts. oblanceolate to ovate, pointed or acuminate, very strong-toothed: fr. small, with few drupelets, reddish black. Common in Quebec to Pa.—Not known to be in the trade, but inserted here because it is confused with R. hispidus and other species.

As. Dewberries: Plant trailing or decumbent.

Group 1. Swamp Dewberries, with weak bristly stems, obovate shining lfts., and small red fruit.

30. hispidus, Linn. (R. Hovorilis, Michx. R. sempervivens, Bigel.), Fig. 2210. Seems very slender, scarcely woody but usually persisting over winter, creeping, bearing many weak reflexed small bristles: lfts. usually 3, thick, shining above, wedge-ovate or oval-ovate, usually obtuse, doubly serrate: fls. small, white, on few-flowered herbaceous nearly or quite leafless peduncles arising from the creeping canes: fr. small and of few drupelets, red to red-black, sour. Swamps or low sandy soils, Nova Scotia to Ga. and Kans.—Of no value for the fruit, but sometimes offered by dealers as a subject for covering the ground in moist places. The leaves usually persist through the winter, and in sunny places they assume a fine bronzy hue.

Group 2. Soft-caimed Dewberries, with the stems thin and little woody or even almost herbaceous and the peduncles L-2-fld.

31. Escenini, Tratt. (R. villosus, var. humifusus, Torr. & Gray. R. Baileyanus, Britt.). Plant weak, with slender canes lying on the ground, the prickles small and relatively few or even none, the flowering canes sometimes almost herbaceous although having survived the winter: lfts. small and thin, oval-pointed to nearly oval, irregularly and sharply serrate, nearly glabrous (or hairy on the margins and the veins): fls. of good, size, white, solitary (sometimes in 2’s) on short, leafy peduncles: fr. small and nearly globose, loose, black, often good. Sandy places, New York and Mich. to Miss. Evol. Native Fruits, Figs. 77 and 87.—Has been confounded with R. villosus, but, as Rubuses go, it seems to be well distinguished. Probably not in cultivation.

Group 3. The common Northern Dewberries, with strong, prickly, often half-ascending canes and 2-several-fld. peduncles.

32. villosus, Ait. (R. Canadensis, Authors, not Linn.). Figs. 2211,2212. Canes strong, often several feet long and usually armed with strong recurved prickles, not standing alone when full grown but often rising 2 feet from the ground, the shoots mostly glabrous or becoming so: lvs. of medium size or becoming very large on strong plants, firm and thick, the 3-7 leaflets oval or ovate pointed or acuminate and sharply double-toothed: fls. white, few to several on the ends of short, leafy shoots of the season: fr. usually globose or short-oblong, shining black, the drupelets usually large. Fields and roadsides, Ontario (and Newfoundlad?) to Fla. and Arizona.—The common Dewberry of the North, occurring in many forms in old fields, and often a troublesome pest. There are varieties cult. for the fruit. This is the plant named Rubus villosus by Alton in 1739, although it has been supposed that he had the High-bush Blackberry (R. nigrobacbus). When

2205. Rubus nigrobacbus (X ½).
it was determined, in 1898, that Aiton had the Dewberry, rather than the Blackberry, when he made the name *R. villosus*, it became necessary to revise our nomenclature. It was supposed until that time, also, that Linnaeus meant to designate the Dewberry by his *R. Canadensis*, but he really had the Thornless Blackberry.


**Var. norubicus**, Bailey. *Lucetia Dewberry*. Figs. 697, 698, Vol. 1. Very robust form, with large, wedge-obovate, deep-cut leaflets, very long pedicels, very large florets (sometimes 2 in. across) and leafy-tipped calyces: fr. large. West Virginia, and in cultivation as the Lucetia Dewberry, which is the most popular current variety.

33. *invulus*, Bailey (*R. Canadensis*, var. *invulus*, Bailey). Figs. 2213, 2214. Canes strong, terete, somewhat ascending, not very prickly (the prickles straightish); leaflets large and rather thin, light green, those on the verdurous shoots coarsely and simply toothed and the teeth usually abruptly pointed; fl.-cluster forkling, with 2-6 long, slender, usually hispid pedicels; florets large, with leaflike sepalæ. Not uncommon from New York to Kansas and the Gulf. In cultivation as Bartel and other Dewberries. When once understood, this species is generally easy to recognize. The best single diagnostic character is the large simple toothing of the leaflets on the sterile shoots.

**Group 4. The Southern Dewberries, with very long, prickly and often hispid canes, narrow persistent leaflets, and mostly 1-flowered peduncles.**

34. *trivialis*, Michx. **Southern Dewberry.** Fig. 2215. A most variable and perplexing species, the difficulties being increased by the fact that the same plant may bear three kinds of leaves: the large, broad Blackberry-like leaflets on the young verdurous sterile shoots; the smaller leaflets on the canes that are to bear fruit and which often persist over winter and remain at flowering time; the small leaflets that appear with or somewhat before the flowers. It is seldom that the leaves of sterile and flowering shoots of the same plant are preserved in herbaria. Canes very long, usually wholly prostrate (sometimes 10-15 ft.), thickly armed with prickles and sometimes bearing reddish bristles; leaflets, usually 3, narrow-ovate to oblong, short-pointed, rather shal-lower and sometimes bluntly toothed, the petiole and midribs usually prickly; florets of medium size, mostly on simple, more or less prickly peduncles: fr. usually oblong, sometimes excellent but often dry and seedy. From Virginia to Florida and Texas, and in cult. in two or three forms for its fruit. This is the common Dewberry of the southern states. It is often a serious pest in old fields. Some of the forms are very distinct, but it seems to be impossible to discover characters by means of which they can be distinguished with even a fair degree of uniformity. Some of these forms have fls. 2 in. across. Fig. 2215 is a drawing of one of the specimens (there are two similar specimens on the sheet) on which Michaux founded *R. trivialis*. Botanically, this species is probably the most perplexing of American Rubi. Some of the kinds in the extreme South are remarkably robust. Forms have been found with canes 40-50 ft. long and nearly an inch in diameter.

**Group 5. The Western Dewberries, with pubescent leaflets, and florets often imperfect.**

35. *vitifolius*, Cham. & Schlecht. (*R. arilinus*, Cham. & Schlecht. *R. macropetalus*, Doug.), Pacific Coast Dewberry. Widely trailing, with slender, more or less pubescent canes which are provided with long but weak, straight or slightly recurved prickles; leaflets, various, usually thicker and more woolly upon the staminate plants, composed of three ovate, doubly crenate-toothed leaflets, or sometimes only 3-lobed, the long petiole and usually the midribs prickly; florets perfect, staminate or pistillate on different plants, borne on shoots 6-12 in. high, which bear 1- to 2-flowered prickly or hispid and generally pubescent peduncles, the petals of the staminate forms large and showy, those of the pistillate forms usually small, the calyx lobes either short and entire or somewhat prolonged and indistinctly toothed: fr. of fair size, blackish, mostly round-oblong.
sweet. In the mountains, particularly in the Coast Ranges, of the Pacific slope; also in Idaho.—It has come into some prominence as a fruit plant within the last dozen years. Named varieties are Anguinaughe, Skagit Chief, Bolle of Washington and Washington Climbing Blackberry. The species is perplexingly variable, and well-marked characters seem to be associated with the different sexual forms. The Lognberry (which see, p. 937) is said to be a hybrid between this species and R. Irideus. R. vitellinus is recorded as having been crossed with R. crataegifolius by Luther Burbank. The Mammoth Blackberry of California is said to be a cross between R. vitellinus and the Wild Blackberry of Texas (R. argenteus). See Pacific Rural Press, Sept. 4, 1897, for description and portrait. The account says that the Mammoth "produces berries of immense size, supposed to be the largest Blackberry ever grown, berries 2½ inches in length being frequently found.

* * * The canes of the Mammoth are very peculiar, being very large and thickly covered with small, short spines. The canes start early in March, grow thick and stout until about 5 ft. high; they then take on a running habit and grow from 25 to 30 ft. in a season. Late in the fall the tips or stolons seek the ground and take root." The variety is partially extravagant in California. The fruit is said to be more acid than the old Lawton Blackberry, but "when perfectly ripe is sweet and of superior flavor."

Group 6. Exotic Dewberries, with very long, prickly, glaucous canes and large very sharp-toothed fruits.

36. dumetorum, Wiehe. Fig. 2216. Canes long and slender, terete, often 10-25 ft. long, trailing or half-prostrate, glaucous, thickly beset with rather small somewhat curved spines: lfts. usually 3, mostly broad-ovate, pointed to acuminate. In California it is said, becoming bronzy and brown in autumn: fls. small, white, the calyx white-tomentose, on short pedicels in a cluster terminating leafy growths of the season: fr. of a few large black drupes, Europe.—Lately introduced, the covering of banks and stony places, for which it is highly recommended. Its autumn color is attractive. Hardy in New England.

R. villosus, Ham. Raspberry, apparently allied to R. occidentalis, and prized in cult. for its glaucous-white canes: reaches 4-10 ft., with strong arching canes that bear strong recurved prickles: lfts. ovate or oval, incised-serrate, whitish beneath: fls. large and white, 1-3 on drooping pedicels: berry amber-colored, size of the common Raspberry, the calyx at first erect but finally spreading. Temperate Himalayas. B.M. 1678. R.H. 1835:5. On. 34, p. 156.—R. Capensis, Burbank. Under this name Luther Burbank describes a bramble that came to him "by way of New Zealand from South Africa, and is probably

the one that Stanley speaks so highly of as growing in places on the Dark Continent. The canes grow to a height of 6-10 feet, bending over and rooting from tips like Blackcap Raspberries. The whole plant is covered with a short, rusty down, and few short scattered prickles; the fruit is fully as large or larger than Shafter's Colossal Raspberry, of a purplish wine or mulberry color, and of excellent quality, though the berries do not separate from the receptacle as freely as they should; it is a very promising berry-plant." See Burbank's "New Creations in Fruits and Flowers." June, 1894; also On. 48, p. 135. The picture represents a very rugose leaf with 5 shallow nearly rounded lobes and very irregularly serrate margins; stems with curved prickles, and a small cluster with large, globular short-pedicelled fruits. It is probably R. Moulmein.—R. Japonicus, Veitch. Known to horticulturists in its variegated form (R. Japonicus tricolor): slender trailing, with rose-colored stems and pedicels: lfts. ovate, mostly indistinctly 3-lobed, very sharply toothed, the youngest ones pinkish white and the mature ones blotted green and white. Not known to be in cult. in this country. It would probably not be hardy north. The botanical position of the plant is not designated. G.C. III. 16:95. J.H. III. 29:60. G.M. 37:44. —R. Moluccanus, Linn. A large Raspberry, common in India and Malaya, and to be expected as an introduced plant in many warm countries. Very robust, the canes and branches reddish-hairy and spiny: lfts. very variable, large, usually hairy, dull-pubescent beneath, shallowly 3-5-lobed, irregularly serrate: fls. white, in contracted terminal clusters: fr. in shades of red, scarlet. B.R. 6:401. —R. stipitatus, Smith, produces an edible fruit, prized in Alaska: stem simple and herbaceous, only a few inches long, 1-fl.: lfts. cordate, 3-lobed or 5-parted: fls. red. Northwestern Arctic America.

L. H. B.
RUDBECKIA (after the two Professors Rudbeck, father and son, predecessors of Linnaeus at Upsala; Compositae. Cone-flower. As defined by Gray (Syn. Flora N. Amer., 1886), Rudbeckia is a genus of 21 species of North American herbs, many of which are hardy and perennial, bearing in summer showy fìs. which usu-
ally have yellow rays, though in one species (R. atrorubens) the rays are all dark crimson, and in the other species the rays are occasionally more or less covered with purple-brown towards the base. Under Rudbeckia are often included in nursery catalogues certain plants which Gray refers to Echinacea and Lepachys. These three genera form an interesting floricultural group. Rudbeckia and Lepachys are typically yellow-îdæ, genera, while Echinacea contains a few forms with fls. ranging from flesh color and rose-purple to crimson. The chaff of the receptacle is usually persistent in Rudbeckia and deciduous in Lepachys. Among the hardy herbaceous species, there are sev-
eral with striking habit and distinct foliage. There is a wide range of color among wild plants of the same species, and specimens with the brown-purple color at the base should be sought for. The rays may be few or many, short and broad or long and narrow, toothed in various ways, star-like or making a continuous limb, drooping or horizontal, and always set off by the disk, which may be purple, black or yellowish, high and col-
umnar or low and roundish. The season of bloom could be extended. The flowers of many of the kinds are ex-
cellent for cutting.

2213. Rubus invius, the cul-
tivated form known as Bartel Dewberry.

See Rubus, page 1586.

RUDBECKIA

The only full double form, apparently, is Rudbeckia Golden Glow, which has had great popularity since 1896. The origin of this great favorite seems to be un-
known. About 1894 John Lewis Childs found it among some plants sent by correspondents. See Gnm. 6:376. For the structure of the Rudbeckia influenza see Fig. 829, Vol. II.

W. M.

The Cone-flowers are of easy cultivation in almost any soil and situation, from a semi-shady position to one in full sun. Most of the species are found inhabiting moist locations, but thrive well in the garden under the ordinary methods of cultivation, although R. lacinia and its double form, Golden Glow, do much better if abundantly supplied with moisture. R. kirta, our Black-eyed Susan,—sometimes called by the children out west "Nigger-heads,"—will thrive in the driest, hottest situation, where many others would fail. The best known as a gar-
den plant, and probably the showiest, is Golden Glow, which the under-
signed considers the best perennial of recent introduc-
tion. If cut back severely when through blooming and well watered, it often produces a

2214. Leaf of Rudbus invius, showing the simple teeth (X %).

See Rubus, page 1586.

second crop of flowers. Autumn Glory will be well liked when better known. It is fine for massing and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It re-
sembles R. utitd, but is taller and blooms longer. R. triloba is one of the very best, and, while a biennial, perpetuates itself through self-sown plants. It forms a dense twiggy bush somewhat over three feet high and nearly as broad if kept moderately well watered, and much smaller if in a dry situation. These plants may be used with effect as a border to a large bed of hybrid delphiniums, as the latter will tower above them and bloom in their young state. By the time the delphiniums are cut down for their second flowering the Rudbeckias hide their untidiness and are in their prime, but later on may be pulled up to again expose the delphiniums. A group may be formed by using the lighter-colored flower forms of Hibiscus Syriacus—such as Totus albus, Lady Stanley, and Elegansima—for a center or back-
ground, and interspersing groups of the taller Rud-
beckias (except Golden Glow, which is too tall and spreading) and boltonias next to them. In front of these place R. speciosa and R. triloba, with the blue form of Aconitum Napellus, and for a border use R. biolor, var. superba, placed well to the front to be pulled up when its bloom is past. This group will give color from July until frost. The allied plant Echinacea pur-
purea and E. Augustifolia are well adapted for grouping in open bays in shrubby borders, as their flowers are ex-

RUDBECKIA

vremely durable and seem in harmony with such surroundings. Rudbeckias are easily increased by seeds, cuttings or division.

W. C. EGAN.

2216. Rubus dumetorum, an Old World Dewberry (X 1/2). Page 1587.

A. Base of upper lvs. cordate-clasping........................ 1. amplexicaulis

AA. Base of upper lvs. not cordate-clasping.

B. Color of disk brown or dark purple: shape of disk never cylindrical.

C. Lower lvs. deeply 3-cut.

D. Duration biennial: disk black-purple............... 2. triloba

DD. Duration perennial: disk dull brownish............... 3. subtomentosa

CC. Lower lvs. not deeply 3-cut.

D. Plants bristly-hairy.

E. Rays 3/4-1/2 in. long ..... 4. bicolor

EE. Rays 1-2 in. long ...... 5. hirta

DD. Plants nearly glabrous.

E. Lvs. mostly entire...... 6. fulgida

EE. Lvs. irregularly serrate. 7. speciosa

BB. Color of disk greenish or yellowish.

C. Lvs. entire or barely dentate.

D. Height 2-4 ft.: lvs. bright green................. 8. nitida

DD. Height 4-9 ft.: lvs. glaucous..................... 9. maxima

CC. Lvs. (upper stem-lvs.) 3-eleft. 10. lacinata

INDEX.

amplexicaulis, 1. lacinata, 10. speciosa, 7.
bicolor, 4. maxima, 9. superba, 4.
Golden Glow, 10. nitida, 8. triloba, 2.

1. amplexicaulis, Vahl. Annual, 1-2 ft. high: rays 1/2 in. long or more, yellow, often with a brown-purple base; disk brownish, finally somewhat cylindrical. Low grounds, La. and Texas. B.B. 3:418.


8. nitida, Nutt. This and the next are southern perennial's, with lvs. entire or barely dentate: rays drooping, pure yellow, several or numerous; disk finely columnar, 1-2 in. long. Wet ground, Ga. to Fla. and Tex. Gn. 47:1018.


R. angustifolia, Linn., is Holianthus angustifolius.—R. pinnata, Vent., is Lepachys pinnata.—R. purpurea, Linn., is Echinacea purpurea.

W. M.

RUE. See Ruta graveolens.

RUE ANEMONE. See Syndesmon.

RUE, GOAT'S. Galega officinalis.

RUELLIA (after Jean de la Rueille, a French botanist). Acanthaceae. A genus of about 150 species of herbs or shrubs, mostly American, pubescent, villous or rarely glabrous: lvs. opposite, mostly entire: fls. violet, lilac, white, red or rarely yellow. The fls. are sessile or nearly so in axils of lvs. or bracts; they are solitary, fascicled, or in spreading, paniculate cymes. Bracts herbaceous, loose or imbricated, usually small and narrow, rarely oblong or lanceolate. Corolla- limb 5-lobed, equal, or with the upper lobes connate at the base; stamens 4; capsule oblong or club-shaped, terete or compressed, 6-20-seeded: seeds compressed.

a. Blossoms sessile or nearly so.

b. Lvs. green.

C. Fls. blue, 1½-2 in. long.

clitoa, Pursh. A hardy perennial herb, about 1½ ft. high, erect or prostrate, hirsute or pubescent: lvs. hairy, cilatate, usually oblong, sessile or short-petioled, 1½-3 in. long; fls. solitary or clustered, axillary, blue, 1½-2 in. long. Aug. Sept. in dry, light soil, N. J., south and west. B.B. 3: 263.—Prop. by seeds or division.

cc. Fls. rosy, 2-6 in. long.

macrantha, Mart. It forms a compact, many-stemmed

Rudbeckia triloba (X 1/2)
RUCELLA

rue, 1-6 ft. high, with ovate-lanceolate lvs. 4-6 in. long; fls. large, bell-shaped, with tubular base, purplish rose with purple veins, solitary in leaf-axils. Brazil.

G.C. III. 17:45. R.H. 1881:410. — G. W. Oliver says in his "Plant Culture" that *R. macrantha* is of easy cultivation and is one of the best greenhouse flowering plants for amateurs. Cuttings rooted in September furnish fair-sized flowering plants in January. These, if desired, may be planted out in late spring, when they will have formed large specimens, which may be lifted and potted.

b. Lvs. marked with white.

c. Fls. white, often veined with lilac.

Devosiana, Hort. A low-growing tender Brazilian species, with lanceolate lvs, marked on the upper surface with white along the nerves and having the lower surface entirely purple; fls. rather small, usually white, with blue stripe, axillary; corolla-tube suddenly dilated and bent at the middle.

c. Fls. carmin or rose.

Makoyana, Hort. A compact, bushy plant resembling *R. Devosiana*, Hort., in foliage, but differing in the color of the fls. (bright carmin) and by their somewhat larger size. Brazil. R.B. 21:109. R.H. 1886:576. — Prefers shade. It is said that the color of the foliage is better when soot is mixed with the soil.

a. Blossoms on long peduncles.

b. Fls. blue or purple.

tuberosa, Linn. A perennial herb, 2-3 ft. high, with oval or ovate lvs. 2-3 in. long and blue fls. 1½-2 in. long, in terminal, nearly naked panicles; stigma single; capsule 12-16-seeded. Southwestern U.S.; cult. in Fla.

b. Fls. red.

c. Peduncles much branched.

amusa, Nees (Stephanophyllum longifolium, Pohl). A half-hardy perennial, about 1½ ft. high; lvs. oblong-lanceolate or oblong, narrowed at both ends; margins repand-denticulate or simply repand; fls. bright red, in axillary sprays in summer. Brazil. F.M. 1880:419.

c. Peduncles but little branched.

formosa, Andrz. Fig. 2219. A low-growing, tender, herbaceous perennial: lvs. ovate, rounded at the base, hairy on both sides; fls. on straight, axillary peduncles; corolla scarlet, showy, 1½ in. long, the upper 2 lobes joined for half their length. Summer. Brazil. B.M. 1900. — Cult. in California.

R. varians, Vent. See *Dedalacanthus nervosus*. F. W. Barclay.

RULINGIA (after J. Ph. Ruling, a botanist of Gottingen). Sterealidaeae. This includes two plants cult. in S. Calif. *R. purelfiora* is highly recommended as a rock plant by Ernest Brunton, of Los Angeles, who grows it in quantity for its trailing habit and myriads of small pink fls. borne in spring. Franceschi says that *R. pannosa* is odd and pretty by reason of the flabby coating of the leaves. A genus of about 15 species of shrubs or undershrubs from Australia, except one a native of Madagascar. Lvs. various in size, entire, toothed or lobed; fls. mostly white, small, in cymes; calyx 5-lobed; petals 5, broad and conic or convolute at the base, with a small, broad or linear figula at the top; stamens shortly or scarcely joined at the base, 5 without anthers, petal-like, 5 perfect, short; ovary sessile, 5-celled; ovules 1-3 in each cell. Flora Australiensis 1:297.

a. Lvs. 1-3 in. long.

b. Lvs. usually less than 1 in. long.

c. Lvs. more than 1 in. long.

d. Lvs. 1½-2½ ft. long; ascending or prostrate; lvs. ovate or ovate-lanceolate, obtuse, densely crenate, mostly lobed; fls. pinkish, in shortly pedunculate cymes.

RUMEX (the Latin name). Polygonaceae. Dock. Sorkel. Herbs, mostly perennial, with strong roots, of more than 100 species in many parts of the world. Most
As a genus, Rumex is closely allied to Fagopyrum, the buckwheats, Rheum, the rhubarbs, and Polygonum, the jointweeds. They are mostly leafy-stemmed plants, with small flowers in panicles, the pedicels mostly in whorls and jointed; the blades, perfect or imperfect, with 6-veined calyx, the 3 inner lobes larger and generally one or all of them bearing a grain or tubercle near the center; stamens 6; stigmas 3: fr. 1, 3-sided often margined or winged. In the larger species the stems are green. Most of them are corm-growing plants. See Dock and Sorrel.

A. Dock: lvs. not hastate: fls. perfect, or at least not dicots.

b. Wings of calyx not tubercle-bearing: 

veneans, Pursh. Perennial, 1½ ft. or less tall, glabrous, branched: lvs. oblong-ovate or ovate-lanceolate, usually tapering at both ends, entire, the stipular sheaths (acrost) funnel-shaped and prominent; wings of fl. short-petioled, entire, gray-green, somewhat motiled beneath; petiole large, perfect, large, in crowded panicles, green; fruiting calyx-lobes ½ in. across, brown, entire, velvety, the pedicels drooping. Indian Dock. and Calif. 

2220. Rhus juncana (X 2). (See page 192.)


RUMEX

1591

Acetosella, Linn. COMMON FIELD OR SHEEP SORREL. Common in all old fields, where it indicates sterile soil: lvs. oblong, from a hastate-lobed base: fls. reddish, in erect racemes. Not cult., but the sour root-leaves are sometimes used for greens. Eu.

b. Plant annual.

rosens, Linn. One to 2 ft., with spreading and branched stems, glabrous and somewhat glaucous: lvs. small, deltoid-ovate, entire, short-pointed, trunca-tu-acute or almost coriace at base; racemes short and leafless or nearly so, the pedicels drooping in fr.: wings coriace orbicular, ½-⅔ in. across, thin, rosé-veined, without callosities. Egypt to Persia. —Rarely cult. as an ornamental for its showy fruiting calices.

L. H. B.

RUPTURA-WORT. Herniaia.

RÚSCUS (an old Latin name). Littl-dovow. BUTCHER'S BROOM. A genus of possibly 3 species scattered over Europe. Erect shrubs, with minute bract-like lvs. and branches (phyllodia) simulating leathery, persistent, veined, sessile, leaf-like bodies; fls. small, springing from the midrib of the lower surface of the phyllodium.


According to A. Blance, R. Hypoglossum, Linn., has been highly commended lately in Germany as a decorative subject. This species and R. Hypoglossum, Linn., are both natives of southern Europe, where they have been studied by various botanists, some of whom distinguish them by various characters, while others unite them into a single species. J. G. Baker considers R. Hypoglossum a variety of R. Hypophyllum, differing in having the flowers under the cluster of fls. in the form of a large leafy bract lacking entirely the texture of the phylloclad. In B.M. 2049 R. Hypophyllum is shown with minute white fls. and handsome red berries nearly ½ in. thick.

F. W. BARCLAY.
Scrophulariaceae. About a dozen species of Mexican shrubly plants with angular, usually slender, often pendulous branches; lvs. usually small, becoming scale-like on the branches, opposite or verticillate: fls. bright red, in dense or loose corymb or of a single flower; calyx 5-parted; corolla-tube cylindrical, the lobes spreading or nearly equal; staminodia very short or wanting; stamens 4; capsule subglobose, 2-celled; seeds numerous, very small, winged. A recent synopsis of Russellia by Dr. B. L. Robinson, with a key to the species, will be found in Proc. Am. Acad. Arts & Sci., vol. 38, No. 36, March, 1900.

Russelian are of easy cultivation. *R. juncea* and its varieties make excellent basket plants, being almost continuously in bloom. Propagated by cuttings.

**juncea.** Zacc. (R. scoparia, Hort.). CORAL PLANT.  
Fig. 2220. A tender shrubby plant, with smooth, somewhat rush-like branches, nodding or pendulous at the top: lvs. linear-lanceolate or ovate, small, becoming minute bracts on the branchlets; raceme very loose, remotely flowered; peduncles elongated. B.R. 21:1773. P.M. 4:79.  
-Vars. Lemoiniea and elegantissima are garden hybrids of *R. juncea* and *R. sarmentosa*. They are more floriferous, especially during the winter, than the type.

F. W. BARCLAY.

**RUSSIAN CACTUS.** Same as Russian Thistle.

**RUSSIAN FRUITS.** See Pomology. **R. THISTLE.**  
See *Salsola*.

**RUST.** A name for a class of fungi which produce disease in plants. Rasts are of the class Uredineae. The mycelium branches among the tissues of the host and produces several kinds of spores, either upon the one host (autocorous), or upon different hosts (heterocorous). These spores, as shown typically in the disease of the wheat, are called respectively uredosporcs, teleutosporcs, aceridiosporcs, etc. Recent researches by Eriksson and Hennings in Sweden show that the three common rusts which affect the grains, namely: *Puccinia graminis* (Figs. 2221-2), *P. rubigo-terre* and *P. coronata*, can be split up into seven species, characterized by their cultural reactions with a large series of plants, and that *Puccinia graminis* has besides six specialized

chrysanthemum rust (*Puccinia Hieraciini*), black, or wheat rust (*Puccinia graminis*), hollyhock rust (*Puccinia malvacearum*), etc.  
JOHN W. HARSBERGER.

The rusts are fungi constituting a very large and economically important class known as Uredineae. They are all obligatory parasites, attacking a vast number of native and cultivated plants. The mycelium of

2223. *Ruta graveolens.* Flowers slightly enlarged.  

the rust fungi exists entirely within the tissues of the host. The spores are formed in masses or sori just beneath the epidermis. When ripe they break through the epidermis, forming brown patches and spots from which they are scattered. Many of the rusts produce several spore-forms, which often occur in regular succession either on the same host or on different hosts. For example, the wheat rust produces uredospores and acerosporcs on the wheat and aceridiosporcs on the barberry.  

Rusts rarely kill the plants which they affect, and hence in many cases the damage done is not as apparent as in many other diseases. In all cases, however, the plants are weakened, and often much disfigured. They are among the most difficult fungous diseases to combat. Spraying has been tried in many instances, but has proved, at most, only partially successful. The most profitable course for overcoming these diseases seems to be the selection of resistant varieties.

HEINRICH HASSELBRING.

**ROTA** (classical name of rue). *Ruta.* About 40 species from the Mediterranean region of Europe and from Asia. Perennial herbs, often woody at the base, glandular, punctate: lvs. simple to much pinnate, odorous: fls. yellow or greenish, in terminal corymb or panicles, hermaphrodite, usually 4-merous; petals 4-5, free, often dentate or ciliate; stamens 8-16: ovary superior: capsule 4-5-lobed, indiscisant or dehiscent at apex.  

*graveolens,* Linn. **Rue. HEBR OF GRACE.** Fig. 2223. A hardy perennial, woody at the base, 1½-2 ft. high; lvs. fragrant, much divided; lobes oblong, the terminal oblong-oval; fls. yellow, July. Prop. by division and seeds.  

*Patavina,* Linn. (Haplophyllum Patavium, Hort.). A hardy perennial herb 4-6 in. high; lvs. glabrous, the lower oblong-spatulate, narrowed at the base, the others trisected and lanceate; corymb dense; pedicels somewhat longer than the fls.: fls. golden yellow. June, July.  

F. W. BARCLAY.

**RUTABA GA, or SWEDISH TURNIP.** Consult *Brassica campestris,* page 177; also *Turnip.*

**RUTLAND BEAUTY** is *Convulvulus Sepium.*

**RYE.** See *Secale.* **RYE, Wild.** See *Elymus.*
SABAL (possibly a native name in South America, but the author of the genus does not explain). *Palmetto* Spineless palms, low, tall or almost stemless, the robust, ringed trunk obliquely ascending at the base, clothed above with dead leaf-sheaths: bracts terminal, orbicular or cuneate at the base, filabellately multi-fid; petals linear, bifid, filamentous on the margins, induplicate in the bud; rachis short or long; ligule short, adnate to the rachis; petiole concave above, the margins smooth, acute; sheath short; spadix large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spadix sheathing the branches and peduncles tubular, oblique at the throat; bracts and bractlets minute: bracts, small, glabrous, white or green : fruits small, globose, black, the short style basal. Species 6; Florida to Venezuela, and one in Sorona.

Some botanists make the species names all feminine; others neuter.

JARED G. SMITH.

The Cabbage Palmetto (*Sabal Palmetto*) grows in groups of a few specimens to several hundreds or even thousands in the rich black soil on the banks of the St. Johns and Oklawaha rivers of Florida, forming a glorious sight; and even the tourist who is blind to most of the charms of nature cannot help being overwhelmed by the beauty and grandeur of these palms. They are found in a few places in South Carolina and they attain their fullest development in Florida, where they always form an important feature of the landscape. Generally they grow in dense groups, but they are more beautiful in all their parts where they have room enough to spread. In southern Florida the undersigned has often found underneath the crown of leaves a dense wreath of ferns (*Polypodium aureum*), which heightens the charm of these palms considerably. On the St. Johns the trunk is often covered with the trumpet creeper (*Tecoma radicans*), or it is hidden by the dense foliage of the cross-vine (*Bignonia capreolata*), both of which form a beautiful ornament, especially when in flower. These suggestions of nature are often followed by planters who have a feeling for nature-like landscape effects. The Cabbage Palmetto thrives even in the poor sandy soil, and it is greatly improved by cultivation. Even good-sized trees are not difficult to transplant if the whole stem is carefully dug out and all of the roots and leaves are cut off. If the stem has been set at least three feet deep and the soil is kept well watered after planting, the Palmetto is almost sure to live. In addition to the Palmetto, all of the Sabals mentioned in this work are cultivated by the undersigned on high pine land in southern Florida. Under these conditions the Sabals have proved a great success, as also all species of Phoenix and all Copes of the australis type, while the species of Washingtonia, Frythea, Livistona and Trachycarpus have been an entire failure. *S. Blackburnianum* is, in the judgment of the undersigned, the finest of all the fanned palms that can be grown in Florida.

All the species that form trunks are objects of great beauty when well grown. They need to be well fertilized, or the lower leaves will suffer and finally die, thus detracting much from the elegance of the specimen. They all grow naturally in rich black soil, but they all thrive exceedingly well in the sandy pine woods soil if well fertilized and watered; in fact, they can hardly be fertilized too much, and the more nitrogenous manure and water they get the faster they grow. When transplanted they must be set deep. In planting palms the writer always makes a hollow about 6 ft. in diameter and about 2 ft. deep in the center. This center, which receives the plant, is the deepest point, while the ground all around is slightly sloping. Care must be taken to remove the sand after heavy rains or the crown will soon be buried and the little plant dies. As the plant first forms the trunk in the soil and as the growth is rather rapid, this precaution is not necessary after the plant has attained a few feet in size.

H. NEBLING.

The Cabbage Palmetto (*Sabal Palmetto*) is rich in historical associations. It is also noted for its imperishability under water. The trunks make good piles for wharves, as they resist the attacks of the borer in sea water. The leaves make the best of thatching. Until the tree reaches a height of 10-20 ft. the bases of the leaf-stalks remain upon the trunk, forming a unique *cheveaux de frise*, which adds much to its picturesque-ness. This palm, when pot-grown, is valuable for greenhouse culture at the North.

The Dwarf Palmetto can resist as low a temperature as 10-17°F. The graceful flower-spike rises above the leaves to a height of 5 or 7 feet.

*S. longipedunculatum* somewhat resembles the Cabbage Palmetto, and its flower-spikes extend far above the leaves.

E. N. REASONER.

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2224. The Palmetto in Florida—Sabal Palmetto.

1. Adansoni, Guerns. (S. minor or minor, Pers. Corypha minor, Jacq. not Linn.). Dwarf Palmetto, Blue Palm. Stem short, buried in the earth: bracts 2-3 ft. long, blade circular in its outline, somewhat longer than the petiole, glaucous; segments slightly cleft at the apex; spadix erect, much longer than the bracts, 3-6 ft.; drupe 3/4 in. thick, black. Southern states.

B. M. 1844.
it agrees in having but one of the three carpels developed and fertile, while in S. Mexicana two or even three are not infrequently developed. Considering the extent to which this section of Mexico has been visited by collectors, it would be remarkable if this attractive plant should not prove to be already in cultivation in European gardens." Possibly already in cult. in this country.

W. M.

SABBATIA (Libertas Sabbati, Italian botanist of the eighteenth century). Gentianaceae. About 13 species of Atlantic North American annuals or biennials with showy rose-pink or white fls. in summer or autumn. Fls. 5-12-mucron, in cymes or terminating the branches; calyx 5-12-veined; corolla usually with a yellow eye, the lobes convolute in the bud; filaments rather short, filiform; anthers linear or elongate oblong, arcuate, recurved or revolute; style 2-veined or parted; capsule globose or ovoid, thick-coriaceous or at first flesh; seeds small, numerous.

Sabbatia requires a light, sweet soil. Seed may be sown in fall or early spring. The plants are easily transplanted.

a. Fls. 5-parted, rarely 6-parted.

b. Lvs. narrow-ob lanceolate to linear.

c. Color of fls. rose to white: lvs. obuse.

brachiatii, Ell. Stem but slightly angled, 1-2 ft. high: lvs. very obtuse, obscurely 3-nerved at the base, thick, rigid, pale green, with a yellowish greenish wash. Styles and stamens 5-8 

SACCOLOBIUM (name referring to the saccale labelum). Orchidaceae. Epiphytic herbs with erect leafy (or rarely creeping) stems, usually with a heavy node at the apex; lvs. distichous, leathery and fleshy, usually channelled; iodophores lateral, in the cultivated species a long, densely-fld. cylindrical raceme; fls. medium or

F. W. BARCLAY.
SACCOLABIUM

small; sepals subequal, free, spreading, the lateral pair not decurrent on the base of the column; petals similar, sometimes wider; labellum united with the base of the column, spurred, the mouth of the spur open; petals orange, with a paler spur; petals oblong; petals oval. Suada Islands.

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochlin China, Java, and Manila. They are closely allied to the genera Acrorides, Phaleniopsis and Vanda, and require somewhat similar treatment, but do not always acclimatize themselves as readily to artificial cultivation unless given a location with more or less natural surroundings, though some of the more free-growing species, like N. ampalacum, N. curvifolium, N. cireostes and S. Hendersonianum, can usually be grown successfully in the Cattleya or Cyprpidium department. The large-growing species with thick, succulent leaves require a warm, moist atmosphere where the winter temperature can be retained at 63° to 70° F. by night and about 73° during the day, and in the summer or growing season 10 degrees in advance of this.

All succeed best when suspended from the roof in pans, baskets or on blocks where they can have free circulation of air about them at all times, receive indirect benefit of the sun’s influence, which will harden their tissue, and where the compost may readily and freely dry out, during the resting period especially. Grown otherwise the more succulent species, such as S. giganteum (a Vanda), make soft, weak tissue, which is susceptible to wet spot, a usually fatal disease. Clean, chopped sphagnum, freely interspersed with broken pieces of charcoal, is the most satisfactory growing material, and this should not be pressed in so firmly as to entirely exclude access of air to the roots, but the plants must always be firmly secured with pieces of charcoal, peat moss or other similar material, or securely fastened with copper wire to keep them in position, otherwise being more or less top-heavy they are liable to work loose, under which conditions they cannot become properly established.

Shading should be applied to the glass from February until November to break the sun’s direct rays, but during the balance of the year when the solar light is weak its direct influence will be found beneficial. In bright weather during the growing season the plants need a liberal supply of water, both at the roots and over the foliage, but during the resting period and in wet, inclement weather, water and syringing must be carefully and sparingly administered. Judgment in this respect is very essential to the successful culture of these plants. The supply of Saccoblamium is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis.

ROBERT M. GREY.

A. Fls. rose-colored.

Hendersonianum, Reichb. f. Dwarf: lvs. 4-6 in. long, strap-shaped, subacute, distichous on the stems, but spreading in various directions: racemes minute, about as long as the lvs.: fls. forming a cylindrical mass, bright rose, 3/8 in. across; dorsal sepal orbicular, con- cave, lateral ones lanceolate; petals ovate-oblong; petals obo- vate: labellum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B.M. 6222.

ampullaceum, Lindl. Fig. 2225. Dwarf: stem 6-8 in. high, with 2 rows of lvs.: lvs. strap-shaped, channeled, apex truncate and dentate; racemes nearly erect, 4-6 in. high: fls. deep rose color; sepals and petals ovate, veined, spreading out flat; labellum linear-falcate, one-half as long as the petals; spur slender, straight. May, June, N. India. B.M. 5395. J.H. III. 32. Var. Moulinienses, Hort., is a geographical variety with stronger growth and larger fls.

AA. Fls. orange or scarlet-orange.


cerium, Reichb. f. Stem short, thick: lvs. strap-shaped, obtusely 2-lobed; racemes dense, half drooping: fls. orange, with a paler spur; petals oblong; petals ovate. Suada Islands.


2225. Saccoblamium ampullaceum (X 3/4).

var. Hendersonianum.—S. illustre, Hort., probably—Vanda densiflora, var. illustre.—S. pavonius, Lindl.—Rhynchostylis retusa.—S. retusa, Vogn.—Rhynchostylis retusa.—S. Rhedii, Wight.—Rhynchostylis retusa.—S. violaceum, Reichb. f.—Rhynchostylis violacea.

HEINRICH HASSELBRING.


SACRED BEAN of India. Nelumbo nucifera.

SADDLE TREE. Rare name for Tulip-tree, Liriodendron.

SAFFLOWER. Carthamus.

SAFFRON. Crocus sativus.

SAFFRON, FALSE. Carthamus tinctorius.

SAFFRON, MEADOW. See Calochicum.

SAFFRON THISTLE. Carthamus tinctorius.
SAGE (Salvia officinalis). For at least three centuries this shrubby, fibrous-rooted perennial from southern Europe has been widely cultivated in kitchen gardens for its aromatic, whitish green, wrinkled, oval leaves. These are arranged opposite on ascending or decumbent, pale green, leafy stems which rise 6 to 24 inches in height. In early summer the upper parts of these bear generally blue, though sometimes pink or white flowers, followed by almost black spherical seeds borne in dark purple capsules. The name "Salvia" is derived from *salve*, to save, in reference to the plant's use in ancient medicine; the name sage, from its supposed power to make people wise by strengthening the memory. In medicine it is but little used. In modern practice it is, however, credited with tonic, sudorific, carminative, antihelmintic and stomachic properties, and is frequently used as a gargle for phlegmonous affections of the mouth and pharynx. Its pleasant, though powerful-smelling, bitterish leaves are used for flavoring soups and stews, but mainly for dressings with luscious, strong meats such as pork, goose and duck. Among culinary herbs it ranks first in America, being more widely cultivated than any other except parsley, which is more largely employed for garnishing than as a flavoring agent. When possible the young leaves should be fresh, for unlike carefully cut-off stems, they lose much of their aroma, which is due to a volatile oil and which even with careful curing rapidly dissipates. For best results the shoots should be gathered before flower-stems develop, because they are then rich and supple; and later cuttings may be better for drying upon a commercial scale, since this plan is thought to involve too much labor, the plants are cut in August if seed has been sown early, and the stumps, if not too short, produce again in late autumn; or if grown as a secondary crop, which is the common way, they are cut only once—namely, in autumn. Plants grown from cuttings (see below) will often produce three crops in a season. Small scale market dries are carried by air roasting. For drying, the plants being either laid loosely upon racks or the floor, or hung from the ceiling and walls. Upon a larger scale a fruit evaporator with a steady current of warm air at about 100° F. may be used. After drying, the leaves are rubbed to a powder and stored in air-tight vessels.

Sage does best in an open, sunny aspect and a well-drained, mellow loam of medium texture, rich in humus and free from manure or other fertilizer containing potash, phosphoric acid and nitrogen should be applied before the plowing, if done in the spring. Fall plowing is generally preferred where Sage alone is to occupy the land. In each case plowing should be done a month before the soil will permit. The plowing of the soil must precede, and clean cultivation follow planting, the plants being set in drills at 15 in. apart and 10 in. asunder for manual cultivation or 18-21 in. apart and 10 in. asunder for power cultivation. The former method is, as a rule, more profitable though more laborious. After harvesting (see above) if the bed is to be permanent, northern plantations should be mulched with marsh hay or other material free from weed seeds. For garden practice it is common to divide the clumps biennially, since the plants become straggling if left longer. Upon a commercial scale, however, it is better to rely upon cuttings or seedlings. Propagation may be done by cuttings, by seed, or layers or suckers. Seed, the vitality of which lasts three years, may be drilled thinly in flats in greenhouse, hothed or cold-frame in early spring; or out of doors, as soon as the ground becomes dry enough, in specially prepared beds of fine soil, covering them about 1½ in. deep. In the former case the plants must be pricked out and hardened off to render them stocky and hard before transplanting.better, they should be taken directly to the field. This operation may be performed from late August to late September, or until late July, the plants being not less than 2-3 in. tall. The former method, which is the common commercial practice. Cutting is best done late in the day, after the sun has set, and the shade and moisture are essential to success. Mature wood cuttings, made in early spring, should be ready for the field in less than six weeks; immature, taken from outside shoots just before they would form blossom heads, are left in the cutting bed until the following year. Such plants are usually more prolific than those grown from mature wood or from spring seedlings, and are, therefore, best when Sage alone is to occupy the land. But when it is to be over-planted with vegetable, mature wood cuttings or seedlings will probably be found best, though little or nothing can be cut before September. As practiced by market-gardeners in the vicinity of New York each year, the above methods has its advocates, but practically all agree upon the plowing and harrowing of the ground in June or July after harvesting an early crop, such as beets, cabbage or peas, and plowing broadcasting of all weeds and to keep the surface loose, after which, if well done, but slight hoeing is necessary. In September, when the plants crowd each other, each alternate plant or row of plants is cut for sale and the remainder allowed to fill the space. At the first cutting each plant should make about two marketable bunches; at the second at least three. This practice not only insures plants full of leaves at each cutting but at least double the quantity in the end.

In America the green, broad-leaved varieties are in far greater demand than the colored and the narrow-leaved kinds. A variety known to the writer is Holt Mammoth, which is exceptionally prolific of large leaves. It is said to produce no seed.

SAGE BRUSH. Species of Artemisia.

SAGE, JERUSALEM. See *Phlomis*.

SAGENIA (derivation unknown), *Polyopodiaceae*. A genus of ferns, mostly of large and coarse habit, with superior reniform or heart-shaped indusia fixed by the sinus, as in Dryopteris, but with veins uniting freely to form areoles with free included veinslets. About 25 species, are known, principally from the East Indies, a few from tropical America.

decurrens, Presl. Leaf-stalks narrowly winged from a creeping rootstock; lvs. 2-4 ft. long, 1 ft. or more wide, cut down to a winged rachis and with 4-8 pairs of pinnae 6-12 in. long, 1-2 in. wide; sori large, in two regular rows between the principal veins. India to Polynesia.

L. M. UNDERWOOD.

SAGINA (Latin, fatness; perhaps alluding to the forage value). *Caryophyllaceae*. A genus of about 8 species of annual or perennial tufted herbs, mostly from the temperate regions of the world. Lvs. awl-shaped; fls. small, usually comparatively long-stemmed; sepals 4-5; petals 4-5, entire or slightly margined, minute or minute; stamens 2, oblong in number to the sepals or twice as many: ovary 1-loculed, many-seeded; styles of the same number as the sepals and alternate with them.


F. W. BARCLAY.

SAGITTÁRIA (Sagittta is Latin for arrow). *Asteraceae*. Arrowhead. A small genus of very variable aquatic plants, the number of species depending on the point of view of each author. Nearly or quite 100 specific names occur in the genus, but Micheli, the latest monographer (DC. Suppl. 1706) says there are but 14 species, of which 10 are doubtful. In his monograph of the American forms (6th Rep. Mo. Bot. Gard.) Jared G. Smith admits 21 species. The present ten described are the most common in the United States, rather than from few species. In common with most aquatic plants, they are widely distributed. They occur in many parts of the world, in both temperate and tropical
regions. Most of the species have arrow-shaped leaves, whence the name. They are useful for foliage effects in bogs and shallow ponds, and also for their white buttercup-like flowers, which are borne in successive small whorls on an erect scape. They are mostly used for colonizing in the open, but S. Montevidensis—now the most popular species—is grown in indoor aquaria or for regions.

Plants of mostly erect habit, the lvs. and sepalas arising from more or less tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monocious (staminate fls. usually in the uppermost whorls) or diocious, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small akenes; inflorescence composed of successive whorls of 3-stalked fls. Sometimes the lvs. are floating.

Planted as a perennial in the garden, the lvs. and sepalas arising from more or less tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monocious (staminate fls. usually in the uppermost whorls) or diocious, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small akenes; inflorescence composed of successive whorls of 3-stalked fls. Sometimes the lvs. are floating.

A. Sepals of pistillate fls. (usually in the lower whorls) erect after flowering, and the pedicels of these fls. thick: carpels not glandular.

Montevidensis, Cham. & Schlecht. Giant Arrowhead. Very large, sometimes growing 6 ft. tall, with leaf-blades 1-2 ft. long: lvs. arrow-shaped, with long, diverging, sharp basal lobes: fls. very large (2 to nearly 3 in. across), the rounded petals white with a purplish blotch at the base. From Brazil, Chile and Peru. B.M. 6755. On. 27:473. L.H. 31:543. First known as a cult. plant from seeds sent to England in 1833 from Buenos Ayres by John Ball. It is now a popular plant for aquaria and lily ponds. Tender to frost. It is sparingly naturalized in the southern parts of the U.S., on both the Atlantic and Pacific sides.

AA. Sepals of pistillate fls. reflexed after flowering; pedicels of these fls. slender: carpels somewhat glandular.

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

puhila, Nutt. (S. nutans, in part. S. subabulata, Bueh.). Silently and simple, usually only a few inches high: lvs. linear or narrowly oblanceolate, rigid: fls. few, usually in 1 whorl, white, 1/2-3/4 in. across, the flaments broad. N. Y. to Ala., along the coast. Offered by dealers in native plants.

BB. Bracts 3, at base of the whorls.

c. Lvs. usually distinctly sagittate.

latifolia, Wild. (S. variabilis, Engelm. S. sagittifolia, var. variabilis, Michx.). Fig. 2256. Very variable in stature and shape of lvs., ranging from a few inches to 3-4 ft. tall: lvs. mostly broad-sagittate with long basal lobes, but running into very narrow forms: fls. clear white, about 1 in. across, usually monocious, the flaments slender: akenes winged, with a lateral or oblique beak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants for colonizing in bog gardens and lily ponds.

sagittatofolia, Linn. Old World Arrowhead. Rhizome thick and tuberous, stolon-bearing: lvs. broad and sagittate, very variable in form and size: sepalas erect, simple or branched, overtopping the lvs.: bracts narrow-ovate, free or slightly connate at base, shorter than the pedicels: petals large, white: flaments glabrous: akenes nearly or quite orbicular and in this respect differing from the allied American species. Throughout Europe and Asia. By some authors the American S. latifolia and others are considered to be con-specific. There is a form with double lvs. (var. flore-pleno, Hort. S. Japonica, Hort.). S. Chineseis of most trade lists is apparently one of the many forms of this species. There appears to be another S. Chinensis in the trade, with lanceolate lvs., the botanical position of which is undetermined.

dd. Filaments abruptly broadened, pubescent.

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

SAGO PALM. Consult Cycas.

SAINTPAULIA. See Hypericum; also Symphoricarpus.

SAINTPAULIA. From the discoverer of the plant, Baron Walter von Saint Paul, Gesneriaceae. Usambara Violet. A monotypic genus from eastern tropical Africa, where it was found growing in wooded places in fissures of limestone and granite rocks, in rich, light soil. It is a stemless hairy perennial, with bright-petioled ovate or oblong-cordate lvs. 1-2 in. long and nodding blue fls. 1 in. across, borne in stout peduncled
The plants especially to be mentioned in this category are Swiss chard, beet tops, spinach, kale, endive, and mustard. Many other plants find occasional or local favor. See Greens.

The only general cultural directions which can be given by sald plants are that blanching is often desirable and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm, light soil, in the best mechanical condition, is necessary for the same reasons.

F. A. Watch.

SALICORNIA (Latin, salt and horn; saline plants with horn-like branches). Chenopodiaceae, Glasswort. Marsh Samphire. A genus of about 8 widely scattered species of leafless seashore herbs, hardy or tender, annual or perennial. This and other chenopods which grow in large quantities in the Mediterranean region were formerly used in making soap and glass, as they yield a large percentage of soda. The ashes of such plants were known to the trade as barilla. The species have probably never been in cultivation and have no horticultural interest.

SALISBURY. See Ginkgo.

SALIX (ancient Latin name of widow). Salicaceae. Willow. A genus of trees and shrubs characterized by simple lvs.; bids with a single bud-scale; lvs. in lax clusters; catkins (male catkins) included in the bud-scale; flowers (female catkins) separate, not joined; pistilate fls. on short, simple or branched pedicels, or on pedicels which increase in length as the flowers open; petals 0; 2, anthers and filaments united; style various; stigma purple; seeds many, very minute. One of the choicest of blue winter-flowering plants. First bloomed in cult. in 1893.

2227. Saintpaulia ionantha (X 5/4). A young plant just coming into bloom.


-Of its propagator and culture G. W. Oliver says: "The end of March is a good time to propagate, when the ripened leaves should be cut off with an inch of the stalk attached, and inserted in the sand bed, covering only a small part of the leaf-blade. The sand should not be kept too wet during the process of rooting. Their propagation from seed and general culture is similar to that of Gloxinia. The plants may be flowered the entire year or given a period of rest by partly withholding water."

F. W. Barclay.

SALAD PLANTS. The principal salad plant in America is the lettuce, which is used exclusively, but not always expertly, for salads. For full directions for growing lettuce in the garden and under glass, see Lettuce. Next to lettuce the best known salad plant in this country is probably endive, which is excellent, especially when well-blanced plants are to be had in the winter. Chicory is much like endive, as regards its treatment either in the garden or in the salad dish. Like endive, it is frequently seen in the larger city markets. The common dandelion should be mentioned in this category. When forced and blanched it makes a salad fit for the most cultivated epicure. For ordinary home cultivation and use, however, the common garden cress (Lepidium sativum, not water cress, nor upland cress) ranks next to lettuce in value. Its rapid growth and high flavor equally recommend it. This plant is said to be a great favorite in English gardens and forcing houses, where it is grown in mixture with white mustard and is pulled very young and eaten roots and all. Corn salad is another plant sometimes grown in gardens and used for salad-making. It is most acceptable to those who do not relish the pungency of mustard and cress. Cives is used by many people as an ingredient of lettuce and other salads; also young onions. Many other plants are used in various places and by various persons for salads. Besides the salad plants proper, many vegetables are used in a cooked or raw condition for salads. Such are cabbage, cauliflower, brussels sprouts, potatoes, lima beans, beets, Jerusalem artichoke, etc. With salad plants may also be included pot-herbs, or "greens."

2228. Staminate catkin of Salix discolor. Natural size.

2229. Pistillate catkin of Salix discolor. Natural size.

is an adaptation to facilitate naturally the distribution of the species. Certain it is that twigs broken from the tree by the wind are carried down streams and, being anchored in the muddy banks, grow there. It is one of the most aggressive trees in occupying such places.
The genus is represented by species in both continents. It is, however, much more abundant in north temperate regions than in south. The arctic regions are several species. *Salix arctica* and several allied species are among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of northern temperate, tropical and southern temperate zones are large trees. The arborescent species all form wood very rapidly. Specimens of White Willow which may not be of great age look venerable from their great thickness. The wood is light in weight and color, finely and evenly porous. The wood has been extensively used in the manufacture of gunpowder. It has also been used for many other purposes. Certain species have for many years been extensively cultivated in Europe for materials with which to manufacture baskets. *S. viminalis* appears to be the favorite species for this purpose. Basket Willow is now extensively cultivated in central New York, and considerable manufacturing of this material is done there.

As ornamental trees the Willows present little variety. The bright yellow catkins of some species are attractive in spring. They are considerably used as "nurse trees" for slower growing trees that require partial shade while young. The red and yellow branches of certain Willows are very bright and cheery in winter. The weeping forms are very popular, but they are often planted with little sense of fitness. The cultural remarks under *Populus* will apply to Willows.

Willows are rarely propagated from seed. The seeds are very small and contain a green and short-lived embryo. A very short exposure of the seeds to the air will so dry them out that they will not germinate. The safest way to secure seedlings is to plant the seeds as soon as the capsule opens. Many hybrids have been described based on specimens found in nature that presented characters intermediate between recognized species. Artificial hybrids have also been made between many species. The dioecious habit of the species seems to facilitate cross-pollination, and it seems probable that the intermediate forms so frequently met with and designated in the monographs as varieties are natural hybrids. Upwards of one hundred hybrid Willows have been described as growing in Europe. Although as many or even more species occur in America, fewer hybrids have been detected here. The hybrids described as growing in America are for the most part between native species and those introduced from Europe.

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A. Scales of ament green, deciduous.
B. Stamens more than 5.
C. Buds small.

| B. Buds large: tvs. very shiny above | 1. nigra | 2. amygdaloides | 3. lucida | 4. pentandra |
### 1. nigra, Marshall. **Black Willow.** Fig. 2233. Tree, 30-40 ft. high; bark flaky, often becoming shaggy: twigs brittle at base; buds small; lvs. lanceolate, green, both sides finely and evenly serrate; amans loose, f. long; scales oblong, deciduous; stamens 3-6: ovary ovate-conical, glabrous; style short but distinct. E. N. Amer. Var. *falcata,* Pursh. Lvs. elongated, narrow and falcatate. Var. *pendula* is cult.

### 2. amygaloideae, Andersson. **Peach-Leaf Willow.** Tree, 30-40 ft. high: bark longitudinally furrowed, less inclined to be flaky; buds broader, glaucous beneath, on rather long, compressed petioles; amans loose, f.: ovary lanceolate-conical; style very short. Central and western N. Amer.

### 3. lutea, Muhl. **Shrub or low, bushy tree,** 6-15 ft. high: branches yellowish brown and highly polished: buds large; lvs. smooth, rather large and recurved at the apex: lvs. large, broadly lanceolate-acuminate, serrate, dark green, shining above: amans large, appearing with the lvs.; scale pale green, deciduous; stamens 4-5: ovary pedicellate, rather ovoid, glabrous. E. N. Amer. — A beautiful plant, deserving of more extensive cultivation.

### 4. pentandra, Linn. (S. laevifolia, Hort.). **BAY-LEAF or LAUREL-LEAF Willow.** Shrub or small tree, 8-20 ft. high; branches chestnut color: lvs. large, elliptic to broadly oblong-acuminate, acuminate, shining and dark green above, paler beneath; amans appearing after many of the lvs. are fully developed, not conspicuous. Europe and Asia.

### 5. frigilis, Linn. (S. viridis, Fries. S. Roselliana, Sm.). **Brittle Willow.** Fig. 2233. Tree, 50-60 ft. high, excurrent in habit and of very rapid growth; branches brown, obliquely ascending: buds medium size, pointed; lvs. large, lanceolate, acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glabrous serrate; amans appearing with the lvs. (the same is rare in America), seldom bearing good seed, slender; scales deciduous. Eu., N. Asia. Gm. 19, p. 517; 55, p. 89.—Frequently cultivated and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hedges of this Willow some fifty years ago. Many of these occur now throughout the country, the trees being 40-50 feet high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. decipiens Hoffm. Twigs yellow; buds black in winter: lvs. smaller and brighter green. Probably a hybrid with another species.

### 6. alba, Linn. **White Willow.** Fig. 2234; also 2230-2. Large tree, with short and thick trunk, not excurrent habit; branches yellowish brown: lvs. ash gray and silky throughout, giving a white appearance to the whole tree, 2-4 in. long, elliptical. Eu. Gm. 55, p. 87.—Hereofore associated with the next species, from which it differs in color of twigs and venature and color of lvs., as also in its general habit. It is only occasionally seen in America and has been known as *S. alba,* var. argentea, S. splendens, Bray, and *S. regalis,* Hort. These forms, not easily distinguishable from one another, may be readily distinguished from the following species.

### 7. vitellina, Linn. (S. blenda, Anders.). **Yellow Willow.** Becoming a very large and venerable appearing tree, the rather short trunk often 4 ft. or more in diam. It is often pollarded. — The color is dilute greenish and rounded in outline. Branches yellow: lvs. silvery-hairy when young, glabrous when mature, glaucous beneath, the whiteness intensified after growth. Amants appearing with the leaves. Abundant in E. N. Amer. Mn. 8, p. 25 (erroneously as *S. alba*).—Displaying many variations, the most obvious of which are: Var. *aurea,* Salisb. (var. anurantha, Hort.), branches golden yellow, especially just before the leaves appear in spring. Var. *Britzensis,* Hort., bark red. These as well as other choice varieties are certified. Var. *pendula* in Gm. 55, p. 15 cult.

### 8. Babylonica, Linn. (S. pendula, Moench.). **NAPOLEON’S Willow.** Fig. 2234. A tree of weeping habit, 30-40 ft. high, with long, slender, olive-green branches: buds small, acute: lvs. 2-6 in. long, attenuate at base and apex: amans appearing with the lvs., slender, the pistillate green: capsule small, 1 in. long, Caucasus. Gm. 1, p. 571; 34, p. 557; 39, p. 72; 55, p. 92. S. H. 1:361.—Long known in cultivation and often grown in cemeteries. Several forms recognized, some of which may be hybrids: Var. *aurea,* Hort., branches golden yellow. Var. *annularis,* Forbes, lvs. twisted back to form a sort of ring. Var. *dolorosa,* Row. **WISCONSIN WEEPING Willow.** Lvs. glaucous beneath; hardy farther north. Var. *Salamonii,* Hort., more vigorous and upright in habit, a form originating in France. Gm. 55, p. 19. S. H. 2:237. & *Salomonii* of one catalogue is perhaps an error for this. Var. *Japonica,* Thunb., lvs. more decidely toothed; amans longer and looser.

### 9. elegansissima, Koch. **THURLOW’S WEEPING Willow.** Tree with more spreading habit and larger crown than *S. Babylonica:* branches long and pendent, yellowish green, sometimes blotched with brown; appears to be more hardy than *S. Babylonica.* Japan. Gm. 55, p. 24. S. H. 2:363. *R. Stibaldii,* Hort., is this species or is closely related.

### 10. interior, Rowlee (S. rubra, Rich., not Huds. S. longifolia, Muhl., not Lam. S. flavilllis, Sargent and other recent authors in part). Fig. 2244. Varying in its nature, from a large shrub to a small tree, usually growing along streams and lake shores: twigs smooth and brown to densely tomentose and gray: buds large, brown, and rounded apex, very small: lvs. nearly or quite smooth, sparsely cuneate to extremely cuneate, sessile, linear-elliptical, remotely dentate, the teeth narrow, sometimes cuneate to obtuse, often spinescent, car-shaped, obscurely denticulate, deciduous: amans of
late spring on short lateral peduncles, which bear 4-6 is., those borne later in the season on much longer leafy branches, very loosely fil.; Ivs. fascicled in clusters of 3-5 on the axis, a distinct interval between the fascicled, first appearing in May and often bearing a second set of amts. in early summer; scales usually glans or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous after flowering: filaments crisp hairy below, smooth above: capsules sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity: stigmas short, sessile. Central N. America.—The pistillate amts. in anthesis, becomes more so as the capsules mature, and by this character branches: leaves ca. 3-5 in. long, 1-3 in. wide, round or subcordate at base, rugose, very variable: amts. appearing before the Ivs., large and showy, especially the staminate ones. Eu. & Asia.—The typical form often occurs in yards where it sprouts from the stock upon which the more popular but scarcely more ornamental variety, pendula, has been grafted. Var. pendula, Hort. Kilmarnock Willow, green and shining, confused below on stock about 4 ft. high, and forming a weeping shrub. Often planted in yards, S. multioris is supposed to be a hybrid, and probably belongs with S. Caprea. S. Caprea var. tricolor, Hort., is said by W. F. Kelsey to be a round-headed tree, with “tricolored foliage.” S. palmatia, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green Is., and reddish purple young wood.

13. Caprea, Linn. GOAT WILLOW. Fig. 2555. A small tree, 12-25 ft. high, with upright branches; leaves ca. 3-5 in. long, 1-3 in. wide, round or subcordate at base, rugose, very variable: amts. appearing before the Ivs., large and showy, especially the staminate ones. Eu. & Asia.—The typical form often occurs in yards where it sprouts from the stock upon which the more popular but scarcely more ornamental variety, pendula, has been grafted. Var. pendula, Hort. Kilmarnock Willow, green and shining, confused below on stock about 4 ft. high, and forming a weeping shrub. Often planted in yards, S. multioris is supposed to be a hybrid, and probably belongs with S. Caprea. S. Caprea var. tricolor, Hort., is said by W. F. Kelsey to be a round-headed tree, with “tricolored foliage.” S. palmatia, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green Is., and reddish purple young wood.

14. Debibiana, Sarg. (S. rostrata, Rich.), Fig. 2324. A small tree, 10-20 ft. high, with short but distinct trunk: buds of medium size, conic, brown: Ivs. dull green and downy above, prominently veined and hairy beneath: amts. appearing with the Ivs., the staminate beautiful golden when in flower; scales narrow and shorter than the pedicels; capsules long rostrate. E. N. Amer.—Prefers dry soil and can be used to good advantage against walls and in rockeries.

15. humila, Marsh. PRAIRIE WILLOW. A shrub, 3-8 ft. high, varying much in stature, and in size of the amts. on the stem so as easily be distinguished from related species.

16. tristis, Ait. DWARF WILLOW. Fig. 2224. A diffuse shrub, 1-1½ ft., with long deep-set root: branches gray, slender: Ivs. small, 1 in. long, linear-lanceolate, very short-petioled: amts. more or less revolute: Ivs. densely and many-fl. E. N. Amer.—Grows in driest situations.

17. sericea, Marsh. SILKY WILLOW. A shrub usually 4-8 ft. high, diffusely spreading from base; branches often reddish: buds obtuse and rounded at apex, or very silky beneath, sometimes becoming less so at maturity: amts. densely fla., appearing with the Ivs.: Ivs. often orange-red; capsules short-peduncled, oblanceolate, rarely truncate at apex. Northeastern N. Amer.

18. petiolaris, Sm., not Hort. Fig. 2233. A low shrub, 3-5 ft. high; branches slender, the whole plant much slenderer than S. sericea, with which it so frequently grows: buds smaller and more pointed: Ivs. only slightly silky when young, soon glabrous, more evidently toothed: amts. rather loosely fla.: capsules rostrate and pointed, distinctly pedicelled. Central and northeastern N. Amer.—S. petiolaris of the trade is S. incana.

19. viminalis, Linn. OSIER WILLOW. A shrub or small tree 2-10 ft. high; branches slender and straight: Ivs. linear-lanceolate, beautifully silvery, 4-10 in. long; margins revolute, entire: amts. appearing before the Ivs., golden yellow. Eu. & Asia.—Most often seen in plantations for basket material, for the production of which the plants are cut near the ground every year. Willow culture in experienced hands is often profitable. (For details, see Osier or Osier Culture, Baill. 1879.) This species does not thrive in this country as well as in Europe.

20. casandra, Fluegee. HOARY WILLOW. Fig. 2233. A shrub, 2-5 ft. high; young branches hoary, becoming smooth and red with age; buds reddish, rounded at the apex: Ivs. lanceolate or linear-lanceolate, 2-4 in. long, dark brown, in clusters of 3-5, crowded above, confused below with dense whiteomentum, revolute: amts. sessile, appearing before the Ivs.; staminate of red-brown capsule densely white woolly, with red style and stigmas. N. Amer.—This species hybridizes freely with S. cordata, and several natural hybrids have been described.

21. myrtilloides, Linn. Fig. 2233. A shrub, 2-5 ft. high, with rather slender brown twigs: Ivs. along the woolly-corylated capsule, distinctly pubescent at both ends, entire and smooth, revolute and veined: amts. rather few-fl.: capsules red, glabrous, N. E. Amer. and Eu. Usually grows in cold peat bogs.—Probably not in cult. The plant sold under this name is probably some form of S. purpurea, which S. myrtilloides closely resembles in general appearance.
22. cordata, Muhl. (S. rigida, Muhl.). HEART-LEAVED WILLOW. Fig. 2236. A large shrub or small tree, 10-30 ft. high: branches stout; buds large, flattened against the branch; lvs. oblong-lanceolate, green on both sides, finely serrate, glabrous and rather rigid at maturity; aments rather slender, appearing in N. the lvs.: capsules glabrous, greenish or brownish. N.

Amer.—This is a variable species and undoubtedly some of the forms included in it are hybrids; several supposed natural hybrids have been described. Var. pendula, Hord., is a deciduous form.

23. irrorata, Anders. COLORADO WILLOW. A dense diffuse shrub, 8-12 ft. high: branches stout, covered with a white bloom; buds large; lvs. linear-lanceolate, 3-4 in. long, ½ in. wide, green above, glaucous beneath, undulate serrate: aments all appearing before the lvs., sessile, very densely ftd.; stamine golden yellow: capsule glabrous, nearly sessile. Rocky Mts.

24. incana, Schr. (S. petiolata and S. rosmarinifolia of Amer. gardeners, but not of botanists). Shrub or small round-topped tree, with long, slender branches: lvs. linear, revolute, 2-5 in. long, very narrow, green above, white-filamented beneath: aments long and slender, appearing with the lvs.: capsule glabrous: filaments of stamens more or less connate. En.—This species is gathered upon hardy stock (S. Caprea) when sold from nurseries.

25. purpurea, Linn. (S. Forbyana, Sm. Vétfris pur- vurea, Rafin.). PURPLE OSM. Fig. 2233. A shrub or small tree, spreading at base, with long, flexible branches: lvs. oblong-lanceolate serrulate, glabrous, veiny, 3-6 in. long, often appearing opposite: aments sessile, slender; pistillate recurved; seeds purple: stamen one: capsules small, ovate. En.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket Willow. Var. pendula. Branches pendent. Grg. 4:243.

26. Sitchenis, Sans. SITKA WILLOW. A shrub, 10-12 ft. high and more: lvs. obovate, glabrous, clothed beneath with silky hairs which have a beautiful satiny luster: aments appearing with lvs., long, cylindrical and graceful, also satiny. This Willow, which, so far as the writer knows, has not been used as an ornamental plant, is one that would be at once novel and beautiful.—The characteristic luster of the leaves is preserved in plants in cultivation. N.W. N. Amer.

W. W. ROWLEE.

SALLOW. Salix Caprea.

SALMON BERRY. Rubus spectabilis. See also Alaska.

SALPICHIROMA (Greek, tube and skin; in reference to the form and texture of the flower). Syn. Salpicichroma, Solaenaceae. About 16 species. Natives of extra-tropical regions, mostly American herbs or shrubs. Lvs. often small, entire, long-petioled: fls. white or yellow, 2-3 in. long (section Eusalpichroma) or only about ½ in. long (section Perizoma): calyx tubular or short, 5-cleft or parted, the lobes linear; corolla tubular or broad-shaped, without a crown in the throat; lobes 5, acute, often short, induplicate-valvate: berry ovoid or oblong, 2-celled; seeds numerous, compressed.

Krelage says of the species described below: "This plant is neither beautiful nor interesting, but it has the advantage of being an exceedingly rapid climber, covering walls with in one season with a thick mass of foliage." Francisci says the small white berries are sold everywhere in Paraguay as "cock's eggs."

rhomboides, Miers (Salpicichroma rhomboides, Miers). A half-hardy climber, mellow woody, with green, flexuous branches: lvs. ovate-rhomboid: fls. small, usually less than ½ in. long, solitary, nodding, white: corolla short, contracted at the middle and at the throat, and bearing on the inside a fleshy, woolly ring; berry ovate-oblong, yellowish or white, edible, but of poor flavor. Argentine Republic. G.C. III. 24:150. R.H. 1897, 251. Gnr. 35, p. 367. —The plant appears to be offered as Withania argentinofolia. Cult. in S. California.

F. W. BARCLAY.

SALPINGIÓSIS. See Salpinchiroma.

SALPINGÓSISOIS (Greek, tube and tongue; alluding to the form of the corolla and the appearance of the style). Solenaceae. A genus of possibly 2 or 3 species of annual or biennial plants, natives of Chile. The only species in cult. is S. sinuata, which was formerly divided into about 6 species mainly on the color of the flowers. S. sinuata has greatly improved in size of flowers and range of color until it is at the present time amongst our very finest half-hardy annuals. Plants about 18 in. high, covered with short glandular hairs. Lvs. entire, wavy-margined, dentate or pinnatifid: fls.
beautifully marbled and penciled with several colors. Calyx tubular, 5-leaf: corolla funnelliform, widely bell shaped at the throat; lobes 5, plicate, emarginate; stamens 4, didynamous: capsule oblong or ovoid; valves 2-leaf.

The varieties of Salpiglossis require the general treatment given half-hardy annuals. They prefer a deep, light rich soil not given to sudden extremes of moisture and dryness. The seeds may be sown indoors by the middle of March, or later, or may be sown outdoors in early spring. Care must be taken that the early sown plants do not become stunted before being planted out. They bloom for several weeks in late summer to early fall. The flowers are useful for cutting and last well in water. The plant is also excellent as a greenhouse annual for late winter bloom. Seeds for this purpose may be sown in late summer.


SALPINGA (Salpinx, trumpet; referring to the shape of the calyx). Melastomaceae. Here belongs the dwarf stove foliage plant known to the trade as Bertolonia margaritacea. The lvs. are large, heart-shaped, metallic green above, with lines of small white dots running from the base to the apex as do also the 5 prominent ribs; the lower surface is a dull but rich ericinum. For culture, and botany of allied genera, see Bertolonia. Fls. 5-merous: calyx tube 10-ribbed, limb with 5 obscure or elongated lobes; stamens 10, opening by a single pore at the apex.


W. M.

SALSAFY is the spelling preferred in England; Salsify in America.

SALSIY (formerly sometimes spelled salsaty) is Tragopogon porrifolius, one of the composite. Fig. 2239. It is a garden esculent, being grown for the fleshy root. This root has the flavor of oysters, hence the plant is sometimes called Vegetable Oyster and Oyster Plant. Salsify is perfectly hardy. The seeds (which are really fruits) are sown in early spring, about as soon as the soil can be prepared, in drills where the plants are to stand. The drills may be 2-3 ft. apart, if tilled by light horse tools, or half that distance if tilled only by hand. In the rows, the plants are thinned to 1-2 in. and sown the entire season, in the North, in which to grow. The roots may be allowed to remain in the ground until spring, for freezing does not harm them. In fact, they are usually better for being left in the ground, because they do not shrivel and become tough as they often do in storage. If they are kept cool and moist in storage, however, the quality is as good as when the roots remain in the ground. At least a part of the crop should be stored, in order that the table or the market may be supplied during winter and early spring.

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

Black Salsify is Scorzonera; Spanish Salsify is Scolymus.

L. H. B.

SALSOLA KALI, var. Tragus, is the Russian Thistle. Figs. 2244, 2245. Some of the bullworts devoted wholly or largely to this weed are Calif. 127, Col. 28, Iowa 26 and 33, New Mex. 16 Min. 33, Ohio 35, Wis. 57, 39. See also the following publications of U. S. Dept. of Agric.: Farmer's Bulletin 10, Bulletin 15, Div. of Botany, also Essay 8, "Survival of the Unike." In the unoccupied lands of the upper Mississippi valley, the Russian Thistle has covered great areas, and it has spread eastward along the railroads. With good tillage and short rotations of crops, little need be feared from the pest.
SALT-BUSHES


SALT-GRASS. Distichlis.

SALT TREE. Halimodendron argenteum.

SALVIA (Latin, to keep safe or healthy; referring to the medicinal properties of the common Sage). Labiatae. A genus of about 650 species of herbs, subshrubs and shrubs, hardy and tender, including Sage, Clary, Scarlet Salvia and many other interesting plants. Salvia is by far the largest of the 136 genera of Labiates described by Bentham and Hooker, and is characterized by peculiarities of the stamens that are connected with the cross-pollination of the fls, by insects. It has been well established that the structure of the flower in Salvia is as complicated and specialized as in any orchid. Some idea of this structure may be gained from Fig. 2241. The bodies shown at 1 and 2 are the two ferital anthers, or rather anther cells. The points 3 and 4 indicate places where other anther cells may be expected. In some species of Salvia the points 3 and 4 are occupied by pollen-bearing anther cells; in others by sterile cells. The body connecting 1 and 4 is not the filament, but the "connective," the filament being the smaller body which joins the connective to the corolla. The extraordinary length of the connective is one of the main generic characters of Salvia. In ordinary flowers the connective is a mere thread, a linear extension of the filament, and rarely separates the two anther cells. In Salvia the anther cells are forced apart to an exceptional distance, and in many cases 2 of the cells are obliterated and devoid of pollen.

Within the generic limits of Salvia the variation is astonishing. The color of the fls, ranges from scarlet through purple and violet to azure-blue, white and even pale yellow, but there seems to be no good pure yellow. Fig. 2243 indicates something of the range in form of corolla and calyx. Some flowers gape wide open, others are nearly tubular. In some the upper lip is longer than the lower, in light-colored cases the lower lip is longer than the upper. The lower lip is always 3-lobed, but frequently it does not appear to be so, for the lateral lobes are much reduced while the midlobe is greatly enlarged, often deep purple, and becomes the showy part of the flower. The calyx is small and green in some, large, colored and showy in others. In many cases, as S. leucantha, the corolla and calyx are of different colors. The bracts range from minute and deciduous to a larger size and more attractive color than the fls. There are usually about 6 fls. in a whorl, sometimes 2, sometimes many. In spite of these and many other wide variations, few attempts have been made to split up Salvia into many genera, presumably from the feeling that the structure of the stamens makes the Salvia a natural, not an artificial group.

Three Salvia are cultivated for their leaves, which are used in seasoning and also in medicine. These are the Common Sage, S. officinalis; Clary, S. sclarea; and S. horminum. For the commercial cultivation of Sage, see Sage.

Clary (S. sclarea) and its near relative, Salvia horminum, are used as herbs and as a source of essential oil for culinary and medicinal use, and for ornament, but their ornamental value lies not in the fls, (which are usually insignificant) but in the colored bracts or floral lvs. at the tops of the branches. The various varieties, varieties Clary, Red-top Clary or White-top Clary; also Red Sage and Purple Sage. The two species (S. sclarea and H. horminum) seem to be much confused in our catalogs, but the plants may be separated by the following characters: the upper lip of the corolla is united in S. sclarea, and truncate in H. horminum; the upper lip of the corolla is sickle-shaped and compressed in Salvia, but straightish and conic in H. horminum. According to De Candolle, the species S. sclarea is distinguished by the purple or bluish flowers, and showy floral leaves. It is to be inferred from Voss' treatment of the two species (in Vilmarin's Blumen-gärtnerle) that S. horminum is the species chiefly grown for flowers, and S. sclarea for leaves, though S. horminum should be restricted to S. sclarea. There is another odd feature about the floral leaves of both species. The red, white or purple tops seem to be composed of sterile lvs., i.e., they do not indorse any whorls of flowers, while the large bracts under the whorls of flowers are green. However, De Candolle refers to S. sclarea two pictures in B.M. and B.R. where the situation is reversed, i.e., the showy colored parts are the bracts under the whorls of flowers, and the flowers on top of the flowers. Moreover, the flowers in the cases just cited are anything but insignificant, being fully an inch long.

Among the Salviae cultivated for ornament there are two large cultural groups, the hardy and the tender. The hardy species are mostly border plants, blooming in spring and early summer. The tender species are generally used for summer bedding, sometimes for conservatory decoration in winter. Many of them bloom in summer and late fall, especially when they are treated as half-hardy annuals.

As regards color of flowers there are also two important groups, the scarlet-flowered, and the kinds with blue, purple, violet, white or variegated flowers. Of the scarlet kinds S. splendens is the most called for; of the blue-flowered kinds, S. patens is the most popular of the hardy class. S. patens probably has the largest fls. of any of the blue-flowered kinds in cultivation.

The most widely used of all Salviae cultivated for ornament is Salvia splendens, or Scarlet Sage. This is one of the most brilliant red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places. It is easily raised from seed sown in a cold frame in a dark background of some kind by way of contrast. A well-managed mass of Scarlet Sage may be maintained in full splendor from the middle of July to frost. Good culture consists in a liberal supply of water, and in cutting off the buds just as they appear, to prevent branching, and troublesome to keep cuttings or plants over winter, as they are particularly liable to attacks of aphids and red spider. It is, therefore, important to get seed of an early-blooming variety of compact habit, and to sow the seed early indoors or in a frame in time to get good plants to set outdoors in May. A good race is over a foot long, with 30 or more fls. in a raceme, and 2-6 fls. in a whorl, each flower being 2 in. or more long. Some varieties have crenate margins, others pinnate, and there are white varieties, together with some intermediate colors. A poorly managed bed of Scarlet Sage gives a few flowers in September and is cut off in a short time by frost. Wet seasons delay the bloom, and if the soil is too rich in nitrogen the plants will make too much growth and the fls. will be late and relatively few. The same principles of cultivation apply to other tender Salvia used for bedding. Florists sometimes lift a few plants of Scarlet Sage before frost, pot them and find that they make attractive plants under glass for a month or two. One advantage that Salvia splendens has over many other red-fl. Salvias is that it need not be cut back after the first leaves and flowers. Special attention is called to the supplementary list, nearly every species of which is distinct at first sight and seems worthy of cultivation. There are many species of bright red interest, distinguished from the others, but not difficult, in America. The following are amongst the most desirable and are described in the supplementary list.
SALVIA

S. Boliviana, conovertillora, elegans, gesnerafolia, leon-uroides, rubescens, strictillorin.

Salvia was monographed in 1848 by Bentham in DC. Prod. vol. 12, and an index to the 401 species therein described is found in Buck's "Tiers, Species et Synonyma," etc., pars iii. In 1870, Hemslcy gave an account The Garden (9:430-434) of 65 species which had been in cultivation up to that time. See also "A Synopsis of the Mexican and Central American Species of Salvia," by M. L. Fernand (Proc. Am. Acad. Arts Sci., vol. 35, 1900, and Contrib. Gray Herb. Harvard Univ. N. S. No. 19). In the work just cited 209 species are described and there is an elaborate key.

2242. Salvia splendens (X 1/3). No. 2.

SUMMARY OF SUBGENERA AND SECTIONS.

SUBGENUS I. SALVIA PROPER. Corolla with a hairy ring inside; anterior portion of the connective directed outwards, bearing an anther cell which is rarely pollen-bearing. All Old World species.

Section 1. Eisaphace. Shrubs or subshrubs, rarely herbs. Teeth of the calyx scarcely enlarged in fruit. posterior lip of the corolla erect, straightish, concave. Includes officinalis.

Section 2. Hymendaphace. Like Section 1, but the lobes of the calyx enlarged in fruit, membraneous and Veiny; posterior lip of the corolla straight in the oriental species, sickle-shaped in the South African. No species cult. in America.

Section 3. Drymaaphace. Herbs, usually tall and glutinous; teeth of calyx scarcely enlarged in fruit; posterior lip of the corolla falcate, compressed. Includes hians.

SUBGENUS II. SCAREA. Corolla with no hairy ring inside; anterior portion of the connective deflexed, abruptly dilated, connected at the calyx extremity. All Old World, herbaceous species.

Section 4. Horminum. Posterior lip of calyx truncate, the teeth small and remote; posterior lip of corolla straight, concave. Includes Horminum.

Section 5. Ethiopis. Posterior lip of calyx 3-toothed; posterior lip of corolla falcate, compressed. Includes argentea and Scarea.

Section 6. Pliothiophace. Calyx ovate (instead of bell-shaped or tubular, as in the preceding sections); posterior lip of calyx concave, 2-grooved, teeth 3, very short and connivent; posterior lip of corolla straight or falcate, concave or compressed. Includes bicolor, pra-tennis and sylvestris.

SUBGENUS III. CALOSPHACE. Corolla with no hairy ring inside but sometimes with 2 teeth near the base; anterior portion of the connective deflexed, connivent, longitudinally connate or closely approximate, often somewhat dilated, rarely bearing an abortive anther cell. All American species.

Section 7. Calosaphace. By far the largest section, characterized as above, and within these limits, immensely variable. Over 250 species, including azurca, cacaiafolia, coccinea, farinacea, fulgens, involucrata, lancealata, leucantha, patens, Seseli and splendens.

SUBGENUS IV. LEONTA. Corolla with a hairy ring inside; anterior portion of connective sometimes directed outwards and bearing either a fertile or sterile anther cell, sometimes deflexed and acute, rarely reduced to a short tooth.

Section 8. Echinaphace. Bracts imbricated, spinescent; posterior lip of calyx 3-toothed; connective bearing a perfect anther cell on the posterior side. Includes carthacea.


Section 11. Notosaphace. Bracts small or minute; posterior lip of corolla entire or with 3 minute connivent teeth. Includes no species cult. in America.

Section 12. Hemiaphace. Bracts small: posterior lip of calyx 3-toothed; connective somewhat continuous with the filament and produced into a very short tooth. Includes verticillata.

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### Key to Species

*(Based on garden characters.)*

| A. Color of corolla vivid red, without a trace of purple. | 1. Greggi
|---|---
| B. Tube of corolla neutral colored; lower lip yellow. | 2. splendens
| BB. Tube of corolla as bright as the lips. | 3. rutilans
| C. Upper lip conspicuously longer than the lower. | 4. fulgens
| D. Base of lip, not cordate. | 5. cocinea
| E. Calyx vivid red. | 6. Remeriana
| EE. Calyx green. | 7. Sesseli
| DD. Base of lip, cordate; bracts usually found at base of whorls. | 8. carduacea
| CC. Upper lip much or little shorter. | 9. Columbiarum
| DD. Upper lip of corolla conspicuously greater than that of calyx. | 10. Hornum

| BB. Calyx without a hairy ring inside. |
| Branches often topped with showy-colored floral lvs. |
| D. Upper lip of calyx 3-lobed; upper lip of corolla laciniate, compressed. | 11. Scalina
| DD. Upper lip of calyx truncate; upper lip of corolla straight, concave. | 12. dryana
| CC. Branches not topped with showy-colored floral lvs. |
| D. Whorls many-flowered. (about 16) | 13. hians
| DD. Whorls about 6-flowered. | 14. farinacea
| EE. Color of calyx purple, of corolla white. | 15. leucantha
| EE. Color of calyx and corolla not as in 1. |
| F. Upper lip of corolla different in color from lower. |
| 1. Bracts ovate-shaped. | 2. argentea
| 2. Bracts ovate or entire. | 3. bicolor
| J. Stem paniculated above. | 4. sylvestris
| Jj. Stem sparingly branched. | 5. capensis
| K. Root often tuberous. | 6. atro-ciliata
| KK. Root not tuberous. | 21. coccinea

### Notes

1. **Greggi**, Gray. Readily distinguished from the common red-flowered kinds by the fact that only the lower lip is showy. This is carmine, and the rest of the corolla dull purplish. The foliage also makes it highly distinct. Though a native of Texas and Mexico it is offered by several dealers in hardy border plants. John Saul considered it "nearly hardy" at Washington, D.C. Shrub, 3 ft. high: lvs. linear-oblong, obtuse, narrowed at base; racemes 2-3 in. long, 6-8-flowered; upper lip short; lower lip with the large middle lobe 2-lobed and 2 small, roundish lateral lobes. B.M. 6825—Section 7.

2. **splendens**, Ker-Gawl. *Scarlet Sage*. Figs. 2241, 2242. The most popular of all red-flowered Salvia. Tender perennial herb from Brazil, 2-3 ft. high, with scarlet fls. 2 in. or more long, borne in terminal pyramidal racemes 6 in. or more long, with 2-6 fls. in a whorl on 30 or more fls., in a raceme. Lvs. ovate, acuminate, serrate; calyx scarlet, large, loose, plaited; corolla tubular; upper lip undivided; lower lip 3-lobed, the lateral lobes much narrower and reflexed. B.R. 8:687.—Var. *Braunii*, Hort., int. before 1880, was an improvement over previous forms in having dwarfer and more compact habit, with brighter and more numerous flowers. G.C. II. 11:783; III. 6:653. Gn. 21:336 (good picture). A.F. 5:331. Other trade names are *var. compacta*, *compacta argentea*, *grandiflora*, *grandiflora argentea*, *grandiflora tricolor*, *grandiflora tricolor pendula*. Also a form with golden foliage is cult. and one or more spotted with yellow. *S. grandiflora* and *ana* are true botanical species which are probably nowhere in cult., and these names in the trade refer to varieties of *S. splendens*. Var. *Soucheti*, Planch. (S. Soucheti, Hort.), introduced about 1856, was considered to differ from the type in having more compact habit and fls. more numerous and erect and more brilliant. F.S. 11:1154. The prevalent idea that this name is referable to S. Rozott is probably due to a hasty reading of F.S. 14, p. 32. A white-flowered form is known to have the type as S. Soucheti alba. For S. Horvayi, consult S. Ianthina. Var. *Issanchou*, Hort., has rose white corolla, calices veined red, and red anthers. I.H. 28:432 (as *S. Brasiliensis*, var. *Issanchou*), where the calyx is bright yellow, striped red. Gn. 21:336. There are about a dozen personal names with these species.

3. **rutilans**, Carr. A plant of unknown habitat which is probably a horticultural form of *S. splendens*, differing in having a small green calyx, whorls nearly always 2-flowered, and inflorescence axillary as well as terminal. Panicles instead of merely racemose. B.R. 16:1225.—The plant figured in G.C. II. 15:117 as *S. rutilans* has an unbranched raceme, with 6-flowered, whorled and small calyx. Offered as late as 1893 by John Saul.

4. **fulgens**, Cav. *Cardinal Salvia*. Mexican Red Salvia. Differ from *S. splendens* in the darker red of the fls., the corolae lvs., and the calyx, which is dull colored and conspicuously striate but hardly "colored"; also the 3 lobes of the lower lip seem to be all about the same size and lying in the same plane instead of having the lateral lobes red. Mexican shrub or herb, 3 ft. high: lvs. ovate, cordate, somewhat acutae, not acuminate. B.R. 16:1225.—This name seems not to be advertised in America to-day, but in 1866 Gray stated that *S. splendens* and *S. fulgens* were the two common red-flowered kinds in cult. Section 7.

5. **cocinea**, Linn. This name is said to be loosely used in trade catalogues for *S. splendens*, and it is doubtful whether the true *S. cocinea* is in cult. Perennial or annual, 3 ft. high: lvs. cordate, fls. sleep-scarlet or less long; calyx slightly reddish, fls. twice as long as upper, the middle lobe very large and 2-lobed. Trop. America; also S. C. to Fls. and Tex. Var. *lactea*, Hort., is advertised. Section 7.

Var. **Pseudo-cocinea**, Gray (S. Pseudo-cocinea, Jacq.), is a tall variety which is hisurate on stem and petioles, instead of glabrate. B.M. 2864.

date: fls. scarlet, 1 in. or more long; calyx purplish or reddish towards tips; lower lip a tripe longer than the upper, the middle lobe large and 2-cleft. Tex., Mex. R. H. 1854:301. B.M. 4393. F.S. 11:1089. — Considered hardly by Thorburn. Section 10

7. Sessel, Benth. (S. Razzii, Scheidw.) Fig. 2243. Remarkable for its large fls. (2 in. long), with boldly deflexed lower lip, which is not 3-lobed but merely 2-cleft and a large lobe on the side for the large, loose calyx; flushed with brick-red towards apex. Mexican subshrub: lvs. ovate, serrate, not cordate. F.S. 14:1407.

8. carduacea, Benth. Fig. 2243. Unique among Salvias for its flower-like foliage and fringed fls. The lvs. and the large conspicuous bracts are very prickly and the lilac-colored fls. much cut, the fringes of the lower lip being more numerous and deeper. Tender perennial from Calif., 1-1 1/2 ft. high. B.M. 5874. C. C. II. 19:56. — Offered by Calif. collectors and lately by eastern seedsmen. Section 8.

9. Columbaria, Benth. A common Californian annual hardly worth cult. for ornament, the blue fls. being about 3/4 in. across and not long as the bracts. Height 9 in.-2 ft.; lvs. few, wrinkled, radical ones long-stalked, oblong, pinnatifid or bipinnatifid; divisions obtuse. B.M. 5555 (fls. lilac). — Offered by Orcutt.

10. officinalis, Linn. SAGE. Wooly white, south European subshrub, varying greatly in breadth and wooliness of lvs.; fls. purple, blue, white, large or small; whorls few, dense, 10-20-fl. — The form commonly cultivated as a kitchen herb is var. tenior, Alef., with blue fls. and lvs. 3-4 times as long as broad. Other forms are: var. albilora, Alef., with white fls. and lvs. 3-4 times as long as broad; var. salicifolia, Alef., with lvs. 4-7 times as long as broad; var. latifolia, Alef., with lvs. twice as long as broad; var. crispa, Alef., with crisped and variegated foliage; var. stellata, Alef., lvs. green and white; var. rcechers, Alef., lvs. green and gold; var. purpurascens, Alef., with somewhat reddish foliage which is said to have the strongest and pleasantest taste, and is preferred in France for kitchen use; var. Milleri, Alef., with lvs. somewhat red and spotted; var. aurea, Hort., with golden yellow foliage and compact habit; var. tricolor, Vilmorin (S. tricolor, Hort., not Linn.), with lvs. of three colors, grey-green, yellowish white and pink, becoming rosy or deep red. Section 1.

11. verticillata, Linn. Perennial herb from southern Europe and western Asia, with lvs. like a dandelion: lvs. lyrate, cordate at base, apical lobe largest, ovate-rotund; whorls globose, 20-40-fl.; fls. blue; corollas twice as long as the calyx. Section 13.


13. blans, Royle. Fig. 2243. Handsome hardy perennial from the Himalayas, with large blue or purple fls. The lower lip often white, prettily speckled with blue or purple; plant villous, 2-3 ft. high; lvs. 3-5 in. long, deltoid-ovate, base truncate or hastate; pedicel 4-5 in. long; raceme 8-12 in. long; fls. 1-1 1/2 in. long; upper lip 2-lobed, lower lip with large obcordate midlobe and broad revolute side lobes. B.M. 6517. B.R. 27:399. R.H. 1845:143. — Section 3.

14. Salvia, Linn. CLARY. Biennial (according to De Candolle); lvs. broadly ovate, cordate at the base, the largest 8-9 in. long, 4-5 in. wide: fls. pale purple or bluish. Discussed above. B.R. 12:1003 (S. Sinuata). B.M. 2290 (as S. bracteata). — Bracts pink: fls. blue, with a white under lip in both plates. Section 5.

15. Horminum, Linn. Annual: lvs. oval-oblong, rounded or wedge-shaped at the base; fls. reddish violet. Discussed above. Voss calls the varieties with colored floral lvs.: var. vulgaris, light violet; violacea (S. Bluebeard, Hort.), light violet-blue; rubra and alba. — Section 4.

16. farinacea, Bent. Figs. 2341, 2445. Charming and popular plant, with violet or purple corollas set off by the light blue mealy calyx. Botanically close to S. azurea but easily distinguished by color of fls. Perennial herb, 2-3 ft. high; lower lvs. ovate-lanceolate, coarsely and irregularly serrate; upper lvs. lanceolate or narrower. R.H. 1873:90. Gn. 9:19; 28, p. 59. — Although native of Texas, it is offered by several dealers in hardy herbaceous perennials. It is also treated as a hardy annual. Section 7.

17. leucantha, Cav. Fig. 2243. Delightful Mexican shrub, with white club-shaped fls. (not widely gaping) set off by purple calyxes. Branches covered with white wool, which is at length deciduous: lvs. lanceolate, serrate; fls. 1 in. long; calyx densely lanate. According to De Candolle the whorls are many-fl., but in B.M. 4318, F.S. 22:2318, and Gn. 21:336, they are mostly 6-fl. — Section 7.

18. argentea, Linn. Biennial, 2-4 ft. high, viscid: lower lvs. 6-8 in. long, oblong, crenate, rugose: inflorescence a panicle 2-2 1/2 ft. long, usually composed of 3 branches: whorls distant, about 6-fl.: fls. white, purplish or reddish above; upper lip or galea much longer than the lower. Mediterranean region. F.C. 3:112. — Seems to be considered a hardy perennial by American seedsmen. It is worth cultivating for the wooly white foliage alone. Section 5.

19. bicolor, Lam. Hardy biennial, spring-blooming plant, with large blue fls., the lower lip white at first, but said to fade quickly to a rusty brown: lvs. all coriace at base and sticky-pubescent; lower ones ovate, incised and dentate; upper ones lanceolate; upper lip of corolla hooded, lower lip 3-lobed. N. Africa, Spain. B.M. 1774. G.M. 40:487. — Section 6.

20. involucrata, Cav. This has just enough purple in its fls. to exclude it from the scarlet-flowered section, but it has a very brilliant color and distinct form of flower. The corolla is swollen in the middle, constricted at the throat and not wide-gaping. The species is also remarkable for the large, showy, rosy purple, deciduous bracts. Lvs. long-stalked, ovate, acuminate, serrate, rounded-wedge-shaped at the base; inflorescence dense. B.M. 2872. B.R. 14:2105. R.H. 1858, p. 239. — Var.
21. *ianthina*, Otto & Dietr. (S. *Hoveyi*, Hort.). Tender herb, doubtless perennial, with the habit of *S. splendens*, but the fls. purple-violet, the calices colored still deeper. Supposed to be native to Mex. or Peru. P.S. 9:384. R.H. 1854:61. — *S. ianthina* is not advertised, but *S. Hoveyi*, said to be a sport from *S. splendens* originating with C. M. Hovey, is probably synonymous with *S. ianthina*. G.C. II. 15:145,—Section 7.


Var. *grandiflora*, Benth. (S. *Pitcheri*, Torr.), which differs in being cinereous-puberulent: inflorescence denser: calyx tomentosum-seriaceous rather than minutely puberulent. This is found from Miss. and Tex. to Kans. and Colo., and in its hardy form is a delightful plant. Here probably belongs *S. Pitcheri*, var. *augustifolia*, once offered by John Saul. G.n. 19:288. G.C. II. 11:653. — According to Woolson the plant usually sent out by nurserymen on both sides of the Atlantic for *S. Pitcheri* is *S. farinacea*. Section 7.

23. *sylvestris*, Linn. Hardy perennial herb, with purple-violet fls.; lower lvs. petioled, upper ones sessile, all oblong-lanceolate, rounded or cordate at base; whorls 6-10-fld.; corollas twice as long as calyx. Eu., N. Asia.—Section 6.

24. *pratensis*, Linn. Fig. 2246 The most popular hardy blue-fld. *Salvia*. Perennial herb, sometimes tuberous-rooted, the lvs. normally blue, with reddish and white varieties. The lvs., especially in the southern varieties, are said to be more or less spotted red: lower lvs. petiolate, oblong-ovate, crenate or incised, coriaceous at base, glabrous above, pubescent beneath along the petioles and nerves; stem-lvs. few, sessile; uppermost lanceolate bracts shorter than the calyx, reflexed, coriaceous-ovate, pubescence about 1 in. long, blue; calyx sticky-villous; corolla twice as long as calyx.—Var. *rubicunda* (S. *rubicundia*, Wender.) is a name which may be used for the reddish-fld. form cult. in America. Var. *alba*, Hort., has white flowers. The following forms are given by Voss, and are probably procurable from Germany: Vars. *atroviolacea*, albiflora, and *variegata*; the last has pale blue fls., with the middle of the lower lip white.

25. *Verbena*, Linn. (S. *Spiliumi*, Wild.). Hardy perennial herb with blue, rarely whitish fls. Here probably belongs *S. splentina* of the American trade, which is presumably an error for *S. Spiliumi*. Lvs. ovate or oblong, lower ones petiolate, narrowed at base, upper ones broader, sessile and coriaceous at base; corolla about half as long again as the calyx. Eu., Orient.

26. *laceolata*, Brousn. A plant has been cultivated under this name in American nurseries, but it is believed to be a hardy perennial, and is probably some common species. The true *S. laceolata* is an annual with blue or purplish flowers about ½ in. long. Prairies, Neb. to Tex., Ariz. and Mex.; also E. Fla.


*S. aemunata*, Ruiz & Pav. Peruvian blue-fld. shrub, the lower lip of *corolla* white toward the base, R.H. 1843:493.—S. *aemunata*, Sims, is a synonym of *S. lamifolia*.—S. *augustifolia*, Cav. Mexican blue-fld. perennial herb, the lower lip longer than the upper and more or less white towards the base. B.R. 15:1534. Section 7.—S. *asperata*, Fafe. Himalayan plant, with yellowish white fls. and very large bracts which are lined with greenish white. B.M. 4851. Section 8.—S. *azurca*, Linn. Very remarkable South African shrub, with large bronzy yellow fls. Lvs. white-woolly, petioled, ovate or roundish; calyx exceptionally large and leafy, bell-shaped and blunt. B.M. 182. G.C. II. 26:745.—S. *Australis*, Linn. A perennial from southeastern Eu., with yellowish fls., the upper lip spotted red. B.R. 13:1009. Section 6.—S. *Boliviana*, Benth. One of the most desirable *Salvias* not cult. in America. It is a splendid red-fld. shrub found in the Bolivian Andes at 12,000 ft., and has a remarkably dense raceme of tubular fls., each 2 in. or more. It is close to *S. rathianus*, but Hooker says, "the panicles of *S. Boliviana* are much denser-flowered, the calices larger, the longer lip, and the corolla twice as long and straighter, with a smaller lower lip." B.M. 6714. F.S. 11:1148. Section 7.—S. *Caudeliflorum*, Boiss., is remarkable from the fact that the fls. are dull and pale except for the large purple underlip. Mexican shrub, found 2,500-
SALVIA

3,000 ft. above sea, B.M. 5917. Gu. 27, p. 113. Section 1.—S. ceratophylla, Linn., is a yellow-flowered, biennial from Asia Minor, resembling white-flowered Salvia, but it has leaves 4 in. long, but they perhaps represent the nearest approach to a good yellow that Salvia affinis, F.C. 1:3, Section 5.—S. echinostachys, DC., has blue-lilacaceous flowers, the lower lip longer than the upper and the fls. marked with white on both lips toward the throat. Also found in Mex. B.M. 898. See Section II—Cinn. Section II—Other rejuvenate the mother, Sambucus. 1609

SAMBUCCUS

B.M. 6980. Section II.—S. Schiniperi, Benth., has white fls., 2 in. long, and is one of the few desirable plants from Abyssinia, but it is a mountain plant, rarely flowering in gardens. Sec- tion 3.—S. strictilora, Hook., is exceptionally interesting by reason of its stiffly erect, tubular fls., the lower lip being not at all reflexed. Red-fl. Perservum, B.M. 3155. Section 7.—S. tauricicilis, Conson & Bal. Morocco subshrub with variegated foliage, and white flowers. Fls. purple, with a yellow stripe on each half of the middle of the lower lip near the throat. B.M. 3901. Grows at 2000 ft., and is tender, probably a species of Sambucus. —S. triolor, Lem., not Hort., has white fls. tipped with purple on the upper lip, and beautifully suffused with red at the apex of the middle of the lower lip. H. & J. 132. F. 8:12-125. W. M.

SALVINIA (Antonio Maria Salvini, 1633-1729, Italian scientist). "Morsitaceae." Salvinia is an interesting plant for the all-aquarium aquarist. It is a floating plant with slender stems bearing 2 ranks of more or less elongating lvs. 4-6 lines or even 1 in. long. The upper surface of the lvs. is covered with papillae or minute warts; the lower is densely matted with brown, pellicular hairs. The plant is supposed to have no root systems. What look like roots are believed to be finely dissected leaves. Many aquatic plants have these two types of foliage, e. g., the Water Buttercup, Houttuynia cordata. Salvinia is a plant of early spring, and lasts into summer, but some persons have lost it over winter by not understanding its habits. It is a yearly and often dies in the winter after ripening a crop of spores. Get a broad pan and let it half fill with water. After the water has cleared place the Salvinia on the surface. In the winter watch for the formation of the spore capsules. These grow in masses near the top of the clusters of root-like leaves. After the plants have formed the spore capsules, they will remain in the soil. The plant often passes the winter in greenhouses in a growing condition, producing no spores.

Salvinia is not a flowering plant. It is a cryptogam, or a plant of two kinds of structure, vegetables and micromycetes. The "spore capsules" mentioned above are technically spore sacs. Of each cluster of sporocarps, 1 or 2 contain 10 or more sesile macrosporangia, each of which contains a solitary macrosphere, the other sporocarps in the cluster contain numerous pedicelled microsporangia, each of which contains numerous microspores. For a fuller and illustrated description see Britton and Brown's Illustrated Flora.

Salvinia is variously estimated to have 1-13 species. Aquatic plants are noted for their wide geographical range. The variations incident to wide range are not considered worthy the plant of species by many botanists. Salvinia natans is closely related to those European and Asian species and possibly the only one. S. Braviliensis is another trade name. Its lvs. are said to have a "dainty hairy surface." W. M.

SAMBUCUS (old Latin name of the Elder, perhaps derived from Greek saambuke, a musical instrument said to be made of Elder wood). Cuprophilaeeae. Elms. About 20 species of trees or shrubs (rarely perennial herbs) with opposite, pinnate lvs., lfts. serrate or laciniated, and numerous small white fls. in compound cymes: fr. a juicy drupe or berry, red, black, white or green. A valuable genus for the planter, of which the golden forms are too much used and the American species, S. Canadensis and pubens, too little. Either massed or single they are very effective. A hint for the effective use of S. Canadensis is pubens, which is much larger in flower and leaf, and more robust. S. pubens grows wild along water courses from natural plantations when the two species are intermingled, the white flowers of the former contrasting strongly with the red fruit of the latter. Readily propagated by cuttings easily rooted in the open ground, and is one of our minor fruit plants. Elderberry vine is a common home product. The Brainard Elderberry introduced in 1890 by Brandt has fruits fully three times as large as the wild berries.

Linden is closely allied to Viburnum, being essentially distinguished by the 5-lobed ovary, that of Viburnum being usually 1-lobed. Other generic characters: calyx 3-5-lobed or toothed; corolla rotate, scarlet, lobes generally unequal; petals ovate, oblong, obtuse or convex; style 3-parted; ovule solitary, pendulous from apex: drupe 3-5-stoned: stome 1-seeded.
SAMBUS

A. Color of fruit black or blackish.

b. Fruit not glaucous.

c. Height 12-25 ft. when full grown.

nigra, Linn. Common European Elder. A large shrub or small tree, 12-25 ft. high, with rough bark; old wood hard, yellow, fine-grained: Ifts. 5-9: Ifts. in flat 5-rayed cymes: fr. black or dark green. — May, June. The following horticultural vars. are sufficiently distinguished by their names: argentea, aurea, heterophylla, laciniata, pulverulenta, pyramidalis, rotundifolia, variegata. Of these var. aurea is distinct by reason of its yellow foliage; laciniata and heterophylla by reason of variously cut Ifts., making them very effective in mass planting. Var. variegata is not constant in its variegation. S. heterophylla, laciniata, variegata, etc., of trade catalogues, are presumably varieties of S. nigra.

SAMPHIRE

Sambucus, Linn. Common American or Sweet Elder. Fig. 2247. Shrubby, 5-12 ft. high; wood with white pith occupying the greater part of the stem: Ifts. pinnate: Ifts. 5-11, smooth: Ifts. white, in a flat group, in a first year: fr. black. June, July. Fruit ripe Aug., Sept. Var. aurea has yellow foliage. Var. variegata has yellowish white markings. Var. laciniata has the Ifts. variously cut and indented. Var. glauca has whitish hairs on the leaves. G. 6:88. G. 55, p. 385. B. B. 3:228.—This is the common Elder, blooming in mid-summer, and one of the choicest of native shrubs although not much appreciated. The flowers are fragrant.

b. Fruit glaucous, i.e., strongly whitened with a mealy bloom.


AA. Color of fruit red.

b. Petioles glabrous.

racemosa, Linn. Lfts. oblong-acuminated, unequal at the base: Ifts. paniculate. Native of Eu.-Asia and closely resembles the next: perhaps a little taller and the twigs usually 4-angled. Vars. in the trade are plumosa, plamosa aurea and laciniata, which are not equal in value to similar forms of S. nigra, var. laciniata. Var. aurea, which is being sent out in 1901, seems to belong to this species.

bb. Petioles pubescent.

pubens, Michx. Red-Berried Elder. Height 5-7 ft.; wood thicker than in S. Canadensis, pith brown; bark warty: Ifts. 5-7: Ifts. in pyramidal paniculate cymes: fr. red. April, May. Fruit ripening in June, while S. Canadensis is still in flower. N. Amer. B. B. 3:228.—The American representative of S. racemosa, and by many considered to be identical with that species.

JOHN F. COWELL.

SAMPHIRE (Crithmum maritimum) is the name corrupted from samphier, itself a corruption of the French Saint Pierre (St. Peter), given to a succulent-stemmed, half-hardy perennial, well known upon rocky coasts above high tide in Great Britain as sea-fennel, parsley-vert, and St. Peter’s herb. It belongs to the family Umbelliferae. The plants, which attain a height of from 1-2 ft., have somewhat linear, glaucous-green, fleshy leaves, %[ in. long, small, white or yellowish flowers, which appear in umbels during July, and oblong, yellowish, fennel-like, smallish seeds of light weight, which ripen in early autumn and lose their germinating power within a year. For more than three centuries the crisp and aromatic leaves and young shoots gathered in August or September have been used in salads and vinegar pickles. Samphire rarely reaches perfection in gardens, but on the sea-coast, unless grown upon sandy or gravelly soil, and watered frequently and plentifully with weak salt and soda solutions. It may be propagated by root division, but better by sowing the seed as soon as ripe, the plants being thinned to stand from 1-1/2 ft. asunder in rows 2-2 1/2 ft. apart.

Golden Samphire (Inula crithmifolia), a native of the marshes and sea-coast of Great Britain, is an erect hardy perennial, 1-1/2 ft. tall, with small, fleshy leaves
and yellow flowers in small, umbel-like clusters. Though grown and used like true Samphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family Composita.

For Marsh Samphire, see Salicornia. M. G. Kains.

SANCHEZIA (after Jos. Sanchez, professor of botany at Cadiz). Anacaulaee. Strong, erect herbs or half-shrubby plants: lvs. large, opposite, entire or slightly toothed or lobed; petioles, connate: fls. 2 in. long, yellow, in heads or spikes at the ends of the branches, or rarely paniculate; calyx deeply 5-parted, segments oblong; tube of the corolla long, cylindrical, somewhat ventricose above the middle, limb 3-loculed, short; anthers linear-oblong, in 5 equal, short lobes; perfect stamens 2, inserted below the middle of the tube, with 2 aborted stamens between them; anther 2-celled, the cells mucronate in front; style long, with one division small, spur-like: ovary on a thick disk, 5-loculed, with 5 ovules in each cell. About 8 species in Peru, Colombia and Brazil.

nobilis, Hook. Plants stout, erect, smooth, except the inflorescence: stem 4-angled: lvs. 3-9 in. long, oblong-ovate to oblong-lanceolate, obtusely toothed, narrowed into winged petioles, connate: fls. 2 in. long, yellow, in heads or spikes at the ends of the branches, or rarely paniculate; calyx deeply 5-parted, segments oblong; tube of the corolla long, cylindrical, somewhat ventricose above the middle, limb 3-loculed, short; anthers linear-oblong, in 5 equal, short lobes; perfect stamens 2, inserted below the middle of the tube, with 2 aborted stamens between them; anther 2-celled, the cells mucronate in front; style long, with one division small, spur-like: ovary on a thick disk, 5-loculed, with 5 ovules in each cell. About 8 species in Peru, Colombia and Brazil.

HEINRICH HAASELBING.

SANDAL-WOOD. See Anadenanthera.

SAND-BUR. See Cenchrus.

SANDERSIOnIA (John Sanderson, discoverer of S. aurantiaca). Alliaceae. A genus of 1 or 2 species from Natal; tuberous plants growing 1-11/2 ft. high, slender, with many sessile leaf-stems and yellow or purple globular bell-shaped flowers, pendulous from a number of the upper leaf-axils, the segments with pointed nectaries at the base. Perianth campanuloid, urceolate: segments deltoid or lanceolate: stamens 6; filaments filiform; anthers linear-oblong, ovary 3-lobed. Glasshouse plants, to be treated like Gloriosa.

aurantiaca, Hook. Lvs. 3-4 × 3-41/2 in.; pedicels 3-41/2-1 in. long, perianth orange-colored, 3-41/2 in. long. Nov. B. M. 4716. R. H. 1808. p. 311. P. W. BARCLAY.

SAND MYRITE. Leioptilum.

SAND PEAR. Pyrus Sinensis.

SAND VERBENA. See Abronia.

SANDWORT is an English name for Arenaria.

SANGUINARIA (Latin, blood; referring to the yellowish red juice of the plant). Papaveracea. Bloodroot. A single species common in woods of eastern North America. Rootstock several inches long, about 3 in. thick, horizontal; lvs. radical, cordate or reniform, usually only 1 from each root bud, on petioles about 8 in. long; fls. white, often tinged with pink, 1-3 in. across, mostly solitary, on scapes about 8 in. long, appearing just preceding the full grown leaves: sepals 2, fleshy; petals 8-12, or in 3 rows, oblong or oblanceolate, early deciduous; capsule 1 in. long, oblong, 2-valved. The Bloodroot is a showy spring flower usually found in woodland, but not a true shade-loving plant, since its growth is, to a great extent, made before the foliage of the trees expands. In cultivation it prefers a rather light soil, but will grow anywhere. It will do as well in sunlight as in shade and will even grow among grass, if not to not to move it down to where the sun has made it has perfected the root growth and buds for the following season. The roots are best transplanted after the leaves have ripened, until the autumn root growth commences, but they may be moved when the plants are in flower. The roots are offered at such low prices by collectors that the plant should be used to a much greater extent for spring gardening.


F. W. BARCLAY.

SANGUISORBA (Latin name referring to reputed medicinal properties, connected with sanguis, "blood"). Rosaceae. About 30 species of upright mostly perennial herbs, with compound leaves and greenish, small flowers in heads: flowers usually perfect (sometimes part of them imperfect), the stamens numerous (rarely 2 or 4), the pistils mostly 1 or 2, the petals none, the uncolored calyx enclosing the mature achenes. The Sanguisorbas are natives of the northern temperate zone. Two species are sparingly cultivated in this country. See Poterium.

minor, Scop. (Poterium Sanguisorba, Linn.). Burnet. Perennial, growing in clumps, glabrous or sparingly hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6-10 pairs and orbicular to oblong and deep-toothed: stems 1-21/2 ft. tall, terminating in small glabrous or oblong heads: lower fls. in the head stamine, the others perfect, the stamens purple, tufted and exserted. Eu., Asin, and naturalized in this country. Sometimes grown in the herb gardein for the fresh young leaves, which are used in salads. It is also an interesting plant for the hardy border. Also recommended as a pasture plant, particularly for sheep. It thrives in dry, poor soils.

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

SANCULAA (Latin, to heat). Umbellifera. Sandele. Black Snake-root. About 20 species, nearly all American, mostly perennial, glabrous herbs with alternate, palmately divided lvs. and small yellow, white or purplish fls. in compound, usually few-rayed umbels: fr. nearly global, small, covered with hooked bristles. Woodland plants with insignificant fls. Useful occasionally as a ground cover in waste shaded places. The following species have been offered by collectors.

SANICULA (Latin, to heat). Umbellifera. Sanicle. Black Snake-root. About 20 species, nearly all American, mostly perennial, glabrous herbs with alternate, palmately divided lvs. and small yellow, white or purplish fls. in compound, usually few-rayed umbels; fr. nearly global, small, covered with hooked bristles. Woodland plants with insignificant fls. Useful occasionally as a ground cover in waste shaded places. The following species have been offered by collectors.
SANICULA

A. Fls. yellow.

Ménziesii, Hook. & Arn. Stem solitary, 1-2½ ft. high, branching; lvs. round-cordate, 2-3 in. across, very deeply 3-5-lobed; fr. about 1 line long, becoming distinctly pedicellate. Calif.

**bipinnatifida**, Doug. About 1 ft. high, with a pair of opposite lvs. at the base and 1-3 above, long-petioled, triangular to oblanceolate in outline, 2-3 in. long, narrowly 3-5-lobed, fr. sessile. Calif.

AAA. Fls. greenish-white.

**Marylandica**, Linn. Stem stout, 1½-4 ft. high; lvs. bright green, the basal long-petioled, the upper sessile, 5-7-parted; fr. sessile. Atlantic to Rocky Mts. Common in woods.

SANSEVIERIA (after Raimond de Sangro, Prince of Sansevero, born at Naples 1710. The spelling Sanseveria is not the earliest). *Hemodoraeae*. Bow-STRING HEMP. A genus of about 10 species from Africa and the East Indies, of essentially tender foliage plants, at least the flower: yellow, short, few-flowered, sometimes stoloniferous: lvs. radical, in clusters tuberous, fleshy, firm, often long, nearly flat or terete, the interior fibrous; scape simple, long, stout: frs. white, clustered, in often dense racemes, or perianth-tube narrow, often long; ovary free, 3-loculed, attached with a broad base.

Sansevierias are easily propagated by division or they may be raised from leaf cuttings about 3 in. long. The leaf cuttings form roots in sandy soil after about one month, after which a long stalk is formed, which produces the new plant at some distance from the cutting. Sansevierias are of easy culture and are well adapted to house decoration, since they do not require much sunlight. A rather heavy soil suits them best.

**Zeylanica**, Willd. Lvs. 1-3 ft. long, 3-6 in. in a cluster, oblongate, radical, dark green with lighter green transverse markings: scape with inflorescence as long as the leaves; bracts 2-4; frs. greenish white, about 1½ in. long, fragrant. B.M. 1179. G.C. III. 4:73.

AAA. Lvs. concave.

**cylindrica**, Boj. Lvs. often 3-4 ft. long, 8-10 in a tuft, terete, solid within, dark green, often banded with paler lines, acuminate, occasionally furrowed: scape with florescence shorter than the leaves; raceme about 1 ft. long; frs. creamy white, tinged with pink. B.M. 5906. G.C. III. 16:222. R.H. 1861, p. 418, 450.

F. W. Barclay.

SANTOLINA (derivation of name doubtless. Com-pam. About 8 species of shrubs or rarely herbs, natives of Europe and Asia, mostly in the Mediterranean region. Lvs. alternate, aromatic, rough, grey, densely hairy or pinnately lobed: fr.-heads yellow or rarely white, of disk frs. only, many-fl.: involucre mostly cymose, ray, squarrose, imbricated, appressed. Santolina is valuable for its distinct foliage and is used for large specimens in shrubberies or as a carpet bedding plant. Cuttings for the latter purpose are usually taken in the spring from plants wintered in a frame or in the cold bed before frost in the fall. They are easily rooted in sand.

Chamaecyparisus, Linn. (**S. incana**, Lam.). **LAVENDER COTTON.** A hardy half-shrubby, much-branched plant, 1½-2 ft. high, with small evergreen, silvery gray lvs. and small globose heads of yellow frs., borne in summer: branches and attached with pinnate sepals. Var. **incana** differs but little from the type: involucres pubescent. **S. alpina**, Linn., is Anthemis montana, Linn., which makes a pretty ground cover and has yellow frs., but appears not to be in the trade.

F. W. Barclay.

SANVITALLA (after a noble Italian family). Com-pam. A genus of about 4 species, natives of the southwestern United States and Mexico. Grows generally low, much-branched, with herbaceous, usually entire leaves and small solitary heads of lvs. with yellow or sometimes blue rays: involucres short and broad, of dry or partly herbaceous bracts; disk from flat to subulate-conical, at least in fruit; its chaffy bracts concave or partially conduplicate; achenes all or only the outer ones thick-walled, those of the rays usually 3-angled, with the angles produced into rigid, spreading awns or horns, those of the disk often flat and winged.

**procumbens**, Lam. A hardy floriferous annual, growing 6 in. high, trailing in habit: lvs. ovate, about 1 in. long; fl.-heads with disk and yellow rays, resembling small Rudbeckias, less than 1 in. across; achenes of the disk flattened and often winged and 1-2 aristate. Summer to very late autumn. Mexico. B.R. 9:737. R.H. 1859, p. 127. —**Var. flore-pleno.** Hort. A double-fl. variety coming true from seed, and as vigorous as the type. R.H. 1856, p. 70. Sanvitalias are of easy culture but prefer a light or sandy soil in full sunlight.

F. W. Barclay.

**SAP.**

The term sap is applied to the juices of the living plant. Sap is composed of water containing mineral substances, which are either native to the plant, or which are absorbed from the soil. In addition, there are organic substances which the plant must obtain from the soil to enable it to carry on its processes of growth and metabolism. These substances are generally referred to as nutrients, and are necessary for the plant to survive. The sap is usually a mixture of water, nutrients, and other substances, such as sugars and amino acids, which are transported throughout the plant by the vascular system. The sap is transported from the roots to the leaves by the xylem, a specialized tissue in the stem. The sap is also used for photosynthesis, which is the process by which plants convert light energy into chemical energy in the form of carbohydrates.

The sap of a plant is an important resource for many animals, including humans. For example, the sap of certain trees can be used to make sugar, which is a valuable food source. The sap of other plants can be used to make medicines, such as quinine, which is used to treat malaria.

In general, the sap of a plant is a valuable resource that is used for many purposes, including food, medicine, and other uses.

F. W. Barclay.
maple and other trees in the early spring, before the soil has thawed and while it is yet too cold for the living matter of the plant to show any great activity, is not due to the bleeding pressure, but to the expansion of the gases and liquids in the trunk and branches of the tree due to transpiration of the sun's rays. During the daytime the bubbles of air in the wood cells become heated and expand, driving the sap from the wood cells into the auger hole which has been bored into the tree. At night the trunks of the tree cool slowly and the flow ceases, to be begun again next day.

The amount of bleeding exhibited by any plant may be found if the stem is cut and bent over in such manner that the end is thrust into a tumbler or small vessel, which will collect the escaping sap.

The ordinary upward movement of sap takes place through the most recently formed wood cells at a rate that varies from a few inches to a yard an hour. The force which lifts the sap is ultimately derived from the sun. The cells in the leaf contain many substances which attract water, and the sun shines on these cells, evaporating some of the fluid; the loss is replaced from the nearest cells below by osmotic attraction and the pull thus exerted may serve to draw water from the roots to the leaves even in the tallest trees, although it is to be said that not all of the question of the ascent of sap may be satisfactorily explained by the facts at hand. See Physiology of Plants. D. T. MacDougal.

**Sapindus** (Latin words meaning soap and Indian; alluding to the use of the fruit in India). *Sapindaceae*. Soapberry. A genus of about 25 species of trees, shrubs or woody vines inhabiting the tropical regions of the whole world. Wood yellow; lvs. alternate, exstipulate, abruptly pinnate; fls. white, small, in lateral or terminal racemes or panicles; scapules 5, obtuse, rarely pedate; petals more or less pubescent and bearing just above the short claw a villous or ciliated comb or appendage; disk annular, usually crenate, bearing 8-10 stamens; seeds with long testa and no aril, black or nearly so.

The fruit has an alkaline principle known as saponin which makes it useful for cleansing purposes. The fruit was much used in eastern countries before the introduction of soap and is still preferred for washing the hair and cleansing delicate fabrics like silk.

**A. Lfts. 4-7.**

**Acarinus**, Wildh. A small tree with rough grayish bark; lfts. oblong-lanceolate and acute to elliptic-ovate and somewhat obtuse, opposite or alternate, entire, glabrous, velvety and lustrous above, tomentolose beneath; rachis usually winged: fr. lucid, 6-8 lines in diam. S. Fla., W. Ind. and S. Amer. Cult. in S. Fla. and S. Calif.

**B. Lfts. 7-18.**

**aulus**, Trab. A species from S. China which is not distinguishable from *S. marginatus*, Wildh., by descriptions. Lfts. 12-14, acute, glabrous: fr. glabrous, nearly globose, strongly keeled. R.H. 1805, p. 304.—For description, see under the preceding name, to which it comes near in bearing in 8-10 years. *The berries contain 28 per cent of saponin. Trees have been known to yield $100 to $200 worth of berries every year. The trees prefer dry, rocky soil.*

F. W. Barclay

**Sapinum** (old Latin name used by Pliny for a resiniferous pine). *Euphorbiaceae*. About 25 species of monoecious trees, shrubs or herbs. Lvs. opposite, pending; petioles and scale-like bracts biglandular; fls. in terminal spikes, the pistillate single below, the staminate in 3's above, all apetalous; sepal imbricated, united below; stamens 2-3; filaments free: capsule with 2-3-seeded locules, more or less fleshy, 3-winged central column remaining after dehiscence.

**Selenium**, Roxb. (Exocarpos selenium, Muell. Stillingia selenium, Michx.). *Euphorbiaceae*. Tallow Tree. Lvs. 1-2 in. long, ovate, acuminate, long-petioled, glabrous: capsules 3½ in. in diameter; seeds covered with a waxy coating which is used in the native land, eastern Asia, for making candles. Now cultivated in many warm regions. Naturalized in southern United States. J. B. S. Norton.

**Sapodilla, or Naseberry** is a common name of *Achras Sapota*, Linn. (*Sapotâ Achras*, Mill.), a tree of the West Indies, Central America and northern South America, cultivated as far north as Lake Worth, Fla., for its fruits. Fig. 2249. It is one of the Sapotaceae. It is an evergreen tree, the thick, lance-oblong, entire, shining lvs. clustered at the ends of the branches. The fls. are borne on the rusty-pubescent growths of the season; they are small and perfect; calyx with 6 lobes in 2 series; corolla 6-lobed, white, scarcely exceeding the rusty calyx; stamens 6. Fruit size and color of a small russet apple, very firm, with 10-12 compartments containing large black seeds, the juice milky, flavor sweet and pear-like. The fruit is much prized in warm countries. From the juice, large quantities of chewing gum are made. As ordinarily seen in the South and in the West Indies, it is a bushy tree 10-20 ft. high, making a handsome subject. It is said to bear well in pots.

L. H. B.

**Saponaria** (Latin for soap; the roots can be used like soap for washing). *Caryophyllaceae*. Soapwort. A genus of about 25 species of annual or perennial herbs, natives of Europe and Asia, allied to Silene and Gypsophila. Calyx ovoid or oblong-tubular, 5-toothed, obscurely nerved: petals 5, narrowly clawed, limb entire or emarginate, sealy at the base or naked; stamens 10: ovary many-seeded: style 2; rarely 3: capsule ovoid or oblong, rarely nearly globose.

Saponarias are readily established in any soil and require but little care. *S. oregoides* is an attractive plant for the rockery or for edging. Propagated by seed or division.

**A. Stem stout, erect.**

**officinalis**, Linn. *Bouncing Bet*. Fig. 2250. A perennial: stems 1½-2½ ft. high, leafy, simple, clustered, glabrous: lvs. mostly oblong-lanceolate, 3-nerved; fls. light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petal lobes oblate, entire, notched at apex. July, Aug. Europe.—Var. Hor- plono is quite double-flowered. *S. canadensis*, Hort., is said to be a deeper-colored double form.

**B. Lvs. obtuse: plants annual.**

**Calibris**, Guss. A low-growing annual, with pink fls.: lvs. oblong-spatulate, obtuse, about 1-nerved: fls.
in a loose corimbous panicle; calyx-teeth ovate, obtuse, membranous-margined. Spring, Italy, Greece. R.H. 151:281. — Var. alba is also in the trade. Seed should be sown in the fall for spring bloom or in April for summer flowering.

BB. Lvs. acute; plant perennial.

ocymoides, Linn. Stems much branched, 6-9 in. high, half-trailing; lvs. ovate-lanceolate, about 1-nerved, small, acute; fls: bright pink, in loose, broad cymes. Summer. Europe.—Several varieties are in cultivation, including var. alba.

S. japonica, Hort. John Saul, seems to be unknown to botanists.

J. B. Keller and F. W. Barclay

SAPROPHYTE (Greek, rotten, and plant, i.e., living on dead organic matter). A plant (whether bacterium, fungus or higher plant) subsisting upon the humus of the soil, or dead or decaying organic materials. The customary classification which includes under the term "saprophyte" all bacteria that do not or with animals no longer correspond with facts. The fungi we class as saprophytes all plants which live upon a dead or decaying organic substratum. Such are the baker's yeast (Sacharomyces cerevisiae), the mushroom (Agaricus campestris) and the stinkhorn (Phallus impudicus). Most mushrooms and toadstools are saprophytes (Fig. 2251). Some of the flowering plants possessing ectotrophic mycorhiza (Indian pipe, Monotropa uniflora) and endotrophic mycorhiza (Yeoitia nudaviris, Corallorhiza inama, Epipogium aphylleus, snow plant, Sarcodes sanguinea and Thesium Arve) are also classed as saprophytes.

John W. Harshberger

SARACA (from Sarac, the name of the genus in India). Leguminosar. About 6 species of tropical Asiatic trees, with glabrous, rigid-coriaceous, abruptly pinnate lvs. and yellow, rose or red fls. in dense, sessile, axillary, corimbous panicles with somewhat petal-like, reddish bractlets: calyx cylindrical, with a disk at its summit; limb 4-lobed; lobes oblong, unequal, petal-like; corolla wanting; stamens 3-8, exserted; filaments filiform; anthers versatile, opening longitudinally: fr. a coriaceous flat pod.

Indica. Linn. A medium-sized tree: lfts. 6-12, oval-lanceolate, acuminate, 4-6 in. long, entire, short-petiolate: fls. orange-red, fragrant, collected in compact, roundish panicles which are shorter than the lvs.; stamens usually 6 or 7, inserted on the fleshy annular ring at the summit of the calyx-tube; style long, curved; bracts red, appearing as a calyx; pod 4-10 in. long, 1-seeded; seeds obovoid, compressed, 1/4 in. long. B.M. 3018. — It has flowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Procured from southern Florida.

F. W. Barclay.

SARCANTHUS (name from Greek words signifying flesh and flower, in allusion to the fleshy nature of the blossom). Orchidaceae. A small genus related to Vanda. Owing to the smallness of the flowers they are rarely cultivated. Sepals and petals similar: labellum firmly united with the base of the column, spurred, with 2 small lateral lobes and a longer concave middle lobe. Folage and habit of Vanda.

Give plenty of water during the growing season. They should have basket culture, with fern root, and a temperature of 65° to 85°. When at rest, give very little water and reduce the temperature to 50°. Culture practically as for Vanda.

teretifolius, Lindl. (Ludisia tereza, Lindl.). Stem 1 ft. high, with cylindrical lvs. 2-4 in. long; raceme bearing 7-8 inconspicuous fls.: sepals and petals obovoid, dull green, with red disk; labellum slipper-shaped, white, lateral lobes edged with red. Sept. (China). B. M. 3571.

Heinrich Hasselbring and Wm. Mathews.

SARCODOIDUM Lobbii, Beer, is Bulbophyllum Lobbii.

SARCOCCOA (fleshy berry). Euphorbiaceae. To this genus is to be referred Pachystandra coriacea, Hook., a small shrub from India, sometimes cultivated in Europe but not known to be in the American trade. It has simple plum-like lvs. and short, axial racemes of small yellowish fls., and a small purple plum-like fruit. Its proper name is S. prauniformis, Lindl. (S. satigra, Muell. S. soliifolia, Baill. S. coriacea, Sweet). It is treated as a cool greenhouse plant. B.R. 12:1012.

SARCODES (Greek, flesh-like). Ericaceae. Sarcodes sanguinea, Terr. (Fig. 2252), is the Snow Plant of the Sierra Nevada. It is a low and fleshy plant growing 3-12 in. high and entirely devoid of green leaves. It belongs to that strange group of the heath family which comprises the fleshy and parasitic plants, of which our Indian pipe or corpse-plant is an example. Few species are known in this suborder, and they are all local or rare. The Snow Plant derives its popular name from its habit of shooting up and blooming as soon as the snow melts away in the spring. The specific name sanguinea refers to the blood-red color of the entire plant. The Snow Plant grows at an altitude of 4,000 to 9,000 feet. It is the only species of the genus, and is not known to be in cultivation.

SARRACENIA (Dr. Jean Antoine Sarrazin, an early botanist of Quebec, who sent S. purpurea to Tournefort). Sarraceniae. Pitcher Plant. Side-saddle

2250. Saponaria officinalis (X 32).

2251. A saprophytic plant—Mushroom.

2252. Snow plant—Sarcochea sanguinea. Natural size.
SARRACENIA

FLOWER. Three small genera and 8 or 10 species common in the Sarraceniaceae. All the plants are American. The six or eight species of Sarracenia inhabit swamps and low grounds in the Atlantic states; *Darlingtonia Californica*, grows in mountain bogs in California and Oregon; *Heliophila* is found on Mt. Roraima in British Guiana. They are all perennial acaulescent bog plants, with hollow pitcher-like leaves, and nodding flowers single or severally on short scapes. The pitchers catch organic matter and enter other insects; small animals often utilize these materials for food. In some species there are contrivances of form, hairs, and lines of color that appear to have special relation to the capture of insects and other creatures. *Darlingtonia*. The plants have been prized as horticultural subjects because of their oddity and the botanical interest that attaches to them. The Sarraceniaceas have been much hybridized, giving rise to distinct and interesting intermediate forms, but these hybrids are known only to specialists and fanciers. *Heliophila* is not in the American trade, but all the other species are. They are considered to be difficult to maintain in perfect condition under cultivation, and, whenever possible, plants are frequently renewed from the wild. They are best treated as semi-aquatic plants. Give plenty of moisture at growing season. Keep partially dormant in winter.

The botanical position of the Sarraceniaceae is not settled. Ordinarily it is placed near the Papaveraceae and Cruciferae. Others associate it more intimately with the Droseraceae. The fls. are perfect, the parts mostly free and pendant; petals numerous; carpels 3-5, united into a compound pistil, bearing many ovules on axile placenta. In *Sarracenia* itself, the flower is large and solitary, nodding from the top of a rather stiff scapes; petals colored, ovate to more or less fiddle-shaped, incurved; sepals thick and persistent; 3 bracts below the calyx; the top of the pistil dilated into a broad, thin, umbrella-like structure on the margin of which the stigmatic surfaces are borne. Fr. a capsule. See Gray, Syn. Fl. p. 79. Masters, G.C. II. 15:817; 16:11, 40. For an account of hybrid Sarraceniaceae, see also Gm. 28, p. 217, and 48, p. 202.

L. H. B.

All of the species comprising those which are indigenous to the southern states only, including *S. flava*, *S. psittacina*, *S. rubra*, *S. variolaris*, and *S. Drummondii*, are well known in Washington. However, they do not grow equally well out of doors. *S. Rubra*, *S. Rubra*, and *S. variolaris* succeed best. *S. psittacina* and *S. Drummondii* do poorly. They are planted in a raised bed, the sides of which are made of rocks cemented together so as to be capable of being flooded with water. Provision is made for drainage by means of a pipe in the bottom, which is opened or closed as occasion requires. The compost is made up of chopped fern roots, moss, sand, charcoal and potsherds, and when planted a top-dressing of live moss is given. In this bed other insectivorous plants are grown, as *Dionaea*, *Darlingtonia*, *Drosera* and *Pinguecula*. *S. Rubra* and *S. purpurea* are sometimes well grown on margins of lilyp pools, if given compost of the above description.

For pot culture in northern greenhouses *S. Drummondii* is the most attractive species. It produces two crops each year. The first opens in spring, while more numerous, are not so beautifully marked as those which make their appearance during the fall months. *S. Rubra* comes next in importance as a pot plant. Out of a large number of hybrids, those having as parents *S. rubra*, *S. purpurea*, and *S. variolaris* take on high coloring in the leaves.

Propagation should be effected by division of the rhizome at the time of repotting; this should be done before flowering. New foliage is raised from seed. All of the species intercross readily.

Sarraceniaceae thrive best in a substance through which water will pass readily. During the growing period the medium should be kept moist. The best grown in a sunny coolhouse. Greenly and thrips are the most troublesome pests. Greenly is most abundant during the earlier stages of the leaves, the thrips appearing later.

G. W. Oliver.

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SARRACENIA

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2. **purpurea**, Linn. Common Pitcher Plant of the North, and the one on which the genus was founded. *Sarracenia purpurea*, Lamarck. Fig. 2253. *Sarracenia purpurea* has been noted for its beauty and ornamental appeal. It continues to be a favorite in gardens and public spaces. *Sarracenia purpurea* is a perennial plant native to North America. It is commonly found in wet, boggy areas, such as marshes and swamps. *Sarracenia purpurea* has a strong, upright growth habit, with its leaves arranged in a rosette shape at the base of the plant. The leaves are glossy green with a purple-magenta vein, and the plant's flowers are a deep, dramatic red. The pitcher-like leaves, which are the plant's main attraction, are adapted to catch and hold insects, providing a rich source of nutrition for the plant. In the wild, *Sarracenia purpurea* often grows in large colonies, creating a vibrant and visually striking landscape. Its beauty and adaptability make it a popular choice for gardens, parks, and landscape design. This plant is a reminder of the intricate relationships between plants and their environments, showcasing how nature has evolved to create efficient and stunning systems.
SARRACENIA

p. 86 bis. Var. crispa, Hort. (S. crispa, Hort.). Differs from the species "in the deeper wing to the pitcher, the strongly reflexed edges of the sepals, the white petals, the blunter, less conical ovary and the shorter and blunter lobes to the disk of the style." Pitchers about 12 in. high. G.C. II. 15:41; 165. I.H. 41, p. 301. Said by some to be a hybrid of S. rubra and S. flava, but Masters does "not see any grounds for the suggestion." Var. erythopurpurea, Bull (S. gelii, Shutt.). Large, the lid or hood blotted with crimson at the base. Var. limbatà, Bull. Large, limb of the lid of hood perforated with dark crimson 1/4 in. wide. Var. maxima, Hort. Pitchers large, with green lids. Var. minima, Hort. Small in all its parts. Var. ornata, Bull. Pitchers large, green, red-veined, the inner face of the long-stalked lid bearing a network of red veins; fs. said to be 8 in. across, canary yellow. G.C. II. 15:633; I.H. 41, p. 365; 16:12. Var. picta, Bull (S. Catesbaei, Ell. S. flava, var. Fildesi, Williams. S. Fildesi, Hort.). Pitchers very large, red-veined, with flat roundish wing.

cc. Base of hood broad, or only moderately contracted.

d. Lid or hood suborbiculare.

5. Drummondii, Groom. Pitchers large and erect, 2-3 ft. long in welloggrown specimens, funnel-shaped, green and prominently nerved, the upper part of the pitcher richly variegated with purplish reticulations and creamy white inter-squares, the wing narrow; lid roundish, the base somewhat contracted, flattish or with recurved mostly wavy margins, becoming erect, hispid on the inner face; fls. 4 in. across, red-brown. Pine barrens, S. W. Ga. and adjacent Fla. G.C. II. 15:633; 16:8. F.S. 8:524.—16:1071-2. I.H. 41, p. 365. A very striking species, with its tall pitchers strongly variegated at the top. Var. rubra, Hort., has pitchers with deep red markings. Var. rubra, Hort., has paler variegations and flowers. Var. undulata (S. undulata, Decne.) has stouter less elongated pitchers, and strongly undulated lid. S. Mexicana, Hort., is said to be a small form of this species.

dd. Lid ovate-pointed or acuminate.

6. rubra, Walt. Pitchers erect and narrow, 10-15 in. long and 1 in. or less across at the orifice, green with reddish veins above, the wing broad: lid or hood ovate, short-acute (or nearly obtuse) to acuminate, becoming erect and concave, veined and tinted with red, the inner face hispid or subhirsute; fls. 3 in. across, the pendulous petals whitish at the base and red-brown above. Swamps, N. Car. to Ala.— Said to hybridize in the wild with S. purpurea. Var. acuminata, DC. Lid long-acuminata. B.M. 3:315. L.B.C. 2:1162. Var. Swestii, Mast. (S. acuminata, Sweet, not Walt. S. Swestii, DC.). Smaller: pitchers cylindrical, with a narrow wing; lid ovate-acuminata. F.S. 10:1074.

II. HYBRID TYPES.

7. Atkinsoniana, S. flava, var. maxima x S. purpurea: More like S. flava; pitchers long and slender, green, with red reticulations; lid broad, cordate, red-veined. 


9. Courtii. S. purpuracea x S. psittacina: "It has developed pitchers about 8 in. long and colored a rich deep crimson, their form being intermediate between that of the two parents," Raised by Mr. Court, at Veitch's. S. II. 1:177.

10. Maddisoniana. S. psittacina crossed with S. variolaris: compact and dwarf; pitchers short and broad, incurving, ascending, green with dull red veins; lid large, ovate and undulate, deep purple-veined.

11. Mandaià. S. flava x var. rubra x S. Drummondii: Described as follows in Pictor & Mandel's Novelties Catalogue of 1833: "A few plants of this rare and beautiful plant has been collected, growing in company with S. flava and S. Drummondii, of which it is no doubt a natural hybrid, being intermediate between the two above-named species. The pitchers grow about two feet in height, are trumpet-shaped and broad at the opening; color light green with slight white mottlings. The lid is large and broad, slightly incurving, undulated at the edges, dark green shaded with red and blotched with white."

12. melanochôria. S. purpuracea x S. Stevensii, the latter a hybrid of S. purpuracea and S. flava: "In habit it is like S. purpuracea, the pitchers being obliquely ascending and distended like that of purpuracea, 6-7 in. high, with a deep wing, narrowing to either end, and a roundish sessile lid 2 3/4 in. across. The color is like that of S. Cheloni. Masters. Raised at Veitch's.

13. Mitchelliana. S. Drummondii x S. purpuracea: greater of S. purpuracea-growing and more graceful; pitchers 9-12 in. tall, rich green with crimson veins: lid reticulated with red, undulate.


15. Williamsii. Supposed natural hybrid of S. purpuracea and S. flava: The pitchers are 9-12 in. high, erect, bright light green, streaked and veined with crimson, with a broad lid like that of S. purpuracea. It was imported by Mr. B. S. Williams, with a consignment of S. flava." Masters. G.C. II. 15:629.


L. H. B.

SASSAFRAS

Sassafras (Sassafras, Salisbours, Saxifraga; medicinal properties similar to those of Saxifraga were attributed to Spanish, Mexican discoverers). Laurus. Ornamental deciduous tree, with alternate, simple or 3-lobed leaves and small yellow flowers appearing in few-flowered racemes in early spring and followed by ornamental dark blue fruit on red stems; resembles the foxglove, is effective in dry lands, although it may grow in clay loams. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright red color in autumn or in length on account of its bright-colored fruit. It prefers, at least in the North, a warm and sunny position. It is not easily trans-
planted when old on account of its long tap-roots. Prop. by seeds sown as soon as ripe; also by suckers, which are propagated in the same way, and by root-cuttings.

One species in eastern N. America. Fls. dioecious, rarely perfect, apetalous; calyx 6-parted; stamens 9, the 3 inner ones furnished at the base with 2-stalked, orange-colored glands; anthers opening, with 4 valves; ovary superio-r,ilocu-loc: fr.: an oblong-ovoid, 1-seeded, dark blue drupe surrounded at the base by the pulch- ecto- scarlet calyx.


**SATIN FLOWER.** See *Sisyrinchium*.

**SATUREIA, or SATUREJA.** See *Savory*.

**SAUNDERS, WILLIAM** (Plate XLVI), horticulturist and landscape gardener, was born at St. Andrews, Scotland, in 1822; emigrated to America in 1848, was appointed botanist and superintendent of propagating gardens, U. S. Department of Agriculture in 1862, and died at Washington, D. C., Sept. 11, 1900. When Mr. Saunders first came to America he served as gardener in a number of places, first at New Haven, Conn., and later near Germantown, Pa. He was instrumental at this time in the improvement of a number of important private and public properties, such as Clifton Park in Philadelphia, and a number of 400-acre estates, Fairmount and Hunting Parks in Philadelphia, and cemeteries at Ab- boy and Rahway, New Jersey. Mr. Saunders' most im- portant piece of work in landscape gardening was in connection with the planting of the grounds of the Gettysburg Cemetery. Soon after finishing this work, he took up his duties as superintendent of the gardens and grounds of the U. S. Department of Agriculture. Through his efforts much was done towards beautify- ing the streets of Washington and the improvement of the parks. The grounds of the U. S. Department of Agriculture were laid out and planted by Mr. Saunders, and for a number of years after the work was inaugurated he was actively en- gaged in introducing plants from all over the world, testing the same and making distributions wherever it was thought they might succeed. One of the most im- portant of his introductions was the navel orange, which was first called to his attention by a woman from Bahia, Brazil, about 1869. Mr. Saunders secured a dozen budded trees and planted them in the green- houses at Washington. Soon after he moved to the wood was distributed in California, and these few trees formed the nucleus for the large plantings of the navel oranges now at Riverside and elsewhere. While Mr. Saunders had been known best as a horticulturist, he was prominently identified with many other important movements looking toward the advancement of agricult- ure in this country. As early as 1855 he was actively engaged in an effort to organize an association of farm- ers, and this work eventually resulted in the forma- tion of the Grange, of which he is often called the

father. His sturdy character, sympathetic nature and kindly disposition endeared him to all who came in contact with him.

B. T. GALLOWAY.

**SAUROMATUM** (sau·ra·ra, lizard; referring to the spotted flower). *Arceae*. Perennial herbs, with uni- sexual naked fls. Those bearing a single pedicel leaf one year, the next year lvs. and fls.: petioles cylindri-cal, spotted below; blade pedately parted; peduncle short: spathe soon withering, its tube oblong, swollen at the base, more or less connate, its blade or banner long- lanceolate, black-purple, variously spotted. Species 6. India, Java and Trop. Africa. DC. Mon. Phaner. vol. 2.

The following are hardy bulbous plants, with large and curious flowers. The fls. are produced from Jan. until June, and the bulbs have kept well in a dry state for a year. There is little danger of the bulbs shriveling or rotting. Plant them 6 in. deep in pots or in the garden. Easily managed by the amateur.

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

**venosum**, Schott. (*S. Similans*, Schott.). Petioles spotted, ¾ ft. long; leaf-segments 8-10 in. long, 4 in. wide, the lateral smaller: spathe-tube 3-4 in. long, purple on the back: blade 14-16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, purple on the back, yellow within and with crowded olive green purple or black spots. Himalayas. B.M. 4465 and P.S. 13:1234 (both erroneously as *S. guttatum*).

JARED G. SMITH.

**SAURURUS** (Greek, lizard's tail; referring to the curve of the spike of fls.). *Piperaceae*. The LIZARD'S Tail is a hardy perennial herb suitable for the bog gar- den. It has been offered by several dealers in native plants. It grows in swamps, has heart-shaped leaves, and bears, from June to Aug., small white fragrant flowers in a dense terminal spike, the upper part of which arches or nods gracefully. Herbs with jointed stems, alternate, entire lvs. and perfect fls. in spikes, entirely destitute of floral envelopes and with 3-4 ovaries: sta- mens mostly 6 or 7 fr., somewhat flabby, wrinkled; carpels 3- 4, indescent, united at base.

**ceratum**, Linn. LIZARD'S TAIL. Fig. 2257. Height 2-5 ft. lvs. petioled, ribs con- verging. Conn. to Ont., Minn., Mo. and south- west. B.B. 1:482. W. M.

**SAVIN, Junipe- ras Sabina and J. Virginiana.**

**SAVORY.** Summer Savory is *Satureja hortensis*, Linn. *Labiate*. Cultivated in kitchen gardens for its aromatic green parts, which are gathered in midsummer for flav- oring meat, dressings and other culinary preparations. The slender, erect, branching, herbaceous stems, 10-12 in. tall, bear soft, narrow, green leaves and clusters of pink, purplish or white flowers in summer, which are followed by brown ovoid seeds whose vitality lasts three years. Propagation is by seed which may be sown in March. Winter Savory (S. montana, Linn.) is a hardy Euro- pean perennial species, having much the qualities of
SAVORY

the annual. It may be managed like thyme. It has woody, slender, very branching stems 12-16 in. tall, narrow, very acute leaves, white, pink or lilac flowers and brown seeds, whose average vitality is three years.

M. C. Kains.

SAVOY is a kind of cabbage.

SAW PALMETTO. Serenoa serrulata.

2257. Saururus cernuous (x 3/2). (See page 1617.)

SAVFRAGAE (Latin, rock and to break; said by some to refer to the fact that many of the species grow in the crevices of rock, by others to the supposition that certain species would cure stone in the bladder). Saxifrages. Rockfoils. As outlined below (including Megasea), the genus contains upwards of 175 species, widely distributed in the north temperate zone, many of them alpine and boreal. In the southern hemisphere they seem to be known only in South America. The Saxifrages are herbs, mostly perennial, with perfect small white, yellow or purplish flowers in panicles or corymbs; calyx with 5 lobes; petals 5, usually equal; stamens mostly 10, in some species only 5; styles 2; fr. a 2-seeded or 2-divided capsule, or sometimes the capsules nearly or quite separate at maturity, with numerous seeds. See Engler, "Monographie der Gattung Saxifraga," 1872.

Saxifrages are various in habit and stature, but they are mostly low and spreading with rosetulate or tufted root-leaves. Most of the species in cultivation are grown as rock-garden plants, although the large-leaved members of the Megasea or Borgenia section are sometimes used as border plants. Great to the small attention given to rock and alpine gardening in America, the Saxifrages are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are likely to suffer from the dryness and heat of the American summer. Partial shade in summer is essential for the best results with most of the species. In winter the stools should be given ample covering of leaves. The most useful kinds for this country are the species of the Megasea section. These are low plants of bold habit, and are admirably adapted for rockwork and for spring forcing under glass. Fig. 1017, Vol. II, shows a clump of these plants in the lower left-hand corner.

The alpine species are mostly dwarf plants with more or less persistent foliage. Some of them, as S. oppositifolia, make dense moss-like mats; others, of which S. Aizoon may be taken as a cultural type, produce a dense rosette of leaves at the surface of the ground, from which a flower-scape arises. Some of these forms are particularly interesting because of the vari-colored or silver effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade.

Most Saxifrages make stolons and offsets freely, and by these the plants are easily propagated; they are also increased by division. Some make bulbs.

The number of species of Saxifrage worthy of cultivation in rockeries and in borders is large, but the following account comprises those known to be in the trade in North America. Very few of the species have been modified to any extent under domestication. There are a number of important hybrids, two of which are in the American trade: S. Andrewsii, hybrid of S. Gemm and S. Aizoon, is somewhat like the latter parent; fls. pale white with purple dots; lvs. spatulate to ligulate, very obtuse, crenulate-dentate; stem erect, few-leaved, glan-

dular-hairy, 6-8 in. tall. S. hybrida splendens is perhaps a hybrid of S. Gemm by S. rotundifolia.

INDEX.

A. Lvs. with many small punctate glands or dots on the surface, usually large and thick and the petiole sheathed at the base: plant aculeolent, with a thick rootstock. BERGEHIA or MEGASEA.

B. Margin of leaf conspicuously ciliate or apiculate-toothed.

C. Base of leaf distinctly cor- date, although narrow.

D. Margin of leaf not ciliate but more or less undulate or cre- nate: lvs. not pubescent.

E. Scrape and inflorescence gla-"brons.

F. Seeds spherical (Cymbal- laria).

G. Apex and margin of leaves bearing a few distinct pores or impressed dots.

H. Arrangement of lvs. opposite.

I. Oppositifolia.

2. Stracheyi.

3. Milesii.

4. crassifolia.

5. cordifolia.

6. purpurascens.

5. purpurascens.

8. oppositifolia.

A. Lvs. without punctate dots or glands (sometimes pitted) on the face, usually not large nor with sheaths at base: root- stocks (if any) slender or short. SAXIFRAGE properly so called.

B. Seeds sphericr (Cymba-

laria).

C. Apex and margin of leaves bearing a few distinct pores or impressed dots.

D. Arrangement of lvs. opposite.

E. Leaf- margins reflexed, crenulate or nearly en- tire, more or less cus- tate with time.

F. Lips. 5, unequal.

G. Lvs. ovate or oboviate.

H. Lvs. ovate or reniform, acute or obtuse.

I. Lvs. ovate or reniform, acute or obtuse.

J. Lvs. ovate or reniform, acute or obtuse.

K. Lvs. ovate or reniform, acute or obtuse.

L. Lvs. ovate or reniform, acute or obtuse.

M. Lvs. ovate or reniform, acute or obtuse.

N. Lvs. ovate or reniform, acute or obtuse.

O. Lvs. ovate or reniform, acute or obtuse.

P. Lvs. ovate or reniform, acute or obtuse.

Q. Lvs. ovate or reniform, acute or obtuse.

R. Lvs. ovate or reniform, acute or obtuse.

S. Lvs. ovate or reniform, acute or obtuse.

T. Lvs. ovate or reniform, acute or obtuse.

U. Lvs. ovate or reniform, acute or obtuse.

V. Lvs. ovate or reniform, acute or obtuse.

W. Lvs. ovate or reniform, acute or obtuse.

X. Lvs. ovate or reniform, acute or obtuse.

Y. Lvs. ovate or reniform, acute or obtuse.

Z. Lvs. ovate or reniform, acute or obtuse.
SAXIFRAGA

EE. Leaf-margins spreading, serrate, sometimes both margins and upper face crustate .... 11. Cotyledon

12. Azizoon

CC. Apex and margin of leaves without pores.

D. True stem all subterranean.

E. Plant propagating by means of subterranean bulbs produced on the very short-jointed caudex .......... 13. granulata 14. rivularis

EE. Plant propagating by non-bulbiferous shoots.

F. Foliage peltate, large. 15. peltata

FF. Foliage not peltate, usually not large.

G. Petals yellow ............. 16. chrysanthia

GG. Petals white (sometimes spotted).

H. Lower leaves, orbicular ............ 17. rotundifolia 18. punctata 19. Mertensiana

HI. Lower leaves, entire, ovate or spatulate (ovate in No. 25).

I. Shape of petals lanceolate, acute, or narrowly rounded ........ 20. bryophora 21. leucanthemifolia 22. Pennsylvanica

II. Shape of petals obovate or orbicular ........ 23. nivalis 24. Virginiana 25. integriifolia

DD. True stem above ground, the plant propagating by evident stolons or offsets.

E. Petals all equal.

F. Pistil more or less adnate to the calyx-tube at its base.

G. Foliate style and withering rather than falling, not divided, the margin usually zygozose 26. azoides 27. broechialis

GG. Foliate herbaceous, undivided or lobed.

28. Camposia 29. coaptiosa 30. apylla

H. Pistil free from the calyx-tube ........ 31. umbrosa 32. Geum

EE. Petals unequal, the two lower ones much larger than the others .......... 33. sarmentosa

1. ligulata, Wall. (S. Schmiditii, Regel). Strong-growing plant, with large radical lys. 3-8 in. across and orbicular or obovate in outline and obovate at base, the margin scarcely undulate but ciliate; scape becoming about 1 ft. tall, this and the pedicels and calices glabrous; frs. white to light purple, orbicular and clawed; fr. subglobose, drooping. Himalayan region. B.M. 3406, "the sepals too acute and the leaves too undulate," according to Hooker. L.B.C. 8:747. R.H. 1868:271.

2. Stracheyi, Hook. f. & Thom. (S. unguiculata, Hort., not Engl.). Fig. 2258. Habit of S. ligulata; lvs. glabrous on both sides, obovate, usually not at all cordate at base, the margin ciliate and from crenate-serrate to nearly entire; pedicels and calices pubescent, the scape becoming 1 ft. or more tall; frs. white or rose (sometimes yellow), the calyx-teeth oblong and often wider above their base; fr. ovate-lanceolate, usually erect. Kashmir, 8,000-14,000 ft. B.M. 56977. B.R. 29:65 (as S. ciliata). G.M. 39:233. J.H. 11:32:281.

3. Milesii, Leichtl. (S. Stracheyi, var. Milesii, Hort.). From S. Stracheyi it differs in having longer lvs. (9-12 in. long and 4-5 in. broad), white frs., oblong calyx-lobes, the petals distinctly clavell: corolla dense. Himalaya.


5. cordifolia, Haw. Very like the above and probably only a form of it; differs in having broader, round-oblolute, and more or less cordate lvs. Altai. Var. purpurea, Hort., has purple frs.

6. purpurascens, Hook. f. & Thom. Lvs. broad-oblolute, to short-oblong, the margins entire or slightly undulate, somewhat cordate at base; sepa 12 in. or less high, bright purple, hairy; frs. deep purple, nodding, the calyx-lobes very obstone; fr. elliptic-lanceolate, erect. Sind (India), 16,000 to 15,000 ft. altitude. B.M. 5686.

7. Huetiana, Boiss. Annual or biennial, but grown from seed as a hardy garden annual and used for edgings and borders of small beds; a dwarf about 6 in. high, compact in growth; lvs. reniform and shallowly 5-lobed, the lobes obtuse or short-apicate. long-petioled, bright green in color; frs. small but very numerous, long stalked in the axils, bright yellow, the petals ovate or oblong; seeds small, tuberculate. Asia Minor. — Very effective little plant.

8. oppositifolia, Linn. Stem or caudex perennial and leafy, the branches rising 6 in. high and bearing many small persistent thick sepal-like lvs., and giving a moss-like aspect to the plant; sterile shoots with lvs. imbricated in four series: frs. solitary on the ends of the annual leafy shoots, lilac or white, the obovate petals exceeding the stamens. Rocks, alpine and boreal parts of Europe and North America, extending into northern Vermont. L.B.C. 9:869. An excellent little rock plant, making a sedum-like mat, the foliage of a purplish cast. There are several cultivated forms, as var. alba, lvs. white; var. major, lvs.
large, lime; var. Pyrenaica (or superba), fls. very large, rose-purple. S. oppositifolia is evergreen. It makes a good carpet under other plants.

9. lingulata. Bell. Radical lvs. in a rosette, numerous, linear-spatulate and somewhat acute, siliate above, the margin cren-ciliate and somewhat ciliate and crustate with lime; stem-lvs. shorter, the margin cren-lagaginous and the lower crustate: fls. rising 1-2 ft., erect or flexuose, and bearing a thyrsoidea panicle of small white fls. with obovate or oblong-obovate 3-nerved petals. Apennines and Alps.

Var. Lantosca, Linn. (S. Lantosca, Bois., & Reut.). Lvs. short, more or less attenuate below, but not at the apex, the margin thin. Maritime Alps. G.C. II. 15:106.

10. Hostitii. Tausch. Radical or basal lvs. many, somewhat erect, flat above and the apex obtuse, ciliate at the base; stem-lvs. oblong and nearly or quite obtuse, crenate-serrate; coryms 5-9-fl., the fls. white or the oblong petals somewhat purple-spetted. Apeninnes and Alps.

11. Cotyledon, Linn. Tufted, the basal lvs. forming attractive silvery rosettes, and sending up long panicles to a height of 1-2 ft.; basal lvs. ligulate to oblong, short-acute, plane, margin cren-lagaginous and dentate and bearing many pores; stem-lvs. lingulate-lanceolate: fls. numerous, white, the petals crenate-obovate and 3-5-nerved and the middle nerve usually bifid, the calyx glandular. Mountains of Eur. Var. pyramidalis, DC., is a robust form, with a large, many-fl. panicle.

12. Alizon, Jacq. (S. rosalarius, Schleich. S. capricata, Lap.). Fig. 2260. Much tufted alpine plant, forming small dense rosettes and sending up a clanny-pubescent, many-fl. scape 5-12 in. high: basal lvs. spatulate, incurved, thick and persistent, the margins white and cren-lagaginous and porose; stem-lvs. smaller, spatulate or cuneate, serrate towards the apex: fls. small and many, cream color to nearly white, the petals obovate to elliptic and 3-5-nerved, and sometimes spotted at the base. Alpine and boreal parts of Europe, Asia and N. Amer. From as far south as Alaska. In eastern country, as northern Vermont and Lake Superior. Very variable.

13. granulata. Linn. Meadow Saxifrage. Plant erect and branched when in bloom, 6-20 in. tall: radical lvs. reniform, incised lobed, the lobes entire or crenate, plicate, stalked; stem-lvs. few, nearly sessile, cuneate: fls. white, somewhat bell-shaped, more or less drooping, about 1 in. across, the petals oblong-obovate and much contracted at the base and 3-nerved. Eu., N. Afr., As. - This is a common Meadow Saxifrage of Europe, blooming early in May. It is an attractive plant. A full double form is in cultivation, being prized for planting in moist shady borders. Not hardy at Boston.

14. rivularis, Linn. Matted little plant, with stems ascending 1-3 in. high: lower lvs. round-reniform, prominently 3-5-lobed, long-stalked; stem-lvs. narrow-ovate to lanceolate, entire: when 5-6 in., white, the petals ovate. Eu., Asia, N. Amer., in this country occurring as far south as the White Mts. and Colo.

15. petalata. Torr. Umbrella Plant. Strong plant, sending up large petalate leaf-blades or petioles 1-3 ft. long, the many pinkish or white fls. borne on long hairy scapes overtopping the young foliage: rootstock stout, horizontal: lvs. orbicular, much lobed or cut, almost centrally peltate: fls. ½ in. across, the petals elliptic and obtuse. Margins of streams, Calif. B.M. 6074. F. S. 23:2441, G.C. III. 27:139. Gn. 26, p. 545; 55, p. 6. Gugg. 7:207—One of the largest of all Saxifrages, and one of the most interesting to the rock-grower. May to mid-June, 1 ft. across, and the rhizome 2-3 in. thick. The fls. appear in advance of the lvs. in early spring. Hardy in Mass., with slight protection, and a most desirable plant when bold effects are desired.

16. chrysanth, Gray. Dwarf escent plant with creeping shoots and rosetulate, imbricated obovate-ovate, glabrous and fleshy lvs.: flowering stems 1-2 in. tall, filiform, glandular-pubescent, 1-3-fl., the ovil petals yellow. Mts. of Colo.—Has been offered by dealers in native plants.

17. rotundifolia, Linn. Root-lvs. thick, crenate-orbicular, dentate-lobed, long-stalked, clustered, but not rosetulate; stem-lvs. nearly sessile, often narrower: fls. 1-2 ft. tall, erect and somewhat branched, hairy: fls. white, the obovate elliptic petals obovate or orbicular; Eur. and Asia. B.M. 63.—A very pretty plant for moist places.

Var. Taggatiana, Engler (S. Taggatiana, Boiss. & Heldr.). Basal lvs. very long-stalked, reniform or nearly orbicular, 5-9-nerved; fls. only 1-2 on the ends of the branches (several in S. rotundifolia itself).—Recommended.

18. punctata, Linn. Plant 1 ft. or more high when in flower, more or less pubescent, the scape leafless: lvs. at first pubescent but becoming glabrous, reniform, equally and strongly dentate or crenate: fls. white, not pubescent, the petals obovate or orbicular; the sepals acutish. Asia and boreal N. Amer.


20. brvophora, Gray. Dwarf, the scapes about 3 in. high and branching: lvs. 1 in. or less long, oblanceolate to narrow-oblong, entire and elliptate, usually rosalate: scape leafless, the branches 1-fl.: petals lance-ovate, white, 2-spotted at the base. Mt. Dana.—Once offered by dealers in native plants.

21. leucanthemifolia, Mihee. (S. Micranthoz, Brittt.). Viscid plant, 5-20 in. tall, much branched, bearing many small star-like white fls. and long-spatulate toothed lvs.: petals lanceolate, unequal, the larger ones cordate at the base and with a pair of yellow spots. Va. to Ga., in the mountains.

22. Pennsylvanica, Linn. Tall stout herb, sometimes 3 ft. and more high, viscid pubescent, nearly or quite simple: basal lvs. sometimes nearly 1 ft. long, oblanceolate, obscurely toothed, much narrowed below, the scape nearly naked; panicle long and becoming open: fls. numerous and small, greenish, the petals linear-lanceolate. Swamps, eastern U. S., south as far as Va. —Recommended as a bog plant.

23. nivalis, Linn. Dwarf, the flowering branches rising 3-6 in.: lvs. ovate or obovate, thickish, crenate, narrowed into a petiole: fls. capitate on a naked scape, the head sometimes branched, white, the obovate or obovate petals persistent. Alpine and arctic regions of Eu., Asia and N. Amer. In the Rocky Mts. it occurs as far south as Arizona.

24. Virginianesis, Michx. Low, viscid pubescent plant, 1 ft. or less tall, from a rosette of obovate or spatulate, crenate-toothed thickish lvs., which are narrowed into a petiole: cyne small and close at first but becoming loose and open: fls. small but many, dull yellow, the petals obovate-oblong-ovate. On rocky ledges, Mass., New York, and Penn. as far south as Va. and Tenn. —A pretty spring flower, and sometimes planted. There is a double-fl. form.

25. integrifolia, Hook. Plant a foot or less tall, viscid pubescent, leafless except at the base, the short cuneate or somewhat mowed lvs. 5-6 in., ovate and very obtuse, the, entire or very nearly so: fls. white, small, in a more or less loose panicle, the petals obovate and twice the length of the spreading-reflexed calyx lobes. Calif. northward.— Once offered amongst native plants.
SCABIOSA

26. azuloides, Linn. Tafted plant, 6 in. or less tall, glabrous beneath, sparsely setose leaf-margins; lvs. linear-lanceolate, somewhat fleshy, scattered along the stem: fls. solitary on axillary pedicels near the top of stem, yellow and more or less spotted with orange, the petals oblong. Eu., Asia, N. Amer., in the U. S. occurring in northern New York, northern Michigan, Rocky Mts., etc.

27. brachiantha, Linn. Dwarf and cespitose, the scape a few inches high and nearly leafless but leafy at the base: lvs. linear to linear-lanceolate, mucronate at the apex, ciliate or spinulose on the margin, stiffish: fls. solitary or corymbose, on long and weak peduncles, yellowish white with orange-red dots, the petals oblong-oblong. Asia and arctic N. W. America and Rocky Mts. Only var. cherlerioides, Engler (S. cherlerioides, Don), has appeared in the Amer. trade: very dwarf, only 2 or 3 in. high, densely cespitose, few-flowered, the lvs. short and somewhat spatulate. Asia and Alaska.


29. caespitosa, Linn. Exceedingly variable species: dwarf and cespitose, the fl-stems erect and nearly leafless and somewhat glandular-plisose (3-4 in. high): lvs. usually cuneate but sometimes nearly linear, usually 3-fld and sometimes 5-fld, the lobes linear and obtuse and nearly parallel: fls. few, white, 1-10 in a raceme or panicule, campionate, the petals spreading, oblong and obtuse, 3-nerved. Eu.

30. aphylla, Stem. (S. lepophylla, Fr.) Small, loosely cespitose species, producing many or several rosettes at the surface of the ground, and sending up short, almost leafless, 3-5-fld, or 2-fld, glandular scapes, lvs. thin, entire or 3-5-lobed: fls. light yellow, the petals linear and acute and about as long as the calyx-lobes. Eu.

31. umbrosa, Linn. LONDON PRIDE. ST. PATRICK'S CABBAGE. Erect-growing plant, the nearly leafless branching fl-stems reaching 6-12 in. high and springing from a dense rosette of lvs. 6-12 in. across: lvs. thick and mostly glabrous, obovate, crenate-dentate, the stalk-like base ciliate: fls. small, pink, with darker spots, in a loose panicled cluster, the petals ovate or oblong and spreading. Eu., in shady places.—A very neat and attractive plant, frequent in European gardens, but rarely seen here. There is a var. variegata, Hort.

32. Geum, Linn. (S. herba, Linn.). Difers from S. umbrosa in being hairy, in having criniferous lvs. that are cordate or notched at the base and on long stalks. Range of last, and said to occur in Newfoundland.

33. sarmentosa, Linn. (S. Japonica, Hort. S. Chinesis, Linn.). STRAWBERRY GERANIUM. In England known as MOTHER OF THOUSANDS, a name also applied to Linaria Cymbalaria, Old Man's Beard. Fig. 2201. True stem or caudex scarcely rising above the ground, but the fl-stems rising 1-2 ft. and much branched, whole plant sparsely hairy: lvs. slender many, long and rooting freely at the soles, in the manner of a strawberry: lvs. nearly orbicular, slightly crenate-lobed, the lobes apiculate, all radical and long-stalked: fls. many, white, the 2 lower hanging petals lanceolate pointed or lance-ovate, the 3 upper ones small and inconspicuous and pinkish and spotted. Japan and China. B. M. 92. G. C. III. 7:237 (showing irritability of plant to light). Gn. 30. p. 393; 32. p. 57. R. H. 1876, p. 427.—An old-time greenhouse plant, and also one of the most beautiful of window-say garden shrubs. Of easiest culture. Var. tricolor, Sieb. (S. tricolor superva, Hort.), has lvs. handsomely marked with creamy white and red variegations. F. S. 18:227-8 (as S. Fortunata tricolor). S. Fortunata, Hook. (S. M. 6377), is a closely allied species, but is less (if any) sarmentose, the lvs. are more sharply toothed, the fls. are white and the lower petals are dentate. L. H. B.

SAXIFRAGE. See Saxifraga.

SCABIOSA (Latin, itch; referring to medicinal use). Dipsacaceae. SCABIOUS. MOUNTAIN BRIDE. About 52 species (from Eu., Asia and Afr.) of annual or perennial herbs, often somewhat woody at the base, with entire, lobed, or dissected lvs. and blue, rose, yellow or white fls. in mostly long-peduncled globose or ovoid-conic heads. Bracts of the involucrse in 1 or 2 rows, foliaceous, mostly free: scales of the receptacle small, narrow or none: corolla 4-5-cleft: stamens 4, rarely 2, all perfect. For a related plant, see Cephalaria.

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

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A. Radical leaves dentate or lobed.
B. Fls. yellow. .
C. Calyx-limb sessile or nearly so.
D. Lvs. sessile.
E. Lvs. pedate.
F. Petal lobes: Calyx-limb pedicellate.
G. Plant 2 ft. high.
H. Plant 6-18 in. high.

AA. Radical lvs. entire.
B. Lvs. ovate-oblong.
C. Heads 3 in. across.

1. ochroleuca, Linn. A hardly perennial herb about 13 in. high: stem branching, 2-flowered, the radical crenate or lyrate pin-natifid, tapering to a petiole, pubescent on both sides, those of the stem 1-2-pinnately divided or cleft into oblong or linear lobes: peduncles long and the involucrse shorter than the fls. June to autumn. Eu. and Asia. Var. Webbia (S. Webbiana, D. Don). Height 6-10 in.: lower lvs. canescent-ciliolate, the upper glabrous. Resembles the type but is smaller in all its parts. B. R. 9:717.

2. arensis, Linn. (S. stachya, Gilib.). A hardly perennial 2-4 ft. high: stem hispid: lvs. villous-hirsute, the radical unequally pinnately parted, the lobes lanceo-
late; those of the stem pinnately divided with linear lobes, the upper linear-lanceolate: involucral bracts obtuse: fls. lilac or blue, 1-2 in. across. June-Aug. Not known to be in the trade. *S. varia*, Hort., being presumably mixed varieties of *S. atropurpurea*.

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**SCAPHOSEPALUM**

*S. gibberosa*, Rolfe (*Masdevallia gibberosa*, Reichb. f.). Lvs. 3-5 in. long, oblong-obovate or lanceolate, obtuse: peduncle 6-10 in. long, warty, bearing a loose raceme of 4-8 fls.; dorsal sepal boat-shaped, with a long tail, dull red, with strong, greenish ribs; lateral sepals partly connate in a concave lamina, then spreading horizontally, yellow, spotted with red and ending in yellowish tails. Colombia. B.M. 6990.

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**SCALLION**, a name for the Shallot; also used for onions that do not make good bulbs but remain with thick bulbs, but generally pronounced and written *scallion* in this country. The word is connected with *Ascallonium* (*Allium Ascallonium*).

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**SCANDIX** (Greek, to sting; in reference to the roughness of the fruit). *Umbellifer*. About 10 species of annual herbs mostly natives of Europe: lvs. pinnately decompound, the segments small and narrow: fls. white, polygamous, often radiate, usually in few-rayed compound or simple umbels: fr. oblong-linear, long-beaked, the ridges obtuse, prominent.

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**Pecten-Veneris**, Linn. Fig. 2263. A hardly garden annual 6-12 in. high, with finely cut lvs. and small white fls. in simple umbels. Eu.—Little grown here.

*S. cernuum*, Linn. See *Cheiril*. F. W. BARCLAY.

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**SCAPHOSPERMUM**

*S. brachiata*, Sibth. & Sm. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately cut, lirrate; the lower lobes deciduous, the terminal large, ovate-oblong: fls. light blue. June and later. Eu., Asia. 


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**SCABIOUS**. For Common Scabious, see Scabiosa. For Shepherd's or Sheep Scabious, see *Jasione perennis*.
ISH, thickly speckled with crimson; dorsal sepal broadly ovate, concave, strongly 5-ribbed, ending in a stiff incurved tail; lateral sepals spreading horizontally, falcately incurved, with a bilobed process near the tip. Colombia. B.M. 7765.

HEINRICH HASSELBERG and WM. MATHEWS.

SCARDBOROUGH LILY. Vallota purpuracea.

SCARLET BUSH. Hamelia.

SCARLET LIGHTNING. Lychnis Chalcedonica.

SCARLET PLUME. Euphorbia fulgens.

SCARLET RUNNER. A red-flowered variety of Phacelopsis multiflora.

SCENTED VERBENA. A name found in some books for the Lemon Verbena. See Lippia.

SCHAUERIA (after J. C. Schauer, professor at Greifswald, 1813-1818). Acanthaceae. Erect, half-shrubby herbs, with entire lvs.; fls. yellow or red, in a terminal thyrse or spike; calyx 5-parted, segments linear or setaceous, long, gradually broadened upward; limb 2-ribbed, the upper lip inferior narrow, entire or emarginate, erect, lower lip cut into 3 subequal, recurved segments; stamens 2 each, with 2 parallel anthers, about as long as the upper lip; aborted stamens wanting; style filiform; ovary seated on a disk, 2-loculed, with 2 seeds in each locule. About 8 species from Brazil. Closely related to Jacobinia, from which it differs by the equal parallel anther cells. It is distinguished from Anisacanthus by its setaceous calyx-lobes, and from Fittonia by its habit.

flavicoma, N. E. Brown (Justicia flava, Hort., not Kurz.,). Fig. 2364. Half-shrubby plants, with erect, branched stems, up to 4 ft. high: lvs. opposite, petiole or petiole-like, ovate to ovate-lanceolate; corolla white, 5-lobed; fls. light yellow, 1½ in. long, borne in erect, feathery panicles; calyx-lobes long, subulate, glandular-hairy, persistent after the corolla has fallen. Autumn. Brazil. B.M. 2816 (as Justicia calycotricha). L.B.C. 29:1921 (as Justicia calli-tricha).—This plant has been confused with S. calycotricha, Nees, and has long been cultivated under that name. S. calycotricha, Nees, has a smooth calyx and broader ovate lvs. which are very obtuse or subacute at the base.

HEINRICH HASSELBERG.

SCHIELLEA (after Scheele, distinguished German chemist). Palmaeae. About 10 species of pinnate palms from tropical South America. They are spiny-leaved, tall or dwarf; leaf-segments arranged in regular series or grouped, linear, in young plants unequally and obscurely 2-cut at the apex; fls. yellowish, dienceous or monoeccious, the males very numerous in the upper part of the branches, the females few or solitary in the lower part and sometimes peduncled; petals of the males long-club-shaped or cylindrical; stamens 6, shorter than the petals; fr. 1-3-seeded.

butyracea, Karst. This species is cult. in S. Calif. Froome especially remarks that it comes from Venezuela, and is a magnificent palm with the habit of Attalea. H. A. Siebriecht writes that it is rare in cultivation and that it is more interesting than beautiful. On account of its large stem base or crown, it requires so large a pot or tub for the size of the plant that it does not make a very ornamental subject.

W. M.

SCHERZIA (Frederick Scherz presented the original species to the Royal Botanic Gardens at Kew, he hav- ing received them in 1850, through J. Potts, from Chi- huahua, Mexico). Gesneracea. A name proposed for four Mexican and tropical American herbs which are now referred to Achimenes (which see). From Achim- enes, Seemann, its founder, distinguished it by its truly infundibuliform, not bilobed, stigma. In habit, the genus suggests Achimenes kiraiana, A. pedunculata and A. multiflora (see p. 18, Vol. 1.), From the American trade one species is offered, S. Mexicana, Seem. (S. car- vutae, Hort.), now more properly known as Achi- menes Scheerii, Hemsl. Stem erect, hairy: lvs. ovate, hairy, dentate, stout-stalked, opposite; fls. solitary in the axis, stalked, the corolla 2–2½ in. long, the tube inclined or drooping and curved, the wide-spreading 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743.

L. H. B.

SCHIMA (said to be an Arabian name). Turinòtròmi- deae. About 9 species of tender evergreen trees and shrubs, with 5-petaled white fls. about 1½ in. across. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as Gordonia Jacotiana. Schwimma and Gordonia are closely related genera, distinguished by Bentham and Hooker as follows: Schwima has inferior stamenes, sepals scarcely unequal, ovules few in each locule and laterally affixed; Gordonia has super- rior radicles, sepals markedly unequal, ovules numerous in each locule and pendulous.

Other generic characters of Schwima: peduncles 1-fld., usually erect: fls. solitary, in the axis or the upper ones crowded in a short raceme; petals connate at the base, imbricate, concave; stamens numerous: ovary 5-celled (rarely 4- or 6-celled); stigmas broad and spreading; capsule woody: seeds flat, kidney-shaped.

Noronha, Reinw. (Gordonia Jacotiana, Roll.). Tender evergreen shrub, 2 ft. high or perhaps more, branched, glabrous: lvs. alternate, elliptic-lanceolate, coriaceous, entire: fls. solitary in the axis, white, 1½ in. across, shorter than the lvs.; petals ovate,Java. B.M. 4539. —A good pot-plant for the greenhouse. Readily increased by cuttings.

W. M.

SCHINUS (Greek name for the Mastie-tree, Pistacia Lentiscus: applied to this genus on account of the resini- nous, mastie-like juice of some species). Anacardiaceae. Resinous, dienceous trees, with alternate, pinnate lvs., sessile fls., axillary and terminal bracteate panicles, small whitish fls. with short, 5-lobed calyx, 5 imbricated petals, broad annular disk, and 10 stamens: fr. a globose drupe. About 17 species, all South American except one in the Sandwich Islands, one in Jamaica and one in St. Helena. Only two are cultivated; they are semi-tropical and grown in the warmhouse at the East and in North Europe, in the open at the South and in Calif. as far north as the San Francisco Bay region.

Molle, the old generic name, is from Mulli, the Peru-
vian name of S. Mollé, and not, as sometimes supposed, Latin molle, soft, which would not be applicable in this case.

Mollé, Linn. 

PERUVIAN MASTIC-TREE. 
CALIFORNIA PEPPER-TREE. 

Figs. 2265, 2266. Evergreen tree. 20 ft. and more, with rounded outline and graceful, pendulous branchlets when not trimmed: lvs. 9 in. or more long, glabrous, alternate, linear-lanceolate; fls. 1½-2 in. long; fls. in conical panicles, yellowish white; ripe fruits the size of peppercorns (whence the popular, but misleading, California name), of a beautiful rose-color.

Payr. in Fl. Mex. 1825, R.H. col. p. 225. G. C. Dix. 17:568, 589. Gu. 25, p. 418. B.M. 3339. In southern and middle California more extensively cultivated than any other ornamental tree except, perhaps, the Blue Gum (Eucalyptus globulus), and thriving best in the warm interior valleys, though hardy on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. Mollé was a generic name used by Tournefort, and placed in apposition with Schinus by Linnaeus (explained above).

terebinthifolius, Raddi, with racemose fls. and lvs, composed of seven broader, somewhat serrate lfts., is sparingly met with in cult. in S. Calif., and proves hardy in San Francisco. Brasil.

dependens, Ortega (Dovaba dependens, DC.), is a shrub or small tree, with more or less drooping branchlets: lvs. ½-1 in. long; oblong, olbon or obtuse; fls. yellow, 1 line long, produced in great numbers in racemes about as long as the leaves. Western S. Amer. B.M. 7406. Br. 19:1658 (Dovaba ovata); 19:1573 (D. dependens); 29:59 (D. longifolia).

gnecus, Duvana distinguished from Schinus chiefly by its simple foliage, but it is now considered a subspecies of Schinus.

Jos. BUETT DAVY.

Schinus Mollé is everywhere present in southern California, where it attains a height of 50 ft. and sows itself. It was a great thing for this region in years past before the water systems had reached their present efficiency. Now the poor Pepper-tree is under a ban, and justly so. Next to an oleander the black scale loves a Pepper-tree. Hence the Pepper-trees, being large and numerous, have been indirectly a serious menace to the orchards of citrus fruits. Thousands of old trees, 2-3 ft. in diameter, have been cut during the past year because of their proximity to orange orchards. At least one nurseryman has actually refused to sell Pepper-trees to people who ordered them. Los Angeles boasts some avenues of this tree. Schinus terebinthifolius is but little known in this region, the tallest tree being only 15 ft. as yet, but it is likely to be extensively planted in the near future.

ERNEST BRAUNTON.

SCHISMATOGLOTTIS (Greek, falling tongue; referring to the fact that the limb of the spade soon falls off the flower). The plants which bear this uncomfor-
table name are amongst the finest variegated foliage plants in the Arum family, and hardly if at all inferior in beauty and ease of culture to the popular Dieffenbachia, which they closely resemble. They are tender plants used for the decoration of warm conservatories, but they have been successfully grown by skilled amateurs in living houses, where a day temperature of 70° could be maintained throughout the winter. The genus contains about 15 species, mostly natives of the Malay Archipelago. They have stomatiferous rhizomes and the caudex lies on the ground. The leaves are large, ovate or lanceolate, banded or blotched with white or pale yellowish. The brightness of the colors in variegated plants largely depends upon culture. Fls. unisexual; fertile males with 2-3 short stamens, truncate at the apex; sterile males with staminodes destitute of pollen; female lvs. with 2-4 pistils; ovary 1-loculed; style and stigma slender: berries oblong, green, yellowish or scarlet. Engler in DC. Monog. Phaner. vol. 2, 1679. For culture, see Dieffenbachia. See also Philodendron, to which the genus is somewhat closely allied.

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2265. Schinus Mollé, the California Pepper-tree.

A. Lvs. lanceolate-oblung, base not heart-shaped.
B. Petiole longer than blade........... 1. Lavallei
BB. Petiole shorter than blade........ 2. variegata

AA. Lvs. ovate, base heart-shaped.
B. Foliage banded with white....... 3. crispa
BB. Foliage blotched with white..... 4. picta

1. Lavallei, Linden. Lvs. lanceolate or lanceolate-oblong, rounded or narrowed at the base but not cordate, blotched with silvery white, some of the blotches much larger than others; petiole 3-4 in. long or less than half the length of the blade. Borneo. This has been confused in the trade with S. Neoguineensis.

3. crispa, Hook. Lvs. 5-7 in. long, leathery, ovate-cordate, with rounded basal lobes, dull green above with 2 whitish, irregular, nearly parallel bands extending from base to apex and about half-way between midrib and margin. Borneo. B.M. 6576.

4. picta, Schott. Lvs. ovate-cordate, the basal lobes short, but the sinus deep, dark green above, marked with lacerated glaucous spots at the middle, on each side of the midrib and between the nerves; petiole 8-10 in. long; blade 6-7 in. long. Java.

5. Neoguineensis, N.E. Br. (S. variegata, Hort., not Hook.). Lvs. ovate-cordate, bright green, irregularly blotched with pale yellowish green, the total mass of green being greater than the variegation; petiole 9-12 in. long; blade 8-9 x 5-6½ in. New Guinea. 1.H. 27:380 as Calocalasia Neoguineensis, the variegation being a bright creamy white.

6. pulchra, N. E. Br. (S. decora; Bull.). Lvs. ovate, obliquely cordate, irregularly blotched with silvery
white, the total mass of green being less than the variegation; petiole 3-4½ in. long; blade 4-5 x 1¼-2½ in. Borneo. I.H. 31:520. G.C. II. 24:263. — S. decorum, var. Wittm{"a}nchiana, was described in 1850 by John Saul, Washington, D.C.

S. Roebelini, Pitcher & Manda, 1895, p. 138. "Lvs. beautifully marked with silvery white in a broad feathery variegation. Only the center and edge of the leaves are plain light green. The plant is compact, tree-growing, with thick leaves as enduring as those of a rubber tree. A fine house plant." This plant is imperfectly known. It is figured in Pitcher & Manda's catalogue 1885:141 as S. Roebelini, and the same thing is used in A.G. 19:589 (1898) as S. pleta and in V. M. 23:71 (1899) as S. crispata. The plant so pictured is distinct from any species described above. There is more white than green in the leaf, only the edges and midrib portion being green. Some growers believe it to be a sport of S. crispata. —S. Scenani, Hort. Bull., was advertised by the U. S. Nursery Co, 1896, but seems unknown to botanists. —S. Scenani, Hort. Bull. still in cultivation, but imperfectly known to botany. Possibly a species of Aichemisia.

W. M.

**SCHIZEEA** (Greek, to split). Schizaeaeae. A genus of small ferns with twisted grass-like lvs. and sodgerlike sporophylls formed of a cluster of closely compacted pinnae, each with two rows of sporangia, which in common with the family are pear-shaped, with an apical ring, opening by a vertical fissure.

pusilla, Pursh. Our only native species, growing in sandy bared places, mainly in New Jersey. Lvs. an inch long, grass-like: sporophylls 2-3 in. long, with 6-8 closely compacted divisions, forming a spike at the apex. Known locally as Curly-grass. The prothallus only recently studied is found to resemble pongadeng filamentous rather than thallus in as ordinary ferns.

L. M. Underwood.

**SCHIZANTHUS** (Greek, split and flower; from the incised corolla). Solanacae. BUTTERFLY FLOWER. About 6 species of annual herbs from Chile, with mostly finely cut leaves and terminal open cymes of variously and highly colored lvs.: calyx 5-lobed, the lobes linear, corolla tubular; limb wide-spread enclosing the face with somewhat 2-lipped, laciniate; stamens 2, exerted; seeds numerous, small. These dainty plants are of easy culture in any good garden soil. They are also useful as pot plants for summer flowering, the see drying somewhat early fall and the plants kept in a light house and given plenty of root room as they need it.

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

B. The middle segment of the anterior lip of the corolla notched at summit.

retusus, Hook. Stem 2 ft. high; lvs. pinnatisect, with the segments entire, dentate or pinnatifid, lvs. in the type deep rose, with the large middle segment of the upper lip orange except at the tip; the lateral segments of the posterior lip falcate, acute, longer than the middle segment. B.M. 2045. B.R. 18:153.

Bb. The middle segment of the anterior lip not notched at apex.

Gráhami, G.H. Lvs. 1-2-pinnatisect; segments entire or dentately pinnatifid; lvs. of the middle half of the middle segment of the anterior lip yellow or orange; the lateral segments of the posterior lip falcate, linear, acute, shorter than the middle segment. B.M. 3044. R.H. 1843:529.

AA. Corolla-tube shorter than the calyx; stamens long-exserted.

pinnatus, Ruiz and Pav. (S. párrigens, Grah. S. Peñafiel, Pact.). Fig. 2266. The most variable of the species, with many horticultural forms distinguished.
by height of stem and color markings of the fls. Typically 2 ft. high: lvs. 1-2 pinnatifid; the segments entire, dentate or incised pinnatifid; fls. varying in depth of color, the lower lip usually violet or blue; the upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B. M. 2341, 2321 (as S. porrigens). B. R. 9:725; 18:1562 (as var. humilis).—Var. nana, Hort., is somewhat low-growing.

F. W. Barclay

**SCHIZOCODON**

(Greek, cut bell; referring to the fringed corolla). _Diapensia_. Schizocodon soldanelloides is a pretty alpine plant from Japan with rosy flowers fringed like the well-known _Soldanella_ of the Alps. It may be readily distinguished from _Soldanella_ (which is a member of the primrose family) by the leaves being toothed, and the stamens 4 instead of 5. The name "Fringed Soldanella" has been proposed for _Schizocodon_, but all _Soldanella_ are fringed. "Fringed Galax" would be better, as Galax is the nearest relative, _Schizocodon_ being, in fact, the Japanese representative of the American Galax. The fls. of _Schizocodon_ are sometimes more or less bronzy, like those of Galax, but their form is not so pleasing. The plant is only a few inches high, and the fls. are borne to the number of 4-6 on a scape. The scapes are numerous and the fls. about 1 in. across. Since 1892 this plant has excited an amount of interest comparable to that caused by the introduction of _Shortia_ in 1889.

_Schizocodon_ is distinguished from allied genera by the following characters: corolla funnel-shaped, 5-lobed; the lobes flabellate; stamens affixed between the lobes of the corolla, and separate from the staminodes, which are long and linear. Other characters: ovary 3-loculed; capsule globose, 3-lobed, loculicidally 3-valved: seeds numerous.

soldanelloides, Sieb. & Zucc. FRINGED GALAX. Fig. 2368. Hardy, tufted, alpine plant a few in. high: lvs. leathery, evergreen, long-stalked, the blade roundish, wedge-shaped or suborbate at the base, coarsely toothed, the teeth apiculate; fls. nodding; segments 5, oblong, obtuse; corolla deep rose in center passing into bluish or white at the edges; staminodes linear. Japan. B. M. 7316. Gn. 4:934. G. C. III. 13:415. G. M. 36:266. J. B. M. 31:523. V. 39:119.—This is probably the only species in the genus, as _S. unifrons_ is _Shortia_ and _S. ilicifolius_ is thought to be a variety of _Schizocodon soldanelloides_, with more variable lvs. and fls. ranging from red to white. Offered by many European dealers, and by one or two Americans; little known here.

W. M.
SCHIZONOTUS

G.C. III. 25:21.—A very variable species, of which the following are perhaps the most important forms: Var. ariëfolius, J. G. Jack (Spírea ariëfolia, Sm.). Large shrub, with arching branches; lvs. usually truncate at the base, with dentate or entire lobes, palmate or pinnately lobed, and pungent beneath; panicle drooping, ample to 10 in. long. B.R. 16:1365. G.F. 4:367. Var. Purshianus, Rehd. (Sp. discolor, Pursh). Similar to the former, but lvs. whitish-tomentose beneath. Var. Hissi, Rehd. (Sp. fissa, Lindl., and probably Holodiscus australis, Heller). Similar to var. ariëfolius in habit, but smaller; lvs. entire at the base, narrower, with entire lobes, ovate-oblong, or linear-obovate, 1 in. long. Var. densus, Dippel (Sp. du mosa, Nutt. Sp. Bouvieri, Carr.). Erect shrub, 8 ft. high; lvs. cuneate, coarsely toothed, pungent beneath, ovate-oblong or ovate-oblong to obovate, 1 in. long; panicle erect, rather small and dense. R.H. 1859, p. 519. This last form is the least desirable as an ornamental plant.

S. purpurascens, Gray, is Solanum purpurascens Greene, a Californian Asclepiad, not in cult. It is a perennial with ascending stems to 1 ft. high, cordate-ovate lvs., and small red-purple fls. in compact umbels.—S. tomentosus, Lindl.—Sorbaria Lindleyana.

ALFRED REHDER.

SCHIZOPÉTALON (Greek, cut and petals; in reference to the pinnately cut petals). Crocifera. A genus of possibly 5 species of annual herbs from Chile, with alternate, serrate, dentate or pinnatifid leaves, and purple or white flowers in terminal racemes. The main generic character lies in the shape of the petals, which are flat and pinnately cut into regular segments.


F. W. BARCLAY.

SCHIZOPHRAGMA (Greek, schizin, to cleave, and phragma, wall; the inner layer of the wall of the valves is cleft into fascicled fibers). Saxifragaceae. Ornamental climbing deciduous shrub with opposite, long-petioled, rather large, dentate leaves, and loose terminal cymes of small white flowers with enlarged sterile ones at the margin. It has beautiful bright green foliage and attractive flowers. The plant is useful for covering walls and trunks of trees. It clings firmly by means of aerial rootlets. Hardy north as far as New York City. It thrives best in rich, moderately moist soil and partial shade, but also does well in full sun. Prop. by seeds or Greenwood cuttings under glass; also by layers. Like Hydrangea petiolaris, young plants produce small lvs. and make little growth if unsupported and suffer to trail on the ground. One species in Japan and another in China, allied to Hydrangea and Decumaria: fls. in loose cymes; sepals and petals 4-5; stamens 10; style 1; ovary 4-5-loculed; marginal sterile fls. consist only of one large white sepal, terminating the branchlets of the infructescence: fr. a small, 10-flowered capsule.

Hydrangeoides, Sieb. & Zucc. Climbing Hydrangea. Climbing to 30 ft. and more: lvs. on petioles 2-3-in. long, reddish, orbicular or broadly ovate, shortly acuminate, rounded or cordate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2-4 in. long: cymes peduncled, 8 in. broad; marginal fls. pedicelled, consisting of an oval to broadly ovate white sepal about 1½ in. long. July, Japan. S. Z. 1:26, 100. Gn. 15, p. 301; 34, p. 281.—The species is often confounded with Hydrangea petiolaris, which is easily distinguished by its marginal fls. having 4 sepals. It has been once introduced under the name Cosmidea integerrima, which is a Chilean plant with entire evergreen leaves. The plant usually thrives best in a shady exposure.

ALFRED REHDER.

SCHIZOSTYLIS (Greek, to cut, and style: alluding to the filiform segments of the style). Iridioceae. Two species of South African perennial herbs with tufted, sometimes fleshy roots, narrow equitant leaves and a slender scape bearing 6-12 red fleshy flowers in a distichous spike. Perianth with a cylindrical tube and bell-shaped limb divided into 6 nearly equal oblong segments: stamens inserted on the throat of tube: capsule obvoid-oblong, obuse.

Nutrient Valley?

Cocceae, Backb. & Harv. Crimson Flag. A winter-blooming tender plant: stem 1-2 ft. high, bearing 2-3 lvs.: basal lvs. 2-3, about 1½ in. long: fls. bright red, about 2 in. across. B.M. 5422. F.S. 16:1637.—The following cultural notes are taken from Garden and Forest 9:16: "The species blooms from Oct. to late Dec. and is useful for cut-flowers at this season. It is perfectly hardy in England but of little use here except for indoor use. The roots should be planted out in rich soil in spring about 8 in. apart, and encouraged to make a strong growth. In the fall the plants may be lifted, potted and placed in a cool greenhouse, where they will flower. After flowering they may be stored in a frame until spring, when the fleshy roots will need to be separated (leaving 2-5 buds to each root), and planted out as before."

F. W. BARCLAY.

SCHOMBURGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). Orchidaceae. This genus contains about 12 species, inhabiting tropical America. They have the habit of Cattleyas or Laelias, except that they are less compact. Pseudobulbs long, fusiform, bearing several brown scales and 2-3 leafy lvs. at the summit: fl.-stems from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of potted showy fls. The fls. are like those of Laelia except that the sepals and petals are narrow and undulate and the labelnum does not completely envelope the column. The labelnum is always evidently 3-lobed.

Give Schomburkias plenty of heat and a light place near the glass, which should be slightly shaded during the hot summer months. Give freely of water in the growing season. Pseudobulbs 10-12 in. long. B.M. 4:270. Pseudobulbs 1-½ in. long, tapering upwards: lvs. 2-3, oblong, leafy: raceme 4-8 ft. high, bearing

2269. Schizostylis discolor (X ¼)
SCHOMBURGKIA racemes glnata, lobed; petals lobed. oblong, with white, some ing about B.R. bearing numerous 1628 1:54. — Var. grandiflora, Lindl. Fls. larger and paler, with more yellow in the lip. B.R. 31:59. B.M. 1476. F.S. 1:54. S. tibicinis requires less compost than the other species.

SCHOTIA crlspa, Var. Africa, his brownish 31:53. pink, at S. linear, with of B.K. crisp. 5172. orantes, ovate-oblong or obovate; panicles many-fl., axillary and terminal; calyx-tube conical, crimson; petals very small, linear, hidden by the calyx.—Cult. in southern Florida.

AA. Fls. nearly sessile.

latifolia, Jacq. Becoming a tree 20-30 ft. high: lfts. 4-8, ovate-oblong or obovate, usually 1½-2½ in. long, ½-1 in. wide: lvs. rosy or flesh-colored, in much-branched panicles; petals longer than the calyx.—Advertised in southern California. F. W. BARCLAY.

SCHRANKIA (F. P. Schrank, director of the botanic gardens in Munich). Leguminosae. Sensitive Brier. About 10 species of perennial herbs or shrubs, mostly American, with bipinnate, usually sensitive leaves and small pink or purple fls. in axillary peduncled heads or spikes. Calyx and corolla regular, 4-5-parted; stamens 8-12: pod linear, acute or acuminate, spiny all over, becoming 4-valved, several-seeded.


F. W. BARCLAY.

SCHRéBERA (perhaps after J. C. D. Schreber, 1739-1810, physician and naturalist). Oleaceae. A genus of 4 species of trees from Africa and India, with unequally pinnate leaves and flowers in very much branched cymes: calyx tubular-bell-shaped, irregularly 4-7-lobed; corolla salver-shaped: tube cylindrical; lobes 4-5; spiraling; stamens 5, near the top of the corolla-tube: ovary 2-celled.

swietenioides, Roxb. A tree, about 40 ft. high, nearly glabrous: lfts. 5-7, ovate, acute, 4½ in. : fls. white, with brown marks, about ½ in. across, in many-fl. cymes. Cult. in southern Florida.

SCHUBERTIA is a subgenus of Araujia, but in this work it is accounted for under Physanthus.

SCIADOPTYS (Greek, skias, skiaos, umbrella, and pitys, spruce; alluding to the position of the leaves). Conifera. Umbrella Pine. Evergreen tree, of narrow pyramidal habit, with linear, rather large, needle-like leaves in whorls and oval cones 3-4 in. long. The only species is hardly as far north as Portland, Me., and is a beautiful conifer of compact, conical form, with glossy dark green foli- age. It is of rather slow growth. It thrives well in a moderately moist, loamy, and also in clayey soil. Prop. by seeds and layers, and sparingly by cuttings of half-ripened wood in summer; but seedlings are to be preferred, as they grow more symmetrically and more vigorously. Monotypic genus from Japan. Lvs. linear, deeply furrowed on both sides. Disposed in whorls at the ends of the short annual shoots; they are of two kinds: the true lvs. are small and bract-
like; the upper ones, crowded at the apex of the shoot, bear in their axils needle-like lvs. of another kind, which, however, are considered by some botanists to be leaf-like shoots, or cladophylla, but linear and conuate in 2's, while others believe them to consist of two conuate lvs. corresponding with the fls.-clusters in Pirus. Their morphological structure points towards the first explanation, while they are lvs. in regard to their physiological function. Fls. monocoeous; the staminate oval, consisting of spirally disposed 2-celled anthers and appearing in dense clusters at the ends of the shoots; the pistillate are solitary at the ends of the shoots and consist of numerous spirally arranged scales subtended by a small bract and bearing 7-9 ovules: cone oblong-ovate, woody, the bracts conuate, with the broadly orbicular, thick scales, spreading at the margin; seeds ovate, compressed, with narrow wing, emarginate at the apex. The wood is nearly white, very strong and straight-grained.

verticillata, Sieb. & Zucc. UMBRELLA PINE. Fig. 2271, 2272. Tree, attaining 100 ft., with ascending branches forming a narrow pyramidal, compact head, in old age loose and with pendulous branches: scale-like lvs. dark brown, ½ in. long; needles 15-35 in each whorl, linear, stiff, obtuse, deeply furrowed on both sides, dark green and glossy above with a white line beneath, 3-6 in. long;

2272. Umbrella Pine—Sciadopitys verticillata (trimmed).


ALFRED RHEDER.

SCILLA (the old Greek name used by Hippocrates; I injure, according to Miller, alluding to the poisonous bulbs). Liliaecea. SQUIL. WILD HYACINTH. BLUE-BELL. About 80 species of perennial bulbous plants, widely distributed in Europe, Asia and Africa in temperate districts. They are remarkable for easy culture, quick growth and beautiful blue, rose or white flowers, blooming early in the spring (some in autumn), and therefore, desirable plants for the wild garden, rock garden, or border. Some are stipe plants. Some of the South African forms have handsome spotted foliage.

Generically, the Scillas are distinguished as follows: Bulb tunicae, large or small; lvs. radical, 1–several in number, linear, liriform, lanceolate, oblong or nearly ovate, in Scilla autumnalis appearing after the flowers; scape 1–several, simple, leafless: fls. in racemes, which are several to many-flowered, open, compact or spicate; bracts small, sometimes minute, hyaline: pedicels short or long, staminate, filaments: anthers 2, filiform, obtuse, introrse; ovary sessile, stigma small capitate; ovules 2 in each locale, rarely 8–10, ascending; capsule globose; seeds 1½–2 mm. in each cell, rarely 1½ mm.; testa black, appressed; embryo small in albumen. The genus is distinguished from Orchidaceae chiefly by the color of the flowers and deciduous perianth, from Hyacinthus by the segments distinct from the bracts; and very numerous. Great Britain possesses three species of Scilla, S. verna, S. autumnalis and S. nutans, while Germany has, in addition to S. autumnalis, three others, viz., S. amara, S. bifolia and S. Italicus.

Among the early flowers there are none more valuable than the Scillas. They vary considerably in form of flower and foliage, and although typically they have blue or blue-purple flowers, most, if not all of the species in cultivation have white or red-purple forms. Scilla Sibirica and S. bifolia are the earliest to flower, and of these forms the Asia Minor or Taurian forms are in advance. The form of S. Sibirica known as multi-florescent is nearly over before the usual forms expand. There is also sometimes cultivated in the garden a pleasing white Scilla, with hyacinth-like flowers, known to the trade as S. amara. But these white forms are mostly odious to the hybridists, and blue-flowering kinds. Occasional hybrids between Scillas and Chionodoxas are met with (see p. 300). Chionoconilla Alleni is the accepted name for a natural hybrid between Chionodoxa Lucille and Scilla bifolia, described by Mr. Allensis.

None of the hardy Squills require special culture, and if planted where they can remain undisturbed for a series of years, they seldom disappoint one if the soil is occasionally enriched by top-dressings of manure, etc. The bulbs should be planted as early as possible in autumn. The varieties may be increased by offsets taken after the foliage has matured. For the cool greenhouse or conservatory, many of the Scillas are ideal subjects. For this culture, 5 or 6 bulbs may be put in a 5-in. pot and the vessel afterwards transferred to a coldframe and covered until growth commences. Up to this period very little water will be required, but as the flower cluster appears the quantity should be increased and the pots transferred to the greenhouse, giving them a position near the glass. The foliage matured, the bulbs may be shaken out of the soil and stored.

Eurysa Scilla, formerly called Scilla maritima (some botanists are in the opinion that it is Scilla maritima), needs to be mentioned in this connection on account of its yielding a medicine for many centuries held in esteem. Almost every one is familiar with syrup of Squills, and has obtained relief from its use in severe colds. The scales of the bulb contain mucilage, sinistrin, sugar and crystals of calcium oxide (stated by botanists to ward off snails); the active principles are scilliperin, scillotoxin and scillin (the latter producing numbness, vomiting, etc.). Scilla bulbs or roots should never be used unless under proper direction, as, in their fresh state they are extremely acrid, and might prove dangerous.

The trade names are considerably confused. Many of the so-called horticultural species and races may be united as mere varieties of species, that have been defined botanically. The following names are believed to include all those in the American trade, but other species are known to fanciers.

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1. festalis, Salisb. (S. nitens, Sm. S. nonscripta, Hoff. and Link. S. cernua, Salisb.). COMMON BLUEBELL. HAREBELL. Lvs. 10-18 in. long, 3/4 in. broad, subacute, conca
tave; scape solitary, tall, stout; raceme 6-15-fld.: bracts in pairs: lvs. blue, purple, white or pink, dropping. April to June. Western Europe, Great Britain. B.M. 1461. Among the garden forms are alba, white; cerulea, blue; lilacina, lilac, blue; rosea, rose or pink colored; cernua, nodding. This is one of the most beautiful of Squills, fragrant, thriving best in some
what shady and sheltered places. Originally placed in the genus Hyacinthus, on account of the general form of the perianth, it was removed to Scilla as having the segments distinct or nearly so, and is now often considered as forming a distinct genus (Aphoglossum, Link; Endymion, Dumort.), either alone or with other species which connect it with the other Scillas.


3. hispánica, Mill. (S. campanulata, Alt. S. póhtula, DC.). SPARROW JACINTH. BELL-FLOWERED SQUILL. Lvs. 5 or 6, glabrous, ascending, lanceolate, 1/4-1 in. broad, subobtuse, convex at back: scape long: raceme equilateral, compact: lvs. cylindrical-campanulate; perianth usually blue but often becoming rose-purple, or white: pedicels 1-1 1/2 in. long. May. Spain and Portugal. B.M. 1102.-Hardy. Several varieties of it are in the trade under the specific name campupulata; viz., alba, white; albo-májor, large white; carnea, flesh-colored; hyacinthoides, hyacinth-like; rosea, rose-colored. This species is worthy of wider acquaintance. The bulbs are cheap and easily obtained in autumn, and if planted then they are sure to bloom the following spring.

4. nudicaulis, Poir. (S. parviflóra, Desf.). Bulb ovoid, 1-2 in. thick: lvs. 4-6, feathery, herbaceous, linear, 6-8 in. long, 1/2-3 in. broad, suberect: scape solitary or paired, 1/2-1 ft. high: racemes dense, 30-60-fld.: pedi
cels short, ascending, 3-5 lines long: bracts minute, linear, evanescent: perianth rose-purple, 1/4 lines long: single ovule in each of the ovarian cells: capsule small, globose, grooved. Flowering in winter in its native home, Algeria.

5. belladonna, Benth. (Barnardia silicoides, Lindl.). CHINESE SQUILL. Leaves 2 or 3, equaling or exceeding the scape, rather hard, acutish, densely hairy; bulb small, ovate: scape erect, slender, or wand-like: perianth spic

Also known as Scilla eilartii.
SCILLA

It is a graceful and elegant species, suitable for cultivation in pots.

11. *hyacinthoides*, Linn. (*S.* parviflora, Salisb.).

HYACINTH. Lvs. 10-12, spreading, 1-½ ft. long, ½-1½ in. broad, narrowed at both ends, minutely ciliate-denticulate on the margins; scape straight, long; racemes many-fl., broad, open; pedicels long, 1½ in.; bracts whitish, minute, persistent; perianth bluish lilac, open, campanulate. Aug. Region of Mediterranean. B.M. 1149. — Hardy. This species is noted for its extreme shyness in flowering. The bulbs are sometimes 2 in. in diam., and produce a profusion of offsets. In Fish's "Bulb Culture" several varieties are mentioned: *caerulea*, fine blue; *alba*, fine white, free-flowering; *rosea*, distinct flesh-colored; *rubra*, deep red, large and fine.

12. Siberica, Andr. (*S.* amena, var. praeceps, Don.).

SIBERIAN SQUILL. Lvs. 2-4, ascending, narrow, 4-6 in. long; scapes 1½-3 in. long; racemes 1-3-fl.; fls. rotate, horizontal or drooping, with short pedicels; perianth deep blue. March. Russia, Asia Minor. B.M. 1025. Gn. 11. p. 105. P.M. 14:100. L.B.C. 2:151. — Hardy. This plant ought always to have a little shelter. It forms attractive tufts and has a desirable habit for rock gardens. Several trade forms exist; viz., *alba*, multi-flora, pallida.

13. *amena*, Linn. STAR HYACINTH. Fig. 2277. Lvs. 4-7, flaccid, ascending, glabrous, 6-9 in. long, ½-¾ in. broad; scapes several, equaling the lvs.; racemes several-fl., 4-6, open; fls. distant, ½-¾ in. in diam., blue; pedicels ascending or spreading. March. Austria, Germany. B.M. 341. — Hardy. It grows luxuriantly, several flowering stems being found on the same plant.

14. *Italica*, Linn. ITALIAN SQUILL. Bulbs clustered, ovoid, or oblong-ovoid, acute; lvs. radical, several, flaccid, spreading, lanceolate, acute, 4-8 in. long, ½-¾ in. broad; scape solitary, slender, longer than the lvs.; raceme dense, many-fl.; pedicels filiform, spreading; bracts in pairs; fls. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segments puberulous at apex; filaments white; anthers sagittate, dark blue. March-May. B.M. 663. L.B.C. 15:1483. — Hardy. This plant has less brilliant flowers than either *S.* Siberica or *S.* bifolia, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.

15. *Japonica*, Baker (*Ornithogalum Japonicum*, Thunb. *Barbárdia Japónica*, Schultes, f.) JAPANESE JACINTH. Bulbs ovoid, 9-12 lines thick; lvs. 2-3, flabby, herbaceous, 6-12 in. long, 4-16 lines broad, acute; scapes 1-3, strict, erect; raceme 20-60-fl.; pedicels ascending; bracts minute, linear, white; perianth 1½ lines long, rose-purple; capitate turbinate, triloculate, 2½-3 lines long; ovules solitary in each ovarian locule. Japan.

16. *véna*, Huds. SEA ONION. SPRING SQUILL. A delicate little plant, with a small bulb and narrow-linear lvs. 2-4 in. long; scape seldom 6 in. long, with

2275. Scilla bifolia (×½)

2276. Scilla Peruvian. In the end of its flowering season.

2273, 2274. Bulb large, ovate, tuncate; lvs. many, broad-linear, 6-12 in. long; margins ciliate with minute white bristles, channelled; scape robust, terminated by a many-fl. conical, broad and compact raceme of purple, line, reddish or whitish fls.; fls. rotate; corolla persistent; anthers short. May, June. Region of Mediterranean, not Peru. B.M. 749. Gn. 27. p. 288. R.H. 1882. p. 508. — The Hyacinth of Peru is not hardy in Mass. It propagates freely by offsets. It flowers all through May and June and forms a most attractive object in the herbaceous border or bed. *S.* Peruvian, however, has one fault that may tell against it in the opinion of many cultivators — it never flowers two years in succession; it seems to need a whole year's rest after the effort of producing its large spike of flowers.

8. *monophyllos*, Link (*S.* monophylta, Plan. *S.* pumila, Broth.). DWARF SQUILL. Leaf solitary, inclosing the base of the scape, 2 in. long, ½ in. broad, involute, ovate-acuminate, with a callous apex, glabrous; scape erect, slender, usually 5-20-fl.; pedicels long, ascending, springing from a small sheathing bract; perianth bright lilac, ½ in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May. Spain, Portugal. B.M. 3023. — Hardy.

9. *bifolia*, Linn. Fig. 2275. Bulb tunicate, oblong-oval; lvs. 2, seldom 3, ciliate, 4-8 in. long, ½-¾ in. broad; scape 2-6-fl., ebracteate; fls. stellately rotate; perianth blue, sometimes reddish or whitish; anthers blue, versatile. March. Native to Europe, Asia Minor. B.M. 746. — Hardy. Several varieties of this exquisite little plant are in the trade: *alba*, white-fl.; *rosea*, pink-fl., etc. Cultivators would do well to obtain all the varieties possible; also as many bulbs of this beautiful species as they can afford. It is one of the most charming of hardy, early spring-flowering plants.

10. *Natalensis*, Planche. Bulb thick, large, ovoid, sub-globose; lvs. broadly lanceolate, glabrous, 9-12 in. long, 4-½ in. broad, ascending; scape erect, terete, 1-½ ft. long; raceme dense, simple, elongated, open, many-fl. (50-100); bracts solitary, subulate; fls. pale blue, stellate, rotate; pedicels long, pale blue. Natal. B.M. 5079. F.S. 10:1043. — Suitable for greenhouse culture.
several small, erect blue fls. in a short, terminal raceme, almost flattened into a corymb; perianth segments scarcely above 3 lines long, spreading. Spring. A plant occurring in stony and sandy wastes near the sea in western Europe, reappearing farther east in Denmark, on the Rhine and Sardinia. —Hardy.

John W. Harshberger.

2276. Scilla Sibirica (X ½).

SCILLA (an old Greek name, transferred to these plants). Araceæ. Climbing perennials, differing from Montiera in floral characters and in the long-petioled, long-sheathed, ovate-lanceolate or ovate-acuminate lvs. Species 9 or 10. East Indies. Scilla comprises one popular and worthy warmhouse plant, known to gardeners as S. argyranthus. For culture, follow directions given under Philodendron.

pictus, Hassk. Internodes of the stem 3-1 in long, 2 in. thick; petioles 1½-2 in. long; blade 4-6 in. long, 1½-3½ in. wide, one side half as wide as the other, coriaceous, bright green (drying black), obliquely ovate-cordate. Var. argyranthus, Engler (S. argyranthus, Hort. Fothos argyranthus, Hort.), is the cult. form, with broad, deeply cordate leaf-blades which are spotted and blotched above with silvery white. Colchis, Philippines, Java, etc.

2277. Scilla amoen.a (X ½)

S. amoenus, Hort. = Monstera acuminata. = S. Cuscuta. Presl, is now referred by Engler to Cuscuta marantifolium. Not known to be in the trade. It is a question whether the Aglaonema commutatun sometimes mentioned in horticultural literature is this species or is Aglaonema marantifolium var. commutatum. Engler. = S. pertusus, Hort. = Rhaphidophora pertussa.

Jared G. Smith.

SCILIPUS (Latin for bulrush). Cyparissac. Bulrush. Sedge. A large genus of rush-like or grass-like plants inhabiting the whole globe, and characterized by perfect flowers in spikes which are solitary, clustered or umbellate; scales spirally arranged; perianth of bracts or none, not enlarged in fruit; every one-loculed, with one anatropus ovule; style not thickened at the base, 2-3-eleft. Only a few species are in cultivation, and these are all perennials (except perhaps the last), suited for shallow water or damp places. The larger are important for use in aquatic gardens. The nomenclature of those in the trade has been very much confused.

A. Stem leafy.

atrovirens, Muhl. Stems clustered, tall and stout, 2-4 ft. high, bluntly triangular; lvs. long, coarse and firm, 3-6 lines wide, spreading; involucre foliaceous; umbel sparingly compound; rays stiff, very unequal; spikes ovoid-oblong, acutish, dark greenish brown, in dense heads of 5-25; scales oblong, cuneate; perianth bristles 6, downwardly barbed above; styles 3. Eastern U. S., in mud or damp soil.

Holoschænum, Linn. Stiff and rush-like, from stout rootstocks; stems clustered, slender, cylindrical, 1-3 ft. high, narrow, basal, stiff, erect and narrow, furrowed; bracts several, the larger one appearing as a continuation of the stem; spikes very numerous and small, closely packed in 1-several globular, light brown heads; 2-3 lines in diameter, acuminate; perianth bristles none; styles 2-3-eleft. Eu., Asia.

—The form in cultivation is var. variegatus, Hort., with stems alternately banded with green and yellowish white. Damp or dry soil.

AA. Stems with very short basal leaves, or none.

lacustris, Vahl. Great Bulkush. Rootstocks very stout; stems scattered, terete, smooth, tall, stout and flexible, 2-9 ft. high; lvs. 1-2, basal, stiff, erect and narrow, furrowed; bracts several, the larger one appearing as a continuation of the stem; spikes very numerous and small, closely packed in 1-several globular, light brown heads, 2-3 lines in diameter, acuminate; perianth bristles 4-6, downwardly barbed throughout; styles 2-3. In shallow quiet water, N. A., Eu., Asia. In Europe the 3-styled form is common; the 2-styled form is often referred to as var. digynus, Gord. (S. Tabernamontanius, Gmel., and Hort.), but is scarcely distinct. Var. zebra, Hort., is a form with alternate bands of green and yellowish white; often known as Juncus sebrinus.

cérnus, Vahl (S. riparius, Spreng., not Hort. Isel-epis græcis, Hort. I. setheus, Hort.). Fig. 2278. Densely cespitose, forming turf; stems 3-12 in. long, very slender or filiform, cylindrical, erect or more often drooping; basal sheaths leafless or with a very short filiform blade; involucral bract subulate, about equaling the spikelet, the latter usually solitary, oblong-lanceolate, 1-3 lines long; scales oblong-ovate, obtuse, pale brown or whitish; bristles none;

styles 3; acene in greenhouse plants rarely maturing. Almost cosmopolitan, except in eastern U. S. and very variable. Grows well in damp pots, the drooping stems producing a very graceful effect. Synonymy much confused.

K. M. Wiegand.

SCLEROCARPS (Greek, hard and fruit; referring to the bony, fruitiferous bracts). CompdsUa. A genus of about 11 species of mostly Mexican herbs, with branching stems and terminal pedunculate heads of yellow flowers in summer.

uniserialis, Benth. & Hook. (Gymnopus uniserialis, Hook.). An annual herb 1 ft. or so high, loosely branched, with alternate, deltoid or rhombic-ovate, dentate, petiolated lvs. and fragrant fl.-heads, with 3-5 oval or oblong, orange-yellow rays. Moist or shady ground, Texas and south. R. H. 1853:261.

F. W. Barclay.

SCOKE. A name for Phyllotaceæ decandra.

SCOLEPENDRIUM. See Phyllita. Many garden forms are cultivated under a variety of names, all derived from Phyllita Scolopedium (the Scolependrium vulgare or the S. officinale of Europe).
SCOLUMBUS (old Greek name used by Hesiod). Com-~ 3
pòsitum. Scolumbus Hispalienus (Fig. 2279) is the vegetable known as Golden Thistle or Spanish Oyster Plant. It makes a root much like salsify, except that it is much lighter colored and considerably longer. Its flavor is less pronounced than that of salsify, but when carefully cooked, it possesses a very agreeable quality which is somewhat intermediate between that of salsify and parsley. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish Oyster Plant, aside from affording a variety in the kitchen garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and sow than those of salsify. They are sown in March or April. The seeds, or rather akenes, are flat and yellowish, surrounded by a white scarios margin. The roots can be dug either in fall or spring. The greatest fault of the Spanish Oyster Plant lies in the prickly character of the leaves, which makes the plant uncomfortable to handle. The roots are often 10-12 in. long and 1 in. thick. It is said that the leaves and stalks are eaten like cardoons by the people of Salamanca; also that the flowers are used to adulterate saffron. Scolumbus Hispalienus, Linn., is a biennial plant native to southern Europe. The radical lvs. are very spiny, oblong, pinnatifid, dark green variegated with pale green spots. The plant grows 2-2½ ft. high, is much branched and bears bright yellow flower-heads, which are sessile and contain only 2 or 3 fls., all of which are ligulate. The heads are sessile, terminal and axillary. Scolumbus contains 4 species, all natives of the Mediterranean region. N. grandiflorus, a perennial species, is rarely cult. abroad for its fls., and N. maculatus, an annual species, for its variegated foliage. L. H. B.

SCORPION GRASS. See Myosotis.

SCORPIURUS. See Caterpillars and Worms.

SCORZONÆRA (old French scorzon, serpent; S. Hispanicus was used against snake-bites). Compositae. The vegetable known as Scorzonera or Black Salsify is a plant with a long, fleshy tap-root like that of salsify, but differing in having a black skin. The flesh, however, is white. It is cultivated and cooked like salsify, but being somewhat more difficult to raise it is rarer than that vegetable, although considered by many to be superior to it in flavor. The leaves may be used for salads. Scorzonera is a perennial plant, but it is treated in cultivation as an annual or biennial crop. Botanically, also, Scorzonera is closely allied to salsify. The two vegetables are easily distinguished in root, leaf, flower and seed. The lvs. of Scorzonera are broader, the fls. are yellow (those of salsify being violet), and the seeds are white. Also, the involucral bracts of Scorzonera are in many series; of salsify, in 1 series. The genus Scorzonera is a large one—over 100 species, all natives of the Old World. Perennial herbs, or rarely annual, floccose, lanate or hirsute; lvs. sometimes entire and grass-like, or wider, sometimes more or less pinnately lobed or dissected; heads long-peduncled, yellow, the fls. all radiate: akenes glabrous or villous. Cult. same as salsify.

Hispanicus, Linn. Scorzonera. Black Salsify. Perennial herb 2 ft. high; stem much branched; lvs. clasping, lanceolate, undulate, glabrous; heads solitary at the ends of the branches. Spain. W. M.

SCOTANTHUS. See Gymnepetalum.

SCOTCH BROOM. Cytisus scoparius.

SCOTCH PINE. Pinus sylvestris.

SCOURING-RUSH. Equisetum.

SCREW BEAN. Prosopis pubescens.

SCREW PINE. Pandanus.

SCROPHULÁRIA (a reputed remedy for scrofula). Scrophulariaceae. Flow°r. A genus of about 100 species, mostly native of Europe, and of very little horticultural value. They are mostly perennial, tall-growing herbs, with usually large opposite leaves and small, often dull-colored flowers in a terminal thryse in mid or late summer. Corolla short; the tube globular or obovate, ventricose; lobes 5, unequal, 1 reflexed or spreading, the others erect; stamens 4, the sterile stamens represented by a scale on the throat of the corolla; seeds numerous.

nodosa, Linn., var. Marilándica. Gray. A tall-growing, hardy perennial herb, usually 5 ft. high, often more with large, dark green, ovate acuminate lvs. and small, dull purplish or greenish fls. in a nearly naked, open thryse. Throughout the United States.
SCROPHULARIA

The plant is sometimes used as a foliage background for the herbaceous border. It is too inconspicuous in flower and too weedy in habit for general use. The typical form is native to Europe and Asia.

P. W. BARCLAY.

SCULLION. See Scallion.

SCUPPERNONG. A variety of grape grown in the South. See Vitis rotundifolia and Grape.

SCURY PEA. Peas screw.

SCURVY GRASS (Cochlearia officinalis, Linn.), a common European perennial, is so called from its anti-seborrhic qualities, which have long been recognized. Sigh, resins, or cress, stomachic and laxative properties have been ascribed to it. In general appearance—leaf, flower—fruit—it somewhat resembles its close relative, water cress, but in flavor it is acrid, bitter, pungent, and has a strong suggestion of tar. Bruising reveals a disagreeable odor. When cultivated it is treated as an annual, the seed being sown upon garden loam in a cool, shady place where the plants are to remain. It is grown to a limited extent in America, has escaped from cultivation, but so far has not become obnoxious as a weed like water cress.

M. G. KAINS.

SCUTELLARIA (Latin, dish; referring to the form of the persistent calyx). Labiate. SKULLCAP. A genus of nearly 100 species of annual, perennial or shrubby plants widely scattered about the world, with simple leaves and blue, yellow or red, tubular 2-lipped flowers in terminal spikes or racemes in the axils of the stem-leaves. Calyx in anthesis bell-shaped, gilbous, with a helmet-shaped projection; stamens 4, ascending and parallel, all fertile, the two anterior longer: anthers ciliate, pilose.

INDEX.

a. Lvs. sessile or nearly so.

b. Foliage entire.

c. Habit procumbent. 1. Baicalensis

d. Habit erect. F. in terminal racemes. 2. brevifolia

de. F. in axils of stem-leaves.

e. Plant with moniliform tubers. 3. resinosá

f. Plant without moniliform tubers. 4. Wrightii

BB. Foliage erect or dentate. 5. alpina

c. Habit procumbent. 6. galericulata

c. Habit erect. 7. scythian

AA. Lvs. petiolated.

d. Color of fls. red. 8. Mociniana

d. Color of fls. not red.

c. Margin of lvs. entire.

d. Shape of lvs. linear. 9. angustifolia

d. Shape of lvs. obtong. 10. antirrhinoides

c. Margin of lvs. cinere.

d. Fls. 2-3 lines long. 11. orientalis

d. Fls. longer. 12. orientalis


2. scythian, A. Gray. A half-hardy, compact perennial, ¾-1 ft. high: lvs. numerous, obtong, long-narrow, about ½ in. long; fls. dark purple, about ¾ in. long. Blooming season long; summer. Dry limestone banks, Texas.


4. Wrightii, Gray. A tufted perennial, about 6 in. high, with numerous oval, ovate or spatulate-oblong lvs. about ½ in. long and violet or rarely white fls. ½ in. long. Kansas to Texas.

5. alpina, Linn. A hardy spreading perennial, about 10 in. high, with ovate, serrately dentate lvs. and large, purple and white or somewhat yellowish fls. in dense, terminal racemes. July and August. Russia. Europe. H. 1889:12.—A handsome rock or low border perennial.

6. galericulata, Linn. Hardy, perennial by slipform stolons, 1-3 ft. high: lvs. ovate to oblong-lanceolate, about 2 in. long; fls. solitary in the axils of the upper lvs. about 1 in. long. June-Sept. In moist ground throughout the U. S. and En. B. B. 3:36.

7. Mociniana, Benth. A tender, moderately low, shrubby plant, probably the showy of the genus, with opposite, long-elliptical, acute lvs., and long, tubular, red fls. with a yellow throat, about 1½ in. long. In moist, dense, terminal spikes. Autumn. Mexico. R.H. 1872:556.—According to Gn. 10, p. 606, the plants are of easy culture with warm greenhouse treatment and may be grown as bush specimens or in smaller pots with a single stem, when they will flower at about 1 ft. in height. Cuttings are easily rooted.

8. angustifolia, Pursh. A hardy perennial, about 6 in. high, with lvs. ½-1 in. long, narrowed at the base, and violet-blue fls. ½-1 in. long, with the corolla-tube slender. Moist ground, northwestern United States.

9. antirrhinoides, Benth. Resembles the larger-leaved forms of S. angustifolia, but has longer petals and the lvs. mostly obtuse at base and also shorter and broader fls. 7-10 lines long. Moist, shady ground, northwestern United States.

10. orientalis, Linn. A hardy perennial, increasing by slender stolons, 1-2 ft. high: lvs. ovate to lanceolate, 1-3 in. long: racemes axillary or terminal, narrow, leafy bracted: fls. blue, nearly white. Moist soil throughout the United States.


J. B. KELLER and F. W. BARCLAY.

SCUTICARIA (Latin, scutica, lash or whip). Orchidáceae. This genus is remarkable for its long whip-like leaves, which are channeled on one side. No evident pseudobulbs are formed, but each shoot terminates in a long, pendulous leaf. The lvs. are rather crowded on the short rhizome. Fls. solitary or several, on short peduncles. In structure the fls. resemble Maxillaria, but the petals are easily distinguished by the terete leaves. Sepals and petals similar, the lateral ones forming a mentum: labellum movable, 3-lobed, with large, erect, lateral lobes: pollinia on a transversely elongated stipe. Two species from South America.

These plants require a temperature similar to Cattleya and Laelia, but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. S. Steilli does best on a block, as the plant grows downward in an inverted position. The compost should be kept moist at all times, particularly while the plants are in action. They are propagated by division.

Steilli, Lindl. Lvs. attain a length of 4 ft., as thick as a goose-quill: fls. on short scapes; sepals and petals oblong, connivent, pale yellow, with chocolate blotches; labelrum large, cream-colored, striped with brownish purple. Fls. at all seasons. British Guiana. B.M. 3573. B.R. 23:1986 (both as Maxillaria Steilli).


HEINRICH HASSELBERGER and R. M. GREY.

SCYTCHIN LAMB. Refer to Cibotium.

SEA BEAN. Consult p. 135, second column; Sea Buckthorn is Hippophae; Sea Dafoil is Hymenocallis.
SEA FORTHIA

SEAFORTHIA (Francis Lord Seaforth). Palmææ. Seaforthia elegans is a name familiar to every gardener who has room in his conservatory for tall specimen palms. Twenty years ago this palm was grown to a greater extent in smaller sizes and for a greater variety of purposes, but it has been superseded for such uses by the Kentias (Florea Belmoreana). Seaforthia elegans is often called the Australian Feather Palm. Whether more than one thing is cultivated under this name is doubtful.

According to Flora Australiensis 7:141 (1857) the proper name of Seaforthia elegans, R. Br., is Pychospérrma élégans, Blume. It is variously described as a low or very tall palm: i.e., attaining several feet; segments numerous, more or less toothed or irregularly jagged at the end. Probably the plants cultivated as S. elegans are Archontophyton Cunninghamii.

For S. robusta, see Rhopalostylis. W. M.

SEA GRAPE. Coccoloba uvifera.

SEA HOLLY. Eryngium.

SEA-KALE (Crambe maritima, Linn.) is a large-leaved, strong, cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home garden, for it supplies an excellent of good quality at a season when vegetables are scarce. Sea-kale demands a deep, rich and rather moist soil, in order to give the best results and to maintain its vigor for a few years. The plants require about as much room as rhubarb; that is, they should stand from 3 to 4 feet apart each way. The culture and general requirements are much the same as for rhubarb. The young shoots are blanched as they grow, in early spring. The blanching is accomplished by heaping fine, loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower pot so that the light is excluded from the ground around. These shoots are eaten before the leaves have begun to expand to any extent, and whilst they are crisp and tender. The vegetable is prepared in the same manner as asparagus.

Sea-kale is propagated by root cuttings, and also by seeds. Quicker results are secured from cuttings. If strong cuttings, 4 or 5 inches long, are taken in early spring and grown in strong and rather moist soil, the plants may be strong enough for cutting the following spring; but it is usually better not to cut them until two years from starting. The cuttings may be placed where the plants are to stand permanently, or they may be grown in drills in a seed-bed. The latter plan is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year. The seeds are really fruits or pods, and each fruit produce two or three plants. Usually the fruits are sown without shells. The seedlings are raised in the seed-bed and transplanted when one year old to permanent quarters. On good soil, plants of Sea-kale should maintain their vigor for five to eight years after they have come to cutting age. As soon as they begin to show signs of decay the plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Plants may be forced in hotbeds or under the greenhouses benches, as recommended for rhubarb. Sea-kale has large, glaucous, palmate-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. Sea-kale grows wild on the seacoasts of southwestern Europe.

L. H. B.

SEA LAVENDER. Statice.

SEA ONION. Uriginea maritima; also applied to Ornithogalum caudatum.

SEA PINK. Armeria.

SEASIDE GRAPE. Coccoloba.

SEASON VINE. Cissus siyoides.

SEA-URCHIN CACTUS. Echinopsis.

SECALE (the ancient Latin name, said to be derived from seco, to cut; according to some, applied to spelt). Gramineæ. Species 2. S. fragilis, an annual of southern Russia, and S. cerealis, the cultivated spelt, according to Hackel, is derived from the perennial, S. montanum, native in the mountains of southern Europe and central Asia. Spikelets with 2 perfect fls. sessile on opposite sides of the raceme; each fl. has a single spike, empty glumes subulate and 1-nerved, by which characters the genus differs from Triticum, in which the empty glumes are ovate and 3-nerved.

S. cerealis, Linn. R. V. Fig. 2289. A tall annual commonly cultivated in Europe, less so in this country, as a cereal. Also cultivated here for annual pasture. F1 leaves long-awned. Much more commonly grown in New York and New England than westward.

A. S. Hitchcock.

SECHIUM (by some said to be derived from Sieyos, with which the genus was once united, by others to have come from the Greek, a "crown," because swine are fed on it). Cucurbitacææ. One very odd tendril-climbing vine, probably native to the West Indies and adjacent South America. This species, S. edule, Swartz, Fig. 2281, is known under a variety of names, as Chocho, Chuchu, Chow Chow, Chayotte, Cahypa, Pepinella. The vine itself, with herbaceous annual stems, is useful for covering arbors in warm countries. The root becomes a large corky tuber, sometimes weighing 20 lbs., and is edible. The fruit is irregularly ribbed, 3-5 in. long (shown in upper specimen in Fig. 2281), and attached at the upper end of the cavity. It is not removed from the fruit, but the entire fruit is planted. Because seeds are not to be had separate, the notion has arisen that the fruit is seedless. Sometimes, germination begins before the fruit drops from the vine. The fruit is variously ribbed and lobed, varying from pale green to cream-colored and white, according to variety, the surface shining and somewhat spiny. In tropical countries the fruit is cooked for eating, much as squash is served with us. Some persons prefer the roots to yams. Sechium edule is a common commodity in the West Indies, and the fruits in southern markets. It is also grown to some extent in Florida and southern California. In northern countries, the plant makes a strong vine in one season but does not bear. The plant has little ornamental value.

In Sechium the fls. are monoeccious. The staminate are in short, long-stalked axillary clusters; the pisti-
SECHIUM
hothouse. 3-lobed none America, by forms feet hardy large fls. lar, fifth in thin, It species ally seeds, species Kuntze). Mey. stamens in. SEDGE. refuse; seeds species fairly small and of Austr. Ji'liiggea a flowers on walls). Some kind of the regions %-% Fruits is round of Arg., Ji'liiggea. Some groups, Securinega long: Ji'liiggea. A. is distinguished from Securinega by the seeds, which are concave on the ventral surface; the fr. is berry-like. F. Securinegas. Willi., is a spiny shrub, with tor- fous, light-colored, glabrous branches; lvs. ovate to orbicu- lar, emarginate, cuneate at the base, glabrous, ½-1 in. long: fls, small, in axillary clusters, the staminate fls. more numerous and on slender pedicels: fr. glbose, white, ½-¾ in. across. India to trop. Austr. For cultivation in trop. regions or in the hothouse.

SEEDS. Consult Gourx and Cyperus.

SEDOM (Latin, sedes, to sit: the plants fix themselves on rocks and walls). Ursulaeaceae. Sedum is a large group of fleshy-leaved herbaceous plants, mostly hardy and perennial, including the Stonecrop and Live-forever. The flowers are usually small, rarely ½-¾ in. across, but the clusters are often showy and 3-4 in. in diameter. There is a pretty blue-flowered species and one with scarlet flowers, but with these exceptions the genus might be divided into two groups, those with yellow flowers and those with white or pinkish flowers. The foliage is always succulent, but otherwise remark- ably varied: the leaves opposite, alternate or whorled, entire or serrate, rarely deeply cut, sometimes large, broad and flat, sometimes thick and pulpy, sometimes minute and moss-like. Some of the plants are stout, erect and bushy, but many of them have a set of creep- ing barren shoots, terminated by dense rosettes, while the flowering stems are erect and often furnished with leaves of an entire kind.

Sedom is a genus of about 120 species, all found in the temperate and frigid regions of the northern hemisphere except a solitary species in Peru. Herbs, rarely shrubby at the base, glabrous or glandular-pubescent: foliages in cymes usually 4-5 (rarely 8-10) (rarely 12-14). The genus is closest to the House- leck and other species of Sempervivum, but the floral parts of Sedom are typically in 4's or 5's, while those of Sempervivum are typically 8-16. Also Sedom is monographed by M. T. Masters in Gardeners' Chronicle for 1878. Masters' arrangement has been followed below. There is also a good horticultural review in On 27, pp. 314-316 (1855).

Sedums are of the easiest culture. As a rule, they prefer sandy soil, and are very averse to a wet position in winter. They are standard plants for carpeting poor and sandy waste places where few other things will grow. The little yellow dowered plant with pulpy foli- age that spreads in nearly every cemetery is Sedum acre. Sedums are also general favorites in all forms of rock- gardening. They are much used for edge-beding, especially the kinds with mealy or glaucous foliage, and those with various metallic shades of purple. In the hardy border, the more robust and bushy kinds, like S. nevadense and spectabile, are preferred, though any of the lower growing kinds are suitable kinds. However, only any of the evergreen kinds are welcome in winter when the hardy border shows few other bits of color or signs of life. As a rule, Sedums like the sun, but a few of the species may help to solve the difficult problem of carpeting the ground underneath the trees where the soil is dry and shaded. Sedums are also favorites for baskets and vases, especially the kinds with trailing stems and minute leaves. For greenhouse decoration, S. spectabile is the favorite, as it is perhaps the showiest of the genus. It may be had in flower at any season of the year and remains in bloom a long time. It is also one of the favorite Sedums for window-sills, balconies and house tops, especially in crowded cities. Sedum acre, however, is everybody's plant. A pot of it is often the only pleasant sight in an ugly city alley. Sedums are plants for poor folks. The chief points against them are that they have never been fashionable and anybody can grow them. They can be propagated by seeds, but they are easily multiplied by the young offsets. These rosettes are somewhat bulb-like in nature and Sedums could probably be propagated if it were worth while by using each leaf of a rosette. The key to the species is necessarily unsatisfactory. It would answer better for wild plants. In the gar- dens the species run together, especially those of the Telephium group, Nos. 10. There is no absolute proof that these and other Sedums intercross in the gardens, although it is practically certain. Although the species may run together, it has been thought best to take clear-cut types and to make the key as sharply def- ined as possible instead of giving generalized de- scriptions through which the plant lover may search in vain for distinguishing marks.
Section I. Herbaceous Perennials, i. e., plants that die down to the root during winter. (In greenhouse culture some become evergreen.)

A. Flowers unisexual. 1. roseum
AA. Flowers bisexual. 2. Artemisia

B. Lvs. narrow.

C. Arrangement of lvs. opposite. 3. Artemisia

D. Height about 4 in. 4. Middendorffianum
DD. Height 12 in. or more. 5. Selkianum
EFF. Selkianum

BB. Lvs. broad; roots tuberous.

C. Arrangement of lvs. scattered (rarely opposite in S. Telephium). 6. Middendorffianum
DD. Margin of lvs. dentate. 7. Telephium
EE. Margin of lvs. nearly entire. 8. telephoides

CC. Arrangement of lvs. opposite (sometimes in 3's in S. spectabile).

D. Buds obvoid, abruptly pointed. 9. maximum
DD. Buds long and pointed. 10. spectabile

Section II. Evergreen Perennials. Foliage does not die during the winter.

A. Foliage flat, broad and relatively thin; lvs. spathulate or wider.

B. Lvs. in tufts or rosettes (at least those of the barren shoots).

C. Fls. yellow; anthers yellow.
D. Each fl. ½ in. across. 11. spathulifolium
DD. Each fl. 3/4 in. across. 12. obtusatum
CC. Fls. white; anthers reddish.

D. Barren shoots with lvs. in 3's. 13. ternatum
BB. Lvs. scattered, i.e., not tufted.

Cm. Erect: fls. whitish or pinkish. 15. populifolium
CC. Stems (barren ones) prostrate.

D. Fls. yellow.
EE. Margin of lvs. coarsely toothed above the middle.
FF. Petals lanceolate. 16. Kautschucia
FF. Petals linear. 17. hybridum
EE. Margin of lvs. entire. 18. Japonicum

DD. Fls. pink, rose or white.

E. Arrangement of lvs. opposite.

F. Base of lvs. narrowed. 19. stoloniferum
FF. Base of lvs. cordate. 20. oppositifolium
EE. Arrangement of lvs. alternate. 21. Ewersii
EEE. Arrangement of lvs. in 3's. 22. Asacampseros

AA. Foliage more or less fleshy; lvs. usually linear, not wider than lanceolate (unless in No. 28).

B. Apex acute, sharply pointed.

C. Fls. yellow.

D. Inflorescence decurved. 24. relexum
DD. Inflorescence not decurved.

E. Cymes scapoid. 25. stenopetalum

EE. Cymes umbellate. 26. sermentosum
CC. Fls. lilac or white. 27. pulchellum
BB. Apex of lvs. blunt.
C. Fls. yellow.
D. Lvs. ovate, bitter. 28. acon
DD. Lvs. oblong, tasteless. 29. sexangulare
CC. Fls. white or pink.
D. Plants usually glaucescent.

E. Anthers black. 30. dasypylhum
EE. Anthers purple. 31. Hispanicum
EEE. Anthers pink. 32. brevifolium
DD. Plants not glaucescent.
C. Fls. pinkish; buds 5-angled. 33. Lydium
EE. Fls. white; buds oblong. 34. album
EEE. Fls. white; buds roundish. 35. Monregelans

Section III. Annuals or Biennials. These die after flowering and fruiting. Annuals flower the first year, biennials the second.

A. Lvs. flat, not cylindrical.
B. Fls. scarlet. 36. sempervivoides
BB. Fls. yellow. 37. Formosanum
AA. Lvs. more or less cylindrical.
B. Fls. blue. 38. caeruleum
BB. Fls. dull rose or white. 39. villosum

Section I. Herbaceous Perennials (Species 1-10).

1. roseum, Scop. (S. Rhodiola, DC.). Rootstock thick, fleshy, exuding a perfume of rose water: height 6-8 in.; lvs. scattered, oblong, 1½ x ⅛ in.; fls. greenish or reddish purple, in a terminal flat-topped cyme about 1½ in. across; petals 4; stamens 8 in the male fl., absent in the female; carpels in the female fl. 4. Summer. Eu., N. Amer., Himalayas.—The only species here described that has unisexual flowers. A neat-growing plant suitable for rockeries or the front row of borders.

2. Asiaticum, Spreng. Height 6-12 in.; lvs. opposite, linear, coarsely and irregularly toothed; fls. greenish yellow, in compact, globose cymes, floral parts in 5's. Summer. Himalayas.—Cultivated abroad and possibly in America. Its almost pinnetoid foliage makes it very distinct. In India it is said to have red flowers. It seems to suffer from the wetness of an ordinary border in winter, and should probably be wintered under glass.

3. Middendorffianum, Maxim. Lvs. alternate, oblong-lanceolate, dentate toward apex; fls. yellow, in a flat-topped cyme. Summer. Amurland.—According to J. W. Manning, it grows 4 in. high, and has deep green foliage which becomes a rich purple in winter. Woolson says it is densely tufted.

4. Aizoon, Linn. Height 1 ft. or more, usually ½-2 ft.; lvs. alternate, oblong-lanceolate, coarsely and irregularly toothed for the greater part of their length, 2½ x ⅛ in.; fls. yellow, ½ in. across, in a loose, paniced cyme 1½-3½ in. across. Late summer. Siberia.—An old garden favorite, suitable for the hardy border and for rockeries.

5. Maximowiczii, Regel. Height 1 ft.; lvs. subopposite or alternate, oblong-ovate or oblong-lanceolate, regularly toothed; fls. yellow, in a dense, flat cyme. July, Aug. Japan, Amurland. Go, 19, p. 263; 27, p. 316. By some this is considered a variety of S. Aizoon. It is similar to S. Aizoon in habit but larger, differing in the sepals of unequal length and in the peculiar lacy-shaped fls.-buds, which are dilated below and narrowed into a long beak above. Desirable for borders; also used for carpet beds. Seeds, as well as plants, are offered.

6. Selkianum, Regel. Also spelled Selkianum. Height 12-18 in.; lvs. alternate (1), serrate in the distal third; fls. yellow, nearly 1 in. across, in a hollow-topped, leafy cyme. Late summer. Amur., Manchuria.—Re-sembles S. Aizoon but has narrower and pilose leaves. Offered in 1893 by John Saul.

7. Telephium, Linn. Orpine. Live-forever. Fig. 2292. Height 12-18 in.; lvs. scattered, rarely opposite, oblong-ovate, obtuse, dentate; fls. pink, spotted red, or
sometimes pure white, in dense, terminal and lateral subglobose cymes. July, Aug. Eu., N. Asia. Gn. 27, p. 316.—Naturalized in America, where it spreads much but blooms little. Vars. hybridum, purpureum and rubrum are live American trade names representing forms with dark purple foliage, the last-named variety being said to retain its purple color all summer. All the forms are suitable for the front rows of borders and rockeries. The young shoots in spring are pretty objects and differ with the different varieties. The larger forms with bright flowers are preferable. S. purpureum and purpureascens, Koch, are varieties of S. Telephium. Subspecies Fabaria. Masters (S. Fabaria, Koch, not Hort.). This is regarded by Masters as a subspecies of S. Telephium, with lvs. narrower than in the type, the cymes always terminal and shorter peduncled; fls. smaller and earlier; petals less recurved. It is doubtful whether this is really in the trade. See S. spectabile.

8. telephoides, Michx. Height 6-12 in.; lvs. scattered, 2 x 1 in., oblong-obovate, nearly entire or sparingly toothed; fls. flesh-colored, in small dense cymes 1-1 1/2 in. across. June. Alleghany from Md. south.—Offered 1891-92 by H. P. Kelsey.

9. maximum, Suter. A stout, bushy plant 2 ft. or less high, with either green or purple stems: lvs. opposite, ovate-acute, more or less crenate, crenate-dentate; cymes terminal and lateral on long peduncles, forming a loose panicle: petals whitish, spotted red towards tip, Aug.–Oct. Eu., Caucasus, northwestern Asia. Gn. 21, p. 316.—Var. variegatum, Hort., has gold and green foliage, according to J. W. Manning. F.S. 16:1699 (as var. versicolor) shows a form with rosy purple stems: lvs. green, yellow and white, margined rosy purple. This species has many forms, the stems green or purple, fls. green or reddish, lvs. cordate or tapering at the base, spreading or recurved, variegated or not. It is the best for borders, but in the autumn it is apt to get too straggly and needs support.

Var. hamatodes, Mast. Stems 2-2 1/2 ft. high, deep purple: lvs. 5 x 3 in., oblong-ovate, obtuse, coarsely and irregularly toothed, purplish: petals whitish, tipped red. September. Here belongs S. atropurpureum, Hort., according to Masters, but the plant or plants passing as such in America are very different. S. atropurpureum, Turez., which appears as a good species in Index Kewensis, is probably a synonym of S. roseum.

10. spectabile, Bor. (S. Fabaria, Hort., not Koch). Showy Sedum. Fig. 2283. This is the most popular of all Sedums and is used for the greatest variety of purposes. Robust, glaucous, 1 1/2-2 ft. high; lvs. opposite or in 3's, 3 x 2 in., ovate, oblong-obovate or entirely or obscurely wavy-toothed: fls. 1/2 in. across, in flat-topped, inversely pyramidal, leafy, umbellate cymes 4 in. across, Sept., Oct. Possibly from Japan. Gn. 27, p. 315. I.H. 8:271.—The fls. vary from rose to purple and perhaps to white. Fisher & Manda offered var. album. Var. purpureum and roseum are trade names. Also a form with variegated foliage has been advertised. This species remains in bloom a long while and is very attractive to butterflies. Masters declares that it thrives in stiff clay, and does not do so well in lighter soils.

SECTION II. EVERGREEN PERENNIALS (Species 11-55).

11. spathulifolium, Hook. Barren stems creeping, with terminal rosettes of obvate lvs.: flowering branches erect, and bearing scattered club-shaped lvs.: fls. yellow, 1/2 in. across, in terminal cymes; sepals oblong-obtuse. May, June. N. W. Amer. G.C. II. 10:577. Gn. 24:413.—Offered in 1881 by Gillett, but is probably not cult. in eastern states, and probably requires pot culture indoors. Here may belong Franceschi's S. spathulatum, a California species, which he calls a "giant among Sedums, growing several ft. high." Masters' plant is not over 1 ft. high.

12. obtusatum, Gray. Barren stems prostrate, with rosettes of spatulate lvs.: fls. stems erect, ultimately leafless and then scarred; fls. yellow, in terminal, umbellate cymes 1 1/2-2 in. across; sepals oblong-acute. June, July, Calif.—Offered in America, but probably not now in cult.


14. Névi, Gray. Barren stems prostrate, with terminal rosettes of obvate-spatulate lvs., tapering into a short stalk surmounted at the base, sprinkled with pink dots: fls. stems erect, with appressed, scattered lvs. similar to, but smaller than those of the barren stems; fls. white, 3/4 in. across, in forked cymes whose branches are about 1 1/2 in. long and recurved; anthers brownish purple. July. Mt's. of Va. and Ala.—Hardy in Mass. and desirable for edgings or rockeries, according to Edward Gillett.

15. populiifolium. Pall. A very distinct species by reason of its shrubby base, stalked, poplar-shaped lvs. and corymbs of whitish fls. which have the scent of hawkthorn. Roots fibrous: stems 6-10 in. high, branched: lvs. alternate, ovate, acute, coarsely and irregularly toothed. Fls. nearly 1 in. across. greenish or pinkish, in corymbose cymes; stamens pinkish; anthers purple. Aug. Siberia. B.M. 211. Gn. 27, p. 316. R.H. 1857, p. 150.—Rare in cult., but desirable for borders and rockeries and makes a charming pot-plant.

17. *hybridum*, Linn. Creeping, glabrous or glandular; lvs. alternate, stalked, spatulate, coarsely toothed in the upper half; fls. yellow, in umbellate cymes 2-3 in. across; petals linear, Summer, Siberia.

18. *Japonicum*, Siebold. Diffuse; lvs. scattered or opposite, spatulate, acute, entire; fls. yellow, 1/2 in. across, in axillary and lateral paniced cymes; petals lanceolate. Var. *variegatum*, Hort. has lvs. with golden blotches, according to John Sanl. *S. macrophyllum acre-marginatum,*

225. Stonecrop, or Wall Pepper—

**Sedum acre (X 3/5).**

19. *stoloniferum*, Gmelin (*S. spirium*, Bieb.). Barren stems trailing, marked with annular scars, rooting at nodes; fl-stems ascending 6 in. high; lvs. opposite, spatulate, coarsely toothed above, the margins studded with hyaline papillae; fls. pink (or white), 3/4 in. across, in cymes 2 in. across; anthers reddish. July, Aug., Asia Minor, Persia. B.M. 2570. Gn. 27, p. 315. It is a powerful, aborigine. "It has the disadvantage of affording cover for snails," but "one always knows where to look for the snails."

20. *oppositifolium*, Sims. Very close to *S. stoloniferum*, but the lvs. are brighter green, more regularly decussate, and as they are broader at the base they overlap one another a little and produce a nearer appearance than in *S. stoloniferum*. Fls. white or whitish. Anthers orange, according to Masters, but yellow in B.M. 1807. Aug. Caucasus, Persia.


24. *reflexum*, Linn. Glabrous, barren stems trailing; fl-stems 8-10 in. high; lvs. in 6-7 rows, crowded on the barren stems into a conical mass, 3/4-3/4 in. long, linear; inflorescence decurred or erect before flowering; fls. 3/4 in. across, yellow, floral parts in 3's. England. Var. *crisatum*, Mast. (*S. montisum and robustum*, Hort.), has falcated stems forming a crest like a cockscomb.

25. *stenopetalum*, Pursh. Glaucous; stems 3-6 in. high, erect from a decumbent base; lvs. crowded on barren shoots, sessile, fleshy, lanceolate, 3/4 in. long; fls. bright yellow, in scorpoid cymes, floral parts in 3's. Rocky Mts.—Offered by Gillett in 1851. Rare in cult.

26. *sarmentosum*, Bunge. Glaucous; lvs. opposite or whorled, linear; fls. yellow, 3/4 in. across, in a flat-topped, umbellate, 3-5-forked cyme. China. Var. *carneum* (*S. edentum variegatum*, Hort.), has pink lvs.; lvs. marked with marginal stripe of white or cream-color. This variety is grown in greenhouses and for carpet beds and edgings.

27. *pubellatum*, Michx. Glaucous, trailer, 3-6 in. high; lvs. linear, terete-pointed, gibbous at base, scarcely 3/4 in. long; fls. rosy purple, 3/4 in. across; inflorescence a 3-4-branched cyme, with erect fls. crowded in 2 rows along the upper surface and each provided with a leafy bract. June-Aug. U.S. B.M. 6923. Gn. 27, p. 315. G.C. II. 10:685.—The minute foliage assumes rich tints of red, brown and purple. The branches of the inflorescence are 3-4 in. long and gracefully arched.

28. *acre*, Linn. Stonecrop. WALL PEPPER. LOVE ENTANGLE. Fig. 2285. Barren stems creeping, branched, about 2 in. long; fl-stems 2-3 in. high; lvs. minute, 3/4 in. long or less, crowded, thick, ovoid or nearly globose; fls. 3/4 in. across, in 1-sided cymes having 2-3 forks. June, July. En., F. Asia. Gn. 27, p. 316.—This is the commonest species native to England and one of the commonest in cultivation. It is much used for edging and carpeting bare spots, especially in cemeteries. Thrives best in poor soil. The lvs. have an acid taste. Masters says it may often be seen on the window-sills of London alleys, and adds: "It is one of the commonest, least considered of all plants, but very few have really higher claims to notice." Var. *aureum*, Mast., has lvs. and tips of shoots bright golden yellow in spring. This is a cult. for spring bedding. It gives a bit of color at a dull season. It loses the yellow tint in summer and is never so robust as the green form. Var. *elegans*, Mast., has the tips and young lvs. pale silvery colored. Not as effective or hardy as var. *aureum*. Var. *majus*, Mast. Larger and more robust than the above type: lvs. in 7 rows instead of 5; fls. 3/4 in. across, in a 2-parted cyme. Morocco.

29. *sexangulare*, Linn. Very close to *S. acre* but the lvs. not so bitter to the taste, more slender.

**Sedum caeruleum.**

Natural size.

several times as long as thick, and in 6-7 rows, rather than 5. Europe, rarer. In American gardens it is said to grow to 6 in. high, and flower in June. 1881.—Mostly used for carpet beds.

30. *dasyphyllum*, Linn. Glaucous, glabrous or glandular; lvs. oblong or rondund, studded with crystalline pimples; buds oblong, obtuse; fls. pinkish; authors beach. En., 8 Afr. J. 6067.—Woensln says it grows 3-4 in. high, and is suitable for edgings.

31. *Hispanicum*, Linn. Glaucous; fl-stems 3-4 in. high, reddish; lvs. 3/4 in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pimples at
the tips; cymes 3-7-branched, umbellate; buds 5-6angled; fls. pinkish white, ½ in. across. July. Central and southern Oregon.—Readily distinguished by having the floral parts in 6’s.

32. **Sedum**. DC. Glaucescent: fls. in 4 rows, a tenth of an inch long, pinkish, densely covered with a mealy pubescence; fls. ⅓ in. across, petals white with pink midrib; anthers pink. Western Mediterranean region.—Manning says it grows 4 in. high and blooms in July and August. Said to be exceptionally sensitive to superfluous moisture at the root.

33. **Lychnis**, Boiss. Glabrous, 3-6 in. high: fls. ⅓ in. long, linear, greenish or red-tipped, urticled at base and with numerous pimples at tip when seen with a lens; buds 5-angular; fls. one-tenth in. across, pinkish; anthers reddish. Aug. —See. *S. scabius*, Hort.—Var. *s. aureum*, Hort., was offered by John Sull in 1806.


35. **Monnigena**, Balb (S. ericoides, Desf.). Glabrous, except inflorescence, which is glabular; fls. linear: fls. ⅓ in. across, white; buds roundish, pointed; stemma pinkish. N. Italy, Corsica. L.B.C. 5:464.

**SECTION III. ANNUALS OR BIENNIALS** (Species 36-39).


37. **Fomosum**, N. E. Br. Height 6 in.; stem repeatedly branched in a dichotomous or trichotomous manner; fls. at the branching of stem, with occasionally 1-3 on internodes, flat, spatulate; fls. yellow. Formosa. Int. into S. Calif. in 1900.


39. **Villosum**, Linn. Glandular-pubescent, 3-4 in. high, with no barren branches; fls. 2-3 times as long as thick; fls. few, dull rose (or white according to Masters) in a small, loose cyme. Bogs and stony hills, mountains of Eu.—This is one of the very few that prefer wet feet. The white-fld. form is advertised by one dealer in perennials. The species, however, is an annual.
pared soil in the open, may be as great as 50 per cent. Viability varies with seasons and other conditions. While it is true as a general statement that the older the seed the less the viability, yet the reverse may be true within narrow limits. Sometimes lettuce and melons that germinate only 50 per cent in December, germinate 70-80 per cent in May.

In order that seeds shall germinate, they must be supplied with moisture and be given a definite temperature. The requisite temperature and moisture vary with the different kinds of seeds, and they are to be determined only by experience. Seeds may be planted in any medium which supplies these requisite conditions. Although seeds are ordinarily planted in the ground, such practice is not necessary to germination. They may be planted in cocoanut fiber, moss or other medium. However, the ground may supply the requisites for germination, and it also supplies plant-food for the young plantlet when it begins to shift for itself; and, furthermore, the plants are in the position in which they are desired to grow. In the case of many seeds, germination is more rapid and certain when the seeds are sown in cocoanut fiber or other medium, for the conditions may be more uniform. As soon as germination is fairly complete, the plants are transplanted to the soil. The depth at which seeds shall be sown depends on many conditions. Out of doors they are planted deeper than in the house, in order to insure a uniform supply of moisture. A depth equal to twice the diameter of the seed is an old gardeners' rule. This applies well to the sowing of most seeds under glass when the soil is well prepared and is kept watered, but in the open ground three to four times this depth is usually necessary.

The finer the soil, the shallower the seeds may be planted, other things being equal. Better results in germination are secured when the seeds are sown in a specially prepared seed-bed. The conditions may then be better, the gardener is able to protect the young plants from cold wind from insects and fungi, and he is enabled also to economize time and labor. In transplanting from the seed-bed to the field, the gardener unconsciously chooses only the best plants and thereby the crop is improved. The seed-bed may be in a forcing-house or hotbed, or in the open. If it is in the open, it should be near the buildings, where it can be visited frequently and where water may be applied as needed. If the bed is to be used late in the season when the soil is naturally dry, it is well to cover it the previous spring or fall with a very heavy coating of manure. This retains the moisture, and the leaching from the manure adds plant-food to the soil, there by enabling the young plants to secure an early start. When the seeds are to be sown, the manure is removed and the surface is then in ideal condition. In the handling of plants in seed-beds, one must take pains that the plants are not too thick and that they do not suffer for light. If they may become "drawn" and be practically worthless.

In greenhouses and hotbeds, it is well to handle common vegetables and flower seeds in gardeners' flats (Fig. 2293). These flats are easily handled, and the soil is so shallow that it can be kept in uniform conditions of temperature and moisture. The seeds of some of the finer and rarer kinds of ornamental plants require special treatment. These treatments are usually specified in the articles devoted to those plants. Details of the handling of very delicate seeds are well discussed in the article on Orchids.

As a rule, seeds germinate best when they are fresh, that is, less than one year old. Some seeds, however, of which those of melons, pumpkins and cucumbers are examples, retain their vitality unimpaired for a number of years, and gardeners do not ask for recent stock. Seeds of corn salad should be a year old to germinate well. Very hard, hoy seeds of haws and viburnums, often do not germinate until the second year. In the meantime, however, they should be kept moist. Seeds of most fruit and forest trees should be kept moist and cool, otherwise they lose vitality; yet if kept too moist, and particularly too close or warm, they will spoil. Nuts and hard seeds of hardly plants usually profit by being buried in sand and allowed to freeze. The freezing and the moisture soften and split the integuments. Sometimes the seeds are placed between alternate layers of seed or sawdust: such practice is known technically as stratification.

Seed Breeding.—The marvelous industrial and commercial development which has characterized the latter part of the nineteenth century is nowhere more marked than in the art and practice of plant breeding. Whatever may have been their intellectual belief, most planters have acted, to within a few years, as if seed was indeed essential to the production of a crop, but only in the way that many water and manure are essential. The only question was whether or not the seed would grow. It is a majority of even good cultivators have come to recognize in their practice the fact that the possibilities and limitations of a crop are as positively determined by the seed used as is the character of the fruit of an orchard by the trees of which it is composed. There have always been exceptional men, who fully appreciated the importance of seed selection and breeding, which they practiced within their own gardens to secure a supply for their own use, but even professional seedsmen formerly gave little heed to scientific seed breeding, being quite content to "rouge" out mixtures or poorer plants rather than to select and breed only from the best. Now, every seedsmen who values his reputation maintains more or less extensive stock seed farms, where plant-breeding is conducted on the same principles and with the same sort of skill and care that is used in the breeding of animals.

The general method followed is first to form a clear conception of just what points or qualities give value to a variety and what a perfect plant of that sort should be. Then a few plants—say ten—which come as near this ideal as possible are selected and the seed of each separated. These separate lots are planted the next spring in contiguous blocks, and the plants given an opportunity for their most perfect development. As they approach maturity the lots are carefully examined,
and if those in one or more blocks show either general inferiority or a large portion of inferior plants, the entire block is condemned and rooted out, even if in doing so some very fine individual plants are destroyed. The remaining blocks are then carefully examined and that one selected which shows the closest adherence to the desired type, and from it if a few plants are selected and their

power of many commercial seeds, for which the German farmer was paying prices of. The publication of the results obtained by him excited much comment and laid the foundation for the present extensive system of European seed control. At the present time there are many more than one hundred official testing stations in Europe alone. Some of these are independent institutions, while others are conducted as branches of agricultural experimental stations.

The quality of seeds cannot be told by a mere casual inspection but is ascertained only by a careful test. This should include three steps: (1) an examination for purity (freedom from foreign matter), (2) vitality, and (3) genuineness, or trueness to name. The latter is known to seedsmen and growers of plants. Unless seeds possess a high requirement in all of these respects their use will entail great loss to the planter.

**Purity Test.**—The percentage of purity is determined by weight, from a fair average sample of seed selected from different parts of the bulk lot. Wheat and other grains are taken with a sampler, consisting of two hollow cylinders of metal, one inside the other, and about 36 in. long by 1/4 in. in diameter. They are pointed at the bottom and contain a series of openings along one side, which may be turned at will to open or close the holes. The sampler, with the holes open, is thrust into the grain in the car or open bag for its entire length. When filled with seeds the inner cylinder is turned so as to close the holes, and the sampler removed. For clover and other small seeds one uses a "trier," consisting of a single short cylinder open at one end and tapering down to a sharp point, just above which on one side is a long, elliptical opening (Fig. 2294). The trier is thrust through the side of a bag of seed at different points until the aperture is covered, the seed being allowed to run out at the other end into a dish.

The seed thus taken is thoroughly mixed and a given quantity weighed out for testing. The amounts used in the purity test vary with the size of the seed, ranging from 15 grains of June grass, red top, and tobacco to 1.8 ounces of peas and cereals. If the sample is suspected to contain any seeds of such serious pests as dodder, Canada thistle, wild mustard, ergot, etc., at least 1.8 ounces are examined for such impurities.

After being weighed the seeds are spread out thinly on a sheet of heavy paper or glass and by means of a pair of forceps the impurities are removed. This includes inert matter, such as dirt, chaff, broken seeds and foreign seeds. Under the latter designation are included seeds which do not germinate, that is, any seeds of a different name from that under which the sample was sold. The impurities are weighed upon a good chemical balance and the percentage of impurity thus determined.

The purity which a given kind of first-class commercial seed should show depends largely upon the habit of growth of the species and the difficulty of obtaining pure seed of that species. Most vegetables and cereals are grown from seeds, and their seeds are easily cleaned, hence they should be practically pure. Grasses and clovers, on the other hand, are more or less liable to be mixed with other species in the field. Furthermore, the cleaning of the inner cylinder is turned, so great care, often entailing a considerable loss of good seed, hence the proportion of pure seed to be expected in such samples is less than in the former case.

An extensive experience in testing commercial seeds, together with a comparison of the results of other tests made in this country and Europe, has enabled the United States Department of Agriculture to fix a table of standards of purity for most seeds sold by dealers. These standards, however, are subject to future revision if found necessary.

By means of a hand lens and by reference to a standard collection of economic seeds, the foreign seeds in the sample are determined. If determined to be "legume," "cereal," or "other\^\text{1}," the sample is then described as "legumes," "cereals," or "other\^\text{2}," or "foreign\^\text{1}," as the case may be.
SEEDAGE 1643

jected; also if 1 per cent or more of weed seeds be found.

The reference collection of seeds should be kept in
neatly labeled glass bottles, without necks, tightly
stoppers and systematically arranged on shallow paste-
board boxes (see Fig. 2295). A convenient size for these
bottles is 2 in. long by 3.5 in. in diameter. A tray
holding 100 of such bottles should fit into an ordinary
herbarium case. If the collection is of relatively few
species, a card index will be of great assistance in finding the specimens.

Germination Tests.—The seeds used in germination
tests must be taken indiscriminately from pure seed
which has been thoroughly mixed for that purpose.
This solution of plump, healthy-looking seeds for these
tests, as frequently practiced, impairs the authenticity
of the result.

Tests may be conducted in the laboratory between
damp cloths or blotters, or in porous saucers, or in sand
or soil in a greenhouse. Seeds which are known to ger-
minate with difficulty should be tested in a greenhouse
as well as in the laboratory. The same is true of any
species of seed whose conditions of germination are not
well understood.

While damp blotters serve as the best substratum
under ordinary circumstances, and especially where a
large number of tests are to be made, they do not answer
as well for fine, slow-germinating seeds like
tobacco and June grass, and many flower-seeds, owing
to the fact that the blotters sometimes adhere too closely
to permit the proper circulation of air. This may be
remedied to a certain extent by placing narrow strips of
glass between the folds, but main reliance in such cases
should be placed upon soil tests.

All tests are to be made in duplicate, using two lots of
100 seeds each of peas, beans, corn, cucumbers and
others of a similar size, and of seeds of clover, cabbages,
lettuce, etc. The more seeds taken for test the
less the chance of error. However, 5 per cent to 10 per
cent of variation may be expected between the two lots
of seeds, even though they might have been taken from
the same plant. In the case of a greater variation than
10 per cent the test should be repeated. Seeds upon
which moulds form quickly are likely to be old stock.

Soil seeds should be inspected daily, a note being
made of those having sprouted, which are then thrown
out. In testing seeds of the pea family (Leguminosae) one-third of those
remaining hard and fresh at the close of
the test are usually counted as hav-
ing sprouted. The average of the
duplicate tests is to be taken as the
percentage of vitality. Averages
should not be made, however, between
results obtained by different methods,
such as blotters and soil.

Laboratory tests are preferably made
between damp blotters placed in a
metal chamber heated by gas, the heat
being controlled by a thermo-regulator.
The blotters must be free from soluble
chemicals. Blue blotters will be found
less trying to the eye than white. The
germinating chamber may be of any
form which allows proper control of the
conditions of light, heat, air and
moisture. The standard chamber
adopted by the association of Ameri-
can Agricultural Colleges and Experi-
ment Stations was designed by the
writer, and serves equally well for
bacteriological purposes or experi-
ments in plant physiology as for seed
testing (see Fig. 2296).

It is made of 20-gauge corrugated copper, and 2 feet
long, 18 inches deep, and 2 feet high, outside measure-
ments. The outside, except the bottom, is covered with
two layers of felt, each ½ inch thick.

A water space is afforded by the groove walls, which
extend on all sides except the front and are 2 in. apart.
Enterance to this water jacket is obtained at a, d (Fig.
2296), while the water can be drawn off at g. At e, c, on
the top, and at f, near the bottom of one end, are 1-inch
openings into the chamber. One of the upper openings

may be used for the insertion of a thermometer, if desired.
Owing, however, to the influence which the
external atmosphere exerts upon thermometers whose
bodies are partly exposed, provision has been made for
holding two thermometers in a horizontal position, one
on the inside of each panel of the door to the chamber,
by means of hooks of stout copper wire (Fig. 2297, a, a).
The door is made in 2 panels, each consisting of 2
plates of thick glass set about ½ in. apart in a copper
frame, which is covered inside with felt. The inside
margin of the door is provided with a projection (Fig.
2297, c) which fits snugly into a felt-lined groove (Fig.
2297, b), extending around the front side of the cham-
ber. The door is 3 in. shorter than the front of the
chamber, the remaining space being closed with copper
and provided with a ventilator (Fig. 2296, h), which per-

2296. Standard seed-germinating chamber (front view, with
one door slide removed).

Used by the United States Department of Agriculture
and American Experiment Stations. a, a, openings
into water jacket; b, thermo-regulator; c, e, openings
into chamber; d, gas entrance tube; e, microboum
binder; f, gas exit; g, water exit; h, ventilator; i, j,
door slides; k, pan to hold porous saucers, etc; t, blot-
ter test; m, porous saucers with sand test.

nents the exit of carbon dioxide, and can be closed tightly
with a slide. Perfect closing of the door is further ef-
fected by a copper slide extending along the front
margin, which catches firmly at the top and bottom of the
chamber (Fig. 2297, d, d). This device, together with the
groove and its corresponding projection, are adapted
from the Rohrbeck bacteriological chamber. The
outside door is furnished with a frame into which slide
two plates of galvanized iron painted dead black inside
and covered with felt (Fig. 2296, i, j). By this arrange-
ment the interior of the chamber may be kept dark or
exposed to light, or, if desired, one-half may be dark
and the rest light, the other conditions remaining the
same. By raising these slides the thermometers can be
read without opening the door. Glass plates of various
colors may be substituted for the slides, if the effects
of different rays of light on plant-growth are to be
studied.

Seven movable shelves, placed 2½ in. apart, are held
in place by copper ledges ½ inch wide. These shelves
are made of brass rods 1½ in. apart, and each one is
capable of holding up to pounds weight. The tempera-
ture is controlled by a low-temperature thermo-regulator
(Fig. 2296, b). A very low and equable flame is secured
with a microboum burner (Fig. 2296, e). One of the
openings into the water jacket (Fig. 2296, a) is 2 in.
in diameter to admit a Roux thermo-regulator, if a very
even temperature is desired, as in bacteriological work. Fresh air or different gases can be forced into the chamber at one of the openings at the top (Fig. 2296, c, e) and out at the bottom (Fig. 2296, f). Each of the openings at the end (Fig. 2296, f) is closed with a screw cap.

The chamber is provided with three tin-lined copper pans, each having a narrow ledge around the inside near the top, which serve to hold copper rods with folds of cloth, if the experimenter wishes to test seeds according to the ( geneva pan method. The pans also serve to hold porous saucers or plates.

The chamber when empty weighs about 100 pounds, and is therefore easily moved. The shelves will hold about 60 blotter tests, with an equal number of duplicates. It rests upon a detachable base consisting of a stout iron frame 15 in. high, inclosed with a sheet-iron jacket.

Other Forms of Germinating Apparatus.—The so-called "geneva tester," invented at the Experiment Station at Geneva, N. Y., consists of an oblong pan of galvanized iron or tin with ledges around the inside near the top upon which are suspended metal rods, Fig. 2296. Over these rods (y, p) is hung a strip of cloth, arranged in folds, with each end of the strip hanging down into the water, which covers the bottom of the pan. The lower edges of the folds are served (as at o) to hold them in place. The seeds are placed between these folds and are kept moist by capillary attraction; no provision is made for regulating the temperature, the pan being placed in an ordinary living room.

Porous saucers of unglazed clay set in shallow pans containing water are often used for fine seeds. Owing to the difficulty of procuring clay saucers of equal porosity plaster of Paris germinating dishes (Fig. 2290) are recommended. These can be made by any one at a trifling cost by means of a wooden mold, with a detachable top which consists of an ordinary pane of glass to which a Petri dish is attached with glue. Fig. 2290.

A very simple apparatus for sprouting seeds is shown in Fig. 2301. It consists of a shallow tin basin "re-lipped," which is given two coats of mineral paint both inside and out to prevent rusting. The bottom of the basin is covered with water, and a small flowerpot saucer is placed inside. The seeds are laid between two layers of moist blotting paper and on top of the saucer, and a pane of glass covers the dish, which is to be kept in a temperature of about 70° F., such as an ordinary living-room. The basin may be left partly open 2½ hours to time to permit exchange of air and gases. By using a good-sized dish with small saucers, and renewing the water occasionally, several kinds of seed may be tested at once at little expense. Extremes of temperature and excessive moisture must be avoided.

As still simpler method consists of placing the seeds on a sheet of blotting paper, which is rolled up in a tube of rolled-up blotting paper. The tube is then tapped with a screw, into which the paper is inserted, and the tube is closed with a cap. The tube is then placed in a shallow dish and the whole protected from the air by a pane of glass. A number of these small dishes may be placed in a box or a cabinet, and the glass cut and replaced as desired, and the whole protected from drafts and other disturbing influences.

Testing Grass Seeds.—Most grass seeds require special treatment, both in purity and germination tests. For the latter neither blotters nor cloth can be depended upon as a seed-bed, hence soil tests are advisable. One must be taken not to plant the seeds too deeply. Seed of red-top and June grass should be sown upon the surface and the lightest possible cover of soil or sand given it. Before planting the soil should be thoroughly watered, and after sowing a fine rose spray should be used to avoid disturbing the seeds. The same remarks will apply to soil tests of other fine seed.

To prevent counting empty glbones (chaff) a mirror-box (Fig. 2302) is useful. This consists of a box of hard wood, half an inch thick. It is 12 in. long, 8 in. wide and 6½ in. high, the front being open, and the top consisting of an ordinary pane of glass. The inside of the box is painted a dead black. Attached by hinges to the upper margin of the box in front is a rectangular piece of black binder's board, 12 x 8 in. in size. A smaller piece of similar board, 8 in. square, is attached to each end of the box at its upper edge. The purpose of the board is to prevent counternight all extraneous light. In the center of the box is a mirror about 10 x 7½ in. in size, so pivoted that it can be turned at different angles and reflect the light which enters the open side of the box up through the glass top.

Grass seeds are spread thinly over the surface of the glass top, and the mirror adjusted so as to throw the light up through the seed. The operator faces the
apparatus with the open side opposite to him and toward the light. The mirror should be so arranged that it will not throw any light into the operator's face. With this apparatus the outlines of grass seeds within the glumes can be clearly seen, and the chaff can be removed with the other impurities of the sample.

A much simpler method of identifying the sound seeds in grasses consists in the use of a pane of glass, over the surface of which the seed, thoroughly wet, has been thinly spread. This glass is held up to the light, and with the forceps the good seed may be easily picked out. It would be well for the purchaser of grass seed,

especially of meadow fox-tail, awnless brome and velvet grass, to make use of this simple test. For laboratory purposes the mirror box is to be greatly preferred, since the seed can be handled much better when dry.

*Piling Beet Seed.* — Special methods are also required for testing red and sugar beet "balls," each of which contains from 1 to 7 seeds. Three separate lots of 100 balls each are selected with great care, so as to represent average samples. These are rubbed slightly between the hands, soaked 6-15 hours, then placed on blotting paper or sand at a constant temperature of 20° C., for 15 hours out of 24, the rest of the time at 30° C. In 5, 6, 8 and 11 days the balls are examined. Whenever 1, 2, or 3 seeds have sprouted in a single ball, they are carefully cut out with a knife, and the balance of the ball is removed to a second seed-bed, which is numbered to correspond with the number of the seeds which have germinated in the balls placed therein. At the next examination the sprouted seeds are again cut out and the clusters removed to another bed, numbered to agree with the total number of seeds per ball which have sprouted. The test is closed on the 14th day, when the sum of all the germinating seeds of each lot of 100 clusters, together with the number of unsprouted seeds, is ascertained. The average of all the clusters is taken into account, special care being exercised not to count as seeds any cavities which were empty at the beginning of the test.

*Test for Genuineness or "Purity" of Stock.* — The genuineness of the seeds of vegetables and other horticultural varieties of plants can only be told by means of a field test, which should be made in such cases whenever possible. The purity of stock of such seeds is of far more importance than a high percentage of purity and germination. In making field tests of different varieties of seed a check test should be conducted, using a sample, for purposes of comparison, which is known to be authentic. The different tests must be subjected to the same conditions of soil, etc. The genuineness of the seed of grass, clovers, and other forage plants can usually be ascertained by mere inspection and comparison with a standard collection.

GILBERT H. HICKS.

The preceding article was prepared for this work by the Gilberth Hicks, of Washington, D. C., in 1900, while in charge of pure seed investigations for the U. S. Department of Agriculture. It is printed practically as it was written. The subsequent changes in the Department methods are given below by Mr. Hicks's successor. [L. H. B.]

The methods and apparatus in use in the Seed Laboratory of the U. S. Department of Agriculture have undergone some changes since the foregoing was written. These changes have been the necessary result of experience and are in substance the following:

While purchasers are urged to buy the best seeds, it is doubtful whether, under the conditions of trade in the United States, arbitrary standards have much value. The comparison of the price and quality of different grades offered means more than an accidental condition which it is seldom practicable to enforce. A system of inspection that would certainly detect all weed seeds would make the seed too expensive for practical use.

The standard chamber is now covered with asbestos lagging instead of with felt; a single door covered with the lagging has been substituted for the double doors. An air bulb regulator, devised by Mr. E. Brown, has been substituted for the mercury bulb regulator.

The temperatures needed for the successful germination of seeds depend on the kind of seeds tested. Let- ture must have a low temperature, 15° C. giving best results. A temperature of 25°-30° C. will almost entirely inhibit germination. Seeds of teosinte, on the other hand, demand 30° C., while vine seeds give best results under a temperature alternating between 28 and 30° C. A constant temperature at 20° C. is seldom used. Seeds naturally germinate under conditions of constantly changing temperature and favorable natural conditions should be reproduced as nearly as possible in the laboratory. Kentucky blue grass seed is not tested in the green house, better results being obtained in the test by means of alternating temperature. When seeds, as of sugar beet, are sold on a guarantee, the re-test should be made under conditions similar to those under which the original test was made. The energy of germination, that is, the percentage of seeds that sprout in about one-fourth the full time, nearly represents what the seed will do in the field and is of greater importance than the full time test.

A. J. PIETERS.

The Seed Trade of America. — Early History. — The history of the seed business in colonial times is largely one of importation from Holland and England, when small hucksters carried a few boxes of popular seeds with an assortment of dry goods, foodstuffs or hardware. Corn, harley, peas, onions, fruits and vegetables, necessaries in fact for direct use, first claimed the attention of the colonists. Towards the end of the eighteenth century we begin to find references to the saving of stock seeds, and in the newspapers of the day are a number of advertisements of shopkeepers who dealt in seeds. Agricultural seeds were an article of commerce as early as 1747 (Pieters), clover, onions, beans, peas, carrots, cabbage and cauliflower, etc., being raised for seed in the colonies at that time, though chiefly imported. At that time Boston did most of the business.

Among the earliest advertisers of seeds for sale were Nathaniel Bird, 1763, a book dealer of Newport, R. I.; Gideon Welles, "on the Point," 1764; Samuel Deall, a dealer of general merchandise in New York in 1776; William Davidson of New York in 1768, while in Philadelphia, in 1772, we find one Pelatiah Webster advertising clover and duck grass seed; James Longhead "wolly-flower" seed in 1775; while David Reid kept a general assoutment in 1768.

Development of American Trade. — It was not until the opening of the nineteenth century that America began to find that seeds could be grown here as profitably as they could be imported. Grant Thorburn, in New York, and
David Landreth, of Philadelphia, seem to have been the largest dealers at that time. Thorburn's was perhaps the first business of importance devoted entirely to stock seeds, though this honor is disputed by the descendants of David Landreth. Thorburn, in his autobiography, says that he began his business by buying out the stock of one George Inglis for fifteen dollars, Inglis agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small beginnings from which has grown a trade which now amounts to many millions, and this relation between seedsmen and growers is largely typical of relations which have obtained in the trade ever since.

Railway and Postal Service.—With the development of the railway and the postal service the business grew by leaps and bounds, new land was found suitable for different varieties of seed, and a letter could carry to the countryman the garden seeds for his yearly consumption. There is probably no trade which has been more widely benefited by cheap postage and improved mail facilities, but of late years the abuse of their privileges by members of Congress has largely tended to negative this benefit. The originally beneficial distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no adverse criticism, but it has degenerated into an abuse, which is estimated to have taken a trade of some $4,000,000 during the past two or three decades out of the hands of the men who have built up the business.

Catalogues.—Grant Thorburn's catalogue of 1822 was the first to be issued in pamphlet form, and it was the pioneer of the many finely and carefully illustrated catalogues with which we are familiar to-day. These catalogues have been largely instrumental in facilitating the specialization of the industry and its subdivision in the hands of the country dealer, who buys seeds at wholesale, combining as they do the most complete lists and illustrations of varieties with directions as to methods, conditions, and seasons for planting. They are distributed literally in hundreds of thousands. It is of interest to remember that up to 1844 the wording on the bags was written by hand, a laborious and expensive process, which of itself is an indication of the small volume of the trade at that date.

Imports and Exports Statistics.—With regard to the export of seeds, A. J. Pieters' admirable report for 1899 in the Yearbook of the Department of Agriculture may be taken as the latest information. He says in part: "The statistics of exports date from 1855, and no separate records of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always taken the lead in the seed export trade, and until recent years garden seeds have not been a considerable factor in the total values. In 1875 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade had existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1853 to $2,185,706 in 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregated $5,393,663. During the decade ending with 1899 clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $29,739,277. The aggregate was increased by more than $3,000,000 before the end of 1899. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad."

Development of Home Industry.—The importation of stock seeds for garden use has been decreased by 1876, and with the exception of a few staples in agricultural and flower seeds, America may be said to have become to a great extent self-supplying. The greatest development of this industry has been in the years next the close of the war. In 1876 J. H. Gregory estimated that there were in all 7,000 acres devoted to garden seeds, while the census of 1890 showed that there were 396 seed farms, containing 106,850 acres. Of these farms, 296 were established between 1860 and 1890, and it is likely that about 150 more were started during the same period. The census returns, however, do not give the actual acreage devoted to growing seeds. As many seeds are grown by those not regularly in the business, it is probable that census returns as to acreage are under rather than over the mark. The statistics available in the United States Census are very imperfect, partly owing to the lack of a uniform system of registration, both in the returns of home industry and also in custom house returns, but chiefly to the reluctance of seedsmen and growers to make public the results of their business methods or even the methods themselves.

Contract System of Growing.—The contract supply has been the general method pursued by the larger seedsmen, farmers in those locations best suited to certain seeds contracting to grow supplies from stock seeds found by the seedmen. As the巉, one farmer will grow only one or two varieties. A saving in the expense of supervisions has been made by the growth of the system of subletting a contract. The middleman has posted on the abilities of his neighbors and the qualities of their soils for many miles around, and often place and keep sight of the growing of many more varieties than he himself could handle on his own land. Many of these middlemen do not grow seeds themselves but act merely as the seedsmen's growing agent among the farmers of a large district. Excepting in California, where the growers as a rule devote their whole capital to the business, it is a frequent custom throughout the country for seedsmen to make cash sales against crops. Few seed houses grow their own seeds.

Value of Staples, Home-grown and Imported.—The following table will give as close an estimate as can be made of the annual cost of the chief staple garden seeds handled in America.

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden peas</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Garden beans</td>
<td>300,000</td>
</tr>
<tr>
<td>Onion seed</td>
<td>300,000</td>
</tr>
<tr>
<td>Lettuce seed</td>
<td>250,000</td>
</tr>
<tr>
<td>Radish seed</td>
<td>30,000</td>
</tr>
<tr>
<td>Turnip seed</td>
<td>25,000</td>
</tr>
<tr>
<td>Beet seed</td>
<td>15,000</td>
</tr>
<tr>
<td>Celery seed</td>
<td>5,000</td>
</tr>
<tr>
<td>Miscellaneous seeds, Flower seeds</td>
<td>$2,125,000</td>
</tr>
<tr>
<td>Probable invoice cost of imported garden seeds</td>
<td>$1,709,000</td>
</tr>
</tbody>
</table>

Total growers' value $4,825,000.

An estimate recently made by one of the largest seedsmen in the country gives the capital invested in the business at about $2,000,000, or a slight reduction in the value of under seed at the present time as about 150,000 acres.

Staples and Localities of Production.—The following table may be taken as the present principal garden seeds and the cultivation where they are most profitably raised (See, also, Bailey, "Principles of Vegetable Gardening," p. 179):

<table>
<thead>
<tr>
<th>Seeds</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>String beans</td>
<td>New York, Michigan, Wisconsin</td>
</tr>
<tr>
<td>Bects</td>
<td>Imported chiefly from France, owing to better method of selection in practice there, but would adapt itself to almost any of the older states of the Union.</td>
</tr>
</tbody>
</table>
Cabbage: About half imported, the other half chiefly from Long Island, Connecticut, Pennsylvania, and to a small extent, Puget Sound.

Cauliflower: Finest kinds imported from Denmark; coarser kinds from Italy.

Carrots: The bulk of finest kind imported from Florida, with other grades in Connecticut, and coarser grades in California.

Sweet corn: Connecticut, Nebraska, New York, Ohio.

Cucumbers: Chiefly in Nebraska, northern New York.

Lettuce: California.

Watermelons: Nebraska, Kansas and the South.

Onions: Chiefly in California; Connecticut, New York, Michigan.

Parsley: Northern New York, Canada, Michigan, Wisconsin.

Potatoes: Fine grades chiefly in Maine and New York; also in every state.

Spinach: Imported from Holland.


Turnip: About half is imported from England and France, where it is grown chiefly from American seed; other half chiefly in Connecticut, New York and Pennsylvania.

Lima beans: California.

Celery: California.

Dealers in garden seeds are also large dealers in flowering bulbs, such as hyacinths, tulips, narcissus, crocus, etc. These are chiefly imported from Holland, south of France, Italy and Japan.

Divisions of the Trade.—The trade is divided into six main branches of garden and flower seeds and bulbs and agricultural seeds. The latter is practically a business by itself, devoted to such seeds as blue grass, Timothy, clover, red top and alfalfa, some of which are exported or imported as the exigencies of the season's product demand.

Tariff.—Flower seeds are subjected to no import duties, while on garden seeds there is a tariff of 30 per cent ad valorem. It is a mooted point whether this tariff at the present time operates to the advantage of the trade, the principal seedsmen being generally of the opinion that it tends to stimulate over-production in this country.

Number of Firms in the Trade.—The main business of the country is in the hands of about 150 firms, but practically every grocer-year in country towns and villages carries a stock during the spring season. These men, however, deal as a rule with the larger houses and constitute the principal class of middlemen for retail trade.

Wholesale Seedsmen's League: Its Objects.—On August 24, 1900, some 12 of the leading houses of the country incorporated themselves in the Wholesale Seedsmen's League, with the object of regulating the general interests of the trade. The office of the League is in Philadelphia; its president, F. W. Bruggerhof, of New York; vice-president, S. F. Leonard, of Chicago; secretary and treasurer, Burnet Landreth, of Philadelphia. The climate and soils of the United States are so varied that entirely different methods of carrying on the seed business obtain in different trade centers, and one of the principal efforts of the League is in the direction of agreeing as to the uniform listing of prices for crops of the same seed which mature at different dates in different localities. It is hoped in this way not only to prevent the sacrifice of stock by growers in early districts, but also to prevent the demoralization of the general market, caused by the publication of clearance prices by seedsmen in an early district before the market has been adequately supplied by seedsmen in those districts in which the stock matures at a later season.

J. M. Thorburn & Co.

SEED-BOX. Ludwigia alternifolia; probably also sometimes applied to plants that have loose seeds in inflated pods, as Crotolaria.

SELAGINELLA (diminutive of Latin Selago, old name of a club moss). A large genus of mostly tropical plants of diverse habit, ranging from minute, prostrate annuals to erect or even climbing perennials. Easily recognized by the production of two kinds of spores—powdery microspores from which the male flower is made and larger microspores produced four in a sporangia just within the axil of the terminal leaves of the stem, which often form a 4-angled spike. In all our cultivated species the leaves are in four ranks, the two upper smaller and pressed against the stem, giving it a flattened appearance. Selaginellas are graceful fern-like greenhouse plants, often known to gardeners as Lycopodiums.

SELAGINELLA INDEX.

A. Les all similar, many-ranked. 

Native species, .......................... 1. rupestris

AA. Les 4-ranked, of sorts forming 

an upper and a lower plane. 

Mostly hothouse exotics.

B. Foliation of the spikes uniform. 

C. Main stem decumbent, usually 

reading throughout.

D. Plants perennial; lvs. firm. 

E. Stems continuous, i.e., 

without joints.

F. Branches one-eighth in. 

or less wide; stems 6-9 in. long ........... 2. denticulata

3. serpens

4. patula

FF. Branches ¼ in. or more 

wide; stems 2-8 ft. long 

5. uncinata

6. plumosa

7. concinna

8. stolonifera

9. Kraussiana

EE. Stems articulated .......... 8. denticulata

9. cunninghami

10. Brasilienis

12. apus

13. albo-nitens

CC. Main stems ascending, 

branching nearly or quite to 

the base.

D. Roots confined to the lower 

half of the stems.

E. Plants perennial, with 

continuous stems.

F. Color of lvs. and stem 

pale or bright green .......... 14. atroviridis

15. Californica

16. Martensii

FF. Color of lvs. dark green, 

becoming red; stem 

reddish brown .......... 17. rubella

EE. Plants annual if not 

perennial 

18. Poeltleri

DD. Roots confined to the base 

of the stems. 

G. Stems crowded in 

rosettes, curling 

closely when dry .......... 19. involvens

20. leptophylla

21. cuspidata

p.s.
SELAGINELLA

60. Stems 6-12 in. high, not curling in rosettes..............22. Emmelaniella
600. Stems elongated (2 ft. or more), not crowded.
61. Lvs. equal-sided at base.................23. Wallichii
611. Lvs. produced on upper side at base........24. Victoria

ccc. Main stems climbing.................27. Wildenowii
cccc. Main stems erect, the branches
confined to the upper portion, naked below.

D. Stems not jointed.

E. Color of stems straw-colored, or at most only pink-tinted.

F. Lvs. long, the ultimate divisions of stem ¾-¾
in. wide..................28. grandis
FF. Lvs. shorter without these
 divisions of stem one-sixth to
one-twelfth in. wide.

G. Plants usually less than a foot high........29. viticulos).a
causescens
31. Braунii
32. liabellata
33. Vogelii
34. Lyallii
erinthopus
36. hematooes

EE. Color of stems crisorus........35. gniculata

DD. Stems jointed in lower two-thirds ................37. gniculata

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

1. rupestris, Spring. A small, rock-loving perennial,
with branching stems 4-5 in. long, many-ranked lvs.
ending in a white awn, and square, 4-angled spikes.—
Native of the eastern half of the United States, but re-
placed by many allied species in the Rocky Mts. and on
the Pacific coast. The writer has separated 6 of these
and Dr. Hieronymus, at Berlin, has recently character-
ized 10 others.

long, matted; lvs. of the lower plane slightly spaced,
denticulate, ciliate on the upper side at base and
imbricated over the stem; lvs. of upper plane cuspidate.
Mediterranean region throughout.—Trade names are
var. aurea and foliis variegatis.

3. sérpes, Spring. Stems 6-9 in. long, trailing, bright
green, copiously branched; lvs. of lower plane crowded,
obtuse, spreading, ciliated at the rounded base; lvs. of
upper plane obliquely oblong, acute. West Indies.—
Long in cultivation.

4. palis, Spring (S. sarmentosa, A. Br.). Stems
slender, trailing, pale green, 6-9 in. long, with long,
tail-like tip, and fewer short pinnae branches; lvs. of
lower plane crowded, erect-spreadimg, oblong-lanceolate,
somewhat acute; lvs. of lower plane one-third as long,
acute. Jamaica.

5. sceinata, Spring (Lycepodium caesium and Selagi-
nella caesia, Hort.). Stems 1-2 ft. long, extending in
a somewhat naked tip beyond the branches, doubly
grooved above, with short, alternate branches; lvs.
thin, blue-green, with a distinct midrib, slightly more
produced on the upper side; lvs. of upper plane cuspi-
date, much imbricated. China.—In 1893 John Saul
offered "S. caesia arborea" with the remark that S.
leavigata was a synonym thereof.

6. plunosa, Baker. Stems 6-12 in. long, flat above,
often forked near the base; lvs. of lower plane close,
bright green, much more produced on upper side of
midrib, ciliated on both sides at base; lvs. of upper
plane half as long, ovate, much imbricated. India, Cey-
lon, China, Malay Isles.

7. concinna, Spring (S. serrulata, Spring). Stems
1 ft. or more long, copiously pinnaeately branched,
with more or less fan-shaped compound branches;
lvs. of lower plane crowded, bright green, glossy, much
dilated and rigidly ciliate on the upper side at base; lvs. of
upper plane one-third as long, long-cuspidate, much
imbricated. Mascarene Islands.—Var. folis variegatis,
Hort., is cultivated.

8. stolonifera, Spring. Stems a foot or more long,
with a more or less naked tip, angled above and below,
with short, compound branches; lvs. of lower plane
closely set, rigid, acute, short-ciliate and minutely
nurcled at base. West Indies.

9. Kraussiana, A. Br. Stems 6-12 in. long, flat on
the back, rounded on the face, copiously pinnae, with
compound branches; lvs. of upper plane spaced on the
branches and main stem, acute, slightly imbricated over
the stem; lvs. of upper plane obliquely ovate, acute.
Africa, Madeira.—S. Bröenii, Hort., is a dwarf form
from the Azores. Vars. aurea and variegata are
American trade names.

10. Cunninghamia, Baker. Stems copiously pinnae,
the lower branches compound; lvs. of lower plane ovate
or oblong, ciliate and very unequal-sided at base,
much imbricated over the stem; lvs. of upper plane
distinctly cuspidate. Brazil.

11. Brasilensis, A. Br. Stems copiously pinnae, the
lower slightly compound; lvs. of lower plane mostly
spaced, acute, ciliate at base, ciliate and imbricated
over the stem; lvs. of upper plane half as long, cuspi-
date. Brazil.—Similar to preceding, but with longer
leaves.

12. apus, Spring. Stems 1-4 in. long, angled above,
with short, simple or forked branches; lvs. of upper
plane pale green, serrulate but not ciliate, ciliate on
the upper side; lvs. of the upper plane ovate. Canada
to Texas.—Lycepodium densum, cultivated at the Har-
vard Botanic Garden, is said to belong here.

13. albinoans, Spring. Stems slender, trailing, the
lower branches slightly compound; lvs. of lower plane
spaced on main stem, short-ciliate, bright green; lvs. of
upper plane one-third as long, cuspidate. West Indies.

3203. Club Moss used to cover the soil of an orchid pot—
Selaginella denticulata (X ¼).

14. atroviolida, Spring. Stems 6-12 in. long, ascend-
ing, doubly grooved above; lvs. of lower plane sparsely
3-nerved, firm, broadly rounded; lvs. of the upper plane
half as long, long-cuspidate, much imbricated. India.

15. Caliginosa, Spring. Stems 4-6 in. long, 4-angled,
copiously pinnae; lvs. of lower plane ovate, minutely
cuspitate, dentilicate on the upper side at the base; Ivs. of the upper plane very small, ovate-oblong. Said to come from Lower California, but not known at Kew and doubtfully in cultivation in this country.

2304. Poorly grown specimen of Club Moss, unsuitable for table decoration (× ½).

For contrast with Fig. 2305. This species is S. Martensii.

16. Martensii, Spring. Fig. 2304. Stems 6–12 in. long, flat or rounded below, angled above: Ivs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly imbricated over the stem at base; Ivs. of upper plane obliquely oblong, long-cuspitate. Mexico.—Exists under many varieties in cultivation.

17. Rubella, Moore. Stems 1 ft. long, somewhat erect in habit, reddish brown, with 2 grooves on the upper face; Ivs. of lower plane dark green, becoming reddish with age, obtuse or obscurely ciliate, crinkled and imbricated over the stem at the upper side of base; Ivs. of upper plane ovate-cuspitate. Native country not known.—Has been in cultivation since 1870. Var. variegata, Hort., is cultivated.

18. Poultieri, Hort. Veiteh. Stems densely tufted, slender, suberect, 2–3 in. long, three to four times dichotomously forked; Ivs. of lower plane spaced, suborbicular, obtuse, bright green; Ivs. of upper plane nearly as long, but ovate and acute. Azores.

19. involvens, Spring. Stems densely tufted, 2–6 in. long, deltoid, branched nearly to the base; Ivs. of lower plane crowded, ovate, with a distinct cusp, bright green, thick, rigid, serrulate on both margins; Ivs. of upper plane nearly as long, ovate-lanceolate, cuspidate. Japan to India and the Philippine Islands.

20. Lepidophylla, Spring. Resurrection Plant. Stems 2–4 in. long, densely tufted, spreading in a close spiral so as to form a flattish expanse, curling closely into a ball when quite dry: Ivs. of lower plane oblique, obtuse, minutely ciliate, green on the face, paler below; Ivs. of upper plane nearly as long, obliquely ovate, obtuse. Texas and Mexico to Peru.—Often sold dry under the name of "Resurrection Plant" (which see), as the absorption of water will cause the stem to double in length and swell its bright green upper face of the stems long after the plant is dead.

21. Cuspidata, Link. Stems densely tufted, 6 in. or more long, branched nearly to the base, with copiously compound branches: Ivs. of lower plane obliquely ovate, cuspitate, dilated and ciliated on the upper side at the base, pale green edged with white; Ivs. of upper plane nearly as long, obliquely ovate, cuspidate. A plant occurring under the horticultural name Lycopodium cordifolium has the stem a foot or more long and simple in its lower part, and doubtless represents a distinct species. Cuba and Mexico to Venezuela.

22. Emmeliana, Hort. Fig. 2305. Stems 6–12 in. high, the primary branches ascending, bipinnate; Ivs. of lower plane close, obliquely ovate, those of the branchlets narrower and minutely spinulose; Ivs. of upper plane raised above those of the lower, one-half as large, spinulose-serrulate, short-cuspidate. S. Amer. Named for Th. Emmel, a German gardener.

23. Wallichii, Spring. Stems 2–3 ft. long, with lanceolate branches and simple crowded branchlets: Ivs. of lower plane crowded, smaller towards the end of the pinnae; Ivs. of upper plane one-fourth as long, cuspidate: spikes ¾–1 in. long. India and the East Indies.—Highly ornamental.

24. Victoria, Moore. Stems 3–4 ft. long, with lanceolate-deltoid, ciliate branches, with the lower branchlets forked or slightly pinnate: Ivs. of lower plane crowded, a line long, truncate at base and obscurely petiolated; Ivs. of lower plane one-fourth as long, short-cuspidate. spikes 1–2 in. long. Borneo and Fiji Islands.

25. gracilis, Moore. Stems 2–3 ft. long, somewhat roughened, with lanceolate branches and simple branchlets: Ivs. of lower plane ovate-falcate, adnate to stem on lower side at base; Ivs. of upper plane ovate-lanceolate, cuspidate. Polynesia.

26. Lobbia, Moore (S. cogensa, Hort.). Stems 3–4 ft. long, with lanceolate-deltoid branches and contiguous simple or forked branchlets; Ivs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; Ivs. of upper plane one-third as long, obliquely ovate, cuspidate. Borneo and Sumatra.

27. Willdenovii, Baker. Stems reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguously divided; Ivs. of upper plane one-third long, obliquely obtuse, not cuspidate. India and the East Indies.

28. gracid, Moore. Stems 1½–2 ft. long, branched above; Ivs. of lower plane crowded, lanceolate, acute, rather firm; Ivs. of upper plane one-third long, ascending, much imbricated. Borneo.

29. Viticulosa, Klotsch. Stems with deltoid 2–3-pinnate branchlets; Ivs. of lower plane ascending, acute, short-ciliate and much imbricated over the stem; Ivs. of upper plane one-third as long, obliquely ovate, cuspidate. Central America.

30. Cauliscens, Spring (S. amara, Hort.). Stems stiff, erect, the short final branchlets curling when dry; Ivs. of lower plane crowded, ovate, falcate, bright green; Ivs. of upper plane one-third to one-fourth as long, cuspidate. Japan, China and East Indies.—Var. argentea, Hort., is advertised.

31. Braunii, Baker. Stems deltoid and flexuous above, with deltoid erect-spreadin pinnae, the pinnae short, deltoid and spaced; Ivs. of lower plane ovate-elliptoid, usually revolute at both edges; Ivs. of lower plane short-cuspidate. West China.
32. Selaginella, Spring. Stems erect, deltoide, decomposed, with contiguous final branchlets: 1s. of lower plane obliquely ovate, acute, broadly rounded and ciliated at the base; 1s. of upper plane obliquely ovate, cuspidate. Widely distributed in tropical regions. — One of them is cult called *S. crispa*.

33. Vagelli, Spring (*S. Africana*, A. Br. *S. Perrellii*, Spring). Stems decomposed above, the lower pinnate deltoid, petioled, 3-4-pinnate; 1s. of lower plane lanceolate, ascending, often revolute on both edges, truncate at base; 1s. of upper plane minute, strongly cuspidate. Africa.

34. Lyralli, Spring. Stems deltoid above, the lower pinnate bipinnate, the final divisions ½-1 in. long, ½-1 in. wide; 1s. of lower plane oblong-lanceolate, falcate, acute at the base, 1s. of upper plane minute, acute. Madagascar.

35. erythropus, Spring. Stems under a foot long, deltoid and decomposed above, the lower pinnate 3-pinnate, the ultimate divisions one-twelfth to one-eighth in. wide; 1s. of lower plane oblong-lanceolate, acute, per plane one-half to one-third as long, cuspidate. Tropical America. — *S. selti*, Hort., is said to be a variegated form of this species.

36. haematodes, Spring (*H. filicima*, Spring). Stems 1-2 ft. long, the deltoid pinnate 3-4-pinnate, the ultimate divisions ⅓-⅔ in. wide; 1s. of lower plane oblong-rhomboid, acute, dilated on upper side, without base, not ciliated; 1s. of upper plane ovate-acuminate, cuspidate. Venezuela to Peru.

37. geniculata, Spring (*S. elongata*, KL). Stems 2-3 ft. long, pinnate, 3-4-pinnate pinnate, the divisions ascending and pinnately arranged; 1s. of lower plane ovate, acute; 1s. of upper plane one-third as long, oblong-lanceolate. Costa Rica to Peru.

38. cordifolia, Spring (*S. cordata*, KL). Stems trailing, 1s. with short branchy often ending in whipline tips: 1s. of lower plane acute, pale green, membranous, ciliated on the upper edge, dilated and subcordate; 1s. of upper plane ovate-lanceolate, cuspidate. Brazil.

39. molliceps, Spring (*S. rubricaulis*, A. Br.). Stems erect, 6-9 in. long, bluscate above, much compound: 1s. of lower plane oblong-lanceolate, dark green, very unequal-sided, serrulate on the upper edge; 1s. of upper plane one-half as long, ovate or ovate-lanceolate, cuspidate. Africa.

The following American trade names cannot be satisfactorily accounted for as species: *S. acutis* is said to be one of the most common species cult. in America. — *S. ciricum* is cult. at Harvard Botanic Gardens. *S. Lyalli* is a species introduced from Colombia and probably belongs to species already known from that country. It is said to be a very green plant and a strong grower, whereas *S. Picheleriana* is of dwarfer habit and with stems and under surface of fronds red. *S. magnifica*, &c. *S. Pichelerana*. Grown by John Sull., 1833. — *S. Picheleriana*. Consult S. L. Sargent, Colom. *S. rubricaulis* and *trigularia* were offered by Saul in 1833—8. cultivar. Once cult. by Fisher & Manda, of the United States Nurseries.

L. M. Underwood.

Selaginellas are favorite plants in every good conservatory, being greatly admired for their feathery, moss-like foliage. They have various shades of green, and some of them are remarkable for metallic and iridescent tints, especially bronze and bluish colors, the latter being very unusual among plants in general. *S. Wildenovii* is a very choice large-growing species of the bronze and blue class. Another is *S. uncinata*, often called "Rainbow Moss." Selaginellas are often grown for their own sake as specimen plants, but they are also very commonly used as edging for greenhouses, for covering unsightly spots under the benches, and for hiding the surface soil of large tubs, orchid pots, and the like. See Fig. 2303. They are also delightful subjects for table decoration when grown in pans or jardinières. For this purpose a well-grown Selaginella should be a dense, compact mass of fluffy and feathery, green, not a weak, thin, straggling plant, as shown in Figs. 2304 and 2305. Selaginellas are also employed in bouquets of flowers, clouts being used for "green" in- stead of a genus or fern. Occasionally a fancier of the more difficult species grows a large specimen in a wardian case for exhibition.

In general, Selaginellas are of easy culture. As a rule they prefer moisture and are somewhat tender in foliage compared with some of the species of commercial ferns. *S. denticulata*, *Kraussiana*, *Martensii*, and some other commercial favorites may be propagated without any preliminary treatment in the cutting bench. The young plants of an inch and a half long may be inserted directly into small pots of light sandy soil, placed in a shady position. Spraying them lightly three or four times a day for a week, at the end of which time they will take root. They will soon grow into salable plants.

The popular *S. Emmeliniana*, which is generally considered by florists a variety of *S. cuspidata*, requires different treatment. It is much slower and sometimes requires about nine months from the making of cuttings until the young plants are ready for potting.

Fill regular fern boxes with fern soil, adding one part in five of sand, and press firmly. Select mature fronds of the *S. Emmeliniana*, cut them into pieces half an inch long, scatter thinly over surface of soil, and put just enough finely screened soil on top of the cuttings to attach some small portion of them to the soil. Water thoroughly, cover with glass, and place in a temperature of 70° F. In this condition they will soon form roots and little plants at almost every joint. When sufficiently large they should be separated and transplanted singly or in pairs to boxes where they may be left until large enough to be potted.

The following list of Selaginellas for special and general purpose is not designed to be complete, but merely suggestive. For commercial purposes, *S. denticulata*, *Kraussiana*, *Martensii*, *Emmeliniana*, and *Willdenovii* are the best; for table decoration, *S. Emmeliniana* and *S. Martensii*; for cutting the commercial kinds; for veranda boxes, *S. Brownii*; for bronze and blue colors, *S. Wildenovii* and *S. uncinata*; for palm plants and exhibitions, *S. Brownii*, *Lytali*, *vitticola*, *Willdenovii*, and *S. Bremii*. Also the following, which are generally considered more difficult subjects; *S. atrata*, *hematodes*, and *rubricaulis*; for curiosity, *S. serpens* and *lepidophyllum*.

The curiosities of the genus call for special mention. *S. serpens* is remarkable for its changes of color during the day. In the morning the foliage is bright green; during the day it gradually becomes paler as though bleached by the light; toward night it resumes its lively green hue again. For *S. lepidophyllum*, see Resurrection Plant.

Most of the following species also deserve a few running notes: *S. Brownii* is an old favorite which is often incorrectly labelled *S. Wildenovii* in collections. Its branches, or "foliage" in the popular sense, are exceptionally tough and wiry for the genus. Variegated forms appear in *S. Martensii*. *S. Wildenovii*, *S. vitticola*, and *S. Bremii*, the last-named species being prolific in singular forms. *S. vitticola* is better adapted for use as a pot-plant than for mounding in a fernery, because of its strong-growing, erect, fern-like habit. The branchlets are thrown up from creeping stems and do not root readily, so that this species is usually propagated by division or spores.

W. H. Taplin, N. N. Brucker and W. M.

**Selection.** See Plant - Breeding and the discussion under Seedage.

**Seleinia aurea**, Nutt., is a hardy annual of the mustard family, a native of the U. S. from Arkansas and Texas to the base of the Rockies. It is not known to be indigenous to Europe, but is one of the prettiest of our few native ornamental crucifers. It has small yellow fls. about ⅛ in. across, each of the 4 petals having a central band of red. It is also interesting for its cut foliage and its flat pods through which the seeds may be very easily extracted; for carpeting, or "Honesty." It grows about 9 in. high. B. M. 6607.

W. M.

**Seleinipedium** (from *selein*, moon, and *pedium*, ground; analogous to *Cyripedium*). It was evidently intended to derive the second part of the word from *pedioli*, sandal, and some botanists and horticultural writers use the word thus derived, but Reichbach...
SELENIPEDIUM

wrote Selenipedium). Orchidáceae. The genus Selenipedium comprises the South American Cypripedias. Technically it is separated from the genus Cypripedium on account of the three-loculed ovary. Aside from this character the flowers resemble those of Cypripedium, but the inflorescence is quite distinct. The scapes of Cypripedium bear a single flower (rarely 2 or more), while those of Selenipedium bear several flowers and often become paniculately branched. In general habit the Selenipediums are more robust and luxuriant. The leaves are borne in dense tufts on short, creeping rhizomes. As in many orchids genera, the species of Selenipedium are remarkable for the number of color variations of their flowers. There are many varieties that form connecting links between species, thus making the genus a very difficult one for satisfactory description. It is hoped that the following account, however, will serve to distinguish the leading types.

This genus, like the true Cypripedias, has been a favorite one with hybridizers. Some of the best known species, as S. Sedeni and others, are the products of crosses. The total number of hybrids far exceeds the number of original species. A part of the genera Cypripedium and Selenipedium has been separated by some botanists as a distinct genus, Paphiopedilum, which is now sometimes found in horticultural writings. For culture, see Cypripedium.

HENRICH HASSELBERG.

All Selenipediums enjoy plenty of heat and moisture in the growing season, March to November (65-90°). Give good drainage. Use chopped sphagnum with broken clinkers from the furnace, and the addition of a little leaf-mold, raising the material as high above the rim of the pot as possible. The material is especially to be recommended for the young and divided plants. Give slight shade, and grow on raised benches near the glass. Water sparingly until growth begins. After the first flows have fallen; give 2½ in. across the petals, and water sparingly until growth begins. After the first flowers have fallen; give 2½ in. across the petals, and water sparingly until growth begins. The four species, S. Dominitian, S. Sedeni, S. Schlimii and S. Sargentianum, should not be overpotted. Fill pots three-fourths full of drainage, then place a thin layer of coarse fern root, which will fill pot to level of the rim. Place the plant on top and then fill 2½ to 3 in. on top with chopped sphagnum and leaf-mold mixed with coarse sand or pulverized coal clinkers. Keep the moss in a growing condition.

WM. MATHEWS.

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S. Dominitian, S. Sedeni, S. Schlimii and S. Sargentianum, should not be overpotted. Fill pots three-fourths full of drainage, then place a thin layer of coarse fern root, which will fill pot to level of the rim. Place the plant on top and then fill 2½ to 3 in. on top with chopped sphagnum and leaf-mold mixed with coarse sand or pulverized coal clinkers. Keep the moss in a growing condition.

petals like the sepals; labelium an elliptic bag with a contracted opening, white with a large crimson blotch in front; staminodium yellow. Late summer. Colombia. B.M. 5614. F.S. 18:1917.—Var. albiflorum, Linden. Fls. white, except the yellow staminodium and a suffused blotch on the labelium. J.H. 31:183. Vars. giganteum and superbum are also advertised.

2. Sedeni, Hort. Fig. 2307. Lvs. numerous, crowded, 12-18 in. long, tapering to a point: scapes 12-18 in. high, about 4 in. but often sending out secondary flower branches from the axils of the bracts after the first flows have fallen; 6 ft. 3½-4 in. across the petals; lower sepal oval, greenish white, upper sepal oblong, acute, with faint purplish green veins; petals lanceolate, twisted, purple shading to greenish white at the base; labelium rich crimson-purple shading to paler purple behind, spotted inside.—Garden hybrid between S. longifolium and S. Schlimii. A very luxuriant free-flowering plant. F.M. 1876:206; 1878:362. R.H. 1879:470. Var. candidulum, Reichb. f. Sepals white; petals white tinged with rose; labelium darker rose. A hybrid between S. longifolium and S. Schlimii, var. albiflorum. The following names are also in the trade: grandiflorum, sanguineum, superbum.


4. porphyreum, Reichb. f. (Cypripedium porphyreum, Reichb. f.). Lvs. broadly strap-shaped, acute, about 1 ft. long; fls. mostly purple, resembling those of S. Sedeni, but without purple blash-
white, slightly streaked with green; petals broad, ovate-oblong, undulate, white tinged with rose-purple near the base; labellum intense purple; staminodium white. Garden hybrid between S. Sedeni and S. Schlidi. Gn. 27:495.

6. Ainworthii, Reichb. f. (Cyripedium Ainworthii, Reichb., f.). Lvs. ligulate, acuminate, 1½ ft. long; scape shorter, pubescent, few-fl.; upper sepal oblong-acutish, undulate, whitish or yellowish green with a pale purple border; lower sepal very broad and con-
SELENIPEDUM


2399. Selênipedium Dominianum (x 1-3).

—One of the largest of the Selênipedíums and remarkable on account of the extremely long petals. Peloric forms with the third sepal (labellum) resembling the other two have passed under the name of Uropéidium Lindeni, Lindl.

Var. roseum, Hort. (S. caudátum, var. Warssewiczii, Godfroy.). Sepals yellow, with orange veins; petals deep purple; labellum deep yellow in front, green behind. I.H. 33:396. Var. Wallisii, Hort. (S. Wallisii, Reichb. f. Cyprípedium Wallisii, Hort.). Lvs. paler green; fls. pale, and in every way more delicate than the type. Gn. 49, p. 140. Numerous other varieties of this species are distinguished in cultivation. The following names occur in trade lists: aurescens, Luxemburgense, róbrum, superbum, Scéleri, spléndens, nigrésceans.

15. gránde, Reichb. f. (Cyprípedium gránde, Reichb. f.). A garden hybrid between S. Rézlii and S. caudátum, resembling the former in habit and flowers but much more vigorous, with darker fls.; lvs. dark green, over 2 ft. long; scape over 3 ft. high, with several large, shining fls.; sepals long, oblong-lanceolate, yellowish white, veined with green; petals long, pendent, yellowish green above, brown below; labellum greenish yellow in front, white in side; lobes white, spotted with crimson. G.M. 32:87. A.F. 11:1349. —Var. strátum. A hybrid between S. longiáulum, Rufílii and S. caudátum, var. Reichb. f. III. 3:183.

16. Dominíanum. Hort. (Cyprípedium Dominianum, Reichb. f.). Fig. 2399. Lvs. numerous, about 1 ft. long, acuminate; fls. yellowish green, with copper-brown shades and markings; labellum deep reddish brown, reticulated in front and yellowish green behind. A hybrid between S. Pearsei and S. caudátum. It is intermediate between the parents, but differs from S. caudátum by its acute bracts and narrower lvs., from S. Pearsei by the transverse staminode and hairy ovary. Gn. 43, p. 491. F. 1874, p. 57. —The following varieties also distinguished in cultivation: elegans, rubescens, superbum.

17. Boísíacieranum, Reichb. f. (Cyprípedium reticulárum, Reichb. f.). Plant of vigorous habit; lvs. about 3 ft. long, acuminate; scape few-fl., or sometimes paniculate, 3-7-fl.; fls. of peculiar light green tints, with a few sepa brown and green blotches on the whitish indented part of the lip and with some brown spots on the margins of the sepals; ovary dark brown, with reddish apex and ribs; upper sepals luteolate-lanceolate, very crisp; lower sepals oblong, equal to the labellum, crisp; petals spreading, long-linear, twisted, and very crisp on the margins. Peru. G.C. III. 1:143; 21:54, 55. G.M. 4:469.

18. Klotzschianum, Reichb. f. (Cyprípedium Schombergianum, Klotzsch and Reichb. f.). Lvs. linear, 6-12 in. long, scarcely ½ in. wide, rigid, keeled; scape longer than the lvs., bimorse, purple, 2-3-fl.; dorsal sepal ovate-lanceolate, pale rose-colored, with reddish brown veins, the lower ovate, boat-shaped, colored like the upper one; petals 3½ in. long, linear, twisted, colored like the sepal; labellum greenish yellow, the insect, side-lobes greenish, spotted, British Guiana. B.M. 7178, G.C. III. 15:625.

19. carínium, Reichb. f. (Cyprípedium Phærei, Hort. Cyprípedium cariníum, Lindl. & Pate.). Lvs. 1 ft. long, springing in sedge-like tufts from the long creeping rhizome; scape longer than the lvs., 3-4-fl.; fls. mostly pale greenish, with the segments bordered with white and having purple tips; sepals broadly ovate, waved, as long as the lip; petals more than twice as long, pendent, narrow and much twisted; labellum oblong, the upper margins flat; staminodium provided with 2 hairy processes. Peru. B.M. 5466. F.S. 16:1648.

HEINRICH HÄSELBRING.

SELF-HEAL. See Bræntilla.

SELF-Sterility of FRUITS. Self-sterility may be roughly defined as the inability of a given plant to produce fertile seeds when pollinated with its own pollen. With the rapid strides in plant-breeding, propagation and cultivation, self-sterility and sterility have become important subjects in determining the value and adaptability of new varieties to the various needs and purposes of the planter.

The study of self-sterility in more recent years has been confined mostly to fruit trees and small fruits, and has been conducted by a number of experiment station workers. The list of self-sterile and unsexual varieties is now fairly large for apples, pears, plums, grapes and strawberries. In the case of peaches, apricots, cherries, nectarines and prunes little has been done to determine the number of self-sterile and partially self-sterile varieties. It is generally believed that the ability to produce self-sterility in cultivated plants may be briefly summarized as follows:

1. Change of environment due to domestication produces change in the reproductive organs of the plant. It may result (a) in the suppression in whole or in part of either stamens or pistils; (b) in the infertility or impotency of the pollen upon its own pistils; (c) in changing the time of ripening of the pollen and of the receptivity of the stigma.

2. Asexual propagation tends to reduce the importance of seed production, and to transmit and fur-
SELF-STERILITY

Sempervivum (Latin, living forever). Crassulaceae. Houseleek. About 40 species of fleshy herbs widely scattered in the mountainous countries of the Old World. They are mostly hardy perennials and stemless, and increase by rosettes (Fig. 2310) which are sent out from the parent plant, thereby suggesting the popular name "Hen-and-chickens." The fleshes are thick, short and succulent. The fleshes, which are borne in panicky cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual fleshes are larger than those of Sedum, but the clusters are larger. Houseleeks are cultivated more for foliage than for flowers. They are not used for as great a variety of purposes as Sedums, but they are popular for carpet bedding, rockwork and covering dry banks and bare sandy wastes. They are of the earliest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for permanent carpet beds, and for this special purpose are preferable to the more popular but tender echveria. The foliage remains green all winter. The fleshes are often spotted with red toward the tip, and this color is brighter if the plants have full sunlight. The names "Houseleek" and "Hen-and-chickens" are loosely applied to the whole genus. Of these names are to be restricted, the former should be used for Sempervivum tectorum and the latter for S. gloriferum. The common species, which grows on the roofs of houses in Europe, is S. tectorum. In the case of S. gloriferum the young rosettes are attached to the parent plant by a more slender thread than usual and more easily detach themselves and roll about. The spider-web species are the prettiest of them all, by reason of the webs that cover the young rosettes. These webs are made by the plants themselves and are incidental to development.

Sempervivum is closely related to Sedum, but the floral parts are multiples of 6 or some larger number, while the floral parts of Sedum are in 5's. The genus is a difficult one for the botanist. It has been monographed by J. G. Baker in "Gardener's Chronicle."
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Sempervivum. 

1. tectorum, Linn. Houseleek. Old-Man and Woman. Fig. 2310. Height 1 ft.; rosettes 3-4 in. across; lvs. oblong-cuneate, very glaucous, with a distinct red-brown tip 1-1¼ in. long; pale green, keeled with deeper red; stamens often changed to pistil; filaments bright purple. Eu., Orient. — Var. expanse, Hort., is said to have broader lvs. and more open rosettes. 

2. calceatum, Jord. (S. Calceolium, Hort.) Height under 1 ft.; barre rosettes 2 in. across; lvs. oblong-cuneate, very glazed, with a distinct red-brown tip, 1-¼ in. long; pale 3 in. long and broad, with 8-12 scorioid branches; lvs. ¼ in. across; petals pale red, greenish down the keel both on the back and face. Calcareous Alps of Dauphiny.

3. glaucum, Tenere. Height 6-9 in.; barre rosettes 2-3 in. across; lvs. oblong-cuneate, less glaucous than S. calceatum, with only a very faint red-brown spot at the tip; petals 2-3 in. across; lvs. 1 in. across; petals bright red. Simplon Alps.

4. Atlanticum, Baker. Height nearly 1 ft.; barre rosettes 2-3 in. across; lvs. oblong-cuneate, pale green, hardly tipped red-brown; panicle 3-4 in. across; lvs. 1 in. across; petals pale red. Alps Mts. B.M. 6655 (as S. tectorum, var. Atlanticum). The lvs. of the flowering stem are brightly colored with red, excepting towards the base.

5. montanum, Linn. Height 6 in.; barre rosettes 1½-2 in. across, the new ones few, and borne on red pilose peduncles 1-1½ in. long. lvs. 50-80 in a rosette: petals very dense, 1½-2 in. across, the lowest lvs. nearly sessile; lvs. 1-⅛ in. across, bright mauve-purple. Fls. about the end of June. Alps, Pyrenees.

6. flagelliforme, Fisch. Height 3-4 in.; barre rosettes 1-1½ in. across, the new ones long-peduncled; lvs. 40-50 in a rosette: lvs. 6-8 in a dense head, all sessile or nearly so, 1 in. across or more; petals bright red. Fls. early in June, before any other species. Native country uncertain.

7. pumilum, Bieb. (S. anamalum, Hort.). Height 3-4 in.; barre rosettes at most 1 in. across, the new ones numerous and short-peduncled: lvs. 4-8 in a dense head, all sessile or subsessile, 1 in. across; petals bright mauve-purple. Fls. in middle of June. Cauccus.

8. arachnoideum, Linn. Cobweb or Spider-web Houseleek. Fig. 2311. Height 3-5 in.; barre rosettes at most 1 in. across, the new ones crowded and sessile; lvs. oblong-cuneate, pale green, the tips of nearly all connected by long, soft, white hairs: panicle dense, few-flit: lvs. less than 1 in. across; petals bright red. Pyrenees to Tyrol. B.M. 68. — S. tomentosum, C. B. Lehman, said to differ in having shorter, more oblong-cuneate lvs. and flatter and more compact rosettes and a denser web, could not be distinguished by J. G. Baker. R.H. 1860, pp. 490, 491; 1889, p. 573.

9. Ruthenicum, Koch. Height 6-12 in.; barre rosettes 1½ in. across, the new ones few; lvs. 40-50 in a rosette, slightly pubescent glandular on the faces: lvs. pale yellow, less than 1 in. across. Eastern Eu. — Rare in cult.

10. grandiflorum, Haworth. The yellow petals are set off by the red-purple filaments: height 3-4 in.; bar-
SEMIPERVIVUM

ren rosettes 1-1/2 in. across, the new ones on stalks 1-2 in. long; Ivs pale green and pubescent all over, on the very tip red-brown: fls. 1/4-1/2 in. across, yellow. Eastern Eu., Asia Minor. B.M. 567 and 2115 (as S. globiferum).—The showiest of all the hardy species.

11. Hedellie, Schott. Height 8 in.: barren rosettes 1 in. across, not peduncled: Ivs, 30-40 in a rosette, obovate-cuneate, the upper third or even half tinted bright red-brown: panicle dense, many-fl., 21/4-3 in. across: fls. an inch or less across, pale straw-yellow; petals with 3 small cuspae, not filibrate. Aug. Mohrs of Transylvania and Greece, 5,000-6,000 ft.—One of the latest in flower.

12. globiferum, Linn. (S. soboliferum, Sims). HEN-
AND-CHICKENS. Houseleek. Height 6-9 in.: barren rosettes glossy, 1-1/2 in. in which the numerous young ones detached to the parent only by a slender thread and easily becoming detached from it and rolling about: Ivs. 60-80 in a rosette, obovate-cuneate, the outer ones tipped red-brown, especially on the back: fls. 1 in. across, pale yellow; petals obscurely tricuspidate, conspicuously filibrate at the edge and on the prominent keel. Mohrs of Austria. B.M. 1457.—Unless the young rosettes are thinned out the plants are not so likely to flower.

Under the name of S. globiferum, Linn., seems to have confused all the yellow-fl. hardy species which he knew.

13. arenarium, Koch. Very close to S. globiferum, having the same height, the same globular deciduous rosette, etc., but with narrower Ivs. and the petals longer and more strongly filibrate: Ivs. oblanceolate; fls. 1-1/2 in. across; petals pale yellow, distinctly tricuspidate, with a linear end tooth, strongly filibrate at the edge and less so on the prominent keel. Tyrol. Gn. 49, p. 226.

E. rupestris is advertised by some American dealers, but it seems to be unknown to botanists.

W. M.

SENEBIÉRA (after Joh. Senecber, a naturalist of Geneva). Cyncléires. About 6 species of proembient annual or biennial herbs from the temperate regions of Europe and Asia, and Australia, with alternate, entire or pinnately cut lvs. and small white or rarely purple fls., in short, axillary racemes; sepals short, spreading, equal at the base; stamens free; silques in pairs, small, laterally compressed; valves 3-seeded, indehiscent.

pinnatifida, DC. A common weed in many parts of the world and sometimes used as a pot-herb in foreign countries: plant 3/4-1 ft. high: lvs. pinnately lobed: fls. white, small, numerous. F. W. BARCLAY.

SENECA SNAKE ROOT. Polygata Senega.

SENECIO (Latin name for plants of this genus, ultimately from senex, "old man"); said to be in allusion to the hoary pappus), Compositae, Gliotrvnse. The largest genus of plants, comprising some 1,200 species in all parts of the world. A genus comprising so many members and being so widely distributed is necessarily variable and therefore practically impossible of definition. A distinguishing mark of the Senecios lies in the character of the involucre, — scales in one series, and usually reinforced at the base by a row of shorter scales that give the head the appearance of having a small calyx. The heads are usually radiate, the ray-fl. being pistillate and fertile; but sometimes the rays are absent and then the head is homogamous (fl. all of one kind, i.e., perfect). The disk-fl. are tubular and smooth. The torus or receptacle is usually naked. The achenes are mostly terete and ribbed; pappus of soft whitish, often copious bristles. According to Gray, "minute short hairs or papillae on the achenes of most species swell and emit a pair of spiral threads when wetted. Before wetting, the achenes may be really or apparently glabrous, and after wetting become canescent." Most of the Senecios are yellow-rayed. Of the vast number of species, very few have gained prominence as cultivated subjects. If we omit the greenhouse Cineraria (which is technically a Senecio as understood by Bentham & Hooker), the most popular species are the Farfugium grande (properly Senecio Kmpferi) of florists, S. mikanioides or German ivy, S. elegans or purple ragwort, and S. Cineraria, one of the plants commonly known as dusty miller. Various other plants are known as dusty miller, and one of them (Fig. 2312) is sometimes confused with Senecio Cineraria.

All other species are of very minor importance to the horticulturist. Of the 60 or more species native to the United States and Canada, about a half dozen have been offered by dealers in native plants, but they are practically unknown horticulturally. Most of the species are wholly herbaceous, but in South Africa and South America many species are shrubby. Some species are evergreen, others are climbers. In South Africa and the Canaries is a set that has been separated as Kleinia, distinguished mostly by its habit, being for the most part shrubby shrubs or herbs, with terete or angular stems and white or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents, but they are little known outside of botanical gardens. S. vulgaris, Linn., from Europe, is a common annual weed in various parts of this country. To Senecio belong the genera known to gardeners as Erythrocotyle, Farfugium, Jacobaea, Kleinia, Ligularia. Cineraria is also a Senecio, but the florist's Cineraria is described under that name in Vol. I of this work. Bentham & Hooker refer to Senecio the genus Caucilia, which is kept distinct by American botanists. Hoffmann (in Engler & Prantl's Natürlichen Pflanzenfamilien) refers the garden genus Emilia to Senecio, but keeps Ligularia (including Parfugium) and Cineraria distinct. For S. conchiferus, see Emilia.

Since Senecios afford both greenhouse and hardy border plants, it is impossible to give general cultural directions. The species are not difficult to manage, however, and most of them propagate readily by means of greenwood cuttings and seeds; the hardy species may be divided.

2312. Artemisia Stelleriana, one of the Dusty Millers sometimes confused with Senecio Cineraria. See Fig. 2315.
SENECIO 1657

SENECIO

acanthifolius, 9.
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A. Stem fleshy, with jointed and swollen branches; heads rayless.... 1. articulatus
A. Stem not fleshy.
BB. Scales of involucre usually strictly seriate; stigma short, the style-branches hairy only at the tip.
C. Leaves purple (there are white garden forms).
D. Lvs. large and palmately veined; lobes shallow or none.
E. Leafage white-tomentose throughout.
EE. Herbage green or yellow most only grayish, not white-tomentose.
F. Lvs. large, palmately veined
FF. Lvs. ovate-oblong and dentate, the cauline ones deciduous.... 11. Petasitis
FFF. Lvs. small or ovate, mostly pinnately veined or divided.

1. articulatus, Sch. (Kleinia articulata, Haw.). CANDLE PLANT. Plant branching, glabrous and fleshy, 1-2 ft. high, the branches swollen at intervals; lvs. flat and fleshy, petiolate, lanceolate or ovate, with acuminate lobes; heads discoid and all the florets perfect, white, in small corymbs on naked peduncles; achenes downy. S. Afr.—Perhaps the commonest Kleinia in cultivation, being grown with coolhouse succulents. S. (Kleinia) Antœphyllum, Sch., is sometimes seen in collections, although it is not known to be in the American trade. It is a glabrous shrub 1-4 ft. high, with flaky stems constricted at the joints, small, erect, fleshy, entire lvs. that are decurrent on the stem, and solitary cylindric yellow-fld. heads (with rose tinge) an inch long. B.M. 6099. According to J. D. Hooker, this plant is one of the oldest Cape plants in cultivation, having, according to Dodoens, been brought to Europe in 1570, and cultivated in England in Gerard’s garden in 1596. The name Antœphyllum was given because of its being a reputed antidote against the acrid poison of the Cape Euphorbiun. The names Kleinia spinulosa and K. suspensa have appeared in the American trade, but they are unidentifiable.

2. Kœmbleri, DC. (Liguistaria Kœmbleri, Sieb. & Zucc.). L. Farfugium, C. Koch. Liguistaria Kœmbleri, Benth.). Rhizomatous perennial sending up many lvs. on slender, flocculent-woolly petioles; lvs. large (often 6-10 in. across), orbicular to nearly reniform, cordate at base, angular-toothed, green: fl. stems 1—2 ft. tall, flocculent-woolly, branched, with only small, bract-like lvs.: heads large, with light yellow rays spreading 1½—2 in. across; pappus white and copious. Japan. B.M. 5302.

—Var. aureo-maculatus, Hort. (Farfugium grande, Lindl. F. maculatum, Hort.). LEONARD PLANT. Fig. 2313. Differs in having the lvs. blotched with yellow or white and sometimes with light rose. The variety aureo-maculatus is the only form in general cultivation. It was introduced to England in 1856 "from the garden of a mandarin in the north of China" by Fortune. Twenty years ago this was a common plant in conservatories and window-gardens, but of late years it has been neglected. It is, however, a most worthy plant, not only for the house but for bedding in the open in shady places. The plant is hardy as far north as Washington when set permanently in the open. One form has yellow-spotted lvs. (the commoner) and another has white-spotted lvs. Another form (var. argentatus) has lvs. glaucous-green edged with creamy white. Easily propagated by division.

3. Japonicus, Sch. (Liguistaria Japonica, Less. Erythrocithemum palmatum, Sieb. & Zucc.). Strong perennial herb, growing 5 ft. high (said to reach 13 ft. in southern Japan), and grown for its massive foliage effect: radical lvs. very large, 1 ft. or more across, deeply palmately cut into 7—11 narrow lobed and notched divisions: fl. stems branched, bearing heads on rather long, naked stems; rays orange, spreading 3 in. from tip to tip. Japan. Gn. 22, p. 130.Introduced into this country about twelve to fifteen years ago. It is a bold plant, hardy in New York, and well adapted to planting where strong foliage effects are desired, provided the place is moist.

4. crusat, DC. (Cineraria crusat, Mass.). Low short-stemmed perennial, floccose-woolly: lvs. large,
SENECIO

5. elegans, Linn. (S. purpurascens, Hort. Jacobéa elegans, Meenck). Purple Ragwort. Annual, viscid-pubescent, erect or diffuse, 1-2 ft.; lvs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinuses mostly broad and rounded, clasping at the base; heads in loose corymb, the rays purple, disk-fls. yellow. S. Afr. B.M. 238.—Var. erectus, Harvey. Stem slender but erect, the lvs. pinnate or 2-pinnatifid. Seneio elegans is an old garden plant. A common form of it has double fls. Var. albus, Hort., has white fls.

6. pulcher, Hook. & Arn. Robust, 2-4 ft., white-cobwebby, the stem simple or nearly so and scarcely leafy: lvs. long (4-10 in.), oblong-lanceolate, thick, shallow-lobed and crenate-toothed; heads 2-3 in. across, with many long, red-purple rays and a yellow disk. Uruguay and Argentina. B. M. 5959. R. H. 1877, p. 94; 1896, p. 329. Gm. 49, p. 122. G. M. 40:745.—A very bold species, with striking erect habit and large fls. in summer. Perennial, although it has been described as annual. In protected places and well-drained soils, it is hardy in southern New England.

7. mikanoides, Otto (S. scündens, DC.). German Ivy. Fig. 2314. Slender and glabrous, tall-twinning; lvs. ovate or deltoid-ovate in outline, mostly with a deep basal sinus, sharply 5-7angled or angle-lobed; heads small, discoid, yellow, in close clusters on axillary and terminal branches. S. Afr.—Very common conservatory and window-garden plant, easily propagated by cuttings.

8. macroglòbus, DC. Lvs. mostly hasteate, often with acuminat basal lobes, but various in shape; heads only 1-3 together, and bearing yellow rays. S. Afr.

9. Cineraria, DC. (Cineraria marítima, Linn. Senecio acanthifolius, Hort.). Fig. 2315. Perennial, 2 ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obtuse segments: heads small, yellow, in small, compact corymb, rayless. Europe. F. M. 1872:32.—Var. candidissimus, Hort., has very white foliage. Var. aureo-marginatus, Hort., has lvs. bordered with orange-yellow. S. Cineraria is an old-fashioned garden plant, sometimes known as Dusty Miller: the commoner Dusty Miller is Lychina Coronaria, and another one is Artemisia Stellaris (Fig. 2012).

10. Pabíneri, Gray. Densely white-tomentose all over, branching, 1-2 ft., perennial; lvs. oblong-lanceolate, slightly toothed, narrowed into a petiole; heads few, with yellow rays, about 1 in. in diam., in a corymb. Guadalupe Isl., Lower Calif.—Intr. by Franceschi, Santa Barbara.

11. Petrasitis, DC. (Cineraria Petasitis, Sims). Fig. 2316. Robust perennial, 2-3 ft. tall, gray-floccose on the young parts, branching: lvs. both radical and cauline, 6-10 in. across, long-stalked, cordate-ovate-orbicular, strongly several nerved, shallowly many-lobed, dull green above but gray-tomentose beneath: heads in a long open panicle, the cylindrical involucre ¾ in. high, the few rays light yellow. S. Amer. B.M. 1536.—A striking plant for winter decoration, the star-like fls. (or heads) being produced in great abundance; now becoming disseminated in this country.

12. Doria, Linn. Erect, 3-4 ft.: radical lvs. oval-oblong, dentate, somewhat glaucous, stalked; stem-lvs. oblong-lanceolate, sessile and somewhat decurrent; heads yellow, with 5 or 6 rays. Eur. Hardy perennial.

13. lúgenes. Rich. Perennial: flocco-se-woolly when young but becoming nearly or quite glabrous, 6-24 in. tall, the stem practically naked above; lvs. spathulate to oval or oblong, repent-decussate; rays 10 or 12, yellow, conspicuous. Western U. S. in the mountains and to Alaska.—Var. exaltatus, Gray, has been offered: 1-3 or 4 ft. tall; lvs. thickish, longer-petioled, abrupt or subacute at base.

14. áureus, Linn. Perennial; an exceedingly variable and cosmopolitan group, by some authors split into several species, some glabrous, 1-2 ft. tall; lvs. mostly rounded and undivided, the cauline ones lanceolate and pinnatifid or lancinato; heads many, ½-3 in. high, with 8-12 conspicuous yellow rays. Moist places, nearly throughout the U. S.

15. fastigiatus, Nutt. Perennial: mostly pubescent, the stem stiff and simple and 1-2 ft. high; lvs. all entire or very nearly so, lanceolate or spathulate-lanceolate, obtuse: heads ½-2 in. high, with conspicuous yellow rays. Idaho, Oregon, Washington.

16. Bólínderi, Gray. Perennial; glabrous or soon becoming so, the stems weak and slender and 6-30 in. tall: lvs. thin, palmitately 5-9 lobed or incised, or the stem-lvs. pinnately divided; heads several, ½-2 in. high, with 8-5 rather long yellow rays. California, Oregon.

17. Douglasii, DC. Fig. 2317. Woody or even shrubby at base, with many stems, 2-3 ft. tall, with the aspect of an aster: lvs. small and linear, or the lower ones pinnately parted into filiform divisions: heads numerous, ½-3 in. high, with 8-18 conspicuous yellow rays. Nebr., W.

L. H. B.

SENA. See Cassia.

SENA, BLADDER. Colutea.

SENSITIVE BRIER. See Schrankia.

SENSITIVE FERN. Onoclea sensibilis.

SENSITIVE PLANT. Mimosa pudica.

SEQUOIA (after Sequoyah, otherwise George Guess, a Cherokee half-breed of Georgia, about 1770-1843, inventor of the Cherokee alphabet). Conifer. Big TREES OF CALIFORNIA. REDWOOD. Tall, massive, often
gigantic forest trees, with trunks usually heavily buttressed at base, covered with thick, fibrous bark, deeply and widely lobed; heartwood dark red, soft, durable, straight-grained; sapwood very thin and nearly white: lvs. persistent, alternate, often dimorphic (especially on young trees); fls. naked, monoecious, solitary, the staminate terminal or axillary; stamens numerous; cones maturing in one season. Once widely distributed in several species throughout the interior of North America and parts of Europe, but now limited to two species, which are confined to the mountains of California.

The wood of S. sempervirens at present forms the bulk of the redwood lumber in the trade, and is used on the Pacific coast wherever a light, durable, easily worked material is desired. Most wooden buildings are constructed with this lumber in California, and it is sometimes exported to Europe to be employed as a substitute for red cedar in the manufacture of lead-pencils. Logs with a curly grain are highly prized by cabinet-makers, from whom they have received the name "curly redwood."

The wood of S. gigantea resembles that of S. sempervirens, but is coarser-grained and lighter (in weight), and is therefore not adapted to as wide use as the latter. It is very durable in contact with the soil, however, and is widely used for coarser construction work, ties, fenceposts, vineyard stakes, shingles, and the like.

As an ornamental subject, S. sempervirens will be valuable wherever it is hardy. It is rather insistent upon a cool, moist, foggy climate, however, and is in this respect inferior to the other species, although a variety known as S. sempervirens, var. glauca, is reported to be doing well in southern California.

S. gigantea has been more widely planted in the East and in Europe, and in sheltered locations has maintained itself for a number of years. The most notable examples are those in the Ellwanger & Barry grounds, at Rochester, N. Y., which are now about 40 yrs. old, 30 ft. high and 12 in. in diameter at base of trunks. When seen in the winter of 1900-1, however, these trees were beginning to show the effects of the rigorous climate by their dead and dying tops. This species is far more hardy than S. sempervirens, and even in the dry climate of southern California is reported to be doing very well. A weeping variety known as S. pendula is advertised, which originated some years ago in European nurseries, and is described as having "all pendulous branches, closely pressed against the stem." Both species are said to dislike heavy soils, and to thrive best when planted in deep sandy loam. Both are easily propagated from seed, which sprout readily in a few weeks.

2316. Senecio Petasitis (X \( \frac{1}{3} \)).

2317. Senecio Douglasii (X \( \frac{1}{3} \)).

a. Lvs. dimorphic, usually 2-ranked: buds scaly.

b. S. sempervirens, Eng. CALIFORNIA REDWOOD. Fig. 2315. Tree, 200-400 ft. and more high, with a slightly tapering trunk, 10-20 and sometimes 25 ft. in diam., and often clear of branches for over 100 ft.: branchlets and lvs. distichously spreading, the latter persistent for two or three years and sometimes dimorphic on the same branch, the larger \( \frac{1}{4}-\frac{1}{3} \) in. long, the smaller scale-like: cone oblong, \( \frac{1}{4}-\frac{1}{3} \) in. long, \( \frac{1}{4} \) in. broad, and persistent after opening and discharging the seed. Confined to northern and central Coast Ranges of California on slopes exposed to sea influences. S. S. 10:535.-When cut, or from fallen stems, it throws up many vigorous long-lived shoots, often producing merchantable trees.

aa. Lvs. seldom or not at all dimorphic, not 2-ranked, often imbricate: buds naked.

c. S. gigantea, Decne. (S. Wellingtonia, Seemann). CALIFORNIA BIG TREE. Fig. 2319. Tree, 200-350 ft. high, with heavy massive trunks, sometimes 20-30 ft. in diam. and often clear of branches for over 150 ft.: bark of old trees from 1-2 ft. thick; branchlets hardly distichously arranged, pendulous, cord-like, forming rather tangled masses; lvs. \( \frac{1}{4} \) to \( \frac{1}{2} \) in. and sometimes \( \frac{1}{4} \) in. long on stout shoots, and usually closely appressed and scale-like: cone ovate-oblong, 2-3½ in. long, 1-2½ in. thick, opening only slightly, retaining its original form even when dry, and persistent. Western slopes of Sierra Nevada. S. S. 10:536.

HAROLD V. STUBLEIGH.

Taxodium was the group in which Sequoia sempervirens was at first placed by Lambert from the specimens obtained by Menzies in 1795, and it remained there until 1817, when Endlicher established Sequoia for its reception. The type-species of Taxodium is T. distichum, the deciduous cypress. Like nearly all targas, the deciduous cypress has a very ancient relationship among fossil trees; it once grew on a large part of western Europe and portions of England. Forms of Sequoia, whose ancient history constitutes one of the most interesting chapters in fossil botany, once grew in immense forests in Europe, Asia and North America. The first fossil remains occur in the lower chalk-formations and increase in extent to the tertiary strata, in which they are numerous. In miozene times, fossil Sequoias extended "from the Hebrides to the Steppe of Kirghis." Asia Gray and others have told the story of the rise and fall of this great and strong family of conifers, once as powerful as any tree-group in the world,
but cut off, swept away and destroyed by the glacial age until only the local conditions prevailing in the Coast Range and Sierras of California preserved the two remaining species to the present time. According to Graebner, the Sequoia, which is the megacarpus of Europe, appears in the mimic of Alaska, Greenland, Spitzbergen and Iceland, and it much resembles S. sempervirens. Another fossil species, S. Sternbergii, found in Greenland, seems to have been the ancient representative of S. gigantea. According to the investigations of the United States Geological Survey, the wood of the Arizona petrified forest is that of a species of Sequoia, whose wood went down under a primordial sea, was covered with sandstone, and rose again into the present continent. If one asks how long ago these things happened, the geologist answers, "Millions of years." And it is the same in regard to the period when Sequoas grew in Greenland and in the north of Canada. We can measure that period only by vast and indefinite epochs. But the value and interest of the Sequoias are greatly increased by a consideration of their place as the last modern survivors of so powerful a family.

At the present time the Coast Redwood occupies only a narrow belt of country near the ocean, nor is it continuous even there; the Giant Redwood, or California Big Tree, exists only in a few small and isolated groves, covering in all less than fifty square miles along the western side of the Sierra Nevada range. Compared with the enormous territory once occupied by species of Sequoias, the modern representatives of this ancient and honorable family are represented by a very small area. The first known of the Sequoias, and much the more valuable species, economically speaking, was S. sempervirens, the Coast Redwood of California. This is one of the most important timber trees of the world, and its forests, comparatively limited in area, have yielded and are yielding the most easily obtained, the most durable and most profitable fencing and building lumber of the Pacific coast. The reproductive powers of the tree are enormous; no other known conifer so persistently sprouts from the stump, so rapidly makes new forest, or so well resists fire. But it does not thrive farther inland than the limits of the sea-fog, and a large part of this region covered by this noble tree has been denuded by successive fires and destructive lumbering methods. Small Redwood forests occur in Monterey county, but the most southern forests of commercial importance are in Santa Cruz. The belt, broken by the Bay of San Francisco, extends north through Marin, Sonoma, Mendocino, Humboldt and Del Norte to the southern borders of Oregon. The real Redwood forests are all contained within a strip of coast lands 500 miles long and rarely more than 20 or 25 miles wide. The actual bodies of Redwood within this region are merely a chain of isolated groups separated by clearings or by large areas on which Redwoods never grew. A small grove, now practically destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda county. Well-harvested Redwood logs in a perfect state of preservation in various parts of the Coast Range far south of where the tree now grows, even to Los Angeles and San Diego, showing that in some former period of greater rainfall and more sea-fog, Redwood forests extended much farther along the coast.

Sargent) is undoubtedly one of the rarest of all living species of trees, and one of the most easily visited and studied. It is the best living representative of a geologic age long passed away. Besides this, it is the most impressive and noble of all known trees. But nearly all of the small remaining group of Big Trees except the Mariposa groves are owned by private individuals and are being cut down or may at some future time be de-
stroayed. The famous Calaveras grove, which is historically and scientifically of the most interest of any Big Tree group, was in 1899 bought by a lumberman who expects to convert the trees into timber and "gets his price" from the state of California, the general government or some public-spirited association. Some fine Sequoias are in the Sequoia and General Grant national parks, but private timber claims hold many of the best trees here, and sawmills are now at work in this region.

The resistance offered by this wonderful species to fire, old age and desey is unique, but it reproduces itself with extreme difficulty. The seeds, even under favorable circumstances, have a very low vitality, and one seldom finds a single young tree in the Sequoia gigantea groves, excepting on the south fork of the Kings and on the branches of Tule river. The retention of these magnificent trees is a matter of the utmost interest, especially to Americans. Some of them appear, from an examination of the stumps, to have lived of some living trees at 5,000 years; one observed by Asa Gray, 24 feet in diameter, was about 1,600 years old. There is an extensive and rapidly increasing literature of the Sequoias not only in English, but in other languages.

The present condition (1901) of the nomenclature of the famous California "Big Tree" is unfortunate. According to a strict interpretation of the Rochester Code, Endlicher's name, S. gigantea, must be discarded, because in 1847 Endlicher named the Coast Redwood Sequoia gigantea, thus preventing that term from use again in the same genus. This being admitted, botanists would certainly have to take Seeann's S. Wellingtonia (1855), were it not for Dr. Winslow's suggestion in 1851 that "if the tree is a Taxodium let it be Taxodium Washingtonianum; if a new genus, Washingtoniana Californica." This appeared in "California Farmer," and is open to the criticism that it lacked technical procedure in description. It is only upon Dr. Winslow's letter to the "California Farmer" that Sudworth and others base their Sequoia Washingtoniana. Rejecting this, Sargent and most continental authorities prefer S. Wellingtonia. The retention of S. gigantea, however, is, due to an exception to the Rochester rules, which would seem to involve fewer difficulties than the acceptance of either of the newer names.

Charles Howard Shinn.

SERADELLA. See Serradella.

SEPADias (ancient name of an orchid derived from Seraph, an Euphratean or Orchidaceous Perennial herbs with the habit of Orchis. Four or 5 species are known from the Mediterranean region. Sepals convolute in the form of a helmet; petals included, small; labellum not spurred, with erect lateral lobes and a larger, undivided middle lobe; column with a common viscid disk; rostellum laterally compressed. The following flowers are among the best known.

Keep the plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot them in leaf-mold, loam and sand.

Lingua, Linn. Stem erect, up to 1 ft. high, bearing several narrow, acute lvs.; sepals lanceolate, greenish or purplish; labellum much longer; lateral lobes rounded, erect; middle lobe ovate, acuminate, smooth, red. Mediterranean region. B.M. 5898, B. cordinera, Linn. Resembling the preceding species in habit; labellum brownish red, middle lobe ovate, acuminate, subacute at the base, pilose. Mediterranean region. B.M. 5898, A. R.H. 1802:998, G.C. 11. 20:324. S. elongata, Hort. Brown; lip large; little known to botanists.

Heinrich Hasselblad and Wm. Mathews.

SERENEA (after Sereno Watson, distinguished American botanist). Also written Serenia. Pulsatella. Low, spineless, cespitose palm with creeping branched caudex clothed with the fibrous bases of the leaf-sheaths; lvs. terminal, orbicular, coriaceous, deeply plicate-multifid, glaucous beneath, with narrow bifid infolded segments; rachis none; ligule short; petiole plano-convex, dentate on the margins; spadix long, tomentose, the flexuous rachis covered with deeply obliquely fissured, tubular sheaths, the spreading branches branched, the alternate branches very slender: spathes many, sheathing the peduncle; bractlets minute; fls. white; fr. ovoid, blue-green inch long.

serulata, Hook. f. Saw Palmetto. Fig. 2230. Stem creeping, branching, 4-8 ft. long; lvs. 2-4 ft., circular in outline, fan-shaped, shorter than the slender, spiny-edged petiole; segments slightly cleft at the apex, without thread-like filaments; spadix densely tomentose, shorter than the lvs.; drupe black, 3/4-3½ in. long.

2230. A Florida scene, with Serepacia serulata in foreground and Palmettoses in the background.

arboríscens, Surg. Tree, 30-40 ft. high, with 1 or several stems: lvs. semiorbicular, truncate at base, yellowish green above, bluish green below, 2 x 2 ft., divided nearly to the base into narrow linear-lanceolate lobes.—Discovered by P. W. Rensier in 1857. First described 1899. Differes from above in arborescent habit, more elongated spadix, much smaller fls. and smaller, globose fruit and seeds. Southwestern Fla.

Jared G. Smith.

The Saw Palmetto is the native creeping fan-leaved palm. Those who are clearing land in Florida consider it a nuisance. It is, however, of great interest to northern tourists, many of whom like to take home a small Florida palm in a pot or tub. This species does very well in pots, though it is of slow growth. Relatively speaking, it is very hardy, as it will stand a temperature of 10° F. The leaves of the Saw Palmetto, both fresh and dried, are sent north in great quantities for Christmas decoration. The "crowns" are also largely used for the same purpose and deserve a greater popular-

Crowns are whole tops cut off; they have no roots, and only a part of the stem. They give the effect of the whole plant and are therefore much more desirable for some purposes than single leaves. They will last for weeks, if kept moist, in the shade and free from drafts. Crowns 3-5 ft. high are considerably used for large decorations at Christmas, Palm Sunday and Easter.

E. N. Reasoner.

In clearing the land for the writer's garden one large clump of the Saw Palmetto was purposely retained. At present it makes a striking appearance, somewhat weird and grotesque. The fertilizer which the plant received has improved it wonderfully. Good specimens attain a height of about 6 feet. There is a variety showing a glaucous tone which grows near the coast and which is very beautiful. It seems to be difficult to transplant.
SERENA. See Serena.

SERENEA. See Serenaea.

SERICOPARUS (Greek, silken fruit). Composita. A genus of 5 species of perennial herbs from northwestern United States, naked or nearly so, and barely distinguishable from the section Biotia of that genus. The akenes are not so strongly compressed as in Aster. The flower-heads have white rays and pale yellow disks which sometimes become purplish. S. rigida, Link, was offered in 1851 in the eastern states by western collectors, but it is doubtful if any member of the genus is in cultivation.

SERISSA (from the Indian name). Rubiaceae. A single species from southeastern Asia, a tender shrub of moderate growth with small, opposite, nearly sessile lvs. and rather small, jasmine-like white fls. which are sessile in the leaf-axils or terminal; corolla funnel-shaped, the lobes 3-celled; stamens inserted on the corolla-tube; style shortly 2-cleft: fr. subglobose, 2-celled, 2-seeded.

Iotida, Lam. (S. japonica, Thunb.). The young lvs. are ill-smelling if crushed. Summer. B. M. 351.—Offered by importers of Japanese plants. Var. variegata, Lindl., has yellow-margined lvs. Offered in 1885 by Pitcher & Manda.

F. W. BARCLAY.

SERPENT GOURD. See Trichosanthes.

SERRADELLA is an annual leguminous plant which is valuable as a fodder plant on dry and sandy sterile soils. It may be used for pasture or for hay. It is sometimes cut twice in a season. Sometimes it is sown with winter wheat. The plant is harvested when the pods are green, but is often used as a green manure to bring up the value of sterile fields. The forage, which is much relished by cattle and sheep, has about the same feeding value as red clover.

The scientific name of Serradella is Onphiopus sativus. Thunb. The pods are said to "smell like the cursed foot," referring to the clusters of long, claw-like pods. The genus contains about 7 species of slender, low-growing annuals with pink, white or yellow fls. which are too minute to have any horticultural value. Lvs. ovoid-pinnate; lfts. numerous. W. M.

SERVICE-BERRY is Amelanchier.

SERVICE-TREE. See Sorbus.

SESAME. See Sesamum.

SÉSAMUM (Greek name taken by Hippocrates from the Arabic). Pedaliaceae. A genus of annual herbs from India and Egypt, allied to Pimpinella, with solitary, axillary flowers. The only species of importance is S. indicum, which has been extensively cult, in Asia and Africa from ancient times. The seeds are sold in America under the name of Benne. They yield about half their weight of oil of sesame (known also as bennese, ginelli, or teel-oil), which is odorless and does not easily become rancid. This oil is universally used in India for cooking and medicinal purposes. Large quantities of oil and seed are imported from India to Europe for the manufacture of soap and adulteration of olive-oil. Also cult, in northern states as a medicinal herb, the mucilaginous leaves being used in dysentery and diarrhea of children. The oil of Sesamum, however, which is expressed from the seeds is in large doses laxative.

Indicum, Linn. (S. orientale, Linn.). Lvs. variable, 3-5 in. long, oblanceolate, the lower often 3-lobed or parted; corolla pale rose or white, 1 in. long, tubular, 5-cleft, the 2 lobes of the upper lip short.

SHALLOT. Linn. Bart. 1688. — White and black-seeded varieties have been known for at least two centuries. Runs wild in the extreme South.

W. M.

SETÁRIA (seeds, a bristle; referring to the bristles below the spikelets). Graminæ. Hacket places the number of species at 10, but Scriber and Merrill describe 28 varieties from North America (S. viridis). The culture of Millet dates from prehistoric times. At present it is raised extensively in various parts of Asia as a food plant. In the United States Millet is raised for fodder. There are several groups of varieties grown here, Common, German, Golden Wonder (all of which belong to Setaria Italica), and Hungarian Grass, which is referred to S. Italica, var. Germanica. New Siberian Millet is probably a distinct variety. The "Japanese Millets" belong to Setaria Italica, while the "Japanese Barnyard Millets" belong to Panicum crus-galli.

Spikelets, as in Panicum, awnless, but provided at base with a cluster of rough bristles which extend beyond the spikelets. The bristles persist on the axis after the spikelets have fallen. Inflorescence a dense, cylindrical, spike-like panicle, which becomes quite compound in some of the cultivated varieties. The seed is inclosed in the flowering glume, which is usually finely transversely wrinkled, a character which distinguished the fruit from other species of Setaria. Varieties of these grasses is confused. By some they are referred to Ixoporus, and by others, more recently, to Chactochoa.

Itálica, Beauv. Common Millet of the United States but not of Europe, which is Panicum miliaceum. An annual: culm 3-5 ft. high; spike yellow or purple; bristles 1-3, often shorter than the spikelet. Thought to have been derived from S. viridis. Gm. 12, p. 69.

Var. Germánica, Richt. (Panicum Germánicum, Mill. Setára Germánica, Beauv. or Sarum, Macleh. or Hungarian Grass or Millet. A smaller form more nearly approaching the wild S. viridis; bristles much longer than the spikelets.

macrostácícha, HBK. (S. Atopecérus, Fisch. S. atopiaucévus, var. algeria of the trade). An erect or ascending perennial; spike slender, tapering at apex; bristles 1 or sometimes 2, 3/4-1 in. long; spikelets one-twelfth in. long; first glume one-third to one-half, second two-thirds to three-fourths long; third glume equaling the spikelet; first glume inflated at the base of the spikelet. Texas to S. America.

mágna, Griseb. A coarse stout grass resembling Common Millet. Spike ½ in. thick, as much as a foot long, tapering above and below; bristles 1-3, scarcely ½-1 in. long; spikelets one-twelfth in. long; first glume one-third as long as, second and third equaling the spikelet; flowering glume smooth. Marshes of Gulf states to Central America. A. S. Hitchcock.

SHAD-BUSH. Consult Amelanchier.

SHADDAB. See Citrus and Pomelo.

SHADE TREES. See Trees.

SHADING. See Greenhouse, page 696.

SHAGBARK. See Hickory.

SHALLOT is Allium Ascalonicum, Linn., native of Syria. It is grown chiefly for the small oblong-pointed gray bulbs, which are used in cookery for flavoring; the leaves and bulbs are sometimes eaten in a green salad. The bulbs are of mild flavor, but a little known in North America. They are grown as garlics (see Garlic), the bulbs or cloves being separated and planted early in spring in any good garden soil. Each bulb produces several smaller bulbs. The generic name of the mature bulbs are 2 in. or less long and only about half that in diameter. The leaves are small, terec and hollow. The plant is hardy. The bulbs will keep several months or even a year. Small onions are sometimes sold as Shallots.

L. H. B.
SHAMROCK. Half the world is sure that Shamrock is the wood sorrel, Oxalis acetosella. The other half is equally certain that the true Shamrock is white clover, Trifolium repens. In the time of Spenser's Fairy Queen, Shamrock was said to be good to eat. This applies to the former plant, but not to the latter. Moreover, according to Sowerby, the wood-sorrel is in perfection on Saint Patrick's Day, while white clover is not. The wood-sorrel is sent in great quantities from Ireland to London for Saint Patrick's day. On the other hand, it is said that clover is the plant most commonly used in Ireland. Half a dozen other plants have their followers, and these are all plants with three leaves. Newt, however, there are those that Saint Patrick used the Shamrock as a symbol of the trinity. These declare that the water cress is the true Shamrock. The question will always remain an open one. See Dyer's "Folk-Lore of Plants." W. M.

SHAMROCK, INDIAN. A name found in some English books for the Trifolium.

SHAMROCK FEA. Parochetus communis.

SHAW, HENRY, founder of the Missouri Botanical Garden, popularly known as "Shaw's Gardens." was born at Sheffield, Eng. July 24, 1800, and died at St. Louis, Mo., August 25, 1883. He came to the United States in 1819 and engaged in the hardware business until 1840 in St. Louis, where he continued to reside until his death. As a retired man of his retired, he traveled for a number of years, and in 1849 laid out a modest garden about his country house in the suburbs of St. Louis, which, nine years later, he extended so as to include some forty-five acres, about half of this area constituting an arboretum.

By special act of the General Assembly of the state of Missouri, approved in March, 1839, Mr. Shaw was empowered to provide for the conveyance of his property, either during his life or after his decease, to trustees, for the perpetual maintenance of his garden as a scientific establishment. In 1855 he endowed a department in Washington University, known as the Henry Shaw School of Botany, and on his death left nearly all of his property, valued at some $5,000,000, to a board of trustees for the maintenance, improvement and enlargement of the Missouri Botanical Garden.

Mr. Shaw, though not a botanist, was a lover of plants for themselves and a firm believer in their influence in molding desirable traits in human character. His garden was always open to visitors, among whom he particularly welcomed the self-respecting poor. Thirty years before his death he gave to the city of St. Louis a park site adjacent to his garden, which, like the latter, was improved under his personal supervision.

Special provisions in Mr. Shaw's will, aside from the general arrangements for the development of the garden—in details of which he allows his trustees a very free hand—are for an annual sermon "on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the vegetable kingdom;" premiums for an annual flower show; and two annual banquets, respectively for the trustees and gardeners of the institution. These banquets are the occasion for annual gatherings of men distinguished in botany and horticulture. Wm. Threlase.

SHEEP BERRY. Viburnum Lentago.

SHEEP'S BIT. Justicia perennis.

SHELLBARK. See Hicoria and Hickory.

SHELL-FLOWER. See Cyclobaltha; also Alpinia nutans; also Malocelca laxis.

SHELL LILY is Alpinia nutans.

SHEPHERDIA (John Shepherd, an English botanist). Eluteaceae. Three American shrubs with silvery or brown-scurfy foliage, two of which are in the trade, being grown for their striking appearance and one of them prized for its edible fruit. The leaves are oppo-

SHOEBLACK PLANT. Hibiscus Rosa-Sinensis.
SHOOTING STAR. See Dodecatheon.

SHORE-GRAPE. See Coccoloba.

SHORTIA (named for Dr. Charles W. Short, a botanist of Kentucky). Dispensoideae. Of the light family, Shortia galacifolia is historically the most interesting. Michaux collected the plant in 1788 in the high mountains of Carolina, but as his specimen was in fruit rather than in flower, Richard, the author of Michaux's "Planta Borraginiana-Americana," did not describe it. Asa Gray examined Michaux's specimen, preserved in Paris, in 1829, and afterwards founded the genus Shortia on it. Great search was made for the plant in the mountains of Carolina, but it was not rediscovered until 1877. The history of the efforts to find the plant is one of the most interesting chapters in American botany. For his
torical sketch, see Sargent, "Garden and Forest," vol. 1, p. 506 (1888).

Torrey & Gray founded the genus Shortia in 1842. In 1843 Siebold & Zuccarini founded the genus Schizocodon, from Japan. To this genus Maximowicz added a second Japanese species, S. uniflora: the flowers of this plant, as of Shortia, were unknown when the plant was first recognized. It transpires, however, that Schizocodon uniflorus is really a Shortia, thus adding another instance to the growing list of bitypic genera that are endemic to Japan and eastern North America.

Shortia includes two handsome herbs, with the habitat of Galax, with creeping rootstocks and evergreen round-cordate lvs.: fl. solitary on a slender leafless scape, the calyx with sealy bracts, the corolla bell-shaped and obtuse; Galaxapexceae; with 5-lobed; stamens 5, the filaments adnate to the corolla, alternating with 5 scale-like staminodia; pistil 3-angled and 3-loculed; style filiform and stigma 3-lobed: fr. a globular capsule. From this, Schizocodon is distinguished by linear-elongated staminodia and fringed corolla. Allied genera mentioned in this Cyclo-
pedia are Galax, Pyxidanthera and Schizocodon. Dispen-
sia has two alpine and boreal species, one in the Himalayas and the other in northern Europe and North America. Botanically, the remaining genus, has a single species in Thibet. Dispen sia and Berneuxia are not in the American trade. 

SHOT, INDIAN. See Canna.

SHRUBBERY. Catalogue name for Genista.

SHRUBBERY. Shrubbs and bushes have two values: an intrinsic value as individual or isolated specimens; a value as part of the structure or design of an ornamented place. As individual specimens, they are grown for the beauty of the species itself; as parts of the landscape, they are often grown in masses, constituting a shrubbery. It is often advisable to plant shrubs as single specimens, in order to produce the characteristic beauty of the species; but the tendency is to plant exclusively as isolated specimens, and the emphasis needs, therefore, to be placed on mass-planting.

Plants scattered over a lawn destroy all appearance of unity and purpose in the place (Fig. 2232). Every part of the place is equally accented. The area has no meaning or individuality. The plants are in the way. They spoil the lawn. The place is the bed of flowers that is sheared, the spotted and scattered effect intensified. Rarely does a sheared shrub have any excuse for existence.

A mass of planting emphasizes particular parts of the place. It allows a play of light and shade. It may give the place a feeling of strength and purposiveness. The shrubbery-mass usually should have an irregular outline and generally contain more than one species. Thereby are variety and interest increased. Fig. 2233. The shrubbery-masses should be placed on the boun-
daries; for it is a fundamental concept of landscape gar-
dening that the center of the place shall be open. Fig.
2234; also Fig. 2223, Vol. II. The boundaries are the thresholds between properties, the foundations of buildings, the borders along walks and drives. Judicious planting may relieve the angularity of foundations and round off the corners of the yard. Fig. 2235. Individual specimens may be used freely, but only rarely should they be wholly isolated or scattered. They should be planted somewhere near the borders, that they may not inter-
fer with the continuity of the place and that they may have background to set them off. The background may be understood, however, that boundaries are always to be planted or that foundations are always to be covered. L. H. B.

The term shrubbery is applied to groups of woody plants of comparatively small size. The line between shrubs and trees is not very definite. A shrub gener-

most plants considered rare, is really not so rare as local, though the few stations where it is found abund-
dantly do not seem to present special conditions not to be found elsewhere, and it is hardly understood why it should, in common with certain other plants, be named strictly local. In an indigenous state. For the successful culture of Shortia humus and leaf-mold seem to be absolutely required, and it should either be planted where these conditions are natural or be constantly supplied with this. This suggestion, if carried out with many plants, such as Galax, Pyrola, Chimaphila and probably Epipacta repens, will ensure success, whether or not ordinary garden treatment only is given the seeds. The disappearance of the plants may be expected in a season or two. Semi-double and pink-flowering plants are not rarely found, and it seems likely that cultivation may bring out several worthy varieties. In England Shortia is often grown, not successfully as a pot-plant, and is far more appreciated than in America. It is difficult to procure seed, as the flowering stem usually withers away before maturing, though Shortia is readily propa-
gated by division and runners.

For a single specimen, it is a shade-loving plant and a choice addition to the ericaceous bed, where it will thrive under Rhododendrons and Kalmias. "uniflora," Maxim. Very like S. galacifolia: lvs. cor-
date, broader than long and deeper toothed, -sinuate-
toothed in S. uniflora and only repand-toothed in S. galacifolia. Japan. -grown by hybridizers of these plants, but little known horticulturally. L. H. B.
ally has a number of stems springing from the ground and a tree usually has a single trunk, but this is not uniformly true in either case.

The chief value of shrubbery comes from its use in an artistic way, although some shrubs have edible fruits. Many shrubs, such as lilacs, some of the spireas, gooseberries and currants, produce leaves very early in the season and some, like Forsythia, Daphne, and the Juneberry are covered with a profusion of blossoms at this time. From early spring until November in temperate latitudes leaves and flowers are to be found on deciduous shrubs, and from June until the following spring ornamental fruits can be seen on their branches, the red berries of the elder beginning and barberries ending the list. Some of these fruits are so richly colored and so abundant that they can be seen from a long distance. Many shrubs, like some of the viburnums and dogwoods, attain a height of 10 or 15 feet, while others, like bunchberry and Daphne Cneorum, grow to a height of only a few inches. The leaves of some, like the chokeberry, Thunberg’s barberry, the hazels, viburnums, dogwoods, and sumacs are beautifully colored in the fall. The rhododendrons, laurels (Fig. 2326) and mahonias, and the daphne already named, are examples of shrubs having evergreen foliage. Some leaves, like those of the Salix lucida, are glossy; others, as those of the common hazel, are hairy; some are thick, and others are thin; some large, some small; some entire, and some lobed, serrated or compound. Throughout the season the foliage of a good collection of shrubbery will present the greatest variety of color, including all the hundreds of shades of green as well as yellow, white, gray and purple. Even in winter shrubbery is wonderfully attractive in appearance from the gracefulness of its stems and branches, and from the color of its bark. With the right selections, it will serve almost as well as evergreens to shut out from view fences or other low, unsightly objects.

This great variety in foliage, flower, fruit and habit of growth makes shrubbery adapted to very extended use in the development of landscapes. It is especially appropriate along the boundaries of ornamental grounds (Fig. 2324), upon steep slopes, and in the immediate vicinity of buildings where foliage and graceful lines are needed to connect the walls of a structure with the ground (Fig. 2325), without making too much shade. It might with advantage replace the grass upon all surfaces too steep to walk upon with comfort. The foliage of shrubs that are well established remains green when dry weather turns grass brown. The broad mass of shrubbery will take care of itself when the grass needs frequent attention. Even some level surfaces might be improved in places by exchanging a lawn covering for the covering of low woody plants. Often a broad, open space over a lawn is an important feature of a landscape, since it allows extended views. Many times a landscape would be more interesting if the green underneath this open space were produced by a broad mass of shrubbery like a miniature forest instead of grass.

In planting borders or groups of shrubs, the ground to be occupied by such a group should be entirely spaded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should then be planted so that there is room for about two years’ growth before their branches intermingle. If placed closer they would have a crowded appearance from the start and would not join their branches as harmoniously as when the new growth is allowed to choose its own position. If placed farther apart the effect is also bad. Occasionally a single shrub at the margin of a belt may stand out almost by itself, but generally the effect of a group should be that of a continuous mass of varying foliage. In arranging different shrubs the taller-growing kinds should generally be placed in the center of the group, and the lower species along the border, the space being graded from the highest to the lowest. The reason for this arrangement is that the lower plants would be killed by the shade of the larger ones if placed back of them, and moreover would not be seen; but one should avoid too uniform a slope. For instance,
in a continuous border there should be places where shrubs of larger size occupy the full width so as to bring growth of considerable height into the lawn. The arrangement should be varied so as to avoid all monotony, but in securing this variation a mixture of miscellaneous shrubs of all kinds does not give as good an effect as broader areas of single species or genera slightly interspersed at the margin with shrubs of another kind. Straight rows should be avoided. A laborer or a novice when told this will arrange the plants in a zigzag manner, thinking that he is placing them irregularly, the result often being almost the same as that of two rows. If the group is being planted along a straight line, as the boundary of a lot, the distances of the successive plants from this line might be somewhat as follows: two feet, four feet, five feet, three feet, one foot, and the distances apart, measured parallel with a fixed line, should vary also.

The ideal condition of a group of shrubbery is to have all the individual plants healthy, so that the foliage will appear fresh and of good color. This foliage should extend down to the surface of the adjacent lawn or walk, and shade the ground underneath so completely that nothing will grow there. The leaves which fall with the approach of winter should be allowed to remain as a perpetual mulch. The desired result cannot be secured the first year the shrubs are planted unless they are of large size and moved but a short distance. The aim in caring for a new plantation should be to secure thrifty plants, and this care, like the preparation of the soil, should be as given, a field of corn.

Very little trimming should be done. If a bush is tall and sprawling it may be well to cut it off next to the ground and allow it to sprout again. If there is any dead wood it should, of course, be cut off. But when a shrub is healthy and vigorous, let it grow in its own graceful way. If it encroaches upon the walk, cut away the encroaching branch near the root so that the mark of the knife will not be noticed. Such treatment will help to retain the winter beauty of the branches.

The value of shrubbery is not appreciated as it should be. Those who are interested in the subject will do well to read what is found in the various books on landscape gardening, Bulletin No. 121 of Cornell University Agricultural Experiment Station, the various articles on shrubs and shrubbery to be found in the ten volumes of "Garden and Forest" and in other horticultural journals.

O. C. SIMONDS.

SIBBALDIA (Robert Simbald, Scotch naturalist). Rosaceae. About 5 species of alpine plants, one of which has been suggested as suitable for rock gardens. The genus is reduced by Bentham and Hooker to a section of Potentilla, but Britton and Brown keep it separate chiefly on the ground that the pistils are only 4-12 in number instead of very numerous as in Potentilla. Sibbaldias are densely tufted, hardy perennial herbs with woody stems. The fls. have prominent stipules and 3 leaflets, each of which is characteristically 3-toothed at the apex. The fls. are about ¾ in. across or less, and have 5 minute yellow petals much smaller than the remarkable calyx, which has 5 broad lobes, alternating with 5 smaller and narrower lobes or bracts.

procambens, Linn., ranges from the arctic regions to the summits of the White Mts. and in the Rockies comes as far south as Utah. It is also found in arctic and alpine Europe and Asia. B. B. 2: 217. This plant is recommended by some persons, but is not known to be advertised for sale in America.

W. M.

SIBTHORPIA (John Sibthorp, professor of botany at Oxford, author of Flora Graeca, published 1866-15). Seroputhulariaceae. A genus of about 6 species of hardy or tender perennial, creeping herbs mostly from the tropical regions, with alternate or tufted roundish, long-petioled lvs. and yellow, orange, or red fls. solitary on axillary or fascicled pedrels: calyx 4-5-lobed, with a very short tube, 5-8-elet; stamina usually equal to the number of corolla-lobes; anthers sagittate: capsule membranous, compressed, loculicidally dehiscent, the valves splitting to the middle.

Europeae, Linn. A hardy trailing perennial with very slender stems: lvs. orbicular, less than ¾ in. across, 7-9 lobed; fls. small, on rather short pedicles, the 2 upper lobes of the corolla yellowish, the 3 lower pink. Deep woods, Europe. Offered in 1893 by John Saul, Washington, D.C. Var. variegata is cult. abroad.

F. W. BARLOW.

SICANA (Peruvian name). Cucurbitaeeae. Two or 3 species of tropical American tall-climbing tendril-bearing vines, allied to Cucurbita, but differing in having wide-spread or reflexed calyx-lobes and the authors

2325. Planting may relieve the angularity of foundations.—A bellow of trumpet creeper.

2326. The common laurel of the East, Kalima latifolia (X ¾). not united. S. odorifera, Nand., the Curuba of the tropics, has been introduced as the Cassahana, but long known in the South. Fig. 2327. It is a very quick-growing and interesting ornamental vine; plant pla-
brous, the stems angled; lvs. large (often 1 ft. across), nearly orbicular in outline, deeply cordate at the base, strongly about 5-lobed and the lobes repand-toothed or angled; fls. solitary, monochorous, the corolla stamens, the lower ones 5-5 lobed: fr. globose, size of a small orange, Jamaica. B.M. 7109.

L. H. B.

SIDA (from the old Greek name for *Nymphæa alba*; given without explanation by Linnæus). A hardy herbaceous garden or shrub, mostly native of the tropical regions of the world, with usually accrate, dentate or lobed leaves and small or rarely large, mostly yellow or white flowers, which are solitary or in clusters, axillary or disposed in terminal spicate or heads; bracteoles wanting or rarely 1-2 and bristle-like; calyx 5-lobate or 5-cleft; staminal column divided at apex into many filaments: locules of ovary 5 or more, 1-seeded.

A. Lvs. large, lobed.

*Napœa*, Cav. A hardy herbaceous perennial 5-8 ft. high, from a stout root; lvs. 3-8 in. long, 3-7-lobed; lvs. triangular, long-acuminate, irregularly serrate: fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June–Aug. S. Pa., Va., and Va. B.B. 2-492. —Culture same as for hollyhocks, prop. by seed. Index Kewensis refers the above species to *Napœa dioica*, Linn., but according to Gray's *Synoptical Flora of North America* the two species belong to separate genera, the fls. of the first being hermaphrodite, of the second dioecious. *Napœa dioica* is a strong-growing perennial 5-9 ft. high, with large radical lvs. often 1 ft. across and 9-11-cleft, the segments cut into lanceolate, serrate lobes; fls. dioecious, white, smaller than in *Sida Napœa*. For pictures of these plants, see B.B. 2:160, 322.

AA. Lvs. small, linear.

*Elliotii*, Torr. & Gray. A hardy perennial herb, slender, 1–3 ft. high, with lvs. 1 in. long and yellow fls. Sandy soil in the southern coast states. Offered by western collectors in 1831.

F. W. BARCLAY.

SIDALCEA (compound of *Sida* and *Alcea*, related genera). Matédecæ. About 20 herbs of western North America; lvs. palmately cleft or parted, stipular; fls. often showy, pink, purple or white, in terminal racemes or spikes, mostly without bracts or involucres beneath; stamens united into groups in a double series; carpels 5-9, reniform, separating at maturity. Some of the Sidalceas are annuals, but those in cultivation are hardy perennials, being recommended for the herbaceous border. Of easy culture. Prop. by seeds or division. For monograph, see Gray, *Syn. Pl. N. Amer.*, vol. 1, p. 302.

A. Fls. white, with bluish anthers.

*candida*, Gray. Plant erect, from more or less creeping rootstocks, the stems somewhat branched above, 2-8 ft. tall, glabrous or nearly so: radical lvs. nearly orbicular, cordate, obtusely lobed or deeply crenate; stem-lvs. 5-7-parted, the divisions narrow and often notched; fls. 1 in. or more across, white, in an erect spike-like raceme. Rocky Mts. On. 21, p. 396; 28, p. 29. R.H. 1891, p. 356.

AA. Fls. normally colored (rarely white forms).

b. Mature carpels smooth (not reticulated).

*spicata*, Greene. One or two feet tall, sparingly branched or simple, often more or less hirsute: upper lvs. parted into linear and often lobed divisions: fls. rather small, purplish, in an oblong, more or less interrupted spike, the pedicles short or almost none. California, Nevada and Oregon.

**Silene**. Mature carpels conspicuously reticulated.

*Malvæflora*, Gray. Stems erect or ascending, 1-6 ft. or even more, sparingly hirsute; fls. green, small, incised-crenate, the upper ones 5-cleft or 5-divided, segments narrow and entire or broader and pinnate-lobed: fls. 2 in. or less across when fully expanded, purple. Calif.—Var. *Listeri*, Hort. (S. *Listeri*, Hort.), known also as "Pink Beauty," has satiny pink flowers. It is of European origin.

**Silene**. Mature carpels conspicuously reticulated.

327. *Sicania odorifera*, the Cassabanana (x 3/4).

*Campéstris*, Greene. Two to 5 ft., often branching above, glabrous or sparingly hirsute-pubescent; lvs. green, the lower ones rounded and variously lobed, the upper ones 5-7-parted into narrow divisions: fls. about 1½ in. across, in strict spike-like racemes, pubescent, the petals often laciniate. N. Calif. to British Columbia.


L. H. B.

**Sideroxylon** (Greek, *iron* and *wood*: referring to the hardness of the wood). *Sapodæcea*. About 60 species of trees and shrubs, mostly tropical, with simple lvs. and small fls. in axillary clusters: fls. 5-merous or rarely 6-merous; calyx-lobes roundish or ovate, usually obtuse, nearly equal; corolla more or less bell-shaped; stamens attached to the tube at the base of the lobes and opposite to them; staminodia scale-like or petaloid: ovary usually 5-lobed: berry ovoid or globose.

*Mastichoden doron*, Jacq. A tender tree, with somewhat variable lvs. usually oval or ovate-oblong, 2-8 in. long, and small yellow fls. about ¾ in. in through in the West Indies; cult. in S. Calif.—Franceschi says it yields a sort of chewing gum.

F. W. BARCLAY.

**Sida-Saddle Flower**. *Sarracenia*.

**Sieve Bean**. *Phaseolus lunatus*.

**Silene** (Greek, *silénos*, a god described as covered with foam, connected with *sidon*, salvia; referring to the stickiness of *sainfoin*). *Caryophyllaceæ*. A large and scattered genus of herbs, varying greatly in duration, habit and style of inflorescence, but always with 5-petaled fls. ranging in color from white, through pink and rose to purple. The petals are notched at the apex, rarely toothed or fringed
SIENE

and generally have small tooth-like appendages at the base of the blade. The calyx is sometimes inflated like a bladder, generally 10-nerved, sometimes 20-nerved: ovary 1-celled, many-ovuled; styles commonly 3: capsule dehiscing at the apex into 6 (rarely 3) teeth or short valves. There is a full botanical monograph of Silene, with a key, in the Journal of the Linnean Society, vol. 32 (1896), by F. N. Williams, a specialist on the whole family of Caryophyllaceae. The account is mostly in Latin, and has few descriptions. His revision has not been closely followed below. Williams refers our common S. Virginica and Pennsylvania as well as the European S. viscosa to the genus Melyandrum, characterized by a strictly unicellular capsule with no trace of septation at the base. Only a few of the known species are in cultivation.

Silenes are of easy culture. They mostly bloom in summer, and a few continue well into autumn. By good management the season of bloom may be continued through spring and summer. Toward this end the seeds of the common annual kinds should be sown in early autumn, instead of spring. As a rule, the common kinds prefer a loose, loamy soil, and full sunlight, but the rock-garden kinds require special treatment, and other suggestions for cultivation are given after the specific descriptions. The most popular kinds are the pink and rose annuals, S. Armeria and pendula. Of the perennials the most popular among the white-flowered kinds are S. maritima and alpestris, while S. Virginica, Pennsylvania and Schotts are amongst the most popular kinds with colored flowers. A good horticultural review of the kinds in cultivation is found in The Garden, Vol. 11, pp. 10-13 (1877).

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A. Duration annual or biennial.

b. Petals notched at apex.

c. Plants low and trailing...

d. Calyx sticky-hairy...

e. Inflorescences few-flowered... 3. Armeria

BB. Petals entire at apex...

4. compacta

AA. Duration perennial.

b. Height a few inches.

c. Plants 1-2 ft. high...

d. Calyx 20-nerved, inflated...

e. Fls. rose...

f. Fls. white...

g. Fls. yellow...

h. Calyx 10-nerved, not bladd...

i. Lvs. linear...

f. Calyx bell-shaped...

g. Calyx club-shaped...

h. Lvs. oblanceolate...

i. Plant velvety...

j. Plant glandular...

k. Stem mostly hairy...

d. Petals 2-lobed...

e. Fls. erect...

f. Fls. nodding...

BB. Habits or forms.

c. Calyx inflated after anthesis...

d. Calyx not inflated after anthesis...

e. Petals laciniate or fringed...

f. Petals not laciniate...

g. Fls. crimson or scarlet...

h. Fls. deep red...

i. Aper of petalos sharply 2-toothed...

j. Virginica

k. Aper of petals various...

EE. Fls. white to pink:

1. pendula, Linn.

Trailing, branched annual, with flesh-colored or rosy fls., which become pendulous when their beauty is past; plant pubescent; lvs. lanceolate; fls. solitary or in pairs in the axis; calyx 10-nerved, not bladd.-like after anthesis, but with a few teeth at the apex in fruit; petals emarginate; seeds kidney-shaped. Mediterranean region. B. M. 114. — Var. ruberrima is offered; also varieties with single and double rose-colored fls. R. H. 1884, p. 113. Var. compacta is offered. Gt. 49, p. 555. A good bedding plant.


3. Armeria, Linn. Sweet William. Catchfly. Fig. 2238. Annual, 1-1½ ft. high, with many-flowered panicles of pink, rose or white fls.; glabrous except for the wide sticky bands below the nodes at the top of plant; lvs. ovate; fls. borne in corymbose panicles; calyx tubular-club-shaped, 10-nerved; petals emarginate, appressed. Southern Europe. — Var. alba, Hort., is also popular.

4. compacta, Fisch. Much like S. Armeria but biennial with more compact inflorescence, longer pet.

5. maritima, With. With. maritima. Dwarf perennial, with linear lvs. and solitary, rose-colored fls.: height a few inches; calyx faintly 20-nerved, inflated after anthesis, wholly green or wholly "chocolate-crimson"; petals "undivided," according to Williams, but prettily wavy-lobed in Gt. 11, 55. Alpine Alps.—A rare and choice plant. Niven says it has hardy woodruff roots which are easily damaged in transplant, and therefore those who wish the species should secure seeds. Williams advises a sunny position for it rich sandy soil.

6. maritima, With. With. seaside Catchfly. Trailing perennial, with numerous white fls., borne on few-flowered stems. It has larger fls. than S. inflata, with fewer fls. on a stem, and the petals not so deeply cut at the apex and 2 small scales at the base of each petal is various; calyx 20-nerved, inflated after anthesis. Eu. Gt. 57, p. 372. — The seaside plants are said to be more glaucous than those from the Alps. Var. rosea, Niven, is said to have a less rambling habit and rose-colored fls. Origin unknown. This desirable form seems unknown in America. Var. plena, Hort., has fewer fls. than the type but they are much larger, extremely double and remain in bloom longer. Niven says, "This variety makes a lovely rock plant, and ought always to be placed in such a position that its stems, borne down by the weight of blossoms, may hang over the ledge of a rock; otherwise, if planted in a border, they get be-speckled with soot after a shower of rain. " Niven adds that this variety produces no seed and is more easily propagated by cuttings than by division. Gt. 11, p. 12; 57, p. 126.

7. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-

8. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-

9. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-

10. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-

11. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-

12. aculis, Linn. Cushion Pink. Moss Campion. Moss-like, tufted perennial about 2 in. high, with red-
8. petraea, Walld. & Kit. Tufted subshrub, 4 in. high; lvs. linear; fls. small, solitary; calyx club-shaped; petals bicol, with a bicol appendage, and ciliate on the claw. Caucasus.—Fls. white, according to J. Woodward Manning.

9. Caucesia, Boiss. This and S. Vallesia are perennial, alpine, white-flowered plants 4-5 in. high, with the flowering stems laterally ascending from a terminal rosette. The stems are usually 1-flowered, sometimes 2-3-flowered; lvs. oblong or lanceolate; calyx 10-nerved, not inflated after anthesis. Caucasus. — For distinctions from S. Vallesia, see that species.

10. vallesia, Linn. SWISS CATCHFLY. A very rare plant found in the highest and most sterile parts of the Alps, differing from S. Caucasica in being glandular, rather than velvety, the stem-lvs. long, the fls. long-peduncled and the calyx more widely inflated.

11. alpestris, Jaq. ALPINE CATCHFLY. Perennial white-flowered plant 6 in. high, the fls. borne in a stem of long-peduncled, dichotomous: fls. in corymbose panicles; calyx short, top-shaped to bell-shaped, 10-nerved, not enlarged after anthesis; petals 4-lobed at apex and provided with 2 teeth at the base of each petal in the throat: seed crustate-ciliate on the margin. Eastern Europe.—It forms a dense mass of undergrowth stems and is easily prop. by division or seeds. One of the best.


13. Pennsylvanica, Michx. WILD PINK. Perennial, 6-9 in. high, from a strong taproot and with rose or white fls. in small, dense terminal cymes, viscid-pubescent: lvs. mostly at the base, spatulate or oblanceolate, the 2 or 3 lvs. of stem-lvs. much shorter and lanceolate: petals appressed, 2-lobed, the lobes dentate. April, May, Eastern U.S. B. R. 3:247. L.B.C. 1:41 (as S. incarnata).—Handsome.

14. inflata, Sm. (S. Cucubalus, Wibel). BLADDER CAMPO. BLADDER CATCHFLY. COW BELL. WHITE BEN. Perennial, 2-3 ft. high, with many-flowered panicles of white, drooping fls. about ½ in. across: plant branched, glabrous, glaucous or downy: lvs. ovate, obovate or oblanceolate: calyx 10-nerved, inflated after anthesis: petals deeply cleft. Eu. N. Africa, Himalayas.—This species is not advertised in America but is probably cult. here, possibly as S. maritima, of which it is considered by some a variety. S. inflata is said to be essentially erect instead of procumbent and the petals more deeply cleft. The young shoots are said to be eaten by the poor folk of England as a substitute for asparagus; they taste something like green peas.

15. stellata, Ait. STARRY CAMP. Readily told by its fringed white and nodding fls. and lvs. in 4s. Perennial, 2-3 ft. high: lvs. ovolanceolate, 2-3 in. long: fls. in a very open panicle, calyx inflated, petals laciniate, unappended. Woods, Mass. to N. B., southern Ga. to Tex. B. M. 1107.

16. Virginica, Linn. PINK PINK. Fig. 2229. Perennial, 1-2 ft. high, with large crimson or scarlet fls., viscid-pubescent: stem unbranched: lvs. spatulate or ob lanceolate: fls. 1 in. or more across, loosely cymose, nodding or reflexed after anthesis; petals broadly lanceolate, 2-toothed at apex. N. Y. to Minn., southern Ga. to Ark. B. M. 3342. Gn. 22, p. 375.

17. Californica, Durand. Perennial, 4 in. to 4 ft. high, procumbent or suberect, with large, deep red, scattered fls. and a taproot descending 2-3 ft.; stems several, leafy: lvs. lanceolate, oblanceolate appendaged. California. Rocky Mts..—Offered by western collectors in 1881, but probably not in cult., though presumably a very distinct and desirable plant. This species seems to have been overlooked by Williams.

18. Ménélisii, Hook. Perennial: stems weak, dichotomously branched, 6-12 in. or more high: lvs. ovate-lanceolate: fls. white, "very small for the genus" (not ordinarily exceeding 6-8 lines in diam.), borne in the forks of the branches and forming a leafy inflorescence; petals white, 2-2-cleft, commonly but not always unappended. Rocky Mts. and Pacific slope.—Offered in 1881 by western collectors but probably not cultivated.

19. Douglasii, Hook. Perennial, 1 ft. or more high, with white or pink fls. borne mostly in long-peduncled, 3-flowered cymes: stems very slender, decumbent: lvs. remote, linear, 2-3 in. long; petals 2-lobed, appendaged. June-September.—A complex and polymorphous species in western N. Amer. Robinson describes 6 botanical varieties with no important floral differences. S. Douglasii is still found in one eastern catalogue. Var. Macounii, Robinson, was offered in 1881 under its synonym S. Lyliti, Wats.


S. orientalis, Mill., is an old name which is not accounted for by Williams. DeCandolle, B. & B., Menzies, says it is a species of "taste of Persia." According to Thoburn & Co., it is a hardy perennial, 2 ft. high, with rose-colored fls., which may be readily grown from seed in any light, sandy soil. W. M.

SILK COTTON TREE. See Bombax and Pachira.

SILK FLOWER. Albizia.

SILK OAK. Grevillea robusta.

SILK TREE. Albizia julibrissin.

SILK VINE. Periploca Grewia.

SILKWEED. Asclepias.

SILPHIUM (from the Greek name of an umbelliferous plant of northern Africa). Compósito. Rosin-weed. A genus of 11 species of tall-growing hardy perennial herbs native of the U. S., with somewhat coarse leaves and rather large, sunflower-like heads of flowers which are yellow, except in one species: heads many-flowered; involucre of thick, somewhat foliaceous bracts: rays-fls. or at least their ovaries in more than 1 series, fertile, and with elongated empty deciduous disc; the seedlings: axenes much flattened, falling free or only with the subtending bract. Silphiurns are of easy culture in any good soil. They require full sunlight and are propagated by division or seed.

A. Foliage much cut.

B. STEM-LEAVES SMALL.

terebinthinaceum, Jaq. PRAIRIE DOCK. Stem about 6 ft. high, leafy at the base, much less so above: lvs. 1 ft. long or more, once or twice pinnately parted, the lobes oblong or lanceolate of several, sessile or short-peduncled, 2-5 in. across; rays 20-30. July-September. Western prairies. B. B. 3:408.

AA. Foliage not cut.

BB. STEM-LEAVES SMALL.
SILPHIUM

BB. Stem-lvs. large.

c. Lvs. connate-perfoliáte.

perfoliátem, Linn. CUP PLANT. Stem square, usually dentate, branched above, about 6 ft. high. Lvs. thin, ovate or deltoid-ovate, the lower contracted into margined petioles, the upper opposite, connate-perfoliáte; fl.-heads 2-3 in. across, with 20-30 rays. July, Aug. Western prairies. B.B. 3:496.

SILPHIUM cap-brcats j. lvs. the Europe.


SILYBUM Marianum, Gaertn., Blessed or Holy Thistle, is sometimes grown in old European gardens for ornament, and also for the edible heads, roots and leaves. It is a large fl. thistle 2-4 ft., perennial. S. Europe. Known also as Carduus Marianus, Linn.

SIMMÓNSIA (named for the naturalist, F. W. Simmons, a well-known horticulturist). A monotypic genus differing from Eupatorium in the numerous stamens and one-seeded carpels; discinos: rudiment of pistil absent from the staminate fls.

californiáem, Nutt. A much-branched shrub with small, sessile, entire, coriaceous, oblong-lanceolate lvs.: staminate fls. clustered and the much larger pistillate fls. single in the axils. Dry sand hills of southwestern U. S. -Sometimes cult. for the oil of the seeds, used as a hair tonic. Cult. in S. Calif. J. B. S. Norton.

SIMPLER'S JOY. See Verbena.

SINÁPIS. Included under Brassica.
**SKIRRET**

**Califoniurn**, Dryand. (Markea Califoniurn, Ker-Gawl). A half-hardy perennial; stem 1½ ft. high, 2 lines through, broadly winged; lvs. many, shorter than the stem, about ¼ in. broad; spathe 3-6-fl.; segments of perianth yellow, lined with brown, ¾ in. long; capsule oblong. Calif. to Ore. B. M. 983.—Swampy grounds.

**S. stemless.**

**tenuiflorum**, Humb. & Bonpl. A half-hardy perennial; roots fibrous, fibrous: stem ¼-1 ft. high, often branched below; lvs. suberect or narrowly linear: spathe 3-6-fl.; segments of perianth pale yellow, ⅜ in. long. Mt. of Mexico. B. M. 2117, 2335.

**c. The stem slightly 2-edged.**


**a. Fls. purple, blue or white.**

**b. Stem terete.**

**grandiflorum**, Doug. (S. Douglastii, A. Dietr.). A hardy perennial: root fibers slender, long: stem simple, about 1 ft.; lvs. short, sheathing the lower part of the stem: fls. 2-3, cernuous; perianth-segments bright yellow, rarely white, ¾ in. long. May, June. Northwestern U. S. B. M. 5509. B. R. 16:1364.—This is possibly the handsomest species in the trade. Var. album is also offered and is equally desirable.

**b. Stem flat.**

**c. Spathe very unequal in length.**

**graminoides**, Bicknell (S. anceps, S. Watts, not Cav.). A hardy perennial: stem winged, about 1 ft. high, usually terminating in 2 unequal branches, subtended by a leaf: lvs. nearly equaling the stem, grass-like, 1-3 lines wide; spathe about 21 in. long; pedicel longer than the spathe; fls. blue, ⅜-¾ in. across. April-June. Eastern U. S. B. B. 1:433.

**c. Spathe very unequal in length.**

**angustifolium**, Mill. (S. anceps, Cav. S. Peruanum, Authors). A hardy perennial: root-fibers long: stem about 1 ft. high, ¼ lines through, with 2-3 clusters on long-winged peduncles: lvs. linear, shorter than the stem, 1-½ lines wide: spathe 1-fl.; pedicels about 8 lines long. May-Aug. Me. to Va., west to Colo.—Var. bellum (S. bellum, Watts.). Stems more narrowly winged, usually without any leaf below. This variety is known in New York, New Jersey, and New Mexico. Var. mucronatum, (Michx.). Stems not branched, usually leafless, ending in a sessile cluster overturned by a linear branch. Rocky Mts. and British North America.

**W. W. Barclay.**

**SITOLÖBIUM** is referred to Dicksonia cinctivaria, Swz., a handsome, strong-growing tropical American fern with lvs. 4-8 ft. long, bipinnate, papery, light green; petioles hairy; lower lfts. 1½ ft. x ½ ft.

**SIUM** (from Siôn, old Greek name used by Dioscorides), Umbelliferae. Four widely scattered herbs with pinnate foliage and small white fls. borne in compound umbels. Glabrous plants: leaf-segments deurate: petals indexed at the tip. For S. Sisarum, see Skirret.

**S. lattifolium**, Linn., the WATER PARSNIP, is a British species sometimes naturalized in English wild gardens, especially in damp woods. Like Ferula and certain other umbelliferous plants, it is valued more for its stately habit and handsome foliage than for its flowers. W. M.

**SKIMMIA** (Japanese Skimmia, meaning a hurtful fruit). Rutacea. Ornamental evergreen shrubs with alternate entire leaves, small white flowers in terminal panicles and small white fruits, in compound umbels. The roots grow in large clusters, something like those of a sweet potato or dahlia, but they are much longer, more cylindrical and somewhat jointed. Calif. and New England. Skimmias thrive in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome flowers they are sometimes planted in a bed as a part of the compost and soil of the soil in the greenhouse. The Skimmia is a good winter flowering plant, and is used for cutting. As the root fibres are strong, and thrive best in a sandy loamy soil, but also grow well in strong clay, they prefer a partly shaded situation. They are sometimes planted in a bed as a part of the compost and soil of the soil in the greenhouse. The Skimmia is a good winter flowering plant, and is used for cutting.
SKIRRET

Skirret belongs to a moisture-loving genus, and needs a rich soil. The seeds may be sown in autumn or spring and the plants yield well the first season. For European practice Vilmorin recommends that the seedlings be grown in a seed-bed until they have made 4 or 5 leaves and then transplanted into permanent quarters. Sow the seed in drills half an inch deep, and thin out the seedlings to 8 inches in the row. The roots may be left outdoors in the ground all winter, but others advise storing them in sand or earth.  

W. M.

SKULL CAP. Scutellaria.

SKUNK CABBAGE. Sympathyum latifolium.

SLIPPER FLOWER or SLIPPERWORT. Calceolaria.

SLIPPER, LADY'S. Cypridium.

SLIPPERS, BABIES'. Lotus corniculatus.

SLOE. Prunus spinosa.

SMELOWSKIA (Prof. T. Smelowska, botanist of St. Petersburg, died 1815). Cruciferæ. About 4 species of alpine plants with small white or yellow, 4-petalled flowers: sepals short, lunate, equal at base; pod somewhat short, narrow at both ends; seeds few, arranged in 1 series: lvs. 1-2-pinnatisect: fls. racemose: bracts none.

smilacinia. C. A. Meyer. Low, tufted perennial, very variable in foliage: lvs. soft, usually deeply pinnatifid, with 2 or several pairs of linear to obovate, obtuse segments and a terminal one: rarely a few lvs. entire; racemes at first dense and subcorymbose, but elongating in fruit: fls. white or rarely yellow, about 2 lines long. Arctic regions. Recommended by some for rock gardens, but it does not seem to be advertised in America.

W. M.

SMILACINA (resembling smilax). Liliièceæ. FALSE SOLOMON'S SEAL. About 25 species of hardy perennial herbs of the temperate regions of North America and Asia, with rhizomes (Fig. 2330) and simple leafy stems bearing terminal panicles of small usually white or greenish white flowers: perianth of 6 equal spreading segments; stamens 6, inserted at bases of the perianth-segments: berry globose or nearly so, 3-celled.

Smilacinas are of easy culture in any good soil. They prefer a rich loam in a moist but not wet, partly shaded place. They are handsome plants both in foliage and flower. S. racemosa is probably the most attractive. The plants may be forced slowly for bloom in the late winter and early spring.

SMILAX

A. Fruit red.

b. Plant with 5-4 leaves.


b. Plant with many lvs.

racemosa, Desf. Figs. 2330, 2331. Rootstock rather stout: stem 1-3 ft. high: lvs. 3-6 in. long, oblong-lanceolate or oval or nearly so: fls. numerous, in a panicle: berry 1/4 in. through. In shaded or partly shaded places throughout the greater part of the U. S. B. B. 1:429. A. G. 15:51.

AA. Fruit black, or green and black.

b. Pedicels 2-7 lines long.


b. Pedicels 1-2 lines long.

stellata, Desf. Very near to S. sensilifolia: lvs. usually folded and ascending: raceme shorter and more crowded. May, June. Moist soil, throughout the greater part of the U. S. B. B. 1:430. F. W. BARCLAY.

SMILAX (ancient Greek name). Litilièceæ. A genus of about 189 species very widely distributed over the world, usually woody climbers, which yield means of the coiling appendages of the petiole; sometimes shrubs or rarely herbaceous perennials, with slender twigs: rootstocks usually large and often tuberos; lower lvs. reduced to scales: the upper simple, 3 or rarely several-nerved, often evergreen: fls. usually numerous, rather small, white, in axillary, sessile or peduncled umbels: pedicels nearly equal in length: berries usually globose, 1-4-seeded.

There are 17 species native of the U. S., nearly all of which are useful wild garden plants, having glossy attrative foliage. The last three noted below have been offered by collectors. For Smilax of florists, see Asparagus medeoloides.

a. Lvs. usually variegated. Exotic species.

b. Plant climbing.

argyrea. Lind. & Red. Tender foliage plant: stem wiry, slender, armed with short, stout thorns: lvs. lanceolate, becoming 8-10 in. long, dark green, blotched with gray, 3-nerved, short-petiolate. Bolivia. 1 H. 39:152. According to G. F. 8:365 the above specimen is a rootless healthy plant doing well in a moderate temperature and quickly forming ornamental specimens. It should be given a rich, fibrous soil and a light and sunny position. It may be propagated by half-ripe cuttings of the side shoots with 2-3 eyes inserted in a moderately warm bed.

b. Plant partially climbing.

aspera. Lind. A half-hardy shrub often somewhat scandent, unarmed or with spines: lvs. ovate-deltoid or lanceolate, 11/2-6 in. long, usually blotched with white, 5-9-nerved: fls. white, sweet-scented, in many-flld. umbels: berries 1/4 in. thick, usually 3-seeded and, according to J. D. Hooker, bluish, while Fransceschi mentions them in his catalogue as shining red. S. Eu. to India. G. 26, p. 615.

AA. Lvs. green. Native species.

b. Stem herbaceous.

herbacea. Lind. A hardy perennial with a somewhat procumbent or climbing branched annual stem 4-6 ft. high, unarmed: lvs. ovate to lanceolate acute to cuspidate, obtuse or cordate at the base, long-petiolate, 2-9-nerved: umbels 15-80-flld., long-peduncled: fls. carion-scented when open: berry bluish black, 1/4 in. thick. Apr.-June. In woods or fields throughout the greater part of the U. S. B. B. 1:439.
SMILAX

BB. Stem woody.
Cc. Foliage deciduous.

lauritolia, Linn. Stem stout, high-climbing, armed with straight prickles; branches angled, mostly unarmed: lvs. leathery elliptic or oblone-lanceolate, 3-nerved; umbels 6-30-fld., on short, stout peduncles; berries black, ovoid. N. J., south and west to Ark.

2331. Smilacina racemosa (x 3/4).
Cc. Foliage deciduous.

Walteria, Pursh. Stem climbing, angled, prickly below; branches unarmed: lvs. ovate to ovate-lanceolate obtuse or abruptly acute, 5-7-nerved; umbels 6-15-fld., on short peduncles; berries coral-red or rarely white. Wet soil, N. J. to Fla. west to Mississippi river. B. B. 1:42.

F. W. BARCLAY.

SMOKE TREE. Rhus Cotinus.

SMUT. A prevalent disease of many cultivated cereal grasses and other plants caused by the attack of a fungus of the class ustilaginacee, sometimes producing swellings on various parts of the host, the swellings being eventually filled with brownish or blackish spores known as chlamydospores, which emerge, as a fine dust-like powder, when the outer membrane of the hypertrophic tissues bursts or cracks. The smut on Indian corn may be taken as typical. The disease usually appears first on the leaves, afterwards at the junction of leaf-sheath and blade; finally the ear of corn is attacked, and the tassel. On the leaves blisters are found; on the ear, large, whitish polished swellings appear. As the spores mature, the swellings become darker in color, and the inclosing membrane finally ruptures, exposing the dark olive-green mass of spores. Unlike most other cereals, maize can be inoculated at any age. Several smuts have been described; viz., loose smut of oats (Ustilago avenae), maize and teosinte smut (Ustilago zeae), smut of wheat (Ustilago triticc), rye smut (Urocystis secpula), and coelenchyma smut (Urocystis colchici). For an account of the grain smuts, see Swingle, Farmers' Bull. 75, U. S. Dept. Agric. J. W. HARSHBERGER.

SNAILS. See Caterpillars and Worms.

SOBRALLA 1673

SNAKE CUCUMBER. A form of Cucumis Melo.
SNAKE GOURD. See Trichosanthes.
SNAKEHEAD. Chelone.
SNAKE'S BEARD. Ophiopogon. Snake's Head Iris. Heterocaulius. Snake's Head Lily. Fritillaria Meleagris.
SNAKE'S MOUTH. Pogonia.
SNAKE'S TONGUE. Ophioglossum.
SNAPDRAGON is Antirrhinum.
SNEEZE WOOD. Heleneium.
SNEEZEWOOD. See Pterocylson.
SNEEZEWORT is Achillea.
SNOWBALL TREE. Viburnum Opulus.
SNOWBERRY. Consult Chloeeeca and Chigenes; also Symphoricarpus.
SNOWDROP. See Galanthus.
SNOWDROP TREE. Halesia.
SNOWFLAKE. Leucojum.
SNOW FLOWER. Chionanthus.
SNOW GLORY. Chionodoxa.
SNOW-ON-THE-MOUNTAIN. Euphorbia marginata.
SNOW PEAR. Pyrus nivalis.
SNOW TREE. Pyrus nivalis.
SNOW WREATH. Neviusia Alabamensis.
SOAP BANK TREE. Quillaja Saponaria.
SOAP BERRY. Sapindus.
SOAP BULB. Chlorogalum.
SOAP-PLANT. See Chlorogalum.
SOAPWORT. Saponaria officinalis.

SOBOLEWSKIA (after G. Sobolevski, Russian botanist). Cruciferae. About 2 species of Asiatic annual or biennial, erect, branching herbs, with long-petioled, roundish, coarsely serrate leaves and white flowers borne in numerous corymb-like racemes; silique clavate, compressed or nearly terete, curved, coriaceous, inflated at the apex, 1-celled, 1-seeded.
clavata, Fenzl. Basal lvs. reniform-cordate, the upper nearly sessile; silique 2½ lines long by ½ lines wide. May.—Offered by John Saul in 1893.

F. W. BARCLAY.

SOBRALIA (after Fr. Mart. Sobral, a Spanish botanist). Orchidaceae. This is a genus of extremely handsome orchids with a very distinct habit. The plants have slender, reed-like stems clothed with leaves throughout their entire length. The stems are tufted, forming bushy plants varying in height according to the species. The flowers are among the largest of the orchids, those of S. maerziana attaining a diameter of 9 in. across the sepals. They are, however, very fugacious, fading a few days after opening. Lvs. with sheathing bases, plicate-venose; fls. membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading; labellum convolute around the column, terminal portion large, undulate, often fimbriate, smooth.
S.W. petals, petals, petals, 4. also p.
m. mais, mitting, quite, time, some supply, rather, outher, oghly, Sobralias, purea, but, various, yellow-veined, trade, fanciers, Mexico, 8.
m. S., given, with, Mexico, and, their, require.
S. longitiuliual, nearly, flowers, scarcely, of, they, to, the, prove, for, the, advantage, of.
S. nearly, in, the, appearance,—

Sobralias are charming orchids, and where room can be given to large plants they well repay the space and care they require. Many of them, to be sure, are very fugacious in their blooming, some lasting only a day, but nearly all of them make up for this by a succession of flowers which is more or less rapid. The individual blossoms are of a size to equal almost any orchid flower, and quite as graceful in their general appearance—far

more graceful than most Cattleyas even. Where space for large and bushy plants can be afforded, some of the Sobralias will prove most charming plants, having the double advantage of presenting in a well-grown plant not only beautiful blossoms but a subject which is thoroughly good-looking as a foliage plant. They also have the added advantage of being, in most instances, of rather easy culture. Given a suitable soil and a liberal supply of water they are almost sure to grow and bloom, although they will do better if they are given their time for rest, when less water is allowed without permitting the material about the roots ever to become quite dry.

The flowers of many Sobralias are very fugacious, some lasting only one day, but nearly all of the varieties make up for this fault by a succession of flowers more or less rapid through a blooming period of, in some instances, many weeks. In size the individual blossoms vary from that of an ordinary Cattleya labiata to one scarcely an inch in length, and the plants themselves present as great variety, ranging from such as S. fragrans, which grows less than a foot high, to that giant of the tribe S. Cattleya, which will reach a height of nearly ten feet. They also give as much varie-

ity in their coloring, ranging from a shade of lavender which is almost a blue through different shades of purple to the rich claret color of S. Loewii, and from yellow to the palest white.

F. J. Le Moyne.

1. leucozantha, Reichb. f. Stems tufted, 3 ft. high, spotted: lvs. 4-6 in. long, lanceolate, acuminate: lfs., 6-7 in. across; sepals linear-lanceolate, spreading and recurved, white; petals shorter, oblong, undulate above, also pure white; labellum with a ventricose tube; limb large, circular, notched in front and the margin irregularly lobulate and wavy, throat golden yellow, with a few brownish stripes. Aug. Costa Rica. B. M. 7055. R.B. 23:205. J. H. III. 53:77.

2. xantholeuca, Reichb. f. Stems about 2 ft. high, tufted; lvs. spreading and drooping, lanceolate, 6-7 in. long, with speckled sheaths: lfs. solitary, lemon-yellow, with a deeper shade on the lip; sepals linear-lanceolate, spreading and recurved; petals similar but shorter; blade of the labellum obicular, crisp and undulate, margin crenate. Guatemala. B. M. 7532. R. H. 1890:12. G.C. III. 5:19. Gn. 22:306. — A species with flowers about as large as S. macrantha, but plants of more compact habit.

3. fragrans, Lindl. A small species with stems about 1 ft. high: lvs. 1 or 2, oblong-lanceolate, 4-5 in. long: lfs. 2-3 on a long peduncle, about 3 in. long, pale sulfur-yellow; sepals oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and having many fimbriated crests. Columbia. B. M. 4822.—One of the smallest of the genus.

4. macrantha, Lindl. Fig. 2332. Stems tufted, reed-like, 4-7 ft. high, leafy all the way up: lvs. broadly lanceolate to oblong-lanceolate, long-pointed, 8-10 in. long: lfs. several at the ends of the stems, rose-purple, with the front of the labellum deep purple; sepals linear-oblong, 4½ in. long, reflexed and twisted; petals broad, oblong, wavy above; labellum 5 in. long, the expanded portion almost circular, 3 in. across and 2-lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several thin yellow ridges. May—July. Mexico and Guatemala. B. M. 446. F.S. 7:609. P.M. 14:21 (var.). 14:23 (var.). 6:31:559. Var. Kienastiana (var. alba) has white lfs.

5. Brändtia, Krzl. Stems 3 ft. high: lvs. lanceolate, acuminate, 8 in. long; lfs. purple-rose, paler outside, with the labellum darker and having a yellow disk; sepals linear; petals twice as wide; middle lobe of the labellum very broad, divided into 2 diverging, rather acute lobes; anther-bed with a long recurved horn on each side. Resembles a medium-sized S. macrantha, distinguished by the long horns of the column, and black spots (nec dahs) on the leaf-sheaths. S. Amer.

6. Fenzliana, Reichb. f. Stems slender: sheaths blackish, asperulate: lvs. oblong, acutish; lfs. rose-colored; sepals oblong, acute; petals obvolute-cuneate, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the length. Nicaragua.—Var. alba, Hort., has pure white flowers.


8. Cattleya, Reichb. f. Stems stout: lvs. oblong, acuminate, plaited, bearing several lateral clusters of strong, thick lfs. of a firm fleshy texture, with purplish brown sepals and petals and a purplish lip, with a white column and three yellow lines over the center of the lip. Colombia.
The soil is a superficial covering of the earth's crust, more or less well adapted to the growth of plants. It is usually only a few inches thick. Below this is a subsoil often differing, especially in humid climates, from the soil proper in color, texture, or chemical composition. Very striking definition has been suggested by Sir John B. Lawes, who considered the soil to be rotten subsoil, and the subsoil rotting rock. The term soil is occasionally used in a more comprehensive way to include both the soil and the subsoil.

The soil adapted to the growth of the higher plants consists of fragments of rocks or minerals, organic matter, soil solution, and a soil atmosphere. The mineral fragments vary in size from the finest clay particles to gravel and even boulders. The organic matter is derived from low organisms, from previous vegetation, or from growing plants; as also from stable manure, and occasionally from fish or animal matter added to the soil. Soil solution consists of soil water carrying dissolved substances derived from the soil grains and from the organic matter, as well as from fertilizing materials artificially applied, and constitutes a nutrient fluid upon which the plant derives its material constituents. The soil atmosphere differs from the ordinary atmosphere above the soil in being richer in carbon dioxide and nitrogen, and containing more water vapor and less oxygen.

Soils are classed according to their origin and their mechanical and chemical composition and properties. Genetically, they are classified according to the rock from which they are derived, as granite soil, limestone; or according to the manner of their origin, as alluvial, lacustrian or drift. Mechanically, they are classified broadly into stony, gravelly, sandy, sandy loam, loam, clay loam, clay, silt, black-waxy, or, according to some other physical property; chemically, into barrenous, humous, alkaline and according to other striking chemical features. In the soil survey of the U.S. Department of Agriculture a local name is adopted for each type under which the specific characters are given. Examples of this are loam, silt or sandy loam, Nor- folk sand, San Joaquin loam, Glendale loess.

The physical properties of soils concern the size and arrangement of the particles, and the relation of these to each other and to the organic matter; also the soil atmosphere, the soil moisture, and the physical forces of heat and gravitation. In these there is an intimate relation with physiography or the form and exposure of the surface of the land, as well as to climatology.

There are quantitatively physical changes going on in the soil, as well as chemical changes, which have much to do with the best development of vegetation. The soil moisture may be looked upon as a nutrient solution dissolving its material from the difficulty soluble compounds in the soil and from fertilizers artificially applied. The amount of substances in solution varies with the moisture content and with the way moisture is supplied. The dissolved substances, naturally present in the soil or derived from fertilizers, influence the solubility of the soil components, rendering them more or less soluble according to their nature and existing conditions. It is probable that there is a normal weathering of the soil material which produces a certain concentration in the soil solution which will be maintained on the gradual withdrawal of nutrient material by the plant. However, this natural weathering is often magnified in the field so as to produce the yield and quality of crops desired, and this may be increased by methods of cultivation and fertili-
of the physical properties upon the water supply, and the commercial values of many soils are dependent largely upon this one condition. This is notably the case with the early truck crops, corn, wheat, and grass lands, and with special products such as celery, cranberries and other horticultural crops. With intensive cultivation, however, the flavor, appearance, texture and general quality of the crop assume greater commercial importance, and even with intensive methods these are largely influenced by the character of the soil. This is shown in a striking manner in the localization of certain interests, even under the most intensive systems of agriculture, such as the production of the fine lettuce around Boston, of the carnations, violets, tomatoes and roses in other districts. With the present specialization in these lines, it is not only necessary but desirable that the soil shall have a kind of soil varies as much in quality as in the fertility of cultivation, but should have the proper soil conditions as well as suitable climatic conditions; and to such an extent has this specialization been carried that different varieties of roses, for example, are best grown in different localities where the soils are slightly different. These matters must be realized by the horticulturist in order to attain the highest degree of success in any particular undertaking. 

Milton Whitney.

SOILS FOR POTTING.—Strictly speaking, there are but two distinct kinds of soils, though there are several modifications of physical differences in both. These are mineral soils and organic soils or peat. Peat soils are composed almost entirely of vegetable matter, with little mineral matter. Mineral soils are just the reverse. The physical differences in peat are practically reduced to two; viz., the absence or presence of fiber. The physical differences in mineral soils vary considerably from almost pure clay to almost pure sand; indeed, the mechanical (or physical) analysis of mineral soils is based largely upon the proportions of clay and sand. The following table, taken from Tanner’s “First Principles of Agriculture,” is self-explanatory:

<table>
<thead>
<tr>
<th>Name of soil</th>
<th>Percentage of sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy loam</td>
<td>80 to 90</td>
</tr>
<tr>
<td>Loam</td>
<td>60 to 80</td>
</tr>
<tr>
<td>Clay loam</td>
<td>40 to 60</td>
</tr>
<tr>
<td>Clay</td>
<td>20 to 40</td>
</tr>
<tr>
<td>Clayey</td>
<td>0 to 20</td>
</tr>
</tbody>
</table>

It will be seen that when the proportions of sand and clay are equal or nearly so, the soil is then termed loam. Should clay or sand predominate it is then spoken of as a clay loam, or sandy loam. If other substances, such as lime or gravel, be present, the soil is then termed a calcareous or a gravelly soil.

The composition of soils can be still further known by chemical analysis, but to the average gardener this is not necessary. Moreover, it is not an operation of great novelty and one that requires an experienced chemist to perform. The chemical constituents which plants derive from the soil are present in most soils, though in varying degree, but they are sure to be present in ample quantity in the potting soil selected by an experienced gardener. The air and water may furnish as much as 98 per cent of the material with which the plant body is built up in some cases, and only the remaining 2 per cent derived from the soil. The three most important nutrient elements are nitrogen, phosphoric acid and potash. Of the three, nitrogen is the most important, but all are present in varying degrees in most soils from plastered or sandy. More nitrogen makes five-fifths of the atmosphere and the soil absorbs it chemically through the action of bacteria when the soil is in good physical condition. Hence the importance of remembering always that air in the soil is as important and necessary as water. In his "Physiology of Plants," p. 56, says: "The ideal condition of a soil is one in which it resembles a sponge, and in which it will retain the greatest amount of nutritive substances and water without losing its capacity for absorbing air." Therefore it will readily be seen that the physical condition of soil is far more important to the gardener than the chemical.

Mineral soils vary according to locality, but when the topography of any particular locality is of a hilly or mountainous character, the different variations or physical differences may often be found within the radius of a mile. The capacity of soils to retain moisture varies considerably. A clay loam is far more retentive of moisture than a sandy loam. The experienced gardener therefore selects a clay loam for his strong-rooting, large-leaved tropical plants, because transpiration is so much greater in these plants. For a general collection of greenhouse and small-growing tropical plants he selects a good loam. For cacti, agaves and other succulent plants which will not take as much water at all seasons as other plants, he selects a sandy loam. For ferns, most of the Ericaceae and Gesneraceae he selects peat; while for nepenthes, orchids, bromeliads and the epiphytic ardis he selects fern or kalmia root. Other materials which a gardener should always have on hand when he has a large and varied collection of plants are: leaf-mold, which is made by collecting leaves and storing for at least two years, turning them over occasionally to facilitate decay; living or fresh sphagnum moss; sand; charcoal, and some convenient manures, such as pulverized sheep manure and bone meal.

Growing plants in pots is very different from growing them in borders or the open ground. In pots, especially the larger sizes, the capacity of the soil for absorbing air is in a great measure restricted; therefore, the experienced gardener digs the turf only from good pasture or meadow land, so that it shall be full of the fibrous roots of the grass. Soils containing fiber will absorb air much more freely than that without fiber. But before using the turf for potting it should be placed in square piles, turf downwards, for at least six months in order to kill the grass and all vegetable life. Fern root should also be collected and stored the same length of time in order to kill out the ferns. Fig. 2333. Raw and very coarse soils are usually sifted before used for most greenhouse plants. Shallow sieves are used for this purpose. Fig. 2334.

2334. Sieves for sitting or riddling soils.

Except for sowing seeds and for potting seedlings and freshly rooted cuttings, thoroughly decayed and homogeneous soils should not be sifted, but should be broken into small lumps, as the small lumps assist materially in aërating the soil. If the soil is sifted too much it becomes very fine, packs close and allows too little aëration. Leaf-mold is decayed vegetable matter, or humus. It may have little manurial value, but is used by gardeners to make soils "light" or spongy. For most young plants a good proportion added to the soil is excellent, as it encourages root growth.

Sand is the best medium for rooting cuttings of the majority of plants. It is also added to soils to increase their porosity, especially when potting very young plants. Silver sand is best for all purposes because it contains less oxides than red or yellow sands.
In potting plants, experienced gardeners make potting mixtures or add a variety of materials to the soil to suit the requirements of different plants. For young seedlings or for freshly rooted cuttings, the compost should be of a light and porous nature, but as plants increase in size and vigor a heavier and richer mixture is usually given, that is, if plants are to be grown on as specimens; but the proportion of nutrient substances used in a potting mixture should be determined by the vigor of the plants. It is always better to use too little plant-food than too much; if too much is used it often becomes available faster than the roots of plants can absorb it, and hence causes organic acids to form in the soils which are fatal to the roots of most plants. Many amateur plant-growers in their over-anxiety to grow fine plants make this fatal mistake.

In most gardens the greenhouse space is limited, and a gardener cannot always develop his plants to their fullest capacity or he has to reduce his variety and numbers. For instance, we used to grow fancy pelargoniums three and four feet in diameter, but we found we either had to grow smaller specimens or reduce the variety of our collections. This, then, determines in the mind of an experienced gardener the composition of his potting mixtures. His aim should be to grow the finest possible specimens in the smallest possible pots and space, and all the cultural details given by the writer in this Cyclopedia have been with this idea in mind.

Edward J. Canning.

SOJA. Consult Soy Bean and Glycine.

SOLANDRA (after Daniel C. Solander, a Swedish naturalist and traveler, 1736—1780). Solanaceae. A genus of about 4 species of woody vines native to tropical America, with simple, entire, shining leaves and large, white, solitary, datura-like flowers; calyx long-tubular, 2-5-cleft; corolla funnel-shaped; tube cylindrical; throat obliquely and widely bell-shaped; lobes broad, imbricated; stamens 5, inserted on the corolla-tube: berry globose, pulpy.

A. Plant becoming 20—20 ft. high.

grandiflora, Sw. Fig. 2335. Lvs. obovate-oblong, acute, glabrous, thick: fls. fragrant; corolla twice as long as the calyx, not contracted at the throat, white or somewhat yellowish. B.M. 1874. G.C. III. 21:272. Gn. 53:1161. J.H. III. 34:123.

SOLANUM (Latin, solamen, solace or quieting). Nightshade. Solanum, giving name to the family Solanaceae, is a vast genus of temperate and tropical herbs, shrubs and even trees, but is comparatively poorly represented in temperate North America. Dunal, the latest monographer (DC. Prodr. 13, pt. 1), in 1852, recognized 901 species, and many species have been described since that time. The genus finds its greatest extension in tropical America. Of the vast number of species, barely 25 are of much account horticulturally, and half that number will comprise all the species that are popularly well known. One of these is the Potato, Solanum tuberosum, one of the leading food plants of the human race. The genus seems to abound in plants with toxic properties, although its bad reputation in this respect is probably exaggerated.

As a genus, Solanum is not easily separated from other genera, but some of its most distinctive characters are as follows: Lvs. alternate: inflorescence mostly sympodial and therefore superaxillary or oppo-

2335. Solandra grandiflora (X 1-5).

site the lvs.; corolla gamophylous and rotate or shallow-campanulate, plaited in the budy, the limb angled or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated and connivent and mostly opening by an apical pore or slit: every usually 2-lobed, ripening into a berry which is sometimes inclosed in the persistent calyx. The fls.
are white, purple or yellow. The species are herbs in temperate climates, but in warm countries many of them are shrubby and some are small trees. Many of them are climbers. It is impracticable to distribute the few cultivated species into the various botanical groups of a great genus, and the following species are therefore assembled on a purely horticultural plan.

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A. \textit{Species bearing underground tubers: \textit{Ivs. pinute.}}

(See Baker, Journ. Linn. Soc. 21, for account of the tuberiferous \textit{Solanum}.)

1. \textit{tuberosum}, Linn. \textit{Potato}. Figs. 1929, 1930; 2336. Low, weak-stemmed, much-branched perennial with tender, herbaceous tops, and perpetuating itself asex-

nually by means of thickened or tuberous underground stems, glabrous or pubescent-herbaceous: \textit{Ivs.} usually pinuate, the 5-9 oblong-ovate lfts. interposed with smaller ones: \textit{Ivs.} lilac or white, in long-stemmed dichotomous clusters, the corolla prominently lobed: \textit{fr.} a small globalar yellow berry, usually not produced in the highly developed modern varieties. \textit{Tubers,} Andes of Chile and adjacent regions. — See \textit{Potato}. There is a form with yellow-blotched \textit{Ivs.} (known as \textit{var. ca-}

ricatum) sometimes cult. for ornament.

Var. boreale, Gray (S. \textit{ Fistuliferi,} Gray). Plant usually smaller, as also the tubers, which are about \(\frac{1}{2}\) in. in diam, and send off long, creeping subterranean stolons: interposed lfts. one or two or even none: corolla tubed. \textit{Lvs.}, S. Colo. to Mex. — Apparently only a northward extension of the species.

2. \textit{Maglia}, Schlecht. \textit{Darwin Potato}. More slender and erect than \textit{S. tuberosum} and nearly or quite glabrous: \textit{Ivs.} usually smaller, the interposed ones few and very small: \textit{fr.} smaller than those of \textit{S. tuberosum}, white, slender-pedicelled, in loose, long-forked cymes: tubers small (2 in. or less long), globose or oblong, soft and watery. Coast region of Chile. \textit{B.M.} 6756. — Sometimes cult. as a curiosity. It has been thought by some to be the original of the \textit{Potato}, but this is now given up. Darwin describes the plant in his "Naturalist's \textit{Voyage.}" As grown by the writer, the plant has given little promise in the production of tubers, for the tubers are small and soft.

3. \textit{Jamesii}, Torr. \textit{Low} and slender, 12-18 in. tall under cultivation, the small angular branches glabrous or nearly so, and soon becoming so: \textit{Ivs.} oblong in general outline, the rachis narrow-winged, the lfts. 5-9, with no interposed small ones, small and lanceolate-obl-

ong in shape: \textit{fr.} small, white, the corolla deeply cleft and the anthers large and prominent: tubers few, globose or globular, hard, 1 in. or less in diameter, withstanding frost. \textit{Lvs.}, S. Colo., N. Mex. and Ariz. \textit{B.M.} 6706. — Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

AA. \textit{Species grown (or collected) for the edible fruits: \textit{Ivs. simple.}}

4. \textit{nigrum}, Linn. \textit{Black Nightshade}. \textit{Mo-}

relle of the French. Annual, 1-2 ft., branch-

ing, glabrous or nearly so: \textit{Ivs.} simple and entire, ovate to cuneate-ovate, pointed, long-

stalked: \textit{fr.} white, small, in few-fl. clusters, the pedicels drooping: \textit{fr.} globose, black, size of a pea.—A widespread weedly plant. In the \textit{Dakotas}, according to Hansen, the plant is often called "Stabberry," as it volunteers freely in wheat stubble, and the fruit is much used there for pies and preserves. Hansen finds that the plants withstand considerable frost. In warm countries, growing to \textit{Vilmiorn}, the leaves are sometimes eaten as spinach is, and apparently without any injurious result, although the plant belongs to the dangerous family of the \textit{Solanaceae.}" The writer has grown the plant from French seeds, but he does not know that it is in the American trade. The species is exceedingly variable. Gray thinks that the species should include "many and perhaps most of 50 and more species of \textit{Dunal} in the \textit{Prodrornos}, weeds or weedy plants, widely diffused over the world, especially in the warmer portions."

5. \textit{muricatum}, Alt. (S. \textit{Guatemalense, H. Hort.}). \textit{Pepino.}

\textit{Melon Peak. \textit{Melon Shrub.} Fig. 2337. Erect bushy herb or subshrub, not spiny, glabrous or nearly so: \textit{Ivs.} long and narrow, mostly oblong-lanceolate, the petiole and also to the nearly or quite obtuse point, the margin wholly entire or somewhat undulate: \textit{fr.} rather small, bright blue, deeply 5-lobed, inclined or nodding in a long-stalked, forked cluster: \textit{fr.} long ovoid or egg-shaped, long-stalked, yellow over the stalk, with streaks and splashes of violet-purple, in cult. specimens 4-6 in. long and seedless. Trop. Amer., at temperate elevations. \textit{G.F.} 5:173. \textit{G.C.} III. 3:306. — This plant attracted some attention in this country about ten years ago. It appears to have been introduced into the United
States from Guatemala in 1882 by Gustav Eisen. A full review of the history and botany was made in Cornell Exp. Bull. 37 (1891). The fruit is aromatic, tender and juicy, and in taste suggests an acut eeggplant. In a drawer or box, the fruit may be kept till midwinter. In the North the seasons are too short to allow the fruit to mature in the open, unless the plants are started very early. The Pepino is properly a cool-season plant, and when grown in pots in a cool or intermediate house will set its fruits freely. It is readily propagated by means of cuttings of the growing shoots. The plant will withstand a little frost.

6. Melongéna, Linn. (S. insádum, Linn.). Erect and much-branched, herb or subshrub, 2-5 ft. tall, woody or subwoody, spiny: lvs. large and heavy, obovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose beneath, shallowly sinuate lobed; fls. large, mostly in clusters, the calyx woolly and often spiny; the spreading, deeply lobed, purplish corolla 1 in. or more across; fr. a large berry. India.

Var. esculentum, Nees (S. esculéntum and S. orígerum, Dun.). COMMON EGGPLANT. GUINEA SQUASH. AUBERGINE. Figs. 750-753, 830, Vol. II. Cultivated for its large fruits, which are usually oblong, obovate or egg-shaped in form, and purple, white, yellowish or striped; differs from the wild plant in having fewer spines, mostly solitary fls., and much larger and more variable fruits. There are two well-marked sub-varieties: var. serpentinum, Bailey (S. esculéntum, Desf.). SNARE EGGPLANT. Fr. greatly elongated and curled at the end.

Var. dépressum, Bailey. DWARF PEARLE EGGPLANT. Fig. 754. Plant low and diffuse, many of the branches finally resting on the ground, usually dark-colored, nearly glabrous and always spiny: lvs. small and relatively thin, less lobed: fls. small and longer-stalked: fr. purple, pyriform. See Eggplant.

AAA. Species grown wholly for ornament or curiosity.

b. For the fruit alone.

7. integrifolium, Poir. (S. Teránum, Dunali. Solanum, Hort.). CHINESE SCARLET EGGPLANT. ORNAMENTAL EGGPLANT. ETHIOPIAN EGGPLANT. Fig. 2338. Coarse, bushy herb, 3-5 ft. tall, scurfy-tomentose, armed with strong hooked spines: lvs. much like those of the eggplant but the lobes sharper, spiny on the midrib and petiole; lvs. small, white, in clusters of 2-6: fr. 1-2 in. across, mostly flattened on the ends but sometimes nearly globular in outline, prominently lobed, bright scarlet or yellow. Probably African.—An old-time garden plant, but little grown. Annual.

BB. For foliage or flowers (Nos. 8 to 11 also for fruit).

c. Habit erect, the plant either herbaceous or woody.

d. Plant without spines, mostly with rather narrow lvs.

e. Lvs. entire or very nearly so.

8. Pséudo-Cápsicum, Linn. JERUSALEM CHERRY. Figs. 2339, 2340. Small shrub, reaching 3-4 ft., but usually shorter and smaller specimens in pots, glabrous, erect: lvs. lance-oblanceolate, mostly obtuse, entire or somewhat wavy, shining green, strongly peniveined: fls. few or solitary in lateral clusters, small, white, the corolla 5-parted: fr. globular, ½-3½ in. in diam., scarlet or yellow. Tropics, probably native to Old World.—An old-fashioned plant, often seen in window-gardens, grown for its showy berry-like fruits, which persist a long time. Var. nánum, Hort., is a dwarf, compact form.

Var. Wathérrillii, Hort., Weatherhill's Hybrid, is a form with strongly veined undulate lvs. and pointed orange-colored fruits.

9. Capsicéastrum, Link. Fig. 2341. Resembles the last, but the plant attains only about half the size: lvs. much shorter, obovate-lanceolate to oblong-lanceolate, scarcely undulate, subopposite and one smaller than the other: fls. white, in short racemes: fr. ½ in. or less in diam.; orange-red or scarlet. Brazil. F.S. 12:1242.—Frequent greenhouse and window plant. Var. variegátum, Hort., has variegated lvs.


11. Rantonéti, Carr. (Various sp. S. Rantonéti, Rantonéti, Rantonéti, etc.) Erect, bushy plant, growing 3-5 ft. tall, glabrous; lvs. lance-ovate, entire, alternate: fls. large, violet-blue, 2-5 together in the axils: fr. 1 in. or less in diam., red, very ornamental, drooping. Paraguay and Argentina. K. H. 1859, p. 43:1401.
more or less hairy. Ivs. ovate, sinate or lobed, woolly beneath, usually prickly; fls. blue, 1 in. or less across, triangular-lobed: berry globose, about \( \frac{1}{2} \) in. in diam., smooth, yellow. Tropical India, and in China and the Philippines.—Offered by Franceschi, S. Calif., who describes the fls. as white. Variable.

15. Torreyi, Gray. Strong perennial herb, with close grayish pubescence and scattering weak prickles; Ivs. ovate, with subcordate or truncate base, with 5-7 minute lobes, the midrib prickly beneath: fls. few in the cymes, nodding, 2 in. across, pale blue, deeply pointed-lobed, handsome: berry 1 in. in diam., globose, smooth, yellow. Kans. to Tex. B.M. 6461.

16. pyracanthum, Jacq. Small shrub, somewhat hairy, thickly set with fleshy orange spines: Ivs. long and relatively narrow, pinnately irregularly lobed; fls. blue, with radiating white ribs, deeply lobed, about 1 in. across, drooping in small clusters: fr. globose, \( \frac{3}{4} \) in. or less in diam. Trop. Afr. B.M. 1928.

18. robustum, H. Wendl. Vigorous herb or subshrub, 3-5 ft., densely tomentose, prickly on stems and Ivs., the stems winged: Ivs. very large, sometimes 1 ft. long, broad-ovate or ovate-elliptic in outline, with many pointed angular lobes extending one-third or less the depth of the blade, woolly beneath: fls. white, about 1 in. across, lobed, racemose: fr. globose, small, hairy, orange-colored. Brazil. R.H. 1893, p. 259; 1896, p. 236.—Bold species, useful for subtropical gardening.

19. Warscewiczii, Weck (S. warscewiczioides, Hort.). Strong, erect shrub, 3-4 ft., usually with a strong central stem, densely rusty-tomentose and armed with many short stout hooked or straight spines: Ivs. large, the blade often more than 1 ft. long, rather soft, tomen-

tose or densely pubescent beneath, deeply several-lobed: fls. large, about \( \frac{1}{2} \) in. across, white, numerous: fr. glabrous and shining, pale yellow. Probably South American. R.H. 1895, p. 430; 1896, p. 237.—A very striking plant for subtropical gardening and easily raised from seed in a single season; half-hardy perennial.

EE. Fls. mainly white.

17. marginatum, Lam. f. Shrubby, 3-5 ft. tall, white-tomentose, bearing many straight but not very large prickles: Ivs. mostly ovate in outline, subcordate, shallow-lobed or angled, at some stages with an irregular white band along the margin due to the shedding of the tomentum on the body of the leaf (whence the name marginatum): fls. large, 1 in. or more across, white with blue veins or ribs, shallow-lobed, in few-fld. clusters, the calyx prickly: fr. 1 in. or more in diam., globose or ovoid, drooping, prickly, yellow. Trop. Afr. B.M. 1928.

D. Fls. small, \( \frac{1}{2} \) in. or less across.

20. jasminoides. Paxt. Potato Vine (from the fls.). Fine greenhouse twining shrub, reaching several ft. in height, glabrous: Ivs. rather small, the upper ones lanceolate to lance-ovate and closely set with 2-3 narrow, ovate entire Ivs.: racemes short and united into a cluster 3 in. or less long and about 8-12-fld.: fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. America. F.M. 8:5. B.R. 33:3. On. 43, p. 433; 48, p. 192; 50, p. 19; 51, p. 358; 53, p. 28.—A most useful deciduous climber for the coolhouse, and much grown. Half-hardy, and useful for the open in the South. Will grow 10-20 ft. if given a chance. Var. grandiflorum, Hort., has very large trusses of fls. and is a robust grower; excellent. Gng. 1:259. Var. variegatum, Hort., has variegated foliage.

21. Seaforthianum, Andr. (S. atheranum, Hort. ? S. venustum, Kunth). Beautiful slender climber or trailer, 4-10 ft. long, minutely pubescent; with 2 Ivs. (terminal one largest) or the upper ones simple, the midrib entire, the Ivs. ovate-lanceolate: fls. many in long, drooping panicles, on pedicels swollen at the apex, the corolla mauve or azure-blue, star-shaped, usually 1 in. or less across: fr. ovoid, glabrous, scarlet. Brazil. B.M. 1862, 5823. B.R. 12:969. R.H. 1893, p. 177; 1897:424.—A very beautiful plant for the coolhouse. Blooms in summer and fall. Ernest Brauntun writes: ”*S. Wendlandii* is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbels 12 inches across. It is perhaps the showiest vine in California when in bloom. It is generally hardy here, although some winters nip and even kill the vine in the colder and lower parts of this city. Cut up an old vine, any kind of wood, stick the pieces in sand or light soil,
SOLANUM

and wait. Every cutting will grow. When in a robust condition it is a gross feeder. It should be in the full sun, though it does well anywhere.

S. betaceum, Cav., is Cyphomandra, for which see Vol. 1.—S. ceratium, Velloz., is a shrub or small tree, with cyphomandra-like lvs., and the young parts clothed with fluffy hairs; fls. white: fr. globose, hairy, inclosed in the calyx. B. M. 1791.—S. citatum, Lam. Stout herb or subshrub, 1-2 ft. tall, with prickly stems and ovate acute-lobed lvs.: fls. white, 1 in.

**2342. Solanum Wendlandii.** Much reduced.


L. H. B.

SOLDANELLA (Latin, a small coin; referring to the shape of the lvs.) Primulaceae. About 4 species of alpine plants 2-3 in. high, with nodding, funnel-shaped, fringed flowers of violet or purplish blue, and about ¾-¼ in. across. Soldanellas are amongst the most famous flowers of the Alps, though not the commonest. N. alpina ascends the mountains to the line of perpetual snow. (Grant Allen, in "Flashlights on Nature," declares that the flower of Soldanella actually thaws its way up through a solid block of ice. Soldanellas are cultivated in this country only in a few large rock gardens. Those who have limited resources and dwell in the region of changeable winters might attempt to grow these plants in pots under a frame in lieu of nature's winter covering. According to J. B. Keller, they prefer a half-shady or shady position and are prop. by seed or division.

Soldanellas are native only to the Alps of middle Europe. They are slender, glabrous, perennial herbs, with short rhizomes: lvs. long-stalked, thick, roundish, with a heart-shaped or kidney-shaped base, entire: scapes slender, solitary or few, about 6 in. high or less: calyx 5-parted; corolla 5-cut. The descriptions of the species are here adopted from Koeh's Synopsis Florm. Germanicis. Some white-flowered forms have been recorded.

A. Fls. 2-4 on a scape: corolla split half way to the base; filaments half as long as anthers.

b. Pedicels pubescent.

montana, Wild. Lvs. roundish; margin slightly and remotely crenate: fls. violet. May-July.

bb. Pedicels roughish.

pusilla, Baunig. Base of lvs. heart-shaped or kidney-shaped; margin somewhat wavy: fls. copper-colored, verging on blue, the fringes straight, not spreading. May.

bb. Pedicels pubescent.

minima, Hoppe. Lvs. roundish; fls. pale lilac, streaked purple inside; the fringes spreading at the tips. June, July.

SÓLEA (after W. Sole, author of a monograph of the mints of England). Violaecho. A single species native to the eastern U. S., an herbaceous perennial 1-2 ft. high, with mostly oblong, narrowly acuminate leaves 3-5 in. long, and small nodding greenish flowers solitary or in pairs in many of the leaf-axils: sepals linear and equal; petals nearly equal, connivent nearly their entire length, the lower one much larger, sagittate at the base, emarginate at the broad apex; stamens with broad connectives wholly connate into an ovoid sac open only between the free tips, a rounded or 2-lobed scale-like gland adnate to the base anteriory.


F. W. Barclay.

SOLÆNANTHUS (Greek, tube and flower; referring to the form of the corolla). Borraginaceae. About 15 species of perennial herbs from Europe and Asia with alternate leaves and blue or rosy flowers either in long, simple, bracted racemes or in shorter, bractless, spiral, panicled racemes: calyx 5-parted; segments narrow, but little enlarged in fruit; corolla tubular, the lobes short, erect or somewhat spreading; stamens exserted: ovary lobes 4, distinct: nutlets 4.
Solenanthus, Hohen. (Cynoglossum Acreuminum, Lind.). Plant hardy, 2½-3 ft. high; lvs. rather coarse, the radial ovate-oblong, those of the stem long-lanceolate: fls. blue, forget-me-not-like, in dense, axillary, peduncled racemes. May, June. S. Europe.—A useful plant amongst shrubbery or in the back part of borders. Prop. by division or by seeds.

F. W. Barclay.

Solidago (according to Gray, from "solidus and ago, to make solid or draw together, in allusion to reputed vulnerary properties"). Compositae. Goldenrod. Amongst the glories of the American autumn are the asters and the Goldenrods. They compliment each other. The asters run in cyanic colors, Goldenrods in xanthic,—the blue and blush on the one hand and the yellow and golden on the other. Because the Goldenrods are so common they have not been appreciated for planting. They improve in the garden, however, the plants becoming larger and the bloom fuller and richer. They present no difficulties in cultivation. They may be transplanted from the wild with the greatest ease, and the stools may be lifted and divided as soon as they become root-bound and show signs of failing. The Solidagos are variable, even within the same species. Therefore it is well to mark fine individual clumps when in bloom for removal in late fall or early spring. The observation of a single season should result in a fine collection of individual plants; and the natural efficiencies of these specimens should be maintained and augmented by supplying good soil and giving good care. Too often it is thought that because the plants thrive under poor conditions in the wild, they do not profit by superior conditions in the garden; but this is an error.

Solidagos are perennials, with simple compound leaves, many small yellow (rarely whitish) heads in spikes, thyrses, compound panicles, or racemes. The heads are oblong or narrow-campanulate, with small, mostly appressed scales, containing few florets, the disk-florets all perfect and the ray florets in one series and pistillate. The pappus is composed of 1 or 2 rows of roughish capillary bristles. The genus is characteristic of eastern North America, where about 60 species occur. There are several species on the Pacific coast, a few in Mexico and South America, and two or three in Europe and northern Asia, making, altogether, nearly 100 species.

None of the species are well known in the trade, although any of them may be expected to appear in the catalogues of dealers in native and hardy plants. For descriptions of the species, see Gray’s Syn. Fl. N. Amer., vol. 1, pt. 2; for the species of the northeastern Solidago, also Gray’s Manual and Britton & Brown’s Flora. The following have been offered by American dealers:

bicolar, Linn. censis, Linn., Fig. 2341.
Campanula, Linn. Fig. 2343. — var. procera, Torr. & Gray. Drummondii, Torr. & Gray. elongata, DC. confertiflora, DC. junea, Ait. lanceolata, Linn. latifolia, Linn. Missouriensis, Nutt. moschata, Torr. & Gray. membranosa, Ait. & Fig. 2346. occidentalis, Nutt. odorata, Ait. Ohoeensis, Kidd. patula, Mahi.

petiolaris, Ait. puberula, Nutt. Ribeslii, Frank. rigidia, Linn. rigiduusae, Porter. rugosa, Mill., Fig. 2347. sempervirens, Linn. serotina, Ait. — var. gigantea, Gray. Serihti, Torr. & Gray. speciosa, Nutt. spectabilis, Gray. stricta, Ait. uliginosa, Nutt. umbellata, Mahi. Virgaea, var. alpina, Bigel.

L. H. B.

Sollyra (in honor of Richard Horsman Solly, 1778-1858, an English botanist). Pittosporaceae. Two species of Australian evergreen twining plants; lvs. nodding, on slender pedicles, solitary or in loose, few-flowered cyymes; sepals distinct, small; petals obovate, spreading from the base; anthers connivent in a cone around the pistil: capsule many-seeded. Propagated by cuttings in sand under glass, or by seeds, which germinate readily.

heterophylla, Lindl. Australian Bluebell Creeper. Small shrub, 2-4 ft. high, with slender, twining stems; lvs. variable, from lanceolate or oblong-linear to ovate-lanceolate or ovate-oblong, obtuse or slightly acuminate, entire, 1-2 in. long, usually narrowed into short pitholes; cyymes 4-8-fl., terminal or leaf opposite; fls. bright blue, ½-3/5 in. long. July. B.M. 3525. B.R. 21:253. B.R. 17:1406.—Hardly and much cultivated in middle California and a great favorite on account of the brilliant blue of its flowers. Especially valuable for covering banks, rockwork and low fences, preferring to scramble over other plants. Also grown as a herbaceous border plant, being kept within bounds by the shears. The roots are very attractive to the California pocket-gopher, who plays sad havoc with it if not watched.

J. Burr Darr.

Solomon’s Seal. Polygonatum.

Solomon’s Seal, False. Smilacina.

Sonerila (adapted from a native name). Melastomaceae. This includes a number of dwarf, tender foliage plants which must be grown in the greenhouse all the year round. The plants belong to the same cultural group with Bertolonia, Gravesia, and Monroea and are distinguished by having their floral parts in 3’s. There are about 70 species, all natives of India and the Malay archipelago. The fls. are usually rose-colored, 3/4 in. across or less, and generally disposed in scorpioid racemes or spikes. The genus is monographed in Latin by Cogniaux in DC. Mon. Pl. Ann., vol. 7 (1891). The species described below are all caesplantent species with lvs. distinctly petioloed, those of each pair being of equal size (except in S. mucronata): fls. 3-merous; stamens 3, long-acuminate.

Sonerilas are highly esteemed in Belgium, where they have been developed by Van Houtte, Linden, Van Gaert and others. At present only 8 names are found in the American trade, as follows: S. argentea, Henderson, mormorata, margaritacea alba, orientalis, picturata, pista and punctata. A satisfactory explanation of these names involves a number of others mentioned below. In addition there are about 15 kinds with personal names that vary from the types mentioned below in their variegation. There are also some hybrids between Sonerila and Bertolonia which are known to the trade as Berteronia. The most important of the species mentioned below is S. margaritacea.

It was long thought impossible to grow Sonerila and its allies outside of a bell-jar or Wardian case. The Belgians now dispense with the “double glass” and grow these plants in tropical or even temperate greenhouses. For potting material they use a compost of
Sonerila

fibrous pest and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.

W. M.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaying. A temperature of not less than 75°F suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70-80°F. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use finely screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time in early spring) they start into flower. At this time the plants should be hardened off by gradually withholding water, and they should also be kept a little cooler. When fully ripened they may be cut back in order to furnish material for cuttings. Keep the old stools a little warmer and they will gradually start into new growth again. These plants make choice decorative plants in pans or even in wire baskets and can be used for choice table or mantel decorations.

H. A. Siebrecht.

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argentea, 7. Manse, 6. picta, 3, 4.
guttulata, 4. margaritacea, 5. punctata, 4.
Hendersoni, 6. orientalis, 4. speciosa, 1.
maculata, 2.

A. Foliage not variegated .......... 1. speciosa
AA. Foliage variegated.
BB. Calyx dark-purple; lvs. covered with short, dark purple hairs ........ 4. orientalis
BB. Calyx glabrous or rarely dotted-scurfy.
CC. No. of nerves 7; margin of lvs. minutely serrate......... 3. picta
CC. No. of nerves 9 or 7; margin of lvs. sharply and prominently serrate.

1. speciosa, Zemker. This is practically the only species cult. for its flowers: height 1 ft.:

2. maculata, Roxb. This differs from the other species here described in having lvs. of unequal sizes. The larger one of each pair may be 3-5 in. long; the smaller a half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticulate, 7-9-nerved; fls. violet. India. R.H. 1865, p. 91, is too poor to determine.—Probably not in cult.

3. picta, Kerth. Erect or ascending, with scurfy or puberulous branches: lvs. short-petioled, broadly lanceolate, wedge-shaped at the base, minutely serrate, 7-nerved, lined with white along the primary nerves: fls. rosy. Sumatra.—S. picta of the trade is probably S. orientalis, var. picta.

4. orientalis, Linden. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1891, and remarkable for two novel features: some of the varieties have dark purple or bronzy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. In L. H. 37:113 the lvs. are shown as ovate, acute, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color of fls. not recorded. Habitat not stated. The typical form is said to have bronzy lvs. with an amaranth reverse. Var. guttulata has green lvs. peppered
with small white dots and is pale green below. Var. punctata is much like the preceding variety but has paler leaves. Var. picta has the purplish lvs. of the type, with an irregular lancediolate strip of silvery gray down the middle. Var. Robert Sallier, R.B. 29.61, has dark green lvs. peppered white and with a lancediolate figure of silver down the middle. Said to be a hybrid of var. picta and punctata. It has the stripe of one and the dots of the other.

5. margaritacea, Lindl. This is the most important species. The name "margaritacea" means "pearly," referring to the regular rows of pearly spots between the nerves and parallel with them, which are characteristic of the typical form. Lvs. ovate-lancediolate, acutely serrate, 7-9-nerved, glabrous, purplish below, acutate at the base. Var. R.B. 5190, of S. 11:1126 (nerves too parallel). I.H. 2:40. Love 16.- Supposed to be native of Java. In Vol.VI, edition 1, page 684, Gravettia quitata, var. margaritacea, is erroneously referred to instead of S. I.H. 23:249. Sonerila Alp. Van De Sande shows the Hendersoni and argentea blood in the large silvery blotches, most of which are larger than in Hendersoni.

A very handsome hybrid between the orientalis and margaritacea group. For horticultural purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotched foliage. It differs from the type in having a broader leaf with a shorter cuneum and rounded base, and especially in being covered with irregular blotches, which, however, do not cross the nerves. F.M. 1875:159. I.H. 23:230.-The blotches are all about the same size. S. Mamei, Linden, has more regular and roundish blotches, which are bluish on winter white and on a darker ground. The under side is netted with rosy pur- ple. I.H. 23:254.

7. argentea, Hort. (S. Hendersoni, var. argentea, Fournier). For horticultural purposes this may be treated as a distinct species, characterized by its very flat leaves, resembling that of some begonias, with no dark green except on the nerves. This is the parent of most of the forms that have a silvery cast of foliage, just as S. Hendersoni is responsible for the irregular blotches. S. argentea is a very hardy species. Van De Sande shows the Hendersoni and argentea blood in the large silvery blotches, most of which are larger than in Hendersoni.

The species is named for Dr. Robert Brown, Professor of Botany, University of Edinburgh, a great friend of the plant world and a most distinguished horticulturist.

W. M.

SOPHORA (Sophora, Arabian name of a tree with pea-shaped flowers), Including Stropholobium and Edwardsia. Leguminosae. Ornamental deciduous or evergreen trees or shrubs, sometimes perennials with alternate, odd-pinnate leaves, papilionaceous, yellow, white or violet flowers and long and narrow moniliform pods. The best known species, S. japonica, is hardy as far north as Mass., but S. platycarpa seems to be somewhat hardier. The evergreen species with large yellow lvs. are tender and can be grown only in the southern states and California; they are very showy in spring when they are in bloom; in England they are often planted against a wall, where they can be easily protected against light frost. S. japonica is especially valuable for its late-appearing flowers, which are white and disposed in ample panicles; the foliage is dark green and graceful and the tree is conspicuous in winter on account of its dark green branches. The Sophoras thrive best in well-drained sandy loam but grow fairly well in rather dry soil. Prop. by seeds and the varieties by grafting on the typical form; some species are also increased by Greenwood cuttings and by layers. More than 25 species in the temperate regions of both hemispheres. Trees, shrubs or herbs; lvs. odd-pinnate, with usually opposite small lfts.; lvs. papilionaceous, in racemes or terminal leafy panicles; calyx with 5 short teeth; standard orbicular or broadly obovate; stamens 10, free or connate only at the base; pod stalked, almost terete or 4-winged, rarely compressed, few to many-seeded, moniliform, indistinct or tardily dehiscent. The fls. and frs. of S. japonica yield a yellow dye, S. tenuiflora has medicinal properties, and the seeds of S. secundiflora contain sophorine, a poisonous alkaloid. S. tetrapetra is a valuable timber tree in its native country.

2348. Sonorah Japonica, var. pendula, in winter.

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(Including names advertised under Edwardsia, s. t. = supplementary list.)

affinis, s. l. grandiflora, 4. pendula, 1.
apertudos, s. l. platycarpa, 2.
australis, s. l. secundiflora, 3.
Chinensis, 5. tetrapetra, 4.
Chinensis, s. l. tomentosa, s. l. microphylla, 4.
christophyllum, s. l. violacea, s. l.

A. Fls. white or violet.
B. Lvs. deciduous: lts. in terminal panicles.
C. Calyx rounded at the base.

1. Japonica, Lindl. (Stropholobium. Japonica, Schott). JAPAN PAGODA TREE. Tree, attaining 60 ft., with spreading branches, forming a dense round head; lvs. 7-9 in. long; lts. 5-13, distinctly stalked, ovate to oviolate-lanceolate, acute, rounded at base, dark green and glossy above, more or less pubescent beneath, 1-2 in. long: fls. yellowish white, ½ in. long, in loose panicles 15 in. long: pod distinctly stalked, glabrous, terete, 2-3 in. long, ½ in. broad. July.Sept. China; cult. in Japan. Gn. 24, pp. 219, 211, 214; 29, p. 292. M.I. 38:655.:- Var. pendula, Loud. Figs. 2348, 2349. With long and slender pendulous branches. R.H. 1876:194. 195. Gn. 9, pp. 600, 601; 24, pp. 202, 203, 211; 28, p. 27. M.D.G. 1898:182. The form with variegated lvs. has little to recommend it. There are several allied forms in cultivation probably introduced from E. Asia, of similar appearance and of about the same hardiness; they are yet imperfectly known under provisional names; such as S. Chinitas, Korol.-kori, tomentosa, and violacea, for which see supplementary list. The pictures of the Weeping Sophora (Figs. 2348, 2349) are adapted from Revue Horticole.

C. Calyx narrowed into the pedicel.

2. platycarpa, Maxim. Tree, similar in habit to the preceding but with very distinct frs.: lts. 11-15, alternate, ovate to elliptical lanceolate, acuminate, glabrous or nearly so, 2-3½ in. long; fls. white, over ½ in. long; calyx gradually narrowed into the short pedicel: pod obovate to obovate-lanceolate, compressed and 2-winged, 1-5-seeded. Japan.—Has proved harder than S. japonica and is therefore to be recommended for northern regions.

B. Lvs. persistent: fls. violet, in terminal racemes.

3. secundiflora, Lag. Small tree, 35 ft. high, or shrubby, with short, slender trunk and upright branches forming
SOPHORA

a narrow head; lvs. 4-6 in. long; lfts. 7-9, elliptic or obovate-oblong to oblong, rounded or emarginate at the apex, cuneate at the base, silky-pubescent when young, dark yellowish-green above, 1-2 1/2 in. long; fls. violet-blue, the standard marked near the base with a few dark spots, very fragrant, about 1 in. long, in one-sided racemes 2-3 in. long; pod: white-omentumaceous, terete, 1-7 in. long, 1 1/2-2 in. thick; seed: bright scarlet. Spring. New Zealand, Lord Howe Island, Juan Fernandez, Chile. The following varieties are in cultivation: 1. var. grandiflora, Hook. f. (Edwrdia grandiflora, Salisb.). Lfts. linear-oblong, about 1 in. long, in 10-25 pairs; lfs. 1 1/2 in. long; standard shorter than wing, B.M. 167, G.C. II. 9:729. Gn. 24, p. 211. L.B.C. 12:1162. var. microphylla, Hook. f. (Sophora microphylla, Ait. Edwardia Macabindura, Curt.). Lfts. oblong-obovate to broadly oblong, usually emarginate, 3 1/2-4 in. long; fls. about 1 1/2 in. long; standard about as long as wings. B.M. 1442, 3735. Gn. 24, p. 211. Gn. 12:87 also seems to belong here. 2. Pod not winged: lfs. 3/4-1 in. long. 5. macrocarpa, Smith (Edwardia Chilensis, Miers). Shrub or small tree, with the young branches densely tomentose; lfts. in 10-20 pairs, elliptic or obovate obtuse, silky-pubescent beneath, 3/4-1 in. long; lfs. 3/4-1 in. long, in short racemes; standard about as long as wings; pod: terete, not winged, 1-seeded. Chile. L.B.C. 12:1125. B.R. 21:1798. 6. affinis, Torr. & Gray. Small, deciduous round-headed tree, 20 ft. high; lfs. 13-19, elliptic-obovate, nearly glabrous, 1-1 1/2 in. long; fls. white tinged rose, 1/2 in. long, slender, axillary racemes: pod: terete, black, 3/4-3 in. long, Spring. Ark., Tex. S.S. 3:125 — S. alpescendens, Lind. Grayish pubescent undershrub, with sprightly, erect branches: lfs. 6 in. long, with 15-25 oblong lfts.: fls. yellow; racemes dense, terminal, about 1 in. long; pod: terete, 6-12-seeded. W. Asia to H. China. L.B.C. 12:1163. var. cunealis, Linn. — S. austrialis, Linn. — S. Chinasis, Hort. Allied to S. Japonica. Lfts. 11-17, ovate to obovate-oblong, pubescent beneath, 3 1/4 in. long; fls: pale pink. Probably from China. — S. chrysocephala, Sm. (Edwardia chrysocephala, Salisb.). Allied to S. tetragon: pubescent more golden yellow: lfs. 13-19, obsolete, small; fls. smaller: standard shorter than wings. Sandwich Islands, B.R. 9:785 — S. Kordiâne, Hort. Similar to S. Japonica: lfts. usually 11, lancedate, dark green above, pale and appressed pubescent beneath; 1 1/2 in. long, light green, not yellow, to central or eastern Asia. — S. tormentosa, Linn. Pubescent shrub: lfs. 6-10 in. long; lfts. 15-25 to oblong, obtuse, 1 1/4 in. long, fls. yellow, in terminal, 1-6-in. long, slender: pubescent beneath, on long. S. states, W. India. B.M. 3390. Not hardy north. — S. tangarum, Hort., is similar to S. Japonica, but imperfectly known. lfts. 15-23, oval to oblong-obovate 1 in. long. Probably from Asia. — S. violacea. Thwait., is a shrubby species from Ceylon, not in cultivation, but under the same name another imperfectly known species, probably from China, is cult. It has 15-17 oblong, acute fls., sparingly pubescent above, densely beneath, and pale violet flowers. ALFRED REIDEB. SÍOPHRO-CATTLEYA. Orchid hybrids between Sophronis and Cattleya, little known in America. SÍOPHRO-LÆLIA. Orchid hybrids between Sophronitis and Laelia not advertised in American trade catalogues. SÍOPHNITIS (Greek, modest). Orchidáceae. A genus of about 4 species cultivated on account of their neat habit and brilliantly colored flowers: pseudobulbs small, with 1 or rarely 2 small flat lvs.: fls. from the top of the pseudobulbs, brightly colored; sepals and petals nearly equal, spreading; labellum with a broad middle lobe and small erect side lobes, the base leaving into a cavity in the wall of the ovary; column short, the stigmatic surface covering 2 wing-like projections at its summit; pollinia 8. This genus is closely related to Laelia, Cattleya, etc. These plants, and also Sophro-Cattleyas and Sophro-Laelias, thrive in the temperature of the Cattleya house. In growing season, give a moderate supply of water and plenty of fresh air. Rest them at 50°-55°, and water sufficiently to keep the shriveling, but not to make them in shallow pots with plenty of drainage, and a thin layer of fine turfy root, using no sphagnum. grandiflora, Lindl. (S. coccinea, Reichb. f.). Pseudobulbs clustered: lfs. about 2 in. long, elliptic: fls. solitary, on short peduncles, 1 1/2 in. across, brilliant scarlet, often with a shade of orange, with an orange labellum; sepals oblong-lanceolate; petals broadly elliptic; labellum narrow, with folded sides. Flowers during the whole winter. Organ Ms., B.M. 3769. F.S. 1:222; 17:1716. P.M. 25:143 (var. rosea). B.H. 32:1058; 45:1025. J.H. 34:2319. G.C. II. 22:561; III. 9:689; III. 17:429; III. 21:266. R.H. 1884:492 (var. aurantiaca). A.F. 6:669. cérnea, Lindl. Very small plants, with a creeping rhizome bearing 1-3 lvs.: lvs. ovoid to oblong-lanceolate, leathery, a little over an inch long; fls. 4-8, on a stem from the axils of the lvs., bright scarlet or reddish orange, with an orange lip; sepals and petals ovate; labellum ovate-acuminate, white. Winter. Organ Ms., Brazil. B.M. 6880. HEINRICH HASSELBRAINQ AND WM. MATHEW. SORBÁRIA (derived from Sorbus: the leaves resemble those of the mountain ash). Basílíaca. Rosáceae. Ornamental deciduous shrubs with rather large, odd-pinnate or bipinnate leaves and white flowers in terminal showy panicles. Sorbária sorbiformis, S. alpina and S. Aitichisoni are hardy north, while S. Lindleyana is only half-hardy. They are well adapted for planting on banks of brooks or rivers, but should not be brought together with slow-growing and delicate shrubs, as they spread in suitable soil rather rapidly by means of suckers and are likely to overgrow other plants. The handsome bright green foliage appears very early in spring. The large white panicles appearing in summer are showy, but become rather unsightly after they have faded and should be removed. The Sorbarias, except S. Millefolium, which prefers a rather dry, well-drained soil and sunny position, grow best in a somewhat moist and rich
SORBARIA

soil and thrive also in partly shaded situations. Prop. by hardwood cuttings; also by root-cuttings, suckers and seeds. Four species in Asia and one in N. America, formerly usually united with Spiraea but easily distinguished by their stipulate, pinnate lvs. and the 5 carpels being opposite to the sepals.

a. Lvs. pinnate.
b. Panicles with upright ramifications, dense.
c. Fls. 3/4 in. across.

sorbarioides, A. Braun (Spiræa sorbarioides, Linn. Basillina sorbarioides, Ret.). Flg. 2230. Upright shrub, 3-5 ft. high; lfts. 13-23, lanceolate or ovate-lanceolate, long-acuminate, doubly serrate, stellate-pubescent beneath when young or glabrous, 3-4 in. long; panicles 5-12 in. long; fls. 3/4 in. across. June, July. N. Asia, from Ural to Japan. A.G. 11:122. On. 16, p. 217. - Escaped from cultivation in some localities in the Middle States.

cc. Fls. 3/4 in. across.  


bb. Panicles with spreading ramifications.

c. Young branches pubescent, green.


cc. Young branches glabrous, usually red.

Aitchisoni, Hemsl. (Spiræa Aitchisoni, Hemsl. S. sorbarioides, var. angustifolia, Wenzig.). Shrub, 6-8 ft. high, with upright or ascending, little-branched stems, usually bright red when young; lfts. 13-21, lanceolate to linear-lanceolate, acuminate, narrowed at the base, simply or obscurely doubly serrate, glabrous, 2-4 in. long; panicles to 12 in. long, leafy at the base; fls. 3/4 in. or more across. July-Sept. Afghanistan, Cashmere, G.C. III. 28:225. M.D.T., 1901:18. - A very desirable shrub with handsome graceful foliage, much harder than the preceding species.

aa. Lvs. bipinnate.

Millefolium, Pocke (Spiræa Millefolium, Torrey. Chamisobatrachium Millefolium, Maxim. Basillina Millefolium, Kunzke.). Aromatic, glandular-pubescent spreading shrub, 2-6 ft. high; lvs. lanceolate in outline, 1-3 in. long, with minute, densely set, oblong and obtuse lfts.: fls. 3/4 in. across, in 2-3-in. long panicles, July, Calif. to W. Virginia and Arizona. F. 2:50. G. C. III. 22:237. - Rarely cult.; it has proved hardy in Mass., but, like other plants from the same region, it is likely to be killed by too much moisture during the winter.

SORBUS

(ancient Latin name of A. domestica), including Aria, Aronia, Cornus, Micromelis and Torininaria, Rosacea. Ornamental deciduous trees or shrubs, with alternate simple or odd-pinnate leaves, white or rarely pinkish flowers in terminal corymbs and berry-like, usually red fruit. Most of them are hardy except some Asiatic species and Sorbus domestica, which seem tender. They are chiefly inhabitants of mountainous regions, and the northern species, as A. Americana and sambucifolia, do not thrive well in warmer and drier climates, while A. Aria, tormentalis and allied kinds endure drought and heat well. They all have handsome foliage, which usually turns orange-red in fall. The fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillsides. Those of the Aneuparia group are more adapted for cool and moist mountain regions; those of the Aria and Torininaria group, which grow specially well on limestone soil, are suited to warmer and drier climates. S. hybridæ is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit. S. arbutifolia and S. malvacearpa are handsome shrubs for borders of shrubberies; they prefer moist soil, but S. me- lancarpa also grows in drier rocky situations. Prop. by seeds sown in fall or stratified; also by layers, and S. arbutifolia and S. malvacearpa from greenwood cuttings. Varieties and rarer kinds are usually budded or grafted on allied species, but most kinds will grow on S. Aneuparia or Americana and on Hawthorn. The trees are very subject to borers.

About 30 species distributed throughout the northern hemisphere, in N. America, south to Texas, and in Asia south to the Himalayas. Lvs. simple or odd-pinnate, stipulate: fls. in compound corymbs; sepals and petals 5; stamens 15-20, with red or yellow anthers; styles 3-5, free or connate at the base: fr. a 2-3-locul. pome, usually rather small, with 1 or 2 seeds in each cell. Closely allied and often referred to Pyrus, from which it is chiefly distinguished by its compound inflorescence and by the fls. being more or less perigynous except in the Micromelis group, which has a decidedly inferior ovary like Pyrus; the fruits, too, are usually smaller and berry-like.

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SORBUS

A. Foliage pinnate.
B. Leaves regularly pinnate, with the leaflets of almost equal size.
C. Fruits small, 3/4-1 in. across or slightly larger, berry-like. *Aucuparia* group, species (4-7).
D. Winter-buds covered with white villous tomentum.
E. Young branches and leaflets pubescent.
1. *Aucuparia*.

2. *Tianschanica*.

DD. Winter-buds glabrous or sparingly appressed, rusty-pubescent.
E. Leaves long-acuminate; flowers 2 1/2-3 in. across.
EE. Young leaflets and leaflets glabrous.
2. *Sambucifolia*.

3. *Américana*.

CC. Fruits 1/2 in. or more across, apple-pear-shaped, with guttules; styles 5.
(Cormus group, species 5).
5. *domestica*.

BB. Styles 5; trees or rarely shrubs.
CC. Under side of leaflets glabrous at length; green, leaflets lobed with a white villous tomentose.
(Dominaria group, species No. 46).

6. *hybrida*.

7. *spuria*.

AA. Foliage simple.
B. Styles 2; trees or rarely shrubs.
CC. Under side of leaflets glabrous at length; green; leaflets absent; (Dominaria group, species No. 5).

8. *terminalis*.

EE. Leaves acute or bluntly acuminate.

9. *latifolia*.

FF. Base of the ovate to oblong-ovate leaves broadly cuneate.

10. *intermedia*.

EE. Pairs of veins 3-5; under side of veins white, tomentose.
11. *flabellifolia*.

DD. Leaves not or but obscurely lobed; pairs of veins 6-12.
2. *Aria*.

BB. Styles 5; shrubs with cutely serrate leaves.
(Aria [Aucuparia] group, species 13-14).
C. Flowers red; leaves tomentose beneath.
13. *arbutifolia*.

CC. Fruit black; leaves glabrous or nearly so.

14. *mclelanocarpa*.

(Aucuparia group, species 1-4.)

1. *Aucuparia*, Linn. (*Pyrus* Aucuparia, Gartn.).
EUROPEAN MOUNTAIN ASH. ROWAN TREE. Fig. 2531. Round-headed tree; 20 to 40, occasionally 60 ft. high; young branches pubescent, grayish brown when older; petioles more or less tomentose; flowers 9-15, oblong to oblong-lanceolate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, 3/4-2 in. long; flowers white, 3/4 in. across, flat, 4-6-in. broad, tomentose or sometimes almost glabrous corymbs; stems about as petioles; flowers about 1/2 in. across, bright red, May, June. Europe to W. Asia and Siberia. - *Var. dulcis*, Kretz. (var. Moravia, Zengerl.).

Almost glabrous; petioles purplish; flowers oblong-lanceolate, 2-3 in. long, glabrous beneath. The flowers are of an agreeable acid flavor and are recommended for preserves. The tree thrives well in cold northern climates where hardly any other fruit tree will grow.

2. *Tianschanica*, Rupr. (*Pyrus* Thianschanaica, Regel). Small tree or shrub, similar to the preceding; young branches glabrous, red-brown and glossy when older; petioles and leaves glabrous; flowers 11-15, lanceolate, acuminate, serrate, entire toward the base, dark green and glossy above, light green beneath, about 2 in. long; corymbs glabrous; stems half as long as petals; styles 2-5; fruit, globose, bright red. May, June. C. Asia. Gl. 46, p. 8. B.M. 7755. - Very handsome on account of the contrast of its dark green foliage and red-brown branches.

3. *Américana*, Marsh. (*Pyrus América*, DC. *S. microdonta*, Dum.-Conrs.). AMERICAN MOUNTAIN ASH. DOONEY. Fig. 2532. Small tree, attaining 30 ft. high, spreading branches, or sometimes slender; flowers 11-17, lanceolate, long-acuminate, sharply serrate, glabrous or slightly pubescent when young, light green above, paler beneath, 1-2 in. long; flowers one-fifth to 1/4 in. across, dense, 3-6 in. broad, usually glabrous corymbs; fruit, globose, bright red, 3/4-1 in. across, with the calyx-lobes very small and conical. May, June. Newfoundland to Manitoba, south to Mich. and N. C. S.S. 4:171, 172. - *Var. microcarpa*, Torr. & Gray (*S. microdonta*, Pursh). has narrower foliage and very small fruits about 1/2 in. across.

4. *Sambucifolia*, Roem. (*Pyrus sambucifolia*, Cham. & Schlecht.). WESTERN MOUNTAIN ASH. Small tree or shrub closely allied to the preceding; flowers 7-15, ovate to obovate-lanceolate, obtuse to short-acuminate, sharply serrate, glabrous and dark green above, glaucous and usually pubescent beneath when young, 1 1/2-2 in. long; flowers 1 1/2-2 in. across, in 2-4-in. broad and rather loose corymbs, sometimes few-flowered; fruit, globose, ovoid when young, red, about 1/4 in. across, with more or less upright calyx-lobes. June, July. Labrador to Alaska south to Pa., Mich. and Calif.; N. E. Asia and Japan. S.S.
4:173, 174.—A very variable species; the eastern form resembles more the preceding species, and intermediate forms are not uncommon in the northeastern states. The most distinct form is var. Grayi, Wenz. (var. quin-
ilia, Sarg. *Pyrus occidentalis*, Wats.). Shrubby: Ifts. 7–11, oval to oval-oblong, obtuse, with only a few teeth at the apex, bluish green; corymb 1–2 in. across. Wash. to Calif. G.F. 10:85. *S. ambliculata* is often
ovate to ovate-oblong Ivs., somewhat more deeply lobed, 2½–4 in. long, with 8–10 pairs of veins, Ifts. and lobes broader and obtusish, with the veins usually curving upwards. This is known in gardens as *S. quer-
cifolia* hybrid naana. Var. decurrens, Koehne (*S. long-
ginosa*, Hort., not Kit.), is a transition to *S. Aucupa-
ria*; only the 3 or 5 upper Ifts. are connate into a ter-
minal Ift., which, like the upper separate Ifts., is decur-
rent at the base, under side less densely tomentose. In
some nurseries under the name of *S. ambliculata*.

7. spária, Pers. (*Pyrus heterophylla*, Dur. *S. Aucupa-
ria × arbutifolia*). Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches: Ivs. ovate to oval-oblong, obtuse, with 2–6 lobes near the base, simply crenate-serrate toward the apex, 1½–3½ in. long, pubescent on glabrous beneath: Ifts. white or pinkish white, in pubescent or glabrous cory-
mb 1½–2 in. broad: fr. subglobose or pear-shaped, dark purple or almost black. May, June. Of garden
origin. E.R. 14:1196.—Sometimes cultivated under the
name of *S. querifolia* floribunda naana. Hybrids of dif-
ferent origin are usually united under *S. spária*; the
more pubescent forms with dark purple fr. are probably
the offspring of *S. Aucuparia* and *S. arbutifolia*, while
the more glabrous forms with usually blackish fruit have
*S. Aucuparia* and *S. melanocarpa* as their parents.
A similar form with quite glabrous and more pointed
Ivs., originated at the Arnold Arboretum and probably
a hybrid of *S. Americana* and *S. melanocarpa*, was
named *S. Silveryti*, Dipp.

*(Terminaria group, species No. 8.)*

8. terrnálías, Craun. (*Pyrus tormínális*, Ehrh. *Ter-
minária tormínalis*, Dipp. *T. clíssis*, Rem.). WILD
SERVICE TREE. Round-headed tree, 30–60 ft. high:
winter-buds glabrous; petioles tomentose; Ifts. 11–17,
obovate-oblong to oblong, sharply and rather coarsely
serrate, with acuminate teeth, usually entire near the
base, green and glabrous above, floccose-tomentose be-
neath, at least when young, 1½–2½ in. long: fr. white,
¾ in. across, in broadly pyramidal rather loose tomen-
tose corymbs: fr. ½–1¼ in. across, usually yellowish,
with red or orange cheek, apple-shaped in var. *pyrifo-
mis*, Lodd.: pear-shaped in var. *pyriformis*, Lodd. May–
M.D.G. 1897:376–378.—This species is often confused
with the European ash, from which it is almost indis-
istinguishable without fruits or flowers, except by the
glabrous winter-buds.

intermédia*, var. latifólia, Ser. *P. Aria*, var. latifólia,
H. *Terminária latifólia*, Dipp. *P. Aria × tormín-
lis*). Tree, attaining 50 ft., similar to the preceding:
Ivs. broadly ovate to ovate, usually rounded at the base,
plumply lobed with short, broadly triangular, sharply
serrate lobes and with 4–6 pairs of lobes, or whitish
or whitish tomentose beneath, 2½–4 in. long: petioles
½–1 in. long: fr. about ¾ in. across, in broad, tomen-
tose corymbs: fr. globose or globose-ovoid, about ¾ in.
high, orange to brownish red. May, June. Occasionally
occurring in middle Europe.

3252. Sorbus Americana (X½).

confounded with the preceding species; both are very
handsome in autumn with their large clusters of bright
red fruits. Sometimes a form of *S. hybrida* is found in
American nurseries under the name of *S. ambliculata*.

*(Cormus and Hybrid group, species 6–7)*

5. doméstica, Linn. (*Pyrus Sórbus*, Gerin. *P. do-
Tree. Fig. 2353. Round-headed tree, 30–60 ft. high:
winter-buds glabrous; petioles tomentose; Ifts. 11–17,
obovate-oblong to oblong, sharply and rather coarsely
serrate, with acuminate teeth, usually entire near the
base, green and glabrous above, floccose-tomentose be-
neath, at least when young, 1½–2½ in. long: fr. white,
¾ in. across, in broadly pyramidal rather loose tomen-
tose corymbs: fr. ½–1¼ in. across, usually yellowish,
with red or orange cheek, apple-shaped in var. *pyrifo-
mis*, Lodd.: pear-shaped in var. *pyriformis*, Lodd. May–
M.D.G. 1897:376–378.—This species is often confused
with the European ash, from which it is almost indis-
istinguishable without fruits or flowers, except by the
glabrous winter-buds.

6. hybrída, Linn. (*Pyrus pinuatífla*, Ehrh. *P. Fú-
ícia*, Babington. *S. intermédia × Auviparía*). Tree, at-
taining 40 ft., of regular, pyramidal habit with upright
branches: young branches and petioles whitish tomen-
tose; Ivs. ovate to oblong-ovate, with 1–4 pairs of de-
current Ifts. at the base, or but plinately lobed, upper
part lobed with the lobes becoming gradually shorter
and more indistinct toward the apex, dark green above,
whitish or grayish tomentose beneath, 2½–5 in. long;
petioles about 1 in. long: Ifts. ½–2¾ in. across, in tomen-
tose corymbs about 3 in. broad: fr. globose-ovoid, ¾ in.
high. May, June.—Natural hybrid, occasionally found
with the parents in Europe. Two different hybrids are
usually included under *S. hybrida*; the typical one is
*S. Aucuparia × intermédia*, which has the Ivs. oblong-
ovate to oblong, 3–5 in. long, with 10–12 pairs of veins,
the Ifts. and lobes narrower and pointed and the veins
often slightly recurved. It is mostly cult. under the
name of *S. querifolia* or *querifoloides*, Hort. The second
hybrid is var. *Thuringiaca*, Rehd. (*Pyrus Thuringiaca*,
Ilse), and is a hybrid of *S. Aucuparia × Auvia*; it has
pinnately lobed with broad and short, irregularly serrate lobes and 5-8 pairs of veins, whitish tomentose beneath, 2½-4 in. long; petioles ½-2½ in. long: fls. about ½ in. across, in broad, terminal, lacy panicles; fr. orange-red, globular, about ½ in. high. May, Northern and middle Europe.—This is sometimes confused with *S. hybrid* and considered to be a hybrid of similar origin, but it is certainly a good species. It never bears distinct leaves at the base and the sinuses do not reach farther than one-third toward the middle.


12. *Aria*, Crantz (*Pyrus Aria*, Ehrh. *Aria nivea*, Hort. *Aria Hahnia*, Aria Med.). White BEAM-TREE. Fig. 2354. Tree, with broadly pyramidal or oval head, 50-50 ft. high: lvs. roundish-obovate to oblong-ovate, usually cuneate at the base, acute or obtuse at the apex, sharply and doubly serrate, of firm texture, bright or dark green and glabrescent above, white-tomentose beneath, 2½-5 in. long: petioles ½-2½ in. long: fls. ½-1½ in. across, in tomentose, 2-3-in. broad corymb: fr. subglobose, orange-red. about ½ in. high. May, Middle and southern Europe to Himalayas and Siber.—Debris of the tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and under sides of the leaves. Several varieties are known. Var. *Crética*, Lindl. (*Aria Greca*, Decne.). Lvs. orbicular, obvate, coarsely doubly serrate, 1½-3 in. long, with 6-10 pairs of veins. Southern Eu. Var. *Decaisneana*, Rehd. (*Aria Decaisneana*, Lav. *Pyrus Decaisneana*, Nichols.). Lvs. elliptic to oblong-ovate, acute, irregularly doubly serrate, 3-6 in. long: stamens longer than petals fr. oval. Probably from the Himalayas and sometimes cult. as *S. nepalensis*. Var. *édulis*, Wenzig (*Pyrus édulis*, Willd.). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2½-5 in. long: fr. oval, ½-¾ in. high. There are some garden forms, as *var. æren*, *chrysophylla* and *lute- cens*, with more or less yellow foliage.

(*Aronia group, species Nos. 13 and 14.*)


14. *melanocarpa*, C. Koch (*Pyrus nigra*, Sarg. *Aronia nigra*, Koehne. *Pyrus arbutifolia*, var. nigra, Willd.). Bigbrush. Closely allied to the genus *Aronia* and usually lower: lvs. oval to obvate, abruptly acuminate or obtuse, pale green and glabrous or nearly so beneath: calyx and pedicels glabrous or nearly so: fr. globose, about 1½ in. in. Nova Scotia to Ont., southern to Fla. and Mich. April-June. B.B. 2:237. Var. *grandifolia*, Dipp. (*Pyrus grandifolia*, Lindl.). has larger, obovate or broadly obovate lvs. and larger fls. B.R. 12:1209 as *Pyrus floribunda*, Lindl.; similar forms are found wild occasionally in the northeastern states. Both species are handsome shrubs; *S. melanocarpa* is prettier in foliage and bloom, while *S. arbutifolia* has showier and usually more numerous fruits. The fruits of both species remain on the branches during the winter.

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**SORGHUM**

*SORGHUM*. The genus *Sorghum* is referred to anthropogeny by Haeckel and others, and its botanical relations are discussed under that name. It forms a section of that genus, only one species of which is of economic importance. The various cultivated varieties known as *Sorghum*, *Broom Corn*, *Kafir Corn*, *Jerusalem Corn*, *Milho Maize*, *Durra*, etc., are considered as having been
SORGHUM

SOUTH CAROLINA. HORTICULTURE IN. Fig. 2355. Owing to the combined influence of varieties of soil, latitude and elevation, the climatic conditions of South Carolina and the range of horticultural productions are remarkably varied. With respect to amateur and commercial horticulture, this state may be divided into four belts by lines drawn roughly from southwest to northeast.

1. The coast region, embracing a tier of counties bordering the Atlantic ocean and a number of fertile islands, is especially adapted to commercial horticulture. A considerable area is devoted to growing early vegetables to supply the large cities of the northeastern states. The thermal species grown are melons, strawberries, Irish potatoes, cabbage, asparagus and beans. The Hoffman and Neuman varieties of strawberries, which are especially adapted to this region, are also grown for market. The sweet potato for compact shipment seem to open the way for carrying this vegetable to all parts of the world. This section is especially adapted to the fig, the oriental types of pears and plums and to the early varieties of peaches and apples. While affording every facility for commercial horticulture, there is, perhaps, no part of the globe where an abundant supply of fruits and vegetables may be more easily and continuously provided for domestic use. Fresh vegetables in season may be gathered from the garden every day in the year.

2. The Hill Belt, fifty miles in width, stretching across the state from Georgia to North Carolina, is more varied in soil and elevation, affording a wide range of soil products. In some sections of the Hill Belt rapid strides have been made in peach- and melon-growing for market. From a limited area around Ridge Springs 150 car-loads of peaches were shipped in 1906; from this section also large shipments of melons and asparagus are made. The rapid development of manufactures has created a home market for large quantities of fruit and vegetables. Grapes of superior quality are grown throughout this belt. Standard Labrusca, grapes, such as Delaware, Concord and Niagara, are remarkably exempt from diseases which are more destructive in other sections. The Rotundifolia family, or southern fox grape type, most commonly known from number-colored varieties, are especially well adapted to this section. Other varieties of the same family are more productive than the Scuppernong, such as the Mish Memory, Tender Pulp, Thomas, Jones and Flowers. Berries of some of these varieties adhere to the stems and grow in bunches of from 16 to 24 grapes, hence may be readily shipped as the Delaware. When trained upon vertical trellises and pruned in early fall, the yield far exceeds that of any other type.

3. The Piedmont and Alpine regions, ranging in elevation from 400 to over 3,000 feet, vary even more than the hill country in variety of products to which it is

SORREL. Various species of Rumex (which see) produce large, thick, acid leaves which are prized for salads or for mashing. Leaves of some of the native or naturalized species are gathered as pot-herbs in many parts of the country. In the Old World, however, several species are regularly cultivated in kitchen-gardens; in this country these cultivated species are relatively little known. They are perennials of the very easiest culture. Usually they persist for a number of years after well established, giving an abundance of soft edible leaves early in the spring when herbage is scarce. They are usually grown from seeds, and plants fit for cutting may be had when the plants are one or two years old. Plants should be placed at one side of the garden where they will not interfere with the regular tillage. No special treatment is demanded. When they begin to show signs of failing, new plants should be started or the old ones may be taken up and divided. The rows should stand about 18 in. apart. Do not let the plants exhaust themselves by seed-bearing. The Spinach Dock (Rumex Patientia) is one of the best and earliest. Belleville (Rumex Acetosa) is also an excellent plant for the home garden and has the advantage of following the other as a succession. Various other species may be had of European seed dealers. See Dock. L. H. B.

SORREL TREE. Oxydendrum.

SORREL WOOD. Ozalis Acetosa.

SOUR GUM. See Nyssa Sylvestris.

SOUR SOP. Anona Nucifera.

SOUR WOOD. Oxydendrum.
adapted. The cherry, peach, pear, grape, small fruits and apple afford a tempting variety. The succession of fruits spans the seasons, the winter apples lasting until strawberries are ripe. While little has been done in this great region toward growing fruit and vegetables for shipment, the cotton mills, so numerous in this section, have converted the farms in their vicinity into market-gardens. The typical mountain wagons, hooded with white canvas, laden with luscious apples, mammoth cabbages, early potatoes and fragrant onions, products of the rude methods of the inhabitants of the highland region, are only suggestions of the possibilities of the fertile valleys and mountain coves under the manipulation of skilful hands guided by the trained head.

**SOUTH DAKOTA, HORTICULTURE IN.** Fig. 2356. South Dakota, the twenty-seventh state admitted into the Union, lies a little north of the center of the continent, between lat. 42° 57' N. and 43° 28' S. and long. 96° 26' and 104° 3' W. of Greenwich. Its shape is approximately a rectangle. Its extreme length from east to west is 386 miles; extreme breadth north to south 240 miles; area 76,615 square miles; population (in 1900) 401,570. The Missouri river divides the state into two nearly equal portions. With the exception of a small area in the northeast corner, the southeast part is lowest and all the streams flow in that direction. The state may be divided into three sections: (1) the Black Hills; (2) the Table-lands; (3) the Eastern Section.

The Black Hills in the southwestern part are outliers of the Rocky Mountains, and the extensive and very rich deposits of gold, silver, and other minerals are important sources of wealth. The Indians early knew of these gold deposits, but they were not known to white men until 1874. The Black Hills, so named by the Indians because of the heavy forests of pine and spruce covering the mountains, embrace an area of about 5,000 square miles. Considerable fruit is now being raised in this section under irrigation, as the local market is a profitable one, and it has been found possible to raise many varieties not hardy upon the open prairies of the state.

The Table-lands comprise the entire section of the state west of the Missouri river, with the exception of the Black Hills. Five branches of the Missouri flow from the western part of the state across these lands from west to east. They are White, Bad, Cheyenne, Missouri or Owl, and Grand rivers. The rainfall in this part is too light to make general farming feasible, but the native grasses are very nutritious and stock-raisin is profitable. Horses and sheep are raised in immense numbers and feed the year round upon these ranges, the dry climate curing the grass into the best of hay as it stands.

The eastern section contains three river valleys that cross it from north to south, viz., the eastern half of the Missouri, the James river valley and the Big Sioux river on the eastern border. In the southern part the valley of the Vermillion traverses the region between the Sioux and the James. These river valleys are all very fertile and blend together as they reach the Missouri at the south. Diversified agriculture flourishes in these rich valleys, especially in the southern and entire eastern part of this section. In the higher ground in the northern and western part, stock-raisin and dairying are the main industries owing to the lesser rainfall. Since the defining of the artesian-well basin, general agriculture has been encroaching upon the grazing areas. This basin reaches from the Missouri river eastward to some distance beyond the James. The pressure and flow of these artesian wells varies from a few pounds to 200 pounds per square inch. A flow of more than 3,000 gallons per minute has been obtained from an 8-inch well. These wells are from 100 to 1,500 feet in depth, and afford a valuable means of irrigation and cheap water-power. The water is supposed to come from the Rocky Mountain region. The amount of this supply which can be used has been roughly estimated at 326,885,600,000 cubic feet annually, an amount of water sufficient to fill a river-bed a mile wide, 20 feet deep and nearly 600 feet long. When this water is more generally utilized, it is confidently believed that the horticultural area shown on the map will be extended to include the entire state east of the Missouri river.

Horticulture in South Dakota is to a considerable extent still in the experimental stage. Most of the plant-
river valleys considerable fruit is grown as far north as the Minnesota line. North of this the orchards are few and far between, the country being new and gradually becoming covered by sod and dairying affording more profitable sources of income.

In making up a list for planting throughout the state, it will be a safe rule not to plant any variety less than the Oldenburg and other healthy, experimentally proved grades, as the planter desires a long-lived, fruitful orchard and cannot afford to experiment. The State Horticultural Society recommends the following for trial or general culture of the few hardy varieties in the various districts: viz., Oldenburg, Hibernian, Charlamoff, Wealthy.

The largest orchard in the state is in Turner county, consisting of 7,000 acres on about 132 acres. This orchard was planted in the early seventies and still yields profitably. About 4,000 acres of these are Wealthy and most of the remainder Oldenburg.

Considerable trouble is experienced from root-killing of the common apple seedling stocks. In the northern part of the state, apple root-grafts root-kill every winter unless deeply mulched. The winter of 1898-99 will long be remembered as the "root-killing" winter by the fruit men of several northwestern states. Efforts are now being made to remedy this trouble by testing the Russian method of preventing root-killing; viz., the use of the pure Siberian crab (Pyrus baccata), as a stock. If the experiments are successful apple culture will be practicable in both Dakotas and in a part of the Canadian prairie provinces.

In this connection, as everything below ground should be Siberian. (See Bull. 65 of S. D. Exp. Sta., and Am. Pom. Soc. Report, 1899, p. 143.)

Of plants, only those of the Americana type, such as DeSoto, Wyant, Wolf, Forest Garden, Rollingstone and Hawkeye, are of any value for general cultivation. However, in the southern tier of counties already mentioned, the Minnesota type of Americana is indigenous throughout the state. Many varieties from the native thickets are being grown by the prairie settlers, and these will probably supersede the varieties named above, which originated in Iowa, Minnesota and Wisconsin. Plans rightly managed arc very profitable and the general interest in them is increasing.

The main trouble hitherto has been the tender stocks upon which the hardy natives have been worked, Myrobolan, St. Julien, Marianna, Southern Chickasaw, peach, and other southern stocks all winter-kill, leaving the hardy top to die. Such trees are a delusion and a snare to theprairie planter, and this fact is becoming more generally known. The hands that are not on the tender stocks or their own roots find favor, as no trouble is then experienced from root-killing.

The western sand cherry (Prunus besseyi), a native of the state, is being tested as a stock at the Experiment Station at Brookings. So far their observations are that it will be worthy of use as a dwarf stock for amateur use, the trees being dwarfed and bearing fruit at an early age. It is of some promise as a dwarf stock for peaches, such trees being of suitable size for convenient covering in winter or for growing in boxes.

Of other orchard fruits, pears, quinces, apricots and peaches find no place on the South Dakota fruit list. Cherries are grown to a small extent in the southern counties, but the crop is uncertain in most parts. Raspberries can be grown with winter protection. Blackberries are not as hardy as raspberries. Strawberries are considerably grown in the southern part of the state, and irrigation is found profitable, as it assures a crop in dry seasons. Grapes are grown to some extent in the southern part of the state, but northward suffer severely from winter-killing and are not on the fruit list recommended for that part of the state. Janesville, a Labrusca x riparia (vulpina) hybrid, has been found to be harder than those of the Concord type. It is probable that new varieties of grapes adapted to the prairie northwest will be produced by plant-breeding, notably in the species Vitis riparia, as a foundation. Toward this end about 5,000 wild grape seedlings were grown by the Experiment Station at Brookings in 1900, and this work of plant-breeding is being conducted on a large scale.

Over 27,000 seedlings of various native fruits were raised at this station in 1899-1900. The wild fruits are being crossed with tame whenever possible, but the main reliance is placed upon pure selection, acting upon the theory that "excess of food causes action." The following native species have been taken in hand in this plant-breeding work: sand cherry, choke cherry, pin cherry, black currant, gooseberry, buffalo, hawthorn, black raspberry, cranberry, Juneberry, plum, red raspberry, black raspberry, and strawberry.

The work with cultivated fruits is mainly with the apple, an attempt being made to combine the hardiness of the Russian varieties with the fruitfulness and keeping capacity of the best American winter varieties. Several Siberian fruits have also been taken in hand. These were picked up by the writer in 1897-98 when sent on a ten months' tour of exploration in eastern Europe and western Asia by U. S. Department of Agriculture Hon. James Wilson. The state Legislature in March, 1901, granted an appropriation of $10,000 for a "plant-breeding building," for improved facilities in the breeding of horticultural and agricultural plants.

Of conifers, the hemlock, white pine, balsam fir, arborvitae and Norway spruce fail on the open prairie, while Jack pine, bull pine, Scotch pine, northern red pine, balsam fir and spruce all do well in open exposure. Of deciduous trees, the native species, such as ash, elm, box elder, black wild cherry and hackberry, all do well. Cottonwood and willows do well on marsh land. Considerable fruit has been experienced in the early spring from failure to recognize the fact that species covering a wide geographical range vary greatly in hardiness and that the local indigenous form should be planted when possible.

Horticulture is still in its infancy, there being very few greenhouses in the state. The rich soil makes it easy to raise large crops of vegetables, but so far the trucking industry is assumed of no importance, except near the larger towns. Agriculture has been extensive, rather than intensive. In a state yielding heavy crops of wheat and other cereals, with a soil so rich that commercial fertilizers are not thought of and barnyard manure so little considered that many farmers prefer to move their barns rather than their manure heaps, and with the burning of straw a common practice, the hoe is rarely seen; gang and sulky plows, self-binders and riding cultivators are the more favored implements. In the course of time, with the increase in population, will come a change in methods. Eastern farmers and gardeners find that the soil and climate demand different methods of cultivation.

The list of hardy trees and shrubs would be much longer were it not for the fact that the severest freezing often comes when the ground is bare.

The State Agricultural College at Brookings is the fifth ranking in the country. So far the attendance being about five hundred. The United States Experiment Station is in connection with the college and is busy with the problems presented in a new state. Farmers' institutes and home reading courses are provided to help in the dissemination of agricultural knowledge.

The South Dakota State Horticultural Society is composed of the amateur and professional fruitmen of the state and is an earnest body of workers striving to solve the problems presented to prairie horticulturists. No state appropriation has been granted hitherto, so that the proceedings at present are published from time to time in the agricultural press of the state. The third annual meeting was held at Sioux Falls, January 22-24, 1901. The dry climate is very salubrious, and many people suffering from poor health in warmer and moister sections find relief here.

South Dakota, "The Sunshine State," presents numerous pressing problems as to varieties and methods of cultivation. The latter are being rapidly solved. As to hardy varieties, the modern are rapidly replacing the old. The period of plant-breeding will mark a revolution in the period of evolution. Millions of seedlings will be grown and many species bred together. It is only reasonable to believe that from the ashes of these millions of seedlings, will arise, Phoenix-like, the "new creations" which will dominate our future prairie pomology.
SOUTHERNWOOD

SOY BEAN (Glycine hispida, which see for botanical account) is a European herb, aromatic, much branched, woody-stemmed, rather tender, perennial, 3-5 ft. tall, with pale green or greyish often variegated leaves, small yellowish flowers and minute seeds. Fig. 2357. It is occasionally found in family gardens, where it is grown from seed (or more often from its easily rooted cuttings, which are most readily obtained in early summer) for its pleasant taste and tonic properties, which resemble those of wormwood. It is seldom offered by seedsmen in this country because of its slight importance.

S. H. "

SPARAXIS

SPARAXIS (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Tritonia). Iridaceae. WAND FLOWER. Sparaxis is a group of spring-blooming "Cape bulbs" of the Ixia tribe, with spikes of 6-petaled, more or less funnel-shaped flowers one inch or two across, exhibiting an extraordinary range of color and throat markings. These plants are less popular than Ixias, which they much resemble. The plants are dwarfer and more compact than Ixias, usually 6 to 12 in. high, the spikes are shorter and fewer-flowered, and the blossoms are sometimes larger. Sparaxis is essentially distinguished from Ixia and another allied genera by the subregular perianth, unilateral and axillary stamens, and sessile, lacerated spathe-valves. Other general features are: the rootstock a corn; lvs. linear or lanceolate and arranged in a basal rosette; inflorescence a simple or panicked spike; perianth-tube short; ovary 3-celled; ovaules many, superior. Sparaxis is native to the southwestern provinces of Cape Colony, S. Africa.

Although a few plants of Sparaxis are occasionally cultivated in America by bulb fanciers, one may search through many American catalogues without finding them listed. The Dutch bulb growers offer 25 distinct kinds, which is perhaps a quarter of the number of varieties of Ixias in cultivation. According to J. G. Baker, there is "only one species in a broad sense, varying indefinitely in the size and coloring of the flowers." For practical purposes Baker recognizes the 3 species given below; of these the most important and variable is tricolor.

**Sparaxis pulcherrima** of the Dutch trade is properly Dierama pulcherrima, Baker. This grows 6 ft. high or more and has pendulous fls. bright blood-purple but apparently with pale rose, perhaps other varieties (also a white var.). It is distinguished by its pendulous fls. with regular perianth, simple style-branches, equilateral stamens, and large bracts which are not facinate. B.M. 555. P.S. 17:1810. Gn. 29:315; 44, p. 291. This plant is said by F. W. Burbidge to be "perhaps the most graceful of all the Cape Irises."

A. **Throat of flower same color as segments.**

B. Fls. small; segments ½-3¼ in. long,..........................1. bulbifera

BB. Fls. larger; segments 1 in. or more long,..........................2. grandiflora

AA. **Throat of flower bright yellow, often**

with a dark blotch on the lower part of each segment,..................3. tricolor

**bulbifera**, Ker. Corn globe, ½-3¼ in. thick; basal lvs. about 4, linear or lanceolate, ½-1 ft. long; stems ½-1 ft. long, simple or branched, bearing low down 2-3 small lvs., often with bulbs in the axils; fls. solitary or few in a spike, yellow; perianth-tube ½ in. long.

**grandiflora**, Ker. Habit, corn, lvs. and spathe just as in *S. bulbifera* but the fls. larger, the limb 1 in. or
SPARAXIS

SPARCOXIS

more long, usually yellow or purple, and larger anthers. B.M. 779 (fls. primrose inside, flamed purple outside). B.R. 3:258 (fls. white inside, midvein on the back purple). B.M. 541 (Ixia grandiflora). Fls. rich purple, margined lighter. According to Baker, the principal named forms are: atropurpurea, dark purple; anemonella, pale yellow; Liliago, white, flushed with claret-purple outside; and stellaris, dark purple, the segments narrower than the type, oblongate and acute rather than oblong.

tricolor. Ker. Fig. 2358. Differing from N. grandiflora only in the color of the flowers, which are very variable but always have a bright yellow throat and often a dark blotch at the base of each segment. B.M. 4182; 381 (Ixia tricolor). F.S. 2:124. F. 1843:213 (S. pieta, purpurea, pulchella). According to Baker, this is the favorite species among cultivators. It certainly has the greatest variety of colors and markings. In the works cited the floral segments range from nearly white through rose, brick-red, carmine, crimson and light purple to dark purple, excluding blue and yellow, which latter color usually appears in the throat.

SPARGÁNIUM (Greek, fillit; referring to the ribbon-like lvs.) TYPHACEAE. BUR-REED. Bur-reeds are marsh herbs closely related to cattails but with flowers in globular heads instead of oblong spikes. Three hardly perennial kinds are advertised by collectors of native plants and one or two are procurable from specialists in aquatics. Bur-reeds are desirable only in bog gardens or in wild gardening situations. The beauty of these plants often lies in each species being massed alone, as well as in the mixing with other plants.

Sparganiums have creeping rootstocks and fibrous roots. Some are floating plants. Stems branched or not: lvs. linear, alternate, sheathing at the base: fls. monoeccious, in globose heads, the staminate uppermost; fr. sessile or peduncled, mostly 1-seeded and nut-like.

A. Inflorescence unbranched.

simplex. Huds. Stems weak and slender, 1½-2 ft. high, unbranched; lvs. more or less triaenous; staminate heads 4-6: pistillate 2-6, 5-8 lines in diam.: fr. stalked. June-Aug. N. Amer. B.B. 1:64.

AA. Inflorescence branched.

B. Height 2-8 ft.


BB. Height 2-3 ft.

ramosum. Curt. Lvs. flat: heads 5-9, disposed in axillary and terminal, interrupted spikes, the lowest one larger and pistillate, the others wholly staminate, terminating heads 8-10 lines in diam. July. Southern U. S., particularly in mountain bogs.

SPARRÁNIDA (after Andreas Sparmann, who visited the Cape with Thumberg). Tiliaceae. These 5 species of African shrubs or trees with cordate, dentate or lobed leaves and white flowers in terminal, umbeliform cymes: sepal 4; petals 4, naked at the base; Stamina several, free, the anther-bearing ones interior, the staminodia exterior: capsule globose or ovoid, spiny.

S. Africana is of easy treatment under glass in a temperature never lower than 35°, with plenty of air and light. The plants are benefited by being plunged in the garden during the summer and syringed during dry weather. Plants should be potted early in spring. The tips of young shoots root readily with 60° of heat.

A. Lvs. deeply 5-7-lobed.

palumá, E. Mey. A slender shrub much smaller in all its parts than S. Africana: branches half herbaceous: lvs. on long petioles, the bases long-bladed, the stems finely incised sinuate and unequally toothed, prominently 5-7-nerved below: lvs. white or purplish, densely arranged on the subterminal peduncles: capsule 4-celled. Cult. in S. Calif.

AA. Lvs. not lobed.


F. W. BARCLAY.

SPARWÁNIA (Greek, fillit; referring to the ribbon-like lvs.) Asparagus. A large genus of perennials, rather hardy, with long, slender, starchy roots, which are easily propagated by cuttings. The flowers are white, yellow or purple, appearing in erect racemes, with a purple calyx. The plants are suitable for planting in the garden, and are very ornamental. The leaves are of a deep green, and the flowers are borne on long stalks, rising from the ground. The fruit is a pod, containing several seeds. The plants are propagated by cuttings, which are inserted in a warm greenhouse, or in a cold frame, in the spring. The best time for planting is in the fall, or in March. The soil should be rich and sandy, and the plants should be transplanted when they are about 3 feet high. The SPARROW-GRASS. Provincialism for Asparagáta.

SPARTINA (Greek, spartín, a cord; on account of the tough leaves). GRAMINEAE. Species 7. Perennial marsh plants of various parts of the world, most or all of which are found in the United States. Culms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inwards: spikelets in two series along the triangular rachis: spikes 2-4 several in a raceme.

cynosoroides. Willd. FRESH-WATER CORD-GRASS. In the West known as "Slough-grass." A common coarse fresh-water marsh grass, occurring across the continent in the northern states. Recommended for cultivation along the margins of ponds and artificial lakes. Procurable from collectors.

A. S. HITCHCOCK.

SPÁRTIUM (Greek spártos, the ancient name of the plant). Syn. SPARTHIDIÁS, LEGUMINÁCEAE. Ornamental shrub, with long and slender green branches, small and sparse foliage, and showy papilionaceous yellow fls. in terminal racemes. It is a handsome shrub especially adapted for warmer and drier regions; in the East it is probably hardly as far north as Philadelphia. It becomes naturalised easily, as happened in several localities in S. America, whence it was afterwards described as S. Americanum, Meyen. It grows in almost any kind of well-drained soil and is well suited for planting on exposed sandy and rocky situations. Prop. by means of greenwood cuttings under glass. Ornaments the species in the Mediterranean region and the Canary Islands. Allied to Genista and Cytisus, but chiefly distinguished by the 1-lipped calyx: lvs. simple: fls. in terminal, loose racemes: calyx split, armed. About 55 species of African shrubs or trees with cordate, dentate or lobed leaves and white flowers in terminal, umbeliform cymes: sepal 4; petals 4, naked at the base; Stamina several, free, the anther-bearing ones interior, the staminodia exterior: capsule globose or ovoid, spiny.
SPARTHUM

fiber, which is used in S. France and Spain for making ropes, cords and cloths. Many species of Cyttisus and Genista were formerly referred to this genus. For Spartium Juncinum, Biv., S. tricus, Poit., S. monopera-
mum, Linn., S. radicans, Linn., and S. virgatum, Alit., see Genista; for S. purgans, Linn., and S. scopariun,
Linn., see Cyttisus; Spartium muticum, Ait.=Cyti-
salus.

Juncinum, Linn. (Genista juncinae, Lam. Spartidincus junci
cus, Link.). Spanish Broom. Upright shrub, 10 ft.
high, with slender, terete, green, rush-like branches
sparingly leafy or almost leafless; lvs. oblong-lanceolate
to linear, entire, bluish green and sparingly appressed
pubescent, 3-14 in. long; fls. fragrant, yellow, about 1 in.
long, with ample standard; pod linear, pubescent,
2-3 in. long. June–Sept., in Calif, blooming almost the
Gn. 29. p. 404; 34, p. 284; 44, p. 57.—There is a double-
fl. form.

SPATHIPHYLLUM (Greek word, referring to the leaf-like spathes), Arcece. About 20 species of nearly
stemless plants, mostly from tropical America, with
large, oblong or lanceolate, acuminate or cuspidate,
long-petioled leaves and flowers on a long-peduncled
draceme, subtended by an oblong or lanceolate, leaf-like,
white, persistent, flat spathe: stigma 3-4-lobed: ovules
in each locule 2-8, fixed at the interior angles of the
cells. Gardeners recommend as soil for their culture a mixture of
leaf-mold, peat and fibrous loam, together with some sand and charcoal.

A. Spathe less than 4 in. long.
B. Lvs. 2-3 in. wide.

Heribundum, N. E. Br. Petioles 4-6 in. long; leaf-
blade oblong-elliptical or oblong-lanceolate, very
sharply acuminate, abruptly obtuse and contracted into
a node at the base, dark green above, lighter beneath;
spathes oblong-lanceolate, long-cuspidate acuminate,
about 2 1/2 in. long by 1 in. wide, white; spadix white,
a little shorter than the spathe. Colombia. I.H. 21:159.
F. 1859, p. 76.

B. Lvs. less than 2 in. wide.

C. Scape thickened and curved below the spathe.

Candidum, N. E. Br Petioles 3-5 in. long, minutely
speckled with white; leaf-blade narrowly oblong-lan-
ceolate, 4 1/2-6 in. long by 1-1 1/2 in. wide, acuminate at
 apex, base cuneately rounded, bright green above, paler
beneath: spathe erect or spreading; according to amount
of curve in scape, oblong-lanceolate, acuminate,
3 1/2 in. long, 1 in. broad, white on both sides; spadix
shorter than the spathe. Colombia. F. 1879, p. 19.

cc. Scape straight.

Patini, N. E. Br. Petioles slender, terete, often much
longer than the blade: leaf-blade long-lanceolate, 6-8
in. long, acuminate at both ends; spathe oblong-lan-
ceolate, very long-acuminate, white except for the green
costa, spreading or recurved; spadix long stipitate (5
lines), a little shorter than the spadix. Colombia. I.H.
27:297.

AA. Spathes over 4 in. long.
B. Petioles 20 in. or more long.

Cocchearispatum, Engl. (S. heliconiaphyllum, Schott).
A large plant: lvs. broadly oblong, 20-30 in. long,
shortly acute, the base rounded or cordate; spathe
ovate or oblong-ovate, narrowly cuspidate, somewhat
decurrent on the peduncle, 8-12 in. long; spadix 3-4 in.

BB. Petioles 5-10 in. long.

Cc. Spadix 2-5 in. long.

Candidas, Poepp. (S. canaliculatum, Schott). Leaf-
blades broad-lanceolate to oblong-lanceolate, 10-16 in.
long, acute or acuminate, base somewhat cuneate, acute,
deep green above, paler beneath; spadix 4 1/2-7 in.
long, oblong-lanceolate, acuminate, white on the face, green,
possibly rarely white, on the back: lvs. odorous, West
Indies, Colombia. B.M. 663 (as Pothos canaliculatus).

Cc. Spadix 2 in. long.

Hybridum, N. E. Br. A hybrid between S. candidas,
Poepp., and S. Patini, N. E. Br. Petioles 6-8 in. long;

leaf-blades broadly lanceolate to oblong-lanceolate, acu-
minate, 8-9 in. long: spathe white on both sides, lan-
ceolate, acuminate, 4-5 in. long; spadix 2 in. long. I.H.

F. W. BACILAY.

SPATHOSLITTIS (Greek, spathe and tongue: said
to refer to the shape of the lip). Orchidaceae. Plants
agreeing with Bletia in habit and form of inflorescence:
pseudobulbs broadly conic, 1-2 in.: lvs. elongate, long-
petioled, narrow, plicate, articulated: spadix lateral,
bearing large fls. in a terminal raceme: sepals free,
subequal; petals similar or broader and longer; label-
llum not spurred, lateral lobes somewhat convolute, mid-
dle lobe clawed: column slender: pollinia 8. About
10 species in Asia, Australia and the Malay Islands.

Spathoglottides grow best at the warm end of the Cat-
tleya or Brazilian house in a moist, shady location. Pot
culture suits them best, and the compost should consist
principally of equal parts peat fiber and sphagnum
moos with a little chopped sod added; about one-half of
the pot should be devoted to drainage. They all require a liberal
amount of water when growing, but only enough to keep them in sound condition when at rest.
They are rather hard to increase by division and the supply
depends upon new importations.

2359. Spathoglottis Veillardi.

(P×¾)

plicata, Blume. Lvs. 2-4 ft. long, finely acuminate,
scape 2-3 ft. high, with a raceme 6-12 in. long: fls. 1 in.
across, lilac; sepals and petals broad, acute; middle
lobe of the labellum long and narrow, cuneately dilated
at the tip; cali yellow, villous. Malay Peninsula.

aura, Lindl. (S. plicata, Griff.). Lvs. 12-18 in. high.
narrowly lanceolate; scape tall and stout 2 ft. high:
raceme 6-8 in. long: fls. 1 1/2 in. across, golden yellow;
sepals broad, obtuse; middle lobe of the labellum
equaling the falcate lateral lobes, narrowly lanceolate.
Malay Peninsula. G. C. H. 4:83. — The lip varies, being
sometimes broad and reflex at the apex.
SPATHOGLOTTIS

Viéllard, Reichb. f. (S. Augustinum, Reichb. f., Fig. 2339. Lvs. long- lanceolate, acuminate, 1-2 ft. long; scape 12-18 in. high; robust; raceme 6 in. long, broad, corymb-like at first; fls. 2 in. across, very pale lilac, nearly white; sepals and petals ovate-oblong, subacute; label by, as long as the sepals, lateral lobes brown, with orange calli speckled with red, middle lobe narrow, with a broadened tip variable in form. New Caledonia. B.M. 7013. A.F. 12:93. - S. aureo-Virellati, Hort., is a hybrid between this and S. aurea. Fls. pale chrome-yellow, with the sepals slightly and the petals profusely dished with crimson, the tips of the lobes of the lip rich crimson. G.C. III. 23:369. G.M. 41:308.

S. Kiambuthana, Hook. is often regarded as a variety of S. aurea, from which it differs in having the backs of the sepals mottled with red-brown, the crest glabrous, and narrower lvs. B.M. 7143.—S. plecta, var. Michelotii, is described by Sand. Fls. another color, with the segments broader than the type. Habit more dwarf.

Heinrich Hasselbring and R. M. Grey.

SPATHYEMMA (Greek; referring to the spathes). Skunk Cabbage. Skunk Cabbage is an exceptionally interesting plant. In the East, it is the first wild flower of the year, though it is often seen considered a weed that is a flower by those who have neither seen it nor contemt for it. It is a hardy swamp-loving perennial herb which pushes up its fascinating hooded spathes in midwinter or even before the first of January in favored situations. The spathes are 3-8 in. high, usually grow in clumps, and the variation in their coloring is a never-failing delight. They are mottled with purplish brown and greenish yellow, the former color sometimes becoming bright red, the latter ranging from dark green to bright yellow. These spathes are produced several weeks before the leaves appear, and they inclose odd flowers which are described below in detail. Just when the Skunk Cabbage flowers is a matter of much debate; the stamens are generally out in February or March. The hoops retain their beauty for months. In April or May they decay and the strong-growing leaves soon attain a height of 1-3 ft. and a breadth of 1 ft. or more. All parts of the plant give a strong, skunk-like odor, but only when bruised. A young plant uprooted is a picturesque object. Its thick, horizontal rhizome emits great numbers of strong, fleshy, rope-like roots. The presence of the rank foliage of Skunk Cabbage is generally considered a sign of wet, sour soil unfit for gardening.

Skunk Cabbage is offered by a number of dealers in hardy plants, as also by collectors. There is a considerable demand for it outside of its native region, and particularly in England, where the "hog garden" idea has been developed and has the most supporters. Skunk Cabbage has made a strong impression upon American literature. Its hardness and bravery have been

are busy with the pollen while the plant is in flower and that the carrot flies mostly come later. Skunk Cabbage has long been known as Symplecorpus, but this name must give way to the older one given by Rafinesque.

Generic characters: spadix globose or oblong, entirely covered by fls., the ovaries of which are embedded in the spadix; perianth of 4 hooded sepals; anthers 2-celled; style pyramidal, 4-sided: ovary 1-located, with a solitary, suspended, anatropous ovule; berries in large heads, 1-seeded. Only one species.

Fétida, Raf. (Symplecorpus fétideus, Nutt.). Skunk Cabbage. Fig. 2360. Lvs. numery, 1-3 ft. long, 1 ft. wide, ovate, strongly nervet; spathe preceding the lvs., colored as described above: fr. ripe Aug., Sept. Nova Scotia to Minn., south to Fl. and Iow. B.M. 398. Pothos V., fig. 277. A.G. 14:236. — The Siberian plant is probably the same species.

W. M.

SPATTER-DOCK. Nuphar advena.

SPERMINT. See Mentha.

SPÆRWOOD. Eucalyptus doroctyylon.

SPÆRWORT. Certain species of Ranuncula.

SPEČULÁRIA (from Speculum Venus, meaning Venus' Looking-glass). Campanulaceae. Venus' Looking-glass (Specularia Speculum) is a pretty little hardly annual herb with 5-lobed flowers not quite an inch across. The plants grow about 9 in. high and are dense in spring and summer and are desirable for edging flower beds. They are of easy culture. See Annuals.

Specularia is a genus of about 7 species closely allied to Campanula but differing by the very long calyx-tube, ovary and capsule. The long calyx-tube is one of the most conspicuous features of the plant and has perhaps served to suggest the handle of the mirror. There is one North American species, which differs from all the rest in having perfoliate lvs. and the capsule dehiscing laterally near the middle instead of near the calyx-lobes. It is a weed. The others are Old World herbs, small and annual, with the lower lvs. ovate and entire, the upper ones ovate-oblong or lanceolate and nearly entire. Calyx-tube linear, 1 in. or so long; limb 5-parted, the segments linear and as long as the corolla-lobes; corolla nearly wheel-shaped or broadly bell-shaped; stamens free from corolla: ovary 3-lobed; stigmas shortly 3-lobed.

A. Peduncles about 3-flld.

Spéculum, DC. (Campánula Spéculum, LINN.). Venus' Looking-glass. Fig. 2361. Erect, 9 in. high: calyx glabrous or pubescent, the tube constricted at the apex; lobes finally reflexed, according to De Candolle. Engelh. B.M. 192.—Var. procumbens is offered abroad in addition to white, lilac and double forms. R.H. 1897, p. 254.

AA. Peduncles 1-flld.

Pentagonía, DC. Calyx pilose, lobes spreading. Asia Minor. B.R. 1:56. This species is not now advertised in America. Some specimens have narrow lvs. and longer calyx-tube than S. Speculum. An interesting feature of this species (and perhaps others) is the 5-angled flower-buds.

SPEEDWELL. Veronica.

SPELT. See Triflum.

SPEÆRULA (Latin spargere, to scatter; the seeds are said to be expelled). Caryophylldceae. A genus of 3-8 species of annual herbs including Sperry, which see, a forage plant adapted to poor, dry, sandy soils. It is a common weed in cultivated lands. It grows about 6 in. has linear lvs. which appear to be whorled, and bears numerous, small, white, 5-petaled fls. in summer. The fls. are about 1/2 in. across and borne in terminal panicles. Important generic characters of this genus are the small, scarious stipules, 5 styles, alternating with the sepals, and capsule-valves opposite the sepals.

2360. Skunk Cabbage, as the hoods come up in spring.—Spathyemia lactida (X 1-5.)
Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

*arvensis*, Linn. *Sperry*, which see. Annual, 6-18 in. high, branched at or near the base; lvs. linear, clustered at the nodes in 2 opposite sets of 6-8 together, appearing as if verticillate; stipules small, connate.

**E. B. 2:36.**

**W. M.**

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**SPERGULA**

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**SPHERALCEA** (Greek words, *globe* + *mallow*; referring to the fruit). *Malva* *globosa*. *GLOBE MALLOW*. About 25 species of tender herbs, subshrubs and shrubs, mostly native to the warmer parts of America: lvs. usually angulated or lobed; fls. solitary or clustered, axillary, in terminal racemes or spikes, violet, rose, flesh-color or various shades of red; bracts 3, free or united at the base; calyx 5-lobed; tepals of the ovary numerous, 2-5-ovulated, arranged in a single whorl. Closely allied to *Abutilon* but with 3 bractlets instead of none.

A. Lvs. 5-7-lobed.
B. Fls. in spikes.

**acutifolia**, Torr. & Gray. Perennial herb, 2-6 ft. high: lvs. 3-4 in. long, cordate, palmately 5-lobed (sometimes with 2 or more basal lobes), coarsely serrate: fls. rose-color, varying to white, 2 in. across, 15 or more in spiral clusters terminating the branches. Rocky Mts. B.M. 5404.

**E. B. Fls. in umbels.**

**umbellata**, Don. Mexican shrub, 3 ft. high, with scarlet, pendulous fls., about ½ in. across, and usually 3 in an umbel: lvs. cordate, 7-lobed, crenate. L.B.C. 3:222 and B.R. 19:1608 (as *Malva umbellata*).—Var. tricolor, Hort., was said by John Saul to have red-dish purple fls. striped with white and rose.

**AA. Lvs. 3-lobed.**
B. Fls. scarlet or rose.

**Munroana**, Spach. Perennial herb, 1-2 ft. high: lvs. broad at base, obscurely 3-lobed, crenate, sometimes incised: fls. scarlet or rose, 1 in. across, rosecolored; panicles axillary and terminal, numerous. Dry plains, Brit. Col. to Idaho and south. B.M. 3337 and B.R. 16:1306 (both as *Malva Munroana*). A.G. 11:539.—Advertised in 1890 as the ‘Sunset Plant’. E. S. Carman said the same plant was offered in some catalogues as *Malva minuta*.

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**SPHAGNUM**

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**cispalatina**, A. St. Hill. (S. minuta, Spach. *Malva minuta*, Cav. *M. minuta*, Jacq. [?]). Tender branching shrub, 2-4 ft. high, formerly considered desirable for conservatory decoration in October and November, when it produces its large reddish flowers. Lvs. 1-2 in. long, 3-lobed, coarsely and unequally crenate, midlobe longest: fls. 1-½ in. across, in axillary, few-fl.d. cymose racemes. La Plata. The above description from B.M. 5936.—Minuta means cinnabar red, the color of red lead. There seems to be no reason why *Sphagarea cispalatina* and *Munroana* should be confused. The lvs. of *Munroana* are obscurely 3-lobed, the lobes broad, blunt and short; the lvs. of *S. cispalatina* are deeply and sharply cut, acuminate and narrowed towards the base, the lobes narrow and acute, the midlobe over twice as long as the side lobes. The color of the fls is very distinct and the clusters are branched in *S. Munroana* but not in *S. cispalatina*.

**E. B. Fls. brick-red.**

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**SPHEROGYNE** (Greek words referring to the glosbose stigma). *Mellastoma*. This genus has been referred to Toecoa, which see for *S. latifolia*. The handsome foliage plant known to the trade as *Sphagnum imperialis* is mentioned under this head because its fls. and fr. seem to be undescribed, and the place of the plant in the vegetable kingdom is therefore undetermined. It is a broad-leaved hothouse plant with strong parallel ribs, metallic green above and purplish brown beneath. For cultural suggestions, see *Miconia*.

**imperialis**, Linden. Stem simple or little branched, erect, robust: lvs. opposite, decussate, oval, with 5 longitudinal ribs running from base to apex aompanied by many transverse veins connecting them. Peru. I.H. 21:284.—Native of Peru, and introduced to Europe by Linden in 1871. It is said to be easily grown in a warm house.

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**SPHAGNUM**. Sphagnum moss, bog moss or peat moss is found in swamps or bogs and is one of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite's "Sphagnum of Europe and North America," there are 19 distinct species to be found in North America, besides numerous varieties. Sphagnum mosses differ from the true mosses so much that they are usually classified in a distinct family, Sphagnaceae. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of the fls. of *Sphagnum* (which is often a foot or more in height), its soft appearance, pale green color, and the absence of root-hairs. The stems and leaves are inclosed or en-circled by one, two and often four strata of transparent cells connected with each other by small holes, which have the capacity of sucking up and retaining a large amount of water. These cells therefore perform the function of root-hairs, and it is this abundant water storage tissue that makes Sphagnum moss of so much use to gardeners in the cultivation of orchids, Anthurium, etc., and in fact most plants of an epiphyll or swamp-loving character, such as *Saracenia*, *Darlingtonia*, etc. *Sphagnum* often forms at least one-third of the peat moss, in which pitcher plants and epiphytes are grown. The fresh green tips of *Sphagnum* are also most useful for surfacing pots of orchids and other plants. Besides giving them a better appearance, the moss acts as an index to the moisture condition of the plant. *Sphagnum* is also useful in the propagation of many other plants, such as *Cordyline*, *Nepenthes*, etc.; for starting tropical tuberous-rooted plants, such as *Sansevieria*; for sowing seeds of orchids, *Anthurium*, *Nepenthes* and *Saracenia* when fresh and chopped fine; as a mulch; as a non-conducting material for plants in pots in exposed positions in summer; and in packing plants for transportation, for which purpose it is an ideal material. Owing to its sponge-like character it may be used wet or dry, according to the character of the plants intended for packing.

Unless one has an ideal position in which to keep *Sphagnum moss* after gathering it from its native place,
or unless one has conditions very similar to its native habitat, it is difficult to keep it living for any length of time. This does not greatly matter, except that Sphagnum used for surfacing pots should always be living for the sake of appearance. That which is used in potting and propagating need not necessarily be living as long as it is fresh and not decayed, while partially decayed moss may be used for mulching and packing.

EDWARD J. CANNING.

SPHENÖGYNE. See Ursinia.

SPICE BUSH. Consult Benzoïn.

SPIDER FLOWER. Cleome.

SPIDER LILIES. Hymenocallis and Panthereum.

SPIDER PLANT. See Cleome.

SPIDERWORT. Tradescantia.

SPIGÈLIA (after Adrian van der Spigel, physicoian, 1558-1625). Loganiaçu. About 35 species of American annual or perennial herbs, rarely somewhat woody, with opposite, membranous, feather veined, rarely 3-5-nerved leaves, and long or purplish flowers, usually borne in terminal, one-sided, somewhat curved spikes; calyx 5-lobed; segments narrow; corolla tubular; lobes 5, valvate; stamens 5, attached to the corolla-tube; ovary 2-loculed; style articulated, simple, ending in somewhat capitate and stigmatose at the summit: capsule flattened, circumscissile above the persistent base.


F. W. BARCLAY.

2302. Spinach (X ½).

SPIKENARD. Atria racemosa. FALSE S. Smilacina.

SPILANTHES (Greek, spotted flower). Composita. This genus includes the Parê Cress (Spilanthes oléacea, Linna., the leaves of which impart a pungent flavor to salads and stimulate the salivary glanæes. The plant belongs rather to pharmacy than to the vegetable garden. It is procurable from France. It is an annual herb of almost creeping habit and yellow fls., in conical, rayless heads about three-eighths of an inch in diameter. The seed is sown in early spring. The Brazil Cress differs in the brownish tint of stem and leaves. The preceding points are condensed from Vilmorin's "Vegetable Garden."

Spilanthes is a genus of about 20 species found in the warmer regions of the globe. They are mostly annual, rarely perennial, and have opposite, usually dentate lvs. Some have yellow or white rays and the disk is yellow. S. oléacea has broadly ovate, dentate lvs. and long peduncled heads. Gn. 22, p. 295.

W. M.

SPINACH (Spinacia oleracea, which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 2302. It is a cool-season plant, and therefore it is grown in fall and spring crops. He should not be planted in any good garden or field soil, although for quick results and for tender, succulent foliage, land which has an abundance of available plant-food, and particularly of nitrogen, is most desirable. The plant is hardy, and when the land is well drained, it will ordinarily stand the winter climate as far north as the city of New York, and still further in somewhat protected places.

Spinach is grown both as a fall and spring crop. The fall crop is raised from seed that is sown during the eight weeks the leaves may be large enough for eating. The spring crop is grown from seeds sown in the fall, or from those sown during winter in hotbeds or coldframes, or from those sown directly in the ground as soon as it is fit in the spring. If the plants for spring use are to be started in the fall, the seeds should be sown about six to eight weeks before hard freezing weather is expected. Then the plants will have attained sufficient size and roothold to enable them to pass the winter. It is advisable to cover the plants, just before winter sets in, with straw or loose litter or dry manure. Even though the plants will withstand the winter, they will not necessarily thrive hereafter. It may be advisable to sow particularly in soils that are likely to heave. It is customary to grow this fall-sown Spinach on wide ridges or beds that are made by plowing several furrows together, leaving a dead furrow between. This is to be done to enable the surface drainage. These beds may be from five to ten feet wide. On these beds, the seeds are sown in rows, running lengthwise, the distance between the rows being from 10 to 20 inches, depending upon the methods that are employed for tillage. If the land is protected from freezing, it is to be given, the plants may be placed closer. In the spring the cover is removed from the plants at the earliest opportunity, for Spinach is most desired very early in the season. Unless the land is in extra good "heart," it is well to make a surface application of a soluble fertilizer early in the spring in order to start the plants into growth. A fertilizer that is very rich in nitrogen gives best results; in fact, it is customary in some places to use a solution of nitrate of soda or sulfate of ammonia, applying the material with a sprinkling cart. From 50 to 75 pounds of the fertilizer may be used to the acre with very good results, at each of two or more applications.

For home use, Spinach is sometimes carried over the winter in frames, the plants having been transplanted to the frames or raised in them during the late fall. These frames are usually covered at different times as the season advances, thereby providing a supply for home use. Sometimes the seed is sown in hotbeds that are made late in winter or very early in spring, and the plants are secured in advance of the ordinary season. The growing of Spinach in frames is less frequent than formerly, owing to the fact that the market is now supplied with the product grown in the Middle South.

Spring Spinach may be grown from seeds that are sown as soon as the land can be worked in spring. If the land has been plowed and manured in the fall, quicker results may be secured. Two or three sowings may be made in the home garden for spring use, but after the middle of June Spinach is likely to become tough and is in little demand. If Spinach is wanted during the summer, it is better to use the New Zealand Spinach, which is a气候 variety, that is, it has no relationship with the ordinary Spinach (see Tetragonia). It is usually best to sow Spinach seed where the plants are to stand, although it is sometimes transplanted into frames for a number of reasons; that the plants do not become checked or stunted, else they will tend to run to seed. If the seed is sown too late in spring, when hot weather is approaching, the root-leaves will be very few and the plant will quickly throw up flower-stalks. Spinach is always grown as a
SPINACH

succession or companion crop, as it occupies the land for a small part of the year. There are very few incuts and diseases that are generally troublesome.

Spinach is usually transported to market in barrels or crates. Plants are usually cut so that an inch or so of the root is left with them. All dirt is removed, as also the dead leaves, and the plants are tightly packed. It is essential that the plants be dry before they are shipped.

There are several important varieties of Spinach. The large-leaved varieties are most popular in the markets, such as the Virofay and the Round-leaved. The prickly Spinach is considered to be the most hardy and is chiefly recommended for fall sowing. L. H. B.

**SPINACH ORACH, OR SEA PURSLANE** *(Atriplex hortensis)* is also sometimes called Mountain Spinach.

**SPINACIA** *(from spina; alluding to the spiny fruit).* 

*Chenopodiumacia.* **Spinach.** **Spinacia.** According to Volkens (in Engler & Prantl's *Pflanzenfamilien*), there are only two species of Spinach, *S. oleracea, Linn.,* the common Spinach, and *S. tetrandra, Stev.* The latter is an annual herb of the Asian Minor-Persian region, and is not in cultivation. *S. oleracea, the Spinach,* is probably native to southwestern Asia, but it is now widely cultivated. It is an annual herb, developing rather large, arrow-shaped root-leaves, and these leaves are eaten for "greens." Later in the season it sends up a branching 2-3 ft. tall, bearing axillary clusters of seed-like fruits. In one type these fruits are spiny: this is the form once described as *S. spinosa,* Mench, but which is not now considered to be specifically distinct. Whether the round-seeded or the prickly-seeded type is the original form is not known, but as a matter of nomenclature, Linnaeus' *S. oleracea,* which is the oldest name, is held to include all.

Spinacia belongs to the *Atriplex tribe* of the *Chenopodiaceae.* The cultivated forms have a distinct fact that the pistil-like flowers are bracteate, whereas those of Atriplex are inclosed in a pair of enlarging calyx-like bracts. Spinacia is deciduous, bearing the flowers in small axillary clusters; stamens 4 or 5, in a 4–5-lobed calyx; ovary 1, with 4–5 styles or stigmas, in a 2–4-toothed calyx, this calyx hardening and enclosing the anence and often becoming horned on the sides and giving rise to "prickly seed." One of the chief differences between the cultivated forms and the original wild species is that the cultivated plants are much thicker and broader radical leaves, which are used for greens, often showing little of the halberd or sagittate shape. L. H. B.

**SPINDEL TREE.** **Eunymus.**

**SPIREA** of florists. See *Astilbe.*

**SPIREA** *(ancient Greek name of a plant used for garlands, derived from *spirea, band, wreath; probably first used for the present genus by Clusius).* **Rosacea.** Ornamental deciduous shrubs, with alternate, stipulate, simple and rather small leaves, and small white, pink or almost crimson flowers. In showy umbels, corymbs, or panicles. Many are hardly north; some of the best of them are *Spirea arguta, Thunbergii, Van Houttei, pubescens, triloba, bracteata, media, umbrifolia, alba, Donglasii, Menziesii, tomentosa. Spirea blanda, Japanica, and albiflora require a sheltered position or protection during the winter, though *S. Japanica* and its allies, even if killed almost to the ground, will be sent up in due course of the growing season. *Spirea triloba* and *S. obtusa* are hardy north of Boston.

In regard to the flowering season, the Spireas can be divided into two groups. The first one contains the species of the section Chamisso, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calosperma and Spiraria, with white or pink flowers in corymbs or panicles appearing from June to full. Some of the most important species, arranged according to their native flowering time, are the following: Early-flowering *Spireas—* *S. Thunbergii, arguta, hypericifolia, prunifolia, rubra, *Euonymus japonicus, *choo-choo, *triloba, Van Houttei, Contenonensis, bracteata. Late-flowering Spireas—* *S. bella, corymbosa, densiflora, canescens, Japanica, albiflora, salicifolia, alba, Menziesii, Donglasii, tomentosa, etc.*

This group do not produce their flowers all at once like those of the first group, but continue blooming for a longer time.

The Spireas are all medium-sized or low shrubs and well adapted for borders of shrubbery, as single specimens on the lawn or for rockeries. Especially the species of the early-flowering group possess a graceful habit and make effective single specimens, except perhaps *Euonymus japonicus,* which are stiffer and less handsome and produce suckers. *Spirea canescens* has also the graceful habit of the first group. *Spirea japonica* and its numerous hybrids form mostly low, round bushes and are pretty as single specimens or in the border. *Spirea alba, Donglasii, Menziesii* and *tomentosa* should be planted in shrubbery only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockery *Spirea decumbens,* *corymbosa, densiflora, bullata,* and some dwarf hybrids of *S. Japonica* are to be recommended.

The species of the section Chamisso, and also *S. canescens* and *bella* should be planted as little as possible,—only thinned out and the weak wood removed,—while those of the sections Spiraea and Calosperma can be pruned more severely if necessary, since they produce their flowers at the ends of their shoots. For very early flowering, the following are especially recommended for the earliest flowering: *Spirea arguta, prunifolia, Van Houttei* and *S. Bumalda,* are sometimes forced.

The Spireas grow in almost any moderately moist soil, the Spirea species being generally more moisture-loving; and *S. tomentosa* thrives well only in a peaty or sandy soil, while those recommended above for rockeries require a well-drained soil. Place any seeds sown in spring and covered only slightly with soil, or by hardwood or Greenwood cuttings. The species of Chamisso grow very well from Greenwood cuttings under glass, while the Spireas are usually raised from hardwood cuttings. The Calosperma seem to grow equally well in both ways. The Spireas are also often prop. by division and by suckers.

About 50 species in the temperate regions of the northern hemisphere. Many species formerly included under *Spirea* are now referred to other genera; see Physocarpus, Schizonotis and Sosoraria for shrubbery species and Arumaceae, Umlaria and also Astilbe for the herbaceous ones. There is a monograph of *Spirea* and the allied genera by Maximowicz in Acta Horti Petropolitani, vol. 6, p. 105–261 (1879) and a monograph of the cultivated species, with their numerous hybrids fully described by H. Zabel, Die strauchigen Spireas der deutschen Gärten in America, 1886, 1890. Botanical literature on *Spirea,* the plants are popular and the species are many.

ALFRED REHDER.

The name *Spirea* is often spelled *Spiraea.* Whenever the generic and specific name are both used the digraph should be employed, thus: *Spirea japonica.* Whenever "one species" is used we spell the name without the digraph, in harmony with the Editor's writings. The name *Spirea* should be considered as an English word in common speech just as geranium and chrysanthemum. The word "spirea" is not of Greek origin, but is a corruption of the word "spiras, spirae," a group of small flowers in a *Spirea.*
KEY TO THE SECTIONS.
A. Lvs. always entire: fls. in simple or paniced racemes: follicles usually 2-seeded. (Bryozephriza, Zabel.)
B. Plants tufted, suffruticose: fls. perfect, in usually simple racemes
SECTION 1. PETROPHYTUM (Species not in cult.)
BB. Plant an upright shrub with stout branches: Fls. polygamous in paniced racemes.
SECTION 2. SIBIRIA (Species No. 1)
AA. Lvs. usually serrate, rarely entire: Fls. in umbel-like racemes, corymb or panicles: seeds several.
BB. Inflorescence a simple umbel-like raceme: Fls. white
SECTION 4. CALOSPIRA (Species Nos. 21-36)
CC. Fls. in panicles
SECTION 5. APIARIA (Species Nos. 37-49)

INDEX

A. Fls. in sessile umbels, with none or very small lvs. at the base or only the lower umbels on leafy stalks.
B. foliage entire or evenately dentate only near the apex, often 3-nerved, grayish green... 2. hypericifolila
BB. foliage dentate or serrate, usually penninerved, bright green.
CC. Shape of lvs. linear-lanceolate: glabrous... 3. Thunbergii
DD. Umbels on the lower part of the branches stalked.
EE. Lvs. oblong.... 4. arguta
EE. Lvs. oblongate.... 5. multiforma
DD. Umbels all sessile, 4-5-flld.
EE. pubescent.
AA. Fls. in umbel-like racemes on leafy stalks.
B. Margin of lvs. entire or erinate or dentate only toward the apex.
C. Foliation grayish pubescent on both sides.
CC. Foliation almost glabrous.
DD. Shape of lvs. elliptic to oblong-lanceolate.
EE. Lvs. pinninerved; shoots angular.
EE. Lvs. all or partly 3-nerved.
F. Shoots striped; lvs. all 3-nerved.... 9. crenata
FF. Shoots terete; lvs. supple, partly penninerved, partly 3-nerved... 10. Piwkoswians.
DD. Shape of lvs. almost orbicular, 4-5 in. broad.
BB. Margin of lvs. finely serrate or often slightly lobed (only in No. 19 sometimes entire).
CC. Stamens shorter than or as long as petals; sepals erect or spreading in flower.
D. Foliation glabrous.
E. Form of lvs. orbicular or ovate, long-obovate to obturate lanceolate, 3-nerved or with few lateral veins, almost glabrous, 3/4-1 in. long; fls. small, white, in sessile umbels; pedicels usually pubescent; petals almost orbicular, usually longer than stamens. B. S. E. Eu. to Siberia—VU
C. Stamens longer than petals: sepals reflexed.
D. Shoots terete, often pubescent in fruit.... 19. media
DD. Shoots angular, glabrous. 20. chamaemydra

SECTION 3. CHAMEDEYON (Species Nos. 2-20).
A. Fls. in sessile umbels, with none or very small lvs. at the base or only the lower umbels on leafy stalks.
B. Foliage entire or evenately dentate only near the apex, often 3-nerved, grayish green... 2. hypericifolila
BB. Foliage dentate or serrate, usually penninerved, bright green.
CC. Shape of lvs. ovate to oblong-lanceolate: finely pubescent when young.
DD. Umbels on the lower part of the branches stalked.
EE. Lvs. oblongate.... 4. arguta
EE. Lvs. oblongate.... 5. multiforma
DD. Umbels all sessile, 4-5-flld.
EE. pubescent.

SECTION 1. PETROPHYTUM (Species not in cult.).
The section contains a few rather rare American species of which none is in cultivation. The best known is S. caspito.sus, Nutt. (Petrophytum caspito.sus, Rydb.), a dwarf cespitose subshrub, only a few inches high, with crowded, small, entire lvs. and small, whitish fls. In dense, usually simple racemes on slender stalks arising from the tufts of the grayish green foliage. It is very unlike any other Spirea and more resembles in habit a Saxifraga. It is perhaps better regarded as a distinct genus than the allied Kiseya uniflora, Rydb. (Eriogyna uniflora, Wats.) and Eriogyna pectinata, Hook.

SECTION 2. SIBIRIA (Species No. 1).
1. lavigata, Lind. (S. Altiva, Pall. Sibireva laviga.ta, Maxim.). Shrub, 5 ft. high, with stout upright branches: lvs. cuneate-oblong, bluish green, glabrous, 1-1 1/2 in. long; fls. polygamous, in terminal panicles, 3-5 in. long, those of the staminate plant somewhat shorter. May. Siberia.—Hardy.
rower, oblong-oblanceolate; fls. smaller, yelllowish white; pedi-
cels glabrous; petals obovate, shorter than stamens: flowers somewhat earlier, but less showy. Var. fiabel-
lata, Zabel (S. fiabelilata, Bertol. S. hypericifolia, var.
crenata, Waldst. & Kit.). Lvs. broad obovate to oblance-
olate, acute, incised serrate at the apex or entire on the
flowering branches. Var. obovata, Maxim. (S. obo-
vata, Waldst. & Kit.). Lvs. obovate, rounded at the
 apex, crenate above the middle. S. E. Eu. Var. trun-
cata, Zabel (S. thalicroides, Hort., not Pall.). Lvs.
broader obovate to oblong-ovate, truncate and cre-
ately dentate at the apex. Siberia.

2363.

Spiraea Thunbergii.

3. Thunbergii, Sieb. Fig. 2363. Shrub, 5 ft. high, with
spreading or ascending branches; lvs. sharply serrulate,
1-1/4 in. long; fls. pure white, about 1/2 in. across, in
3-5-flowered umbels; petals obovate, much longer than
stamens: follicles with the spreading styles below the
S. — A very graceful early-flowering shrub, the slender
arching branches clothed with feathery bright green
 foliage, turning late in fall to orange or scarlet. Almost
hardy, but tips of branches sometimes killed by severe
frosts; valuable for seaside planting.

4. arguta, Zabel (S. Thunbergii x multiflora). Similar
in habit to the former but higher and more vigorous:
 lvs. oblong-oblanceolate to oblong-oblong-oblanceolate,
sharply and sometimes doubly serrate, glabrous at length,
1-1/4 in. long; fls. pure white, 1/2 in. across, in many-flowered
umbels, mostly with small lvs. at the base; pedicels glabrous;
petals broadly obovate, almost twice as long as stamens.
most free-flowering and showy of the earlier Spireas; quite
hardy.

5. multiflora, Zabel (S. crenata x hypericifolia). Shrub,
5 ft. high, with slender, arching branches; lvs.
 obovate, cuneate, crenate above the middle, usually 3-
nerved, glabrous at length, about 1 in. long; fls. pure
white, in many-flowered umbels, sessile on the upper
branches, borne on leafy stalks on the lower part of the
branches. May. Of garden origin. — Handsome shrub similar to
the former, but blooming a little later.

high, with upright slender pinnate branches; lvs.
obovate to oblong, denticulate, pubescent beneath, 1-2 in.
 long; fls. pure white, about 1/2 in. across, on slender
pedicels, in 3-6-flowered umbels; petals obovate, longer than
stamens. May. China, Japan. — Var. flavo-pilosum. Fig.
Very handsome, early-flowering shrub, with dark green,
shining foliage, turning orange in fall. The single-flowered
form is less showy and rare in cult.; its foliage is lighter
and not shining.

7. cana, Waldst. & Kit. Dense, bushy shrub, 3 ft.
high: lvs. elliptic to oblong, acute at both ends, usually
entire, grayish pubescent on both sides, more densely
beneath, 1/2-1 in. long; fls. 1/4 in. across, in dense head-
like umbels; petals about as long as stamens; sepals
reflexed in fruit. May. S. E. Eu., W. Asia. — Hardy,
but not very showy.

8. alpina, Pall. Shrub, 4 ft. high, with upright or
arch, angular, reddish brown branches; lvs. oblong-
oblanceolate to oblong-oblong-oblanceolate, acute,
usually entire, glabrous, pinnatived, ¼-1 in. long; fls. white, rather small, in
short-stalked, small glabrous umbels; petals roundish,
little shorter than stamens; sepals upright in fr.; foli-
ciles curved outward. May, June. N. E. Asia. — Hardy
shrub, with graceful foliage.

9. crenata, Linn. (S. crenata, C. A. Mey.). Shrub,
3 ft. high, with slender striped branches; lvs. obleng-
oblong-oblanceolate to obtuse, acute at both ends, crenately
serrate toward the apex, grayish green, puberulous
beneath when young; 3-nerved, ¼-1 in. long; fls. white,
rather small, in dense almost semi-globose umbels; pet-
als roundish obovate, shorter than stamens; sepals upright in fr.:
follicles with erect styles. May. S. E. Eu. to

10. Pikovianus, Bess. (S. crenata x media. S. Nicho-
dierti, Hort.). Shrub, 4 ft. high, with terete upright
branches; lvs. oblong, cuneate at base, with few sharp
seeds at the apex or somewhat entire, peninnerved to
3-nerved, almost glabrous, 1-2 in. long; fls. white or
greenish white, in many-flowered almost glabrous
umbels; petals orbicular, shorter than stamens; sepals
upright in fr.; follicles with the upright style somewhat
below the apex. May. — Supposed natural hybrid, found
wild in Podolia, in Poland.

11. bracteata, Zabel (S. Nipponica, Maxim. S. media,
var. rotundifolia, Nichols.). Shrub, 8 ft. high, with
upright or spreading branches, quite glabrous: lvs.
roundish obovate, usually crenate at the apex, dark
green above, bluish green beneath, of firm texture,
¼-1/4 in. long; fls. over 1/2 in. across, in umbel-like ra-
cemes, sometimes compound at the base; petals orbicu-
lar, longer than stamens; sepals spreading in fr.
June. Japan. G.C. 11. 23:283. — Desirable hardy shrub of vig-
orous growth with showy umbels of pure white fls. and
dark green handsome foliage remaining fresh until late
in fall.

12. Blumei, G. Don (S. rupéstris, Sieb.). Shrub,
4 ft. high, with spreading and arching branches; lvs.
obovate to rhombic-ovate, incised crenate-serrate, pale
bluish green beneath and rather prominently veined,
¼-1/4 in. long; fls. polygamous, white, in many-flowered
umbels; petals roundish obovate, about as long as sta-
men, with spreading or reflexed styles. June, Japan.
B.H. 8:386. — Not hardy north, rare in cultivation;
ten the following or other species are met with
under its names.

13. tribobata, Linn. (S. triboba, Linn.). Fig. 2365.
Shrub, 4 ft. high, with slender spreading branches; lvs.
almost orbicular, inched-dentate and often 3-lobed,
obovate to oblong-oblanceolate, pubescent; fls. white,
pinnatifid, ½-1 in. long; fls. pure white, in many-flowered
umbels; sepals upright in fr.; follicles with ascending styles.
Handsome bushy shrub, quite hardy; cult. under many drug names as S. aquilegifolia, adiantifolia, cra-tegifolia, Bitucul. 15. Cantonînins, Maxim. (S. composites, Zabel.) Fig. 2560. Shrub, 6 ft. high, with arching branches: lvs. rhombic-ovate or rhombic-obilate, rounded or somewhat narrowed at the base, acute, incised or serrate, dark green above to pale bluish green beneath, ¾–1¼ in. long: fls. white, ½ in. across, in many-fld. umbels; petals twice as long as stamens; sepals upright or spreading in fruit. May, June. Of garden origin. G. F. 2: 317. G. T. 5: 535. A. G. 1903. M. D. G. 1900–17. —This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming Spiraeas and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

Handsome shrub, quite hardy; cult. under many drug names as S. aquilegifolia, adiantifolia, crataegifolia, Bitucul. 15. Cantonînins, Maxim. (S. composites, Zabel.) Fig. 2560. Shrub, 6 ft. high, with arching branches: lvs. rhombic-ovate or rhombic-obilate, rounded or somewhat narrowed at the base, acute, incised or serrate, dark green above to pale bluish green beneath, ¾–1¼ in. long: fls. white, ½ in. across, in many-fld. umbels; petals twice as long as stamens; sepals upright or spreading in fruit. May, June. Of garden origin. G. F. 2: 317. G. T. 5: 535. A. G. 1903. M. D. G. 1900–17. —This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming Spiraeas and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

15. Cantonînins, Lour. (S. Reesësiina, Lindl. S. lanceolata, Poir. S. corymbosa, Roxb.). Shrub, 4 ft. high, with slender, arching branches: lvs. rhombic-ovate or rhombic-oblong, in pubescent, dark green above, pale bluish green beneath, 1¼–2½ in. long: fls. white, ½ in. across, in rather dense umbels; sepals upright in fruit: follicles with spreading styles. May, June. China. Japan. B. R. 30: 10. A. G. 1856. —Very handsome shrub, with large pure white fls., but only half as hardy north. Var. florl pono, with double fls. and narrower lvs., is still more tender. This species and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.

16. blandâ, Zabel (S. Chinînins x Cantonînins, S. Reesësiina robusta, or nora, Hort.). Upright shrub, 6 ft. high, with arching branches: lvs. oblong to ovate, acute at both ends, incised serrate, dark green and almost glabrous above, grayish tomentose beneath, 1½–2 in. long: fls. rather large, pure white, in pubescent umbels; sepals ovo-lanceolate, upright in fruit: follicles pubescent, with spreading styles. May, June. Of garden origin. —Only half-hardy north.

17. Chinînins, Maxim. (S. pubescens, Lindl.). Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but smaller, and somewhat shorter, pubescent: fls. ½–¾ in. across, in glabrous umbels; sepals triangular-ovate, upright in fruit: follicles glabrous, with the spreading styles below the apex. May, June. China. G. F. 1: 351. —Handsome, but not hardy north.

18. pubescens, Turecz. Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but smaller, and somewhat shorter, pubescent: fls. ½–¾ in. across, in glabrous umbels; sepals triangular-ovate, upright in fruit: follicles glabrous, with the spreading styles below the apex. May, June. China. G. F. 1: 351. —Handsome, but not hardy north.

19. média, Schmitt (S. contusa, Regel & Korn.). Upright shrub, 5 ft. high, with terete branches, glabrous when young: lvs. ovate to oblong, cuneate at the base, incised or serrate in the middle, almost glabrous or pubescent, 1½–2¾ in. long: fls. in many-fld. rather long-stalked, umbel-like racemes; follicles with the spreading or reflexed styles somewhat below the apex. May, June. China. —Var. glabra, Regel. (S. oblongifolia, Waldst. & Kit.). Lvs. elliptic-oblong to oblong-lanceolate, narrow at both ends, entire or with 1–3 teeth at the base. Var. sericea, Regel (S. sericea, Turecz.). Lvs. pubescent on both sides.

20. chamedryfolia, Linn. Shrub, 6 ft. high, with angular, glabrous branches: lvs. distinctly petiolated, ovate to lanceolate, sharply and often doubly serrate, almost glabrous, bluish green beneath, 2–3 in. long: fls. in many-fld. umbels, the lower ones long-stalked, the upper ones often almost sessile: follicles with the styles upright and terminal. S. E. Eu. to Japan. —Var. flexuosa, Maxim. (S. flexuosa, Fisch.). Less high, with spreading or more or less zigzag branches: lvs. narrower, sharply serrate above the middle. Siberia to Dahurian.

21. canescens, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches: lvs. broadly oval to obovate, very short-petiolate, crenately dentate at the middle, grayish green, pubescent beneath or sometimes almost glabrous at length, 1½–3¼ in. long: fls. white, rather small, in dense, semi-globose coryumbs to 2 in. across, appearing very profusely along the branches; sepals upright or spreading in fr.: follicles villous, with the ascending styles a little below the
SPIREA

22. *decumbens*, W. Koch (*S. procumbens*, Hort.). Dwarf, procumbent shrub, about ½ ft. high, with ascending branches, glabrous; lvs. elliptic to obovate, acute at both ends, crenately serrate above the middle, glabrous, ½-1 in. long; fls. white, in small corymbs, about 2 in. across; foliicles glabrous, with upright terminal styles. June. Tyrol. G.C. II. 11:732.—Pretty shrub for rockeries.

23. *longigémma*, Maxim. Shrubs, 4 ft. high, with slender terete branches, glabrous; axillary buds acuminate, longer than the peduncles: lvs. ovate-lanceolate to oblong-lanceolate, incisedly and doubly serrate, with glandular-tipped teeth, bright green, glabrous. 1½-2 in. long; fls. white, in rather loose, 2-3 in. broad, pubescent corymbs; sepals spreading in fr.: foliicles almost glabrous, with terminal spreading styles. June. N. W. China. G.F. 7:245.—Hardy shrub for rockeries.

24. *bella*, Sims (*S. ovata*, and *S. coccinea*, Hort.). Shrubs, 3 ft. high, with slender, spreading branches, angular and sparingly pubescent: lvs. broadly ovate to ovate, sharply and often doubly serrate, almost glabrous, whitish or bluish green beneath. 1-2 in. long; fls. polygamous, pink, in small corymbs, ½-2 in. across; stamens little longer than petals; sepals reflexed in fr.: foliicles pubescent only at the inner suture, with spreading styles. June, July. Himal. B.M. 4269. L.B.C. 13:1568.—Only half-hardy north.

25. *expansa*, Wall. (*S. bella*, var. *expansa*, Regel. *S. Kumanoensis*, Hort.). Closely allied to the foregoing, more vigorous and upright, 6 ft. high, with terete branches tomentose when young: lvs. ovate-lanceolate to ovate lanceolate, acute at both ends, sharply serrate from the middle, usually pubescent on the veins beneath, 1½-3 in. long; fls. white or pale pink, in 1-4 broad corymbs: foliicles pubescent, diverging. July. Himal. —S. pulchella, Kunze (*S. Kumanoensis*, Hort.), is supposed to be a hybrid of this and the foregoing species; it combines the broader corymbs of the latter with the brighter color of the first species, therefore handsomer than either parent; sometimes cult. as *S. expansa rubra*, but there is also another hybrid of the same name. See *S. rubra* in suppl. list.


27. *Japonica*, Lindl. (*S. callosa*, Thumb. *S. Fortunei*, Planch.). Shrubs, 4 ft. high, with upright branches glabrous or puberulous when young: lvs. ovate to oblong-lanceolate, acute at both ends or acuminate, doubly and incisedly serrate, pale bluish green and usually glabrous beneath. 1-4 in. long; fls. small, pale to deep pink, in usually much compound and rather loose corymbs; sepals reflexed in fruit: foliicles glabrous, diverging, with ascending styles. June, July. Japan to Himal. F.S. 9:871. B.H. 8:129. P.F.G. 2. p. 113.—Handsome shrub, with the young unfolding lvs. of a very purplish color; usually much cult. under the name *S. callosa*.


29. *Fóxii*, Zabel (*S. corvusbôsa × Japonica*). Similar to the foregoing: branches more or less striped, almost glabrous: lvs. elliptic, doubly serrate, glabrous: fls. whitish or pinkish, in large, puberulous corymbs; styles spreading in fruit. June, July. Of garden origin. Less desirable than the preceding hybrid.


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SPIREA

31. **albiflora**, Miq. (S. japonica *alba*, Regel. *S. len-ciditha*, Lange). Fig. 2367. Low shrub, 1½ ft. high, with stiff, upright branches; lvs. lanceolate, coarsely or sometimes doubly serrate, glabrous, 1-2 in. long; fls. white, in dense corymbs, one large terminal and many smaller ones below, forming a kind of raceme; disk prominent; sepals reflexed in fr.; follicles upright, not or little diverging. July, Aug. Japan.

32. **superba**, Zabel (*S. albitiora* × *corymbosa*). Low shrub, with striped dark brown branches; lvs. elliptic-oblong to oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1-3 in. long; fls. rather large, pink, almost whitish; disk prominent; petals orbicular or broadly obovate. June, July. Of garden origin.

### SPIREA

#### Section 5. *Spiraea* (Species Nos. 37-49)

A. **Inflorescence a broad panicle, about as broad as high.** (Hybrids of species of this and the preceding section.)

B. **Panicules rather small, on lateral branchlets at the end of last year's branches.**

C. **Lvs. glabrous or nearly so.**

D. **Apex of lvs. acute.**

E. **Shape of lvs. broadly oval or obovate.**

F. **Shape of lvs. oblong or oval-oblong.**

G. **Lvs. pubescent or tomentose beneath.**

H. **Base of lvs. acute.**

I. **Base of lvs. rounded.**

AA. **Panicules elongated, longer than broad.** (Spiraria proper.)

BB. **Foliage glabrous or nearly so.**

CC. **Lvs. sharply serrate, except at the very base.**

DD. **Panicules tomentulose.**

EE. **Fls. light pink.**

FF. **Fls. white.**

GG. **Panicules glabrous.**

HH. **Lvs. coarsely serrate above the middle: fls. pink.**

II. **Foliage pubescent or tomentose beneath.**

III. **Lvs. glabrous.**

JJ. **Panicules glabrous; lvs. grayish or whitish tomentose beneath.**

KK. **Lvs. acute at both ends.**

LL. **Lvs. rounded or nearly so at both ends.**

MM. **Panicules pubescent.**

NN. **Lvs. usually light tawny beneath.**

#### Spiraea

37. **Fontenaysii**, Billard (*S. Fontenaysii*, Dipp. *S. canescens* × *salicifolia*). Shrub, 6 ft. high, with slender, upright branches; lvs. oval or oblong-oval, rounded at both ends, coarsely serrate above the middle, pale bluish green beneath, almost glabrous, 1½-2 in. long; fls. white, pink, or pinkish white, in broad, flat, elongated panicles; petals orbicular, about as long as stamens; sepals spreading in fruit. June, July. Of garden origin. Not quite hardly north. Var. *alba*, Zabel, the white-flowered, var. *rosea*, Zabel, the pink-flowered, form. *prunosa*, Hort. (*S. brachybdryos*, Lange. *S. luxurians*, Hort. *S. canescens* × *Diplocarps*), is a similar form, but the lvs. are tomentose beneath and the fls. pink.

38. **conspicua**, Zabel (*S. albitiora* × *alba*). Upright shrub, 3 ft. high, with dark brown puberulous branches; lvs. elliptic-oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1½-2½ in. long; fls. pinkish white, in broad, finely pubescent panicles; petals shorter than stamens. July–Sept. Handsome form. A similar hybrid is *S. syringoflora*, Lem. (*L. albitiora* × *salicifolia*), with oblong-lanceolate or lanceolate lvs. serrate above the middle and pink fls. Closely allied is also *S. semperflorens*, Zabel (*S. Japonica* × *salicifolia*, *S. Japonica* or *Fortunei*, var. *paniculata*, Hort.). Higher than the former: lvs. oblong-lanceolate, usually doubly serrate; fls. pink. R.H. 1890, p. 496, 497. Gn. 45, p. 48.
39. *nötha*, Zabel (*S. coromandula × latifolia*). Shrub, 3 ft. high, with brown glabrous branches; lvs. broadly ovate to obovate, short-petioled, coarsely and doubly serrate, almost glabrous, 1½-2 in. long; fls. white to pinkish white, in panicles, glabrous; stamens almost twice as long as the orbicular petals. July, Aug. Of garden origin.

40. *pyramiátá*, Greene (*S. liebiana × Ménziesii*). Upright shrub, 3 ft. high; lvs. oval-oblong to oblong, acute or obtuse, usually with reflexed midrib, glabrous or nearly so, 1½-3½ in. long; panicles 1½-2 in. long, rather dense, puberulous; fls. pinkish or almost white. July. Found wild in Ore. and Washington. —Worthy of cultivation, but not yet introduced.

41. *Sanssouciána*, C. Koch (*S. Douglassi × Japonica*, *S. Regéllána*, Hort.). Shrub, 4 ft. high, with striped, finely tomentose branches; lvs. oblong-lanceolate, sharply and usually doubly serrate, grayish tomentose beneath, 2½-3½ in. long; fls. pink, in broad corymb-like panicles; follicles glabrous, with spreading styles. July, Aug. Of garden origin. —An allied form is *S. intermédia*, Lemoine (*S. albiétora × Douglassi*), similar in habit to *S. springeritóra* but with the lvs. tomentose beneath.

42. *Nobleána*, Hook. (*S. Douglassi, var. Nobleána*, Wats. *S. Douglassi × densiétóra*). Shrub, 4 ft. high, similar to the former; lvs. oblong or narrowly oblong, usually rounded at the base, acute, sharply serrate above the middle, grayish tomentose beneath, 1½-3 in. long; fls. light pink, in dense broadly pyramidal tomentose panicles, 3½-5 in. in diameter; petals half as long as stamens; sepals reflexed in fr.; styles erect. June, July. Natural hybrid, found in Calif. B.M. 5163. H.B. 2:286. —A similar form is *S. pachyóstácha*, Zabel (*S. coromando bós ñ × Douglassi*), with broader lvs. and fls. of paler pink.

43. *salicifólia*, Linn. (*S. Sibirica*, Raf. *S. salicifólia*, var. *clarívea*, Ait.). Upright shrub, 5 ft. high, with terete yellowish brown branches puberulous when young; lvs. oblong-lanceolate to lanceolate, sharply and sometimes doubly serrate with often incurved teeth, 1½-3 in. long; fls. light pink or whitish, in oblong, dense, tomentose panicles leafy below, the lvs. exceeding the ascending ramifications; stamens twice as long as petals; sepals upright in fr.; follicles ciliate at the inner suture. June, July, S. E. Eu. to Japan and probably Alaska. —Var. *Clarívea*, Lodd. *(S. salicifólia, Lodd.)*. Lower, with smaller, lighter pink lfs. L.B.C. 20:1968.

44. *áiba*, Dur. (*S. salicifólia*, var. *pariéticóia*, Ait. *S. lanceolátá, Borkh.*). QUEEN OF THE MEADOW. MEADOW SWEET. Attractive upright shrub, attaining 6 ft., with reddish brown branches puberulous when young; lvs. narrow, oblong to oblanceolate, acute, usually regularly simply serrate, 1½-2½ in. long; fls. white, in leafy pyramidal tomentose panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens white, usually as long as petals; follicles quite glabrous. June-Aug. From N. Y. west to the Rocky Mts., south to Ga. and Miss. Also known as *S. salicifólia*.

45. *latifólia*, Borkh. (*S. salicifólia, var. latifólia*, Ait. *S. carpinifólia*, Willd. *S. Crusádenzii*, Hort. *S. Bethlé heumáns*, Hort.). QUEEN OF THE MEADOW. MEADOW SWEET. Fig. 2368. Branching shrub, 2½-5 ft. high, with bright or dark red-brown glabrous twigs; lvs. broadly oval to ovate or oblong, usually coarsely and often doubly serrate, 1½-3 in. long; fls. white, larger than those of *S. alba*, sometimes lightly blushed and with the stamens and disk more or less pinkish; panicles quite glabrous, broadly pyramidal, with spreading and elongated ramifications; stamens longer than petals. June-Aug. New England and Canada to N. C. Em. 2:485. B.B. 2:196. —This and the preceding species have been referred by most American botanists to *S. salicifólia*. *S. alba* is chiefly found west, *S. latifólia* east of and in the Alleghenies.

46. *Ménziesii*, Hook. (*S. Douglassi, var. Ménziesii*, Presl.). Upright shrub, 4 ft. high, with brown, at first puberulous branches; lvs. oblong-obovate to oblong, coarsely and unequally serrate above the middle, pale green beneath, 1½-3 in. long; fls. small, pink, in rather narrow, 8½-10 in. long panicles; stamens more than twice as long as the roundish petals; sepals reflexed in fruit. June-Aug. Alaska to Oregon.

47. *Billárili*, Hort. (*S. Douglassi × salicifólia*). Shrub, 6 ft. high, with brown pubescent branches; lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, except in the lower third, usually grayish tomentose beneath, at least when young, sometimes almost glabrous at length, 2½-3½ in. long; fls. bright pink, in 5½-8 in. long, tomentose or tomentulose panicles, usually rather narrow and dense. July, Aug. Of garden origin. —*S. Lemoeána*, Bethlæhemnáis *rubra, trium- phans, eximia, Constántin, California*, Hort., are very similar and probably of the same parentage.

2638. *Spiraea latifolia* (X ¾).
SPIRANTA

2369. Spiraea Douglasi (×25).

alba, Hort. With white fls. F.E. 8:833. Gng. 5:149.
This species does not spread by suckers like most others of the section Spiraria. All the last named species are valuable as late-blooming shrubs and decorative with their showy panicles of bright or deep pink fls. They appear at their best when planted in masses in the wilder parts of the park in low ground.


ALFRED REHDER.

SPIRAL FLAG. See Costus.

SPIRANTHES (name Greek; referring to the twisted spikes). Orchideae. A tribe including about 40 species dispersed throughout the tem-
SIRIANTHES

perate zone and extending south to Chile, all terrestrial herbs, few of which have any horticultural value. Some of the harder species are advertised by dealers in native plants and by collectors. Erect herbs with fleshy or tu- berous roots: lvs. mostly at the base or on the lower part of the stem; raceme terminal, twisted: fls. spurrless, small or medium-sized; sepals free or more or less united at the base or united with the petals into a helmet; labellum sessile or clawed, conical, embracing the column and spreading into a crisped, sometimes lobed or toothed blade: pollinia 2, powdery.

A. Color of lvs. scarlet.

SPLAECiA. N. E. Br. (S. colorans, Hemsl.). Lvs. elliptic to elliptic-oblong, undulate, acute, 5-10 in. long; stem 2 ft. high at the top 3 in. long; fls. mostly in spike 3 in. long; longer bracts scarlet. April. Mexico. B.M. 1374 (as Neottia speciosa).

B. F1s. in 3 rows: lvs. persistent at the flowering time.


ROMANZOFI\nA. Cham. & Schlecht. Lvs. linear to linear-oblongate, 3-8 in. long: stem 6-15 in. high, leafy below: spike 2-4 in. long: fls. white or greenish, ringent; sepals and petals broad at base, connivent into a hood; labellum oblong, broad at the base, contracted below and dilated at the apex, crisp. July, Aug. N. Amer. B.B. 1:470. G.C. II. 16:465; 26:300.

INTI\FIA. Torr. Stem 4-10 in. high, glabrous or pubescent, bearing 4-5 lanceolate or oblanceolate lvs. near the top, large: sepals and petals white, lateral sepals free, narrowly lanceolate, the upper one somewhat united with the petals; labellum quadrate-oblong, yellowish above, not contracted in the middle, wavy-crisp, obtuse or truncate. June-Aug. New Brunswick to Minn. and Va. B.B. 1:470.

B. Fls. alternate, appearing in a single spiral row.

c. Lvs. present at the flowering time.

PR?\EOX. Watson (S. graminea, var. Welteri, Gray). Lvs. linear, 4-12 in. long, grass-like: stem 10-30 in. high, glandular-pubescent above, leafy; spike 2-8 in. long: fls. white or yellowish, spreading; lateral sepals free, the upper one connivent with the petal, labellum oblong, contracted above and dilated toward the apex, July, Aug. N. Y. to Fla. and La. B.B. 1:471.

c. Lvs. mostly withered at the flowering time.


GRÆ\CELIS. Beck. Roots clustered: lvs. basal, ovate to ovate-lanceolate, petioled, mostly dying before the flowering time: stem 8-18 in. high, bearing a slender, many-flowered, 1-sided or twisted spike: fls. white, fragrant; sepals longer than the labellum, the lateral ones free; labellum oblong, dilated in front, crenulate or wavy-crisp, thick and green in the middle. Aug.-Oct. Eastern N. Amer. B.B. 1:472. A.G. 13:466.

HEINRICH HASE\BERING.

SPIRODÆLA. Consult Lemma.

SPLEENWORT. Asplenium.

SPOND\IAS. See page 1864.

SPONGE TREE. Acacia Farnesiana. S., Vegetable. Luma.

SPRAGUEA (after Isaac Sprague, of Cambridge, Mass., botanical artist, collaborator of Asa Gray). Portulaceae. Probably only a single species, a bien-
SPRAYING


Following Paris green came London purple, and then white arsenic. Since that time many different forms of arsenical poisons have been compounded, offered to the public and frequently used. London purple has now been largely dropped by fruit-growers, owing to its variable quality. White arsenic, used in combination with soda and with lime, forms at the present time reliable and widely used insecticides.

While sucking insects were instrumental in bringing about the invention of many formulas, it has only been within the last twenty-five years that an effective method has been devised for their treatment. Although kerosene has been recommended and used to some extent for thirty-five or more years, it was not until Cook recommended kerosene in the form of a soap and water emulsion that a desirable, easily prepared oil insecticide was found. About the same time, Dr. Riley, with Mr. Hubbard, of the Department of Agriculture at Washington, recommended the use of what is now known as the Riley-Hubbard formula.

The potato bug invasion and thediscoveries of Paris green in destroying leaf-eating insects did a great deal to stimulate spraying, but due credit should be given plant pathologists for tracing the life-histories of many fungi destructive to cultivated plants.

**Fungicides.**—Early in the eighties diseases of grape-vines threatened the extinction of French vineyards. The situation engaged the attention of French investigators. Notable among them were Professor A. Millardet and his co-workers of the Academy of Science, Bordeaux, France. He, with others, discovered partly by accident and partly by experiment that solutions of copper prevented the development of downy mildew. After much experimentation, "boullie Bordeauxe" was found to be effective in preventing the growth of downy mildew and other plant parasites infesting the grape in that region. This formulation was finally made in 1885. The following year the European formula for Bordeaux mixture was published in several places in the United States, and immediately there commenced an unparalleled period of activity in economic vegetable pathology. The establishment of the U. S. experiment stations gave added impetus to the movement. The rapidity of the spread of spraying knowledge among fruit-growers is remarkable. Ten years ago it was an unknown art by the rank and file. To-day agricultural clubs and granges purchase their spraying materials by the car-load direct from the manufacturer. The American farmer leads his fellow-workers in all parts of the world in the practice of spraying. Although Bordeaux mixture was discovered in Europe, its application has been made practicable by American inventions.

**The Principles of Spraying.**—A spray may be effective (a) by hitting the enemy, (b) by placing poison between the leaf and insect, and (c) by placing poison on the plant with a covering unfavorable to the growth of the pest. The cautious farmer insures his crop against injury by spraying. The fruit-grower asks, "Do I need to spray this year? My trees are not blossoming." Certainly, we answer, spray to protect the foliage from these parasites, insect or fungous disease. Healthy foliage is essential to the production of health and vigor and fruit-buds. Spray this year for next year's crop.

Insecticides kill by contact or by means of a poisonous principle; their efficiency depends largely on the time and thoroughness of the application. If applied too soon they may be displaced or washed away; if applied late the injury is only partly prevented. The insects feed less voraciously and are harder to kill as they approach maturity in the larval stage. With the vegetable parasite the case is not essentially different. The tree is covered with a thin coating which destroys spores of fungi resting there and prevents other spores from germinating. Fig. 2370 shows the stage of development of fruit-bud calling for Bordeaux mixture and Paris green. The keynote to success is thoroughness. Hasty sprinklings are worse than useless; they discourage and disappoint the beginner. Full protection is not afforded unless each leaf, twig and branch has been covered. Time is the next most important factor bearing on success. The early spray is most effective. This applies particularly to the treatment of fungous diseases. Spray before the buds open. Get ahead of the enemy.

**Spraying Machinery.**—Bordeaux mixture was first applied with a broom (Fig. 2371); now there are not a few steam sprayers in use. Poison distributors were first made in America for the protection of cotton, potato and tobacco. There are five general types of pumps: (1) The hand portable pump, often attached to a pail or other small reservoir, suitable for limited garden areas. (2) The knapsack pump is carried on a man's back and operated by the carrier. The tank is made of copper, holds five gallons and is fitted with a neat pump which may be operated with one hand while the nozzle is directed with the other. Excellent for spraying small vineyards and vegetable gardens. (3) A barrel pump: a strong force pump fitted to a kerosene barrel or larger tank, suitable for spraying orchard areas up to 15 acres in extent; may be mounted on a cart, wagon, or stove-bolt, depending on the character of the ground and size of trees. (4) A Gear-sprayer; being a tank provided with a pump and mounted on wheels, the pump is operated by power borrowed from the wheels as they revolve, and transferred by means of chain and sprockets. Suitable for vineyards and low-growing plants, which may be satisfactorily covered by the spray as the machine moves along. For this reason it is not adapted to orchard work. (5) The power sprayer; the power being furnished by steam, gasoline, or compressed air. When the trees are large and the orchard over fifteen acres in extent, a power sprayer will usually pay. Some of these various types of machinery are shown in Figs. 2372-2379.

The essentials of a good pump are (1) durability; secured by having brass working parts (except cast iron); (2) strength; obtained by a good-sized cylinder, substantial...
SPRAYING

valves, wall and piston; (3) easily operated: found in a pump with long handle, large air-chamber and smoothly finished working parts; (4) compactness: secured by placing the cylinder so that it is inclosed by the tank, preventing top-heaviness and facilitating the movement of the pump in the orchard. A barrel or tank pump should be strong enough to feed two leads of hose and throw a good spray from four nozzles. Nearly all spray mixtures require occasional stirrings to prevent settling and insure uniformity. An agitator is a necessary part of the pump’s equipment.

*Special Devices.*—One of these is for the making and applying mechanically emulsified definite proportions of water and kerosene. The liquids are placed in two separate vessels, each of which is supplied with a pump. The apparatus is attached which enables the operator to set it for 5, 10, 15 or 20 per cent of kerosene, as the case may be. As the kerosene and water are forced through the pump and nozzles they are thoroughly emulsified. This type of pump is not yet perfected, but marks a distinct step in advance and fills an important place in the treatment of scale and other sucking insects. For special devices, consult experiment station bulletins.

*Nozzles.*—The nozzles of twelve or fifteen years ago were crude affairs when compared with those now in use. They usually discharged the liquid in a solid stream, or in a spray formed by passing through a sieve-like diaphragm. These are now obsolete. Several types of nozzles are on the market. They all aim at economy and efficiency. A nozzle producing a fine misty spray (much to be desired) uses a minimum amount of liquid, but the spray cannot be projected effectively more than six or seven feet from the nozzle. A coarse spray can be thrown much farther, but drenches rather than sprays the tree and naturally uses a large quantity of liquid. For small trees and bush fruits the Vernon (Fig. 2389), or fine spray type, is best, while for old orchards and park work, nozzles of the McIowan and Bordeaux style (Fig. 2381) are most satisfactory. It is now a common practice to attach two (or even more) nozzles to one discharge (Figs. 2385, 2381).

FORMULAS.

(The commoner mixtures, excluding resin washes.)

**Paris Green.**

Paris green ........................................ 1 pound

Water ........................................... 100-300 gallons

If this mixture is to be used upon fruit trees, 1 pound of quicklime should be added. Repeated applications will injure foliage of most trees unless the lime is used. Paris green and Bordeaux mixture can be applied together with perfect safety. Use at the rate of 4 to 6 ounces of the arsenic to 50 gallons of the mixture. The action of neither is weakened, and the Paris green loses its caustic properties. This mixture is good for beetles that chew.

**London Purple.**—This is used in the same proportion as Paris green, but as it is more caustic it should be applied with two or three times its weight of lime, or with the Bordeaux mixture. The apparatus has a gauge attachment variable, and unless good reasons exist for supposing that it contains as much arsenic as Paris green, use the latter poison. Unsafe on peach or plum trees unless considerable lime is added. For insect that chew.

**Arsenites of Lime and Soda.**—These are cheap, the amount of arsenic is under perfect control and it does not burn the foliage. For chewing insects.

*Arsenate of lime:* made by dissolving 1 pound white arsenic in 2 to 4 quarts water until it is dissolved, then use this arsenic solution to slake 2 pounds good lime, adding water if necessary to slake it. When slaked, add water enough to make 2 gallons of this stock mixture. Also prepared by boiling together, for 30 or 40 minutes, 1 pound white arsenic and 3 pounds lime putty by weight in 2 gallons of water, when dissolved it must be measured so that the arsenic may be applied with accuracy. Keep in a tight vessel and use as desired. Thoroughly stir before using. For most insects one quart to 40 gallons will be sufficient. Arsenite of lime is insoluble in water and will not injure the foliage of any orchard fruit at this strength. This insecticide is growing in popularity. Some green dye stuff may be mixed with it to prevent the ever-present danger of mistaking it for some other material.

*Arsenite of soda:* The arsenite (1 lb.) may also be boiled with 4 pounds of sal-soda crystals in 2 gallons water until dissolved, and this solution used in the same manner (with lime). The arsenite of lime is cheaper, and either can be used with Bordeaux mixture the same as Paris green. When used with water, however, it will be safer to put in some freshly slaked lime. More expensive than arsenite of lime, but thought by some orchardists to be more effective.

**Other Arsenites.**—Green arsenoid and Parangine are more brittle and finer than Paris green, and while of good quality they are just as effectual and require less agitation. Arsenate of lead can be applied in large quantities without injury to the foliage, hence it is very useful against beetles and similar insects that are hard to poison; it also adheres to the foliage a long time.

**NORMAL OR 1.6 PER CENT BORDEAUX MIXTURE.**

Copper sulfate (blue vitriol) ................................ 6 pounds

Quicklime (good stone lime) ................................ 4 pounds

Water ........................................... 50 gallons

For peaches and Japanese plums, an extra amount of lime should be added, and more water (60 or 70 gallons) should be used.

Six pounds of sulfate of copper dissolved in 50 gallons of water, when applied at the proper time, will prevent the growth of fungi. However, if applied in this form, the solution will burn the foliage. Four pounds of quicklime in 6 pounds of copper will neutralize the caustic action. When sulfate of copper and lime are added in this proportion, the compound is Bordeaux mixture. Potatoes demand full strength. Diluted Bordeaux mixture is effective against certain mildews and fruit diseases.

Weighing of copper and lime at time of mixing is very inconvenient. Bordeaux mixture is best when used within a few hours after being mixed. Therefore a stock mixture of Bordeaux is impracticable. It is, however, practicable to have stock preparations of sulfate of copper and lime ready for mixing when required. The lime should be "slaked" in a barrel or box with sufficient water to prevent burning, but not enough to smother. Impor-}

2374. A garden barrel pump.

2375. An orchard barrel pump.

2376. Vineyard power sprayer.

tant. When slaked, most alums, and when old, water to ex-}
clude the air. In this manner lime can be kept all summer unimpaired.

One gallon of water will hold in solution, all summer, 3 pounds of copper sulfate. To accomplish this the sulfate should be suspended at the surface of the water in a bag. The water most loaded with copper will sink to the bottom, and the water least loaded will rise to the surface. If 50 pounds of sulfate are suspended in 25 gallons of water on an evening, each
gallon of water will, when stirred the next morning, hold two pounds of sulfate.

Three gallons of this solution put in the spray barrel equal six pounds of copper. Now fill the spray barrel half full of water before adding any lime. This is important, for if the lime is added to so strong a solution of sulfate of copper, a curdling process will follow. Stir the water in the lime

2377. Square tower, giving more working space for the nozzle-men than the conical form.

barrel so as to make a dilute milk of lime, but never allow it to be dense enough to be of a creamy thickness. If in the latter condition, lamps of lime will clog the spray nozzle. Continue to add to the mixture this milk of lime so long as drops of ferrocyanide of potassium (yellow prussiate of potash) continue to change from yellow to a brown color. When no change of color is shown, add another pail of milk of lime to make the necessary amount of lime a sure thing. A small excess of lime does no harm. The barrel can now be filled with water, and the Bordeaux mixture is ready for use.

The preparation of ferrocyanide of potassium for this test may be explained. As bought at the drug store, it is a yellow crystal and is easily soluble in water. Ten cents' worth will do for a season’s spraying of an average orchard. It should be a full saturation; that is, use only enough water to dissolve all the crystals. The cork should be notched or a quill inserted so that the contents will come out in drops. A drop will give as reliable a test as a spoonful. The bottle should be marked “Poison.” Dip out a little of the Bordeaux mixture in a cup or saucer, and drop the ferrocyanide on it. So long as the drops turn yellow or brown on striking the mixture, the mixture has not received enough lime.

AMMONIAL COPPER CARBONATE.

Copper carbonate..............................5 ounces
Ammonia (20º Beamee)........................3 pints
Water........................................45 gallons

Make a paste of the copper carbonate with a little water. Dilute the ammonia with 7 or 8 volumes of water. Add the paste to the diluted ammonia and stir until dissolved. Add enough water to make 45 gallons. Allow it to settle and use only the clear blue liquid. This mixture loses strength on standing. For fungous diseases

2378. Orchard pump with conical tower rig.

tons of water. For fungous diseases, but now largely supplanted by the Bordeaux mixture. A much weaker solution has been recommended for trees in leaf.

IRON SULFATE AND SULFURIC ACID SOLUTION.

Water (hot)..................................100 parts
Iron sulfate, as much as the water will dissolve
Sulfuric acid (commercial)........................1 part

The solution should be prepared before using. Add the acid to the crystals, and then pour on the water. Sometimes recommended for grape anthracnose, the dormant vines being treated by means of sponges or brushes, but it should be applied with caution.

POTASSIUM SULFIDE SOLUTION.

Potassium sulfide (liver of sulfur)........1½-1 ounce
Water......................................1 gallon

This preparation loses its strength upon standing, and should therefore be made immediately before using. Particularly valuable for surface mildews.

HELLEBORE

Fresh white hellebore........................1 ounce
Water....................................3 gallons

Apply when thoroughly mixed. This poison is not so energetic as the arsenites, and may be used a short time before the sprayed parts mature. For insects that chew.

KEROSENE EMULSION.

Hard soap....................................1½ pound
Boiling soft water............................1 gallon
Kerosene....................................2 gallons

Dilute the soap in the water, add the kerosene, and churn with a pump for 5 to 10 minutes. Dilute 4 to 25 times before applying. Use strong emulsion for all scale insects. For such insects as plant lice, mealy bugs, red spider, thrips, weaker preparations will prove effective. Cabbage worms, currant worms and all insects which have soft bodies, can also be successfully treated. It is advisable to make the emulsion shortly before it is used.

Kerosene and water (suggested for San José scale) may be used in all cases where kerosene emulsion is mentioned. Dilute to the strength recommended in each particular case. It must be applied with a pump having a kerosene attachment.

TOBACCO WATER.—This infusion may be prepared by placing tobacco stems in a water-tight vessel, and then covering them with hot water. Allow to stand several hours, dilute the liquor from 3 to 5 times, and apply. For soft-bodied insects.

A special mixture is recommended by Cobett, in Bull. 70, Exp. Sta., W. Va., who reports a trial of Bordeaux mixture, arsenic and kerosene in combination as having proved “gratifying far beyond our most sanguine expectations.” “This combination was rendered possible by using the kerosene in the oil tank of a kerosene pump and placing the Bordeaux and arsenic in the barrel in the ordinary manner.” For aphids, aphid, insects and fungous diseases.
SPRAYING

Literature.—To say that the literature of spraying is voluminous would but faintly describe the situation. Hardly an experiment station in the United States has failed to publish two or three times on this subject. Many of them issue annual "spray calendars." The Divisions of Vegetable Pathology and Entomology, Department of Agriculture, Washington, D. C., have added a great number of bulletins to the general collection. One of the first American books, "Fungal Diseases," 1886, was written by F. L. Samson Serbiner, then of the Division of Veg. Pathology, Washington. Soon after appeared "Insects and Insecticides," and "Fungi and Fungiicides," both by Clarence M. Weed. The most notable book which has appeared and the only complete monograph of spraying in existence was published in 1896, the author being E. G. Lodeman, then instructor in horticulture at Cornell University. Of the experiment stations aside from Washington, prominent in reporting field work, New York (Geneva and Cornell), Michigan, Delaware, California, Massachusetts and Vermont should be named, although many others have done well. Spraying, though not an American invention, is now distinctly an American practice by adoption and adaptation.

JOHN CRAIG.

SPREKELIA (J. H. von Spreckelsen, of Hamburg, who sent the plants to Linnaeus). Amaryllidaceae. Jacobean Lily. A single species from Mexico, a half-hardy bulbous plant with linear, strap-shaped leaves and a hollow cylindrical scape bearing one large showy flower. Perianth strongly declined, tube none; segments nearly equal, the posterior ascending, the inferior concave and enclosing the stamens and ovary; bracts only one, spathe-like; stamens attached at the base of the perianth-segments, and somewhat shorter than the segment by which they are enclosed, having a few small seeds at the base of the filaments: ovary 3-loculed; style long, slender: seeds compressed ovate or orbicular, black.

formosissima, Herb. (Amaryllis formosissima, Linn.). Fls. red. B. M. 47. Var. glabra has somewhat paler and smaller fls. and glaucous Ivs. B. H. 27:16. For culture, see Amaryllis.

F. W. BARCLAY.

SPRING BEAUTY. Claytonia.

SPROUTING LEAF. Catalogue name for Bryophyllum.

SPRUCE. See Picea. Norway S. is P. excelsa. Sitka S. is P. Sitchensis. Tideland S. is P. Sitchensis.

SPURGE. Consult Euphorbia.

SPURGE, MOUNTAIN. Pachysandra procumbens.

SPURGE Nettle. Jatropha.

SPURRY (Spergula arvensis, which see) has long been grown in Germany, France, Holland and Belgium, where its value as a soil renovator and as a forage crop was early recognized. It is an annual, and when sown in the spring matures seed in from ten to twelve weeks from time of sowing. This plant possesses special value as a renovator for sandy soils. It has long been used by the farmers of Holland to hold in place the shifting sands along the seashore. So well adapted is it to sand that it has been termed "the clover of sandy lands." It is not recommended for the American farmer except where the soil is so poor that other plants fail. In such circumstances it may be used as a cover crop to plow under. The seed may be sown any time from April to August, but in orchards it had better be sown in July. Sow at the rate of six quarts per acre. The seed being small, it should be lightly harrowed in upon a well-fitted soil. It is very persistent in the production of seed, and upon fertile soils it will maintain itself for several years unless thorough cultivation is given. Where soils are in fair condition and other crops will grow, it is doubtful if Spurry has any place. Sometimes written Spurrey.

L. A. CLINTON.

SQUASH (Plate XXXVII) is a name adapted from an American Indian word, and is applied in an indefinite way to various plants of the genus Cucurbita. The application of the name does not conform to the specific lines of the plants. What are called summer Squashes are mostly varieties of Cucurbita Pepo. The winter Squashes are either C. maxima or C. moschata, chiefly the former. If the name Squash belongs to one species more than to another, this species is probably C. maxima. See Cucurbita, particularly the note on p. 416. The pictures show some of the forms of these species. Plate XXXVII is the Hubbard Squash, Cucurbita maxima. Fig. 2382 is the Winter or Canada Crockneck, one of the forms of C. moschata. Figs. 2383-88 are forms of the multifarious Cucurbita Pepo. Fig. 2388 shows the Vegetable Marrow, much prized in England. Squashes and pumpkins are very easy plants to grow, provided they are given a warm and quick soil. They are long-season plants, and therefore in the North they are very likely to be caught by frosts before the full crop has matured, unless the plants are started early and make a rapid and continuous growth early in the season. In hard, rough clay lands the plants do not get a foothold early enough to allow them to mature the crop. On such lands it is impossible, also, to plant the seeds early. As a consequence, nearly all Squashes are grown on soils of a loose and relatively light character. Sandy lands or sandy loams are preferred.
On very rich bottom lands the plants often thrive remarkably well, but there is danger that the plants may run too much to vine, particularly true when the soil has too much available nitrogen. In order that the plants shall start quickly, it is necessary that the soil be in excellent tilth. It is customary, with many large growers, to apply a little commercial fertilizer to the hills in order to give the plants a start. A fertilizer somewhat strong in nitrogen may answer this purpose very well; but care must be taken not to use nitrogen too late in the season, else the plants will continue to grow over-vigorously rather than to set fruit.

Cultural groups of Squashes are of two general kinds, the bush varieties and the long-running varieties. The bush varieties are usually early. The vines run very little, or not at all. The various summer Squashes belong to this category, and most of them are varieties of Cucurbita Pepo. The hills of bush varieties are usually planted as close together as 4 x 4 feet. On high-priced land they are often planted 3 x 4 feet. The long-running varieties comprise the fall and winter types; and to this category may also be referred, for cultural purposes, the common field pumpkins. There is much difference between the varieties as to length of vine. On strong soils, some varieties will run 15-20 feet, and sometimes even more. These varieties are planted from 8-12 feet apart each way. Sometimes they are planted in corn fields, and they are allowed to occupy the ground after tillage for the corn is completed.

For general field conditions, the seeds of Squashes are usually planted in hills where the plants are to stand. If the land is mellow and rich, these hills are nothing more than a bit of ground 12-18 inches across, which has been freshly hoed or spaded and leveled off. On this hill, from six to ten seeds are dropped, and they are covered an inch or less in depth. In order to provide the seeds with moisture, the earth is usually firmed with the hoe. When the very best results are desired, particularly for the home garden, hills may be prepared by digging out a bushel of soil and filling the place with rich earth and fine manure. It is expected that not more than three to five of the plants will finally be left to each hill; but there are many contingencies to be considered. The young plants may be taken off by cutworms or by other insects, or they may be caught by frost.

If it is necessary to start the plants in advance of the season, the seeds may be planted in pots or boxes in a forcing-house or hotbed about three weeks before it is time to set them in the field. If the seeds are started much earlier than this, the plants are likely to get too large and to become stunted. When set in the field, the roots should fill the pot or box so that the earth is held in a compact ball, and the plant should be fresh, green and stocky. Plants that become stunted and develop one or two flowers when they are in the box are usually of little use. Sometimes seeds are planted directly in the field in forcing hills, and when the plants are established and the season is settled the protecting box is removed and the plants stand in their permanent positions.

A good Squash vine should produce two or three first-class fruits; if, however, one flower sets very early in the season, the vine may devote most of its energies to the perfection of that single fruit and not set many others, or may set them too late in the season to allow them to mature. If it is desired, therefore, that the plants shall produce more than one fruit, it is advisable to pick off the first fruit, providing it sets long in advance of the appearance of other pistillate flowers. These remarks apply particularly to winter squashes in northern regions. With small varieties and under best conditions, as many as a half-dozen fruits may be got from a single vine, and in some cases this number may be exceeded. Squash vines tend to root at the joints; but under general conditions this should be prevented, because it tends to prolong the growing season of the vine. It is usually well, therefore, to lift the joints occasionally when the hoeing is done, although the vine should not be moved or disturbed. This precaution applies particularly in the short-season climates of the North, where every effort must be made to enable the plant to set its fruit early in the season and to complete its growth before fall.

There are several enemies and diseases of the Squash. Perhaps the most serious is the striped cucumber beetle, which destroys the tender young plants. This insect is destroyed with the arsenites; but since it works on the under sides of the leaves as well as on the upper, it is difficult to make the application in such way as to afford a complete protection. The insects also are likely to appear in great numbers and to ruin the plants even whilst they are getting their fill of arsenic. If the beetles are abundant in the neighborhood, it is best to start a few plants very early and to plant them about the field in order to attract the early crop of bugs, thereby making it possible to destroy them. From these early plants the bugs may be hand-picked, or they may

2382. Winter or Canada Crookneck Squash—Cucurbita moschata.

2383. Summer Crookneck Squash—Cucurbita Pepo form.

2384. Summer Bergen Squash, a form of Cucurbita Pepo.

2385. The Pineapple Summer Squash, one of the Scallop or Pattyspan type—Cucurbita Pepo.
be killed with very heavy applications of arsenites—applications so strong that they may even injure the plants. Sometimes the hills of Squashes are covered with wire gauze or mosquito netting that is held above the earth by means of hoops stuck into the ground. This affords a good protection from insects that arrive from the outside, providing the edges are thoroughly covered with earth so that the insects cannot crawl under; but if the insects should come from the ground beneath the covers they will destroy the plants, not being able to escape. The Squash bug or stink bug may be handled in the same way as the striped cucumber beetle. This insect, however, remains throughout the season and, in many cases, it is necessary to resort to hand-picking. The insects delight to crawl under chips or pieces of board at night, and this fact may be utilized in catching them. The mildews of Squashes may be kept in check with more or less certainty by the use of Bordeaux mixture or ammonical carbonate of copper.

The varieties of pumpkins and Squashes are numerous, and it is difficult to keep them pure if various kinds are grown together. However, the varieties (Cucurbita maxima) do not hybridize with the true pumpkin species (Cucurbita Pepo). There need be no fear, therefore, of mixing between the Crookneck or Scallop Squashes and the varieties of Hubbard or Marrow types. The summer or bush Squashes are of three general classes: the Crooknecks, the Scallop or Pattypan varieties, and the Pineapple or oblong-conical varieties. All these are forms of C. Pepo. The fall and winter varieties may be thrown into several groups: the true field pumpkin, of which the Connecticut Field is the leading representative, being the one that is commonly used for stock and for pies; the Canada Crookneck or Cushaw types, which are varieties of C. moschata; the Marrow and Marblehead types, which are the leading winter Squashes and are varieties of the C. maxima; the Turban Squashes, which have a "Squash within a Squash" and are also varieties of C. maxima. The Marrows and Marrows are the types grown for exhibition and which may weigh two or three hundred pounds, are forms of C. maxima.

Thoroughly sound and mature Squashes can be kept until the holidays, and even longer, if stored in a room that is heated to 70° above freezing. If the Squashes are not carefully handled the inside of the fruit is likely to crack. Squashes that have been shipped by rail seldom keep well. The philosophy of keeping a winter Squash is to prevent the access of germs (avoid all bruises and cracks and allow the end of the stem to dry up), and then to keep the air dry and fairly warm. The fruits are usually stored on shelves in a heated shed or outhouse. The following advice is given for this occasion by W. W. Rawson: "Cut the Squashes just before they are thoroughly ripe. Be careful not to start the stem in the Squash. Lay them on the ground one deep and let them dry in the sun two or three days before bringing to the building. Handle very carefully when putting in, and be sure that the wagon in which they are carried has springs. Put them two deep on shelves in a building. This should be done on a cool, dry day. If the weather continues cool and dry, keep them well aired by day; but if damp weather comes build a small fire in the stove in order to dry out the green stems. Keep the temperature about 50°, and air well in dry weather. The Squashes may need picking over about Christmas if put in the building about October 1; handle very carefully when picking over. Fifty tons can be kept in a single building with a small fire. Do not let them freeze, but if temperature goes down to 40° at times it will do no harm; nor should it be allowed to go as high as 70°. The Hubbard Squash keeps best and longest and does not shrink in weight as much as other kinds, but any of them will shrink 20 per cent if kept until January 1."

L. H. B.

**SQUASH, GUINEA, or EGGPLANT.** See *Solanum Melongena* and *Eggplant*.

**SQUAW BERRY.** *Mitchella repens*.

**SQUILL.** For the garden Squill, see *Scilla*. For the medicinal Squill, see *Urginea*.

**SQUIRREL CORN.** *Dioecia Canadensis*.

**SQUIRTING CUCUMBER.** *Ecbalium Elaterium*.

**STACHYS** (from an old Greek name applied by Dioscorides to another group of plants, coming from the word for spike). *Labiate*. WOUNDWORT. A genus of perhaps 150 species distributed mainly in temperate countries: perennial or annual herbs, rarely shrubby, with opposite simple, entire or dentate leaves and mostly small flowers, ranging from purple, red, pale yellow to white, sessile or short-pedicelled, in axillary whorls or terminal dense spikes; calyx 5-dentate, teeth equal or the posterior larger; corolla-tube cylindrical, 2-lipped, the posterior usually villous, concave or fornicate, rarely somewhat flat; stamens 4, didymous, the anterior longer, ascending under the upper lip and very little exerted, often delphced after anthesis. Very few of the species are cultivated, although there are several with showy spikes. They are usually found in moist or even wet places when growing wild. A tuber-bearing species (*S. Sieboldii*) has lately come into notice as a kitchen-garden plant.

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**2386. Connecticut or Common Field Pumpkin—Cucurbita Pepo.**

**2387. The Negro Squash.** One of the warty forms of *Cucurbita Pepo*.
date at the base, 3-6 in. long; upper leaves distant, sessile, oblong-lanceolate, acute: fls. purple, in a dense, terminal spike. July. Eu., Asia Minor. – Rarely found as an escape in this country, and once cult. for use in domestic medicine. Useful for ornament, and now advertised for that purpose.

**longifolia**. Benth. (Petunia orientalis, Linn.) A hardy perennial herb about 1 ft. high, densely villous. lower lvs. petioled, oblong-lanceolate, obtuse, crenate; deeply cordate at the base, 4-6 in. long; the upper lvs. similar in shape but sessile, those of the inflorescence bract-like: fls. reddish purple to pink, in a cylindrical, somewhat interrupted spike about ½ ft. long. July. Caucasus.

389. Tuber of Stachys Sieboldii (× 3/4).

**grandiflora**. Benth. (Petunia rosea, Hort.). A hardy perennial about 1 ft. high: lower lvs. broadly ovate, obtuse crenate, long-petioled, base broadly heart-shaped; the upper gradually smaller, nearly similar in shape, and in the uppermost bract-like: fls. violet, large and showy, the curving tube about 1 in. long and three or four times surpassing the calyx, in 2-3 distinct whorls of 10-20 fls. each. Asia Minor, etc. B.M. 700.

**coccinea**, Jacq. One to 2 ft., slender, soft-pubescent: lvs. ovate-lanceolate, cordate at base or somewhat deltoid, obtuse, crenate: fls. scarlet-red, the narrow tube much exceeding the calyx, pedicelled, in an interrupted spike, blooming in succession. Western Texas to Ariz. B.M. 696. – Showy.

**Corolla-tube little exceeding the calyx**.

**Herbaceae**. 36.

**áspersa**, Michx. Erect, usually strict, 2-4 ft. high, the stem retrorsely hairy on the angles: lvs. oblong-ovate to oblong-lanceolate, mostly acuminate, serrate, petiolate: corolla small, glabrous, pale red or purple, in an interrupted spike. Wet places, Ontario and Minnesota to the Gulf. – Has been offered by dealers in native plants.

**lanata**, Jacq. WOOLLY WOUNDWORT. A hardy perennial 1-1½ ft. high, white-woolly throughout: lvs. oblong-elliptical, the upper smaller, the uppermost much shorter and whorled: fls. small, purple, in dense 20- or more fl. whorls in interrupted spikes. Caucasus to Persia. – Often grown as a bedding plant. Valuable for its very white herbage.

**Herbaceae**. 36.

**Plantas grown for edible subterranea tubers**.

**Sieboldii**, Miq. (S. altissimis, Bunge, not Fresenius. S. tuberflorá, Naud.). CHOGOT. CHINESE OR JAPANESE ASPICHEERE. KNOTROOT. CROSES DU JAPAN. Figs. 2290, 2291. Erect, hairy mint-like plant, growing 10-18 in. tall: lvs. ovate to deltoid-ovate to ovate-lanceolate, crenate at base, obtuse-dentate, stalked: fls. small, white or light red, in a small spike: tubes (Fig. 2290) 2-3 in. long, slender, nodose, white, produced in great numbers just under the surface of the ground. China, Japan. G.C. III. 3:13. – Sent to France in 1882 from Pekin by Dr. Bretschneider, and about ten years ago introduced into this country. It is cultivated for the crisp tubers, which may be eaten either raw or cooked. These tubers soon shrivel and lose their value if exposed to the air. The tubers withstand the winter in central New York without protection, so that a well-established plant takes care of itself and spreads. For history, chemical analyses, etc., see Cornell Bull. 37.

**FLORIDA**. Shuttlew. Slender, erect, 1-2 ft., branching, glabrous: lvs. coriaceous-oblong-lanceolate, blunt-toothed, stalked: fls. small, light red, in an open interrupted spike: tubers cylindrical, uniformly nodose, 4-6 in. long. Fla. – Has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. 61), but practically unknown horticulturally. The tubers are fully as good, for eating, as those of S. Sieboldii.

L. H. B.

**Stachytarpéthia** (Greek, dense spike). Verbenáceae. About 40 species of herbs or shrubs, mainly from tropical America, with opposite or alternate, dentate or pinnatifid, white or purple, blue or red flowers solitary in the axils of bracts, sessile or half sunk in the racin of the long and dense or short and lax spikes.

**mutábils**, Vahl. A low shrub, sebaceous-pubescent: lvs. ovate, dentate, sebaceous above, whitish pubescent beneath: spike long, erect: bracts lanceolate, subulate: calyx 4-dentate, hispid, 4-6 lines long; corolla crimson, fading to rose, ½-¾ in. across, in whorls of 7-10, India, Mexico to Guiana. Offered in S. Calif.

F. W. BARCLAY.

**Stachyýrúus** (Greek, spike and tail; in allusion to the form of the inflorescence). Terréstríídáceae. Two species of glabrous shrubs or small trees, one from the Himalayas and the other from Japan, with membranous, serrate leaves and small flowers in axillary racemes or spikes: fls. 4-merous; sepals strongly imbricated; stamens 8; style simple; berry 4-loculed.


**Stackhousia** (after John Stackhouse, an English botanist). About 10 species from Australia and sparingly from other islands of the S. Pacific Ocean. Mostly perennial herbs with slender, erect stems and narrow, entire, often fleshy leaves and terminal spikes of flowers. The genus is the only one of the order: lvs. regular, hermaphrodite: calyx small, 5-lobed; petals 5, perigynous, clawed, usually free at base but united above in a tube with spreading lobes; disk thin, lining the calyx-tube; stamens 5, inserted on the margin of the disk: ovary free, 2, 3-lobed, 2-5-locular, fr. of 2-5 indescent oec. Consult Flora Australiensis 1:405.

**monógyrus**, Labill. (S. linariifloéz, A. Cunn.). A half-hardy perennial herb, usually simple, about 1½ ft. high, with linear or lanceolate lvs., about 1 in. long; spikes at first dense, then lessening, to 4-6 in.: buds pinkish when young: fls. white. B.R. 22:1917. – The plant in the Californian trade is apparently not the above species, for the catalogue says it is tall, robust shrub with fls. heads 1-2 in. across, surmounted by pubescent bracts and bright yellow fls. with a purple-streaked keel.

F. W. BARCLAY.

**Stadmánia** (named by Lamarck in 1793 after a German botanist and traveler). Sapindáceae. The only species of this genus that is well known is a tropical tree from the Bourbon Islands, there known as Bois de fer or Ironwood. This is a large tree with hard, heavy reddish wood, once frequent in the primeval forests of Mauritius but now scarce. It is not known to be in cultivation in America. The proper name of this tree is Stadmánia oppositifólia. Linn., a synonym of which is S. Sidérózygos, DC. Nine other names appear in Index Kewensis, apparently all Brazilian species, but one of them is a bare name and the others were first described in the early sixties in Lindén's catalogue. They are
STADMANIA

therefore very uncertain names, and the following
diagnosis of the genus (taken from Baker's "Flora of
Mauritius and the Seychelles," 1877) is probably su-
ciently inclusive. The regular, regular-polygo-
nous, one-celled, fleshy, thick, deeply
epicarpen, long, dark, round, indescrib-
For the generic name is sometimes written Stadmannia,
a spelling which is said to be an error dating back to
Walters' Annales and is also cited as Stadmannia.

STAGHORN FERN. Platycerium.

STAGHORN SUMACH. See Rhus.

STANDING CYPRUS. Gilia coronopifolia.

STANGERIA (Wm. Stanger, surveyor-general of
Natal; died 1854). Cycoidea. Stangaria paradoxa, T.
Moore, is unique among the cyrads by reason of the
venation of its leaves. In all the other members of
the family the veins of the leaf-segments are parallel
and horizontal; in this one plant they are all free and
run directly from the midrib to the margin. This
pinnate venation is so extraordinary that the plant
looks more like a fern than a cyrsad, and in fact it was
so described before the fruits were known. Stangaria
is a South African plant with an odd turnip-shaped
stem (properly a rhizome), at the top of which are
3-4 handsome leaves each 2 ft. long and 1 ft. broad,
with about 12 pairs of leaflets which are fern-like and
unusually broad for the family. This plant was intro-
duced to the American trade by Reasoner Bros., of
Oneo, M., in 1890, but it is little known in cultivation in
country.

All the cyrads have a high reputation among con-
oisseurs as decorative foliage plants for warm conser-
vatories. The most popular is Cyraea revoluta, which
see for cultural suggestions. The flowers and fruits in
this family are very singular and interesting. The
male cones of Stangaria are 6 inches long and an inch
or so in width. The female cones are much smaller
2-3 in. long. The structure of the cones and fruits
shows that Stangaria is closely related to Erythrina-
alagaces. The species above mentioned is probably the only
ten, but it seems to have several well-marked varieties.
For a fuller account see B.M. 5121.

W. M.

STANHOPEA (named for the Earl of Stanhope, presi-
dent of the Medico-Botanical Society, London). Orchi-
daeae. A genus of about 20 species inhabiting tropical
America from Mexico to Brazil. These plants are easily
grown and very interesting, but the fagacious character
of their flowers has been unfavorable to their extensive
cultivation. The flowers are produced on the thick stems
which bore their way through the material in which they
are planted and emerge from the bottom of the
baskets. The flowers expand with a perceptible sound
carly in the morning. They are large, fragrant, and
dazzlingly colored. The sepals and petals are usually
reddened; they are subequal or the petals are nar-
rower. The label is remarkably transformed. The
basal part or hypochilium is boat-shaped or sacate, often
widened or carinate in the upper margin. This passes
gradually into the mesochilium, which consists of a fleshy
central part and two lateral horns. The terminal lobe or
epicilium is firmly or movably joined to the mesochilium.
It is rather well formed, but the base of the label
is continuous with the long winged column.

The blooms are scattered on the short rhizome,
with scales and each bearing a single long
plated leaf contracted to a petiole at the base.

HEINRICH HASSELBERING.

Stanhopes enjoy a shady, moist location. A tempera-
ture of 60-65° F. at night and 70-75° during the day
should be maintained in winter, with a gradual advance
of 10° toward midsummer. They should be grown sus-
pended from the roof in orchid cabinets or terra cotta
baskets with large openings at the bottom, and if drain-
age is used it should be placed in such a way that it
will not interfere with the exit of the pendulous
flower scapes. Equal parts chopped sphagnum and
peat fiber form a good compost. By severing the
rhizomes here and there between the old pseudobulbs,
new growths will be sent up and thus the plants may be
increased.

R. M. GREY.

STANHOPEA

1715

INDEX.


A. Labelleum with an excavated or
saccate base and a plane ter-
minal lobe.

b. Moschil and pleuridium want-
ing

1. eburnea

bb. Moschil and pleuridium present.

b. Hypochilium longi-exsertum, short-
and sessile

2. Wardii

c. Hypochilium boat-shaped, long
and stalked.

3. oculata

4. Buechelius

5. platyceras

ccc. Hypochilium saccate or glabrose.

b. Epichilium entire or abso-
letly 3-toothed at the apex.

6. insignis

7. Devoniensis

8. Shuttleworthii

d. Epichilium evidently 3-toothed
at the apex.

9. trigrina

10. Martiana

11. saccata

AA. Labelleum reduced to a saccate
pouch.

12. eburnea

1. eburnea. Lindl. (S. grandiflora, Lindl.). Pseudo-
bulbs conical, 1½ in. long, lvs. leathery, 8-12 in. long;
scapes pendulous, with small bracts, 2-3-ft.-fls. 5 in.
across, ivory white; sepals broad; petals narrow; la-
belum 3 in. long, solid, fleshy, excavated at the base
and bearing 2 hooked horns over the mouth, spotted
above with red, purple; column pale green, with
broad wings toward the apex. Guiana. B.M. 3359.
15:1414 (as Ceratocallis grandiflora). B. 4:176.

2. Wardii. Lodde. Pseudobulbs 2 in. long; lvs. large,
broad and leathery: Bower-stem 9 in. long, bearing 3-9
fls., which are bright yellow to golden orange, spotted
with crimson; lateral sepal rounded-oblung, concave,
acute; petal lanceolate, revolute, the ovary in the base
of the labelleum deep violet purple. Aug. Mex. and S.
golden yellow, with 2 dark spots on the hypochilium.
Fragrant.

3. oculata. Lindl. Lvs. ovate, with a blade 1 ft. long;
scape 1 ft. long, clothed with scarious pale brown
sheaths, 3-6-ft.-fls. 5 in. across, very fragrant, pale
yellow, thickly spotted with purple; sepals 3 in. long,
reflexed; petals one-half as large; hypercoil narrow,
white, spotted with crimson and having 2 large dark
brown spots near the base. Mexico. B.M. 5300.
guished from S. saccata, by the red spots on the
calyx, and the paler color and long, narrow hypochilium.
There are several

varieties, differing in color and markings.
4. Bucephalus, Lindl. (S. grandiflora, Reichb. f.) Pseudobulbs crowded, rugose; lvs. petioled, 9 in. long, pointed; the pendulous racemes bearing 4-6 large, tawny orange fls. marked with large crimson spots: sepals and petals reflexed, the former broad; lower part of the labellum curved, boat-shaped, bearing 2 curved horns and a broad desky middle lobe; column green and white, spotted with purple. Aug. Mexico, Peru. B.M. 5278. B.R. 31:24. — Fls. very fragrant. Distinguished by its very short ovaries.

5. piatyéras, Reichb. f. Pseudobulbs and lvs. as in S. Bucephalus but stouter: scape 2-fl.; with ovate acute bracts one-half as long as the ovary: fls. 7 in. across, pale yellow, with numerous ring-shaped spots and blotches of purple; sepals triangular oblong; petals broadly linear, acute; hypochil boat-shaped, 2½ in. long; horns 1 in. long, broad, pointing forward, parallel with the tongue-shaped middle lobe; the hypochil is deep purplish crimson inside, paler and spotted outside, the upper part of the labellum colored like the sepals. Colombia. (In. 33:632.)


7. Devonienis, Lindl. (S. maculosa, Knowles & W.) Lvs. about 9 in. long; scape pendulous, 2-3 fl.; fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepals oblong to ovate-oblong, obtuse; petals narrow; hypochil rounded, saccate, purple, horns incurved, middle lobe ovate, channelled, obscurely 3-toothed. Peru. F.S. 10:574. F.C. 3:121.

8. Shutteworthii, Reichb. f. Pseudobulbs large, conical, sulcate; lvs. broadly oblong, acute; racemes pendulous, loose; sepals, petals and base of the labellum apricot color with dark purplish blotches, front part of the labellum yellowish white; hypochil semi-globose; horns flattened, suberect, terminal lobe triangular; column whitish, green along the middle and spotted with purple on the inside. Colombia.

9. tigrina, Batem. Lvs. and pseudobulbs as in the genus: scape short, pendulous, clothed with large, thin brown scales; fls. 6 in. across, waxy and very fragrant; sepals broadly ovate, concave; petals oblong-lanceolate, both dingy yellow mottled towards the base with large blotches of dull purple; hypochil broad, cup-shaped; horns 1 in. long, fleshy, bent forward at right angles; middle lobe rhomboid, with 3 fleshy teeth at the apex; column large, spatulate. Mexico. B.M. 4197. B.R. 25:1. G.M. 32:298; 38:149. F. 1845:59. G.C. III. 4:481. — One of


11. sacca, Batem. Fls. smaller than those of the other species, greenish yellow, changing to deeper yellow at the bases of the segments, regularly speckled with brown; lateral sepals ovate-oblong, the upper one oblong-lanceolate; petals narrower, oblong, all reflexed; hypochil deeply saccate; horns flat, a little twisted, epichil quadrate. Guatemala. 1.H. 8:270 (as S. radiosa).

12. erornata, Lem. Pseudobulbs and lvs. large; scape short, clothed with green bracts, 2-fl.; sepals erect, 2 in. long, ovate, concave, white, petals smaller; labellum reduced to a fleshy sac-like hypochil, 1½ in. long, yellow deepening to orange at the base; column as long as the labellum and of the same color. Cent. Amer. B.M. 4885. F.S. 2:161. G.C. 1850:295.

S. Ameusinata, Hort. Hugh Low, belongs to the hornless class of which S. erornata is a type and is perhaps a variety of S. Lowii. It has large, waxy, clear white, fragrant fls. over 4 in. across, and a very thick, fleshy, saccate labellum. G.M. 36:352. Habitat.

HEINRICH HASSELBRENG.

STANLEYA (Edward Stanley, Earl of Derby, 1770-1849, ornithologist, once president of Linnean Society). Crucifera. Stanleya pinnatifida is a hardy perennial herb about 3 ft. high, with the general appearance of a Cleome and bright yellow flowers an inch across borne in terminal spikes a foot or more long. The genus contains 5 species of stont herbs native to the western U.S. It belongs to the Sisymbriun tribe of the mustard family, which tribe is characterized by long, narrow pods, seeds in a single series and incumbent cotyledons. Stanleya is distinguished from neighboring genera by the long, club-shaped buds, cream-colored or yellow fls., and long-stalked ovaries and pods. Other generic characters: sepals linear; petals narrow, long-clawed; stamens 6, nearly equal; seeds numerous, penisiform.


W. M.

STAPÉLLA (J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). Aseolpianticae. CARLINE FLOWER. Odd fleshy caesal-like plants from South Africa. Schumann, in Engler and Prantl's "Naturalpflanzenfamilien," considers that the genus contains 70-80 species. Decaisne, in De Candolle's Pro-
dramus, 8 (1844), describes 89 species, and makes reference to several more. The Stapelias are usually grown with greenhouse succulents, both for the great oddity of their forms and for the singular and often large, showy flowers. The plants are leafless. The strongly transversely 4-angled, often pubescent, green branches or stems are generally more or less covered with tubercles and excrescences. The flowers commonly arise from the angles and notches of the stems, apparently in no regularity, and are usually grotesquely barred and marked with dark or dull colors. They generally emit a strong and carrion-like odor. The calyx and corolla are 5-parted; corolla-segments spreading and usually narrow, usually fleshly, mostly purple or marbled, in some species 4-bladed, covering or making 2 series of scales or bracts, of which the inner are narrower, each series in 5's but the scales sometimes lobed or bifid: fr. of 2 follicles, containing comose seeds. Some of the species have petals several inches across, although the plants themselves are relatively small; in fact, the flowers of *S. gigantea* are a foot across.

The Stapelias are easy of cultivation. Most of the species demand the treatment given to Cape Euphorbias and to easteria—a light, airy, rather dry position during the growing and blooming seasons and a soil made porous with rubble. They are mostly summer and fall bloomers. They should remain dormant in winter. Propagated easily by cuttings. They do best, however, when not grown so dry as easteria are grown.

The Stapelias are known in cultivation mostly in botanical gardens and in the collections of amateurs. Only 5 names now occur in the American trade, and one of these belongs properly in the genus Echidnopsis. Several other species are likely to be found in fanciers’ collections.

**A.** Corona formed only of the cohering anthers. *Echidnopsis.*

**cylindrica.** Hort. This is properly *Echidnopsis cereiformis,* Hook. f., omitted from Vol. II, but known in the trade as a Stapelia: stems cylindrical, tufted, 1–2 ft. long, becoming recurved or pendulous at the ends, ¾ in. or less thick, nearly or quite simple, 8-grooved and marked by shallow transverse depressions, fs. arising from furrows in the stem, small (about ¾ in. across), yellow, sessile. Probably South African, but habitat unknown. B.M. 5930.

**B.** Fls. pale yellow, about 1 ft. across.

**gigantea,** N.E. Br. The largest and finest species yet known, and one of the largest and oddest of flowers: branches many, usually less than 1 ft. long, obtusely 4-angled; as described by W. Watson: "The flowers are a foot in diameter, leathery-like in texture, the surface wrinkled and the color pale yellow, with red-brown transverse lines and covered with very fine silky purplish hairs; each flower lasts two or three days, and on first opening emits a disagreeable odor." Zuluiland. B. M. 7066. *G.C. II. 7:693; III. 4:729.* G.F. 8:515. — "The requirements of *S. gigantea,*" Watson writes, "are somewhat exceptional. It thrives only when grown in a hot, moist stope from April till September, when the growth matures and the flower-buds show. It should then be hung up or placed upon a shelf near the roof-glass in a sunny dry position in the stove."

**Bb.** Fls. yellow, 3 in. or less across.

**variegata,** Linn. (S. Curtisia, Schult.). About 1 ft. tall, with 4-angled sharply toothed stems; fls. solitary, sulfur-yellow, the lobes ovate-acute and transversely spotted with blood-red. B.M. 26. *R.H. 1857,* p. 43.—An old garden plant, still seen in collections, often under the name *S. Curtisia.*

**Bb.** Fls. purple, 6 in. or less across.

**grandiflora,** Mass. Fig. 2392. About 1 ft. tall, gray-pubescent, the branches 4-winged and toothed; fls. 4 or 5 in. across, with bright purple petaloid segments, striped or marked with white, hairy. *R.H.* 1858, p. 155.—An old garden plant.

**glabriloba,** N. E. Br. (S. grandiflora, var. minor, Hort.). Fls. somewhat small and not hairy, the seg-

ments becoming strongly reflexed, dull purple-red with yellowish white lines. *G.C. II.* 6:869.

**S. Astreias,** Mass. STARFISH FLOWER. Dwarf; branches 4-angled, mostly curved, sharp-toothed; fl. 4 or 5 in. across, with spreading star-like ciliate segments, violet-purple with transverse yellowish bars. B.M. 596. L. B. C. 5:453. Offered by Blanc, 1895.— *S. Bulfinia,* Sims— *S. normalis.* — *S. normalis,* Jacq. About 6–8 in.; branches 4-angled, with large, spreading teeth, glabrous: fl. 2–3 in. across, with ovate-acute segments, yellow with transverse marking of red-purple. B. M. 1676. G. S. 52, p. 186. One of the commonest of the old kinds, but the name does not appear in the American trade.— *S. Pinnata,* Hort. Stems stout and erect, strongly 4-angled, subulate-toothed and with indexed points; fl. 5 in. across, hairy, brown barred with yellow, the margins of the segments brown-purple. B. M. 5962. F. S. 18:1912.

In 1892, the catalogue of the following names, in addition to some of those above: *S. angustifera,* Jacq. (properly S. piets; Domn.): "Fls. glabrous; corolla yellow, marked with numerous rufous spots; the orifice is marked with large spots of two forms, dark yellow, brown."— *S. deltilia,* (S. deflexa, Jacq.): "Only about 2 in. across, the color greenish or pale red, deeply wrinkled."— *S. planiflora,* Jacq.: "Flower flat; corolla spreading, sulfur yellow, lined and spotted with dark purple."— *S. revoluta,* Mass.: "Distinct flowers, red, with whitish blotches, smooth, very fleshy, and with fringed margins."— *S. rosa,* Mass.: "The flowers are of an obscure violet color, variegated with deep purple and pale red transverse stripes, the margins edged with dark violet hairs."— *S. truncatissima,* N. E. Br.: "A very rare species from the Tsimo river. Corolla 3 in. in diameter, the face entirely dull, smoky purple, darker at the tips of the lobes."

L. H. B.
with 1 or few subglabrous rather large, longy seeds in each cell.

a. Lvs. 3-foliate.

b. Middle leaflet short-stalked; panicle sessile.

Bumálda, DC. Shrub, 6 ft. high, with upright and spreading slender branches; lfts. broadly oval to ovate, sharply acuminate, entire or serrate, with awn-tipped light green, almost glabrous, 1½-2½ in. long; fls. about 3/8 in. long, in loose, erect panicles 2-3 in. long; sepals yellowish white, little shorter than the white petals; capsule usually 2-lobed, somewhat compressed, 3/4-1 in. long. June. Japan. S.Z. 1:55.

3293. Staphylea trifolia (X 1/2).

BB. Middle leaflet slender-stalked; panicle stalked.

trifólia, Linn. American Bladder Nut. Fig. 2298. Upright shrub, with rather stout branches, 6-15 ft. high; lfts. oval to ovate, acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1½-3 in. long; fls. about 3/8 in. long, in nodding panicles or umbel-like racemes; sepals greenish white, petals white; capsule much inflated, usually 3-lobed, 1½-2 in. long. April, May. Quebec to Ontario and Minn., south to S. C. and Mo. Gt. 37, p. 529.—Var. puánitóa, Zabel. Low and suckering; lfts. smaller, broader, glabrous at length; fls. in short, 1-5-fl. racemes; fr. often 2-lobed, 1½-1¾ in. long.

AA. Lfts. 5-7-foliate, only occasionally 3-foliate; panicle stalked.

b. Panicle raceme-like, oblong, pendulous; fls. buds subglobose.

pinnáta, Linn. Upright shrub, attaining 15 ft., sometimes tree-like; lfts. 3-7, oval-oblong, long-acuminata, sharply and finely serrate, glabrous and glaucous beneath, 2-3 in. long; panicles 2-3 in. long; peduncles about 2 in. long; sepals oval, white, greenish at the base, reddish at the apex; about as long as the oblong petals; capsule 2-3-lobed, much inflated, subglobose, about 1 in. long. May, June. Europe to W. Asia. Gn. 34, p. 260.

BB. Panicle broad, ovate, upright or nodding; fls. buds obovate-oblong.


S. Kolander, A. Gray. Allied to S. trifólia: lfts. broadly oval or almost orbicular, glabrous; stamens and style excised: fr. 2½ in. long. Calif. G.F. 2:345.—S. elegans, Zabel. Intermediate between and supposed to be a hybrid of S. pinnáta and Gólchica: lfts. usually 5; panicles very large and nodding. A very free-flowering variety with pinkish tinged fls. is

var. Hessei, Zabel.—S. Emödi, Wall. Shrub or small tree; lfts. 3, oval to oblong, 2-6 in. long; fls. in peduncled, pendulous, raceme-like panicles; fr. 2-3 in. long. Himalayas.

ALFRED REID.

STAR APPLE. See Chrysophyllum.

STARFISH FLOWER. Staphíla Asterías.

STAR FLOWER. Aster, Triénális, Tritéleia and other plants.

STAR GRASS is Chloris trunciata.

STAR OF BETHLEHEM. Orníthogánum umbellátum.

STAR THISTLE. Centaurea.

STAR TULIP. Calochórtus.

STARWORT. Aster.

STÁTICE (from a Greek name meaning astringent, given by Pliny to some herb). Plumbógaíněs. Sea Lavender. About 120 species well scattered about the world, but mainly seacoast plants of the northern hemisphere and especially numerous in Asia. Mostly perennial herbs, rarely annual or shrubby, with usually tufted rather long leaves (radical in the herbaceous species), and small blue, white, red, or yellow flowers. Panicles little branched or much branched, spreading and leafless; bracts subtending the fl-clusters, scale-like, somewhat clasping, usually coriaceous on the back, and with membranous margins; fls. in dense, few- to several-fl. fl-clusters, or 1 or 2 in the axis of a b; fl-clusters usually erect and unilaterally arranged on the branchlets or more rarely nearly sessile; in dense, cylindrical spikes; calyx funnel-shaped, often colored and scarious and persistent. Statices is most readily distinguished from Armería by the indoreseence, Arme-ria bearing its flowers in a single globular head.

Statices are of easy cultivation but prefer a rather deep, loose soil. From the delicate nature of the fl.-panicles the species are better suited to rockwork and isolated positions than for mixing in a crowded border. Many of the species are useful for cut bloom, especially for mixing with other flowers.

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A. Fls. in long, cylindrical spikes.
B. Spikes in open panicle.
BB. Spikes in dense panicles.

AA. Fls. in more or less unilateral spikes or clusters.

b. Branches winged.

C. Calýx blue; corolla white.

D. Plant herbaceous.

E. Plant shrubby.

cc. Calýx whitish; corolla blue.

ccc. Calýx green or whitish; corolla redish.

cccc. Calýx and corolla yellow.

BB. Branches terete or simply angled.

C. Fls. yellow.

D. Fls. not yellow.

E. Calýx blue.

F. Petéoles rather long.

G. Petéoles short or none.

H. Calýx white or green.

I. Bractes green.

J. Bractes white-margined.

K. Spikes 4-fl.

L. Spikes 2-fl.

M. Spikes 1-fl.

1. Suvoróvi, Regel. A tall annual; lvs. radical, ob lanceolate, obtuse, mucronate, 6-8 in. long; margins en tire or sinuate; scapes several, stout, obtusely angled,
nearing 1 long terminal spike and several distant, sessile lateral ones 4-6 in. long, nearly ½ in. through; fls. rose, small, nearly sessile, crowded. June, July. West from Turkestan, B.M. 6092. A handsome annual, suitable for growing in masses and useful for cut blooms.

2. supérba, Regel. A Hardy annual resembling S. Sowerwort, but with the spikes densely crowded into a pyramidal panicle. Asia.—According to Wm. Falconer in G.F.L.; this species is undoubtedly more vigorous as S. Sowerwort. Var. hore-albo, Benary, is also offered.

3. sinúata, Linn. A biennial plant which may be treated as an annual, about 1 ft. high, of a spreading growth; lvs. lyrate-pinnatifid, the lobes round, the terminal lobe terminal, about 1 in. long, narrow, crowded into the petiole; scapes leafless, much branched into a large, paniculate corymb; branches winged: spicate 2-3-fl.: calyx white; corolla large, blue. Late summer. Mediterranean region of Europe. B.M. 71.

4. macrophilla, Brousse. (S. Holleró, Hort., is a garden form of this species). A tender, somewhat shrubby species, its stem branched and bearing clusters of large, sessile, ovate-spataulate lvs. calyx leafless, much branched into a large, paniculate corymb: branches winged: spicate 2-fl.: calyx white; corolla white. B.M. 31:7. Cult. in S. Calif. Makes a good pot-plant for winter flowering in a cool greenhouse. T. D. Hatfield, in G.F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather unsterilized pots, in a light soil with which some charcoal has been incorporated, and given perfect drainage, as excessive moisture at the roots is fatal. Propagation is effected by cutting of the side shoots placed in a cool propagating bed, or better by layering, which is well accomplished in summer by making a notch in each of the side branches and then burying the plant in ordinary garden soil below the incisions." From the Canaries.

5. specíosa, Linn. A hardy perennial, about 1 ft. high, lvs. tufted, ovate to oblanceolate, 4-6 in. long, crowded into the petiole: scape widely branched: branches triangular, slender, narrowly 3-winged, somewhat recurved: spicate 1-2-fl., in usually lax, simple or branched spikes: fls. 2 lines long, typically red, with several garden varieties. Caucasus. B.M. 6537.—Var. nana, Hort. (S. înca, var. nana), is a dwarf form. A.

7. Bondnéli, Lestib. Fig. 2394. A tender annual or biennial plant, about 18 in. high: lvs. radical, spatulate, subnately lyrate, hairy, subulate-pointed at the apex; lower broader: the terminal leaf larger, also several from the same root, terete: branches angled, dichotomously cymose; ultimate branchlets obovate-elliptical, 8-winged, forked at the apex; fls. yellow, individually large, for the flowers clustered in the fork of the branchlets, a few, crowded: spicate 2-fl., in usually lax, slender, narrow, crowded, somewhat unilaterial: spicate 2-fl., in ovate, densely imbricate spikes: fls. blue. B.M. 41. Cult. in Calif. Makes a good pot-plant for winter flowering in a cool greenhouse. T. D. Hatfield, in G.F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather unsterilized pots, in a light soil with which some charcoal has been incorporated, and given perfect drainage, as excessive moisture at the roots is fatal. Propagation is effected by cutting of the side shoots placed in a cool propagating bed, or better by layering, which is well accomplished in summer by making a notch in each of the side branches and then burying the plant in ordinary garden soil below the incisions." From the Canaries.


The flowers are about one-third inch across.

14. lafitolia, Sm. A hardy deep-rooting perennial about 2 ft. high: lvs. large, obovate-elliptical, obtuse, attenuate on the petiole; scape very much branched: branches terete or angled: panicle large, spreading: spicate 1-fl., rarely 2-fl., in lax, narrow spikes; fls. blue. Midsummer. Russia.—A handsome plant. Should be given a very deep soil in a sunny position and left undisturbed.


F. W. Barclay.

STATISTICS concerning horticulture are very imperfect, widely scattered and not always available. The United States Department of Agriculture has published statistics of horticulture in various publications. The Synoptical Index of the Reports of the Statistician, 1863 to 1894, is a document of 258 pages published in 1897. The Section of Foreign Markets has issued many statistical pamphlets of great interest to importers and exporters of horticultural products. Market-gardening,
floriculture, seed raising, the nursery business, and viticulture were subjects of special reports in the Eleventh Census, 1890. In this Cyclopaedia statistics appear under such large topics as Horticulture, Cut-flowers, Floriculture, and the various articles on states.

**STELLARIA** (Latin, star; referring to the form of the flower). Caryophyllaceae. A genus of about 70 species of annual or perennial herbs, mostly diffuse, tufted or weakly ascending. They are scattered about the whole world, but are mainly found in the temperate regions. Lvs. opposite, simple; fls. usually white and disposed in terminal or rarely axillary leafy or naked paniculate cymes; sepals usually 5; petals usually 5, rarely none, bllt, often deeply; stamens 3-10; styles 3-4, rarely 5; capsule aroid to oblong, relatively short, dehiscing by as many as twice as many teeth as there are carpels. See Gray, Syn. Flora of N. Amer.

**A. Fls. 7-10 lines across.**

**Holostea, Linn. Easter Bell.** A hardy perennial, erect, 6-18 in. high, simple or somewhat branched, from a creeping rootstock: lvs. sessile, lanceolate, 1-3 in. long: fls. white, abundant, in a terminal leafy panicle; sepals one-half or two-thirds as long as the petals. May, June, Eu., Asia, June, July. B. M. 600 (as L. quadriflora).—Very showy when in flower. Offered by collectors of native plants. K. M. Wiegand.

**STELLARIA** (Latin, star; referring to the form of the flower). Caryophyllaceae. A genus of 2 species of tender evergreen woody vines, one from China and one from Japan. The lvs. have 3-7 digitate leaflets. Fls. monoecious, in axillary, few-fl., racemae; sepals 6, petaloid; petals wanting: sterile fl. with 6 monodelphous stamens, anthers bimorse, ovary rudimentary: fertile fl. with 6 sterile stamens and 3 carpels.

**hexaphylla**, Decne. Fig. 2395. A handsome vine becoming 40 ft. high: lfts. oval, about 2 in. long, stalked: fls. in axillary clusters, white, fragrant in spring: lvs. about 4 in. long, splashed with scarlet. Japan. A.G. 12:139.

F. W. Barclay.

The Stauntonias are beautiful evergreen climbers and well adapted to the soil and climate of the South Atlantic and Gulf region. Both S. hexaphylla and the related Holobilia latifolia (known also as Stauntonia latifolia) grow well in the writer’s Florida garden, although they are not such very luxuriant climbers as are the Allamandas, Thunbergias and Bignonias. It requires a few years before they are fully established. They are excellent subjects to be planted on old stumps and on small trees, such as catalpas and mulberry trees, which they perfectly cover in the course of time with their pretty evergreen leaves and their rather insignificant but beautifully fragrant flowers. They will not flourish in dry, hot, sandy soil, demanding for their welfare rather moist, shady spots containing a profusion of humus. A little commercial fertilizer containing a fair amount of nitrogen and potash will also prove very beneficial. The need of some kind of a stimulant is shown by the plant itself, which assumes a rather yellowish cast in the green color of the foliage. A few days after it has received some plant-food the foliage shows a very beautiful dark green color. These two species and the beautiful Kadsura Japonica are valuable additions to the garden flora of our southern states.

H. Nehrling

**ST. BERNARD’S LILY.** Anthericum Liliago.

**ST. BRUNO’S LILY.** Paradisia Liliumst.
of the growing season and in frames, etc., during winter. Lvs. 2 lines to 1½ in. long, the lower petioled, the upper sessile: fls. axillary or in terminal leafy eymes; sepals longer than the petals. Eu., Asia. B.B. 2:371.—Fruits straight to be a good fall and winter cover for plant in orchards and vineyards, but is never cultivated. It is an indication of good soil.

F. W. BARCLAY.

STENACTIS. See Erigeron.

STENANDRUM (Greek, narrow authors).—Acan-thoe. A genus of species of tropical or subtropical American herbs, with or without short stems, and usually variegated leaves which are radical or crowded at the base of the plant. Fls. usually small, solitary, in the axils of bracts on a scape-like peduncled spike, which is either dense and has broad imbricated bracts or is interrupted and has smaller bracts; calyx 5-parted; corolla-tube slender, enlarged at the top, 5-lobed; stamens 4; anthers 1-cellcd; style shortly 2-lobed: capsule 4-seeded, or by abortion fewer-seeded.

Lindeni, N. E. Br. A low-growing, compact plant, with broadly elliptical lvs. rounded at the apex and long-attenuate on the petiole, velvety in appearance, of a dark green with a feathering of white or yellow along the margin. Per. beneath: bracts short, scarlet or yellow, about ½ in. long; yellow: bracts ovate, acute, serratte; spikes 2-3 in. long, narrowly cylindrical. J.H. 38:136; 40:173 (4).—Tender foliage plant offered 1893-1895 by John Saul and pitch & Manda.

F. W. BARCLAY.

STENANTHIUM (Greek, narrow flower; referring to perianth-segments).—Lilaceous. Stenanthium occidentale is a rare, hardy, summer-blooming bulb from the Pacific coast, with nodding, greenish-purple, 6-lobed, bell-shaped fls. about ½ across, borne in a slender panicle. Generic characters: fls. polygamous; perianth narrow or broadly bell-shaped, persistent; segments conuate at the base into a very short tube, narrow or lanceolate, 3-7-nerved; seeds 4 in each locule. About 5 species; one native to the island of Sachalinne, another Mexican, the rest west American.


W. M.

STENOCARPUS (Greek, narrow fruit; referring to the follicles, which are long and narrow).—Proteaceae. About 14 species, of which 11 are New Caledonian and 3 are endemic to Australia. Trees with alternate or sepalate or with a few deep lobes and yellow or yellow flowers in pedunculate, terminal or axillary, sometimes clustered umbels: perianth somewhat irregular, the tube open along the lower side, the limb nearly globose, anthers broad, sessile; ovary stipitate, with a long, tapering style dilated at the top; winged at the base.

salignum, R. Br. A medium-sized tree, with willow-like, ovate-lanceolate lvs. 2-4 in. long, with short petioles; fls. usually less than ⅛ in. long, greenish-white, in umbels of 10-20 fls.; peduncles shorter than the lvs.

B.R. 6:441.—Cult. in Calif.

F. W. BARCLAY.

STENOCHAMA (Greek, narrow-fringed).—Polygodia-cea. A genus of herbs formerly included with Davallia, characterized by the decomposed lvs. with cuneate ultimate segments, and the compressed suborbicular or cup-shaped indium which is attached at its sides and open only at the top. For culture, see Ferns.

Stenochama, see Stenochama.

STENOMESSE (Greek, small and middle; alluding to the corolla-tube, which is usually contracted near the middle).—Amaryllidaceae. About 10 species of tropical American bulbous herbs, with linear to broadly strap-shaped leaves and red, reddish yellow or yellow flowers, in a usually many-flowered umbel: perianth-tube long, erect or recurved, the lobes short, erect or spreading; flowers usually straight up by a peduncle somewhat globose, 3-furrowed, 3-lobed: seeds black.

Stenomesse require a good soil and a sunny house with a temperature never below 45°. During the growing season they should have plenty of water, but when at rest comparatively dry is necessary. The offsets should be removed from the old bulbs before growth commences. The plants continue in bloom a number of weeks.

AA. Style shorter than the perianth.

incarnatum, Baker (Colurhia incarnatula, Sw.).—A tender plant: bulb ovate, 2-3 in. through: lvs. thick, glaucous, obtuse, about 1½ ft. long, strap-shaped; sepal 2 ft. high: fls. 4-5 in. long, few to many in an umbel, variable in color but typically erinose, with a green spot on each segment. August. Peru. J.H. 38:123 (perianth-limb light yellow). Tn. 50:1076.

AA. Style longer than the perianth.


F. W. BARCLAY.

STENOTACRUM (Greek, stenos, narrow, and tephos, a trench; the spikelike being partially embedded in the racis).—Graminaceae. About 3 species of tropical regions, one of which is found only at the Gulf coast, especially in Florida, where it is utilized as a lawn grass. In this respect it is similar to Bermuda grass, being naturally adapted to a sandy soil, which it binds by its chionses and creeping habit as does that grass. Spikelets 2-fld., the lower staminate or neutral 2 in a short spike, which is embedded in the alternate notches of the broad racis, thus forming a spike-like panicle. Creeping grasses with compressed culms and flat divergent leaves.

Američanum, Schrank. (S. secundatum, Kunzte, S. glabra, Trin.).—St. Augustine Grass. Flowering branches erect, 6-12 in. high. Var. variegatum has leaves striped with white, and is used as a basket plant.

A. S. HITCHCOCK.

The introduced form of St. Augustine grass is one of the most valuable lawn grasses for the extreme South. It will grow on almost any soil and thrives even in shade. The leaves are rather broad, never over 6 in. high and require little mowing. This grass does not become coarse, does hold dew off the top, and is particularly good for house lots and lawns. It does not need as much water as Bermuda or St. Luce grass. It is mostly propagated by cuttings.

E. N. REASENER.

STEPHANANDRA (Greek, stephanos, crown, and awer, andro, male stamen; alluding to the persistent crown of stamens).—Rosaceae. Ornamental small deciduous shrubs with alternate, stipulate, lobed lvs. and with small white fls. in terminal panicles. Graceful plants, with handsome foliage hardy north or in a greenhouse. Well adapted for borders of shrubberies or rocky banks on account of their graceful habit and handsome foliage. Prop. easily by hardwood cuttings under glass and by seeds; probably also by hardwood cuttings.

Four species in China and Japan, all undershrubs with slender more or less zigzag branches: fls. slender-peduncled, small, with cup-shaped calyx-tube; sepals and petals 5; stamens 10-20: carpel 1; pod with 1 or 2 small seeds, dehiscing along the back. Closest allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1-seeded pod.

foliosa, Sieb. & Zucc. (S. inerata, Zabel). Shrub, 5 ft. high, almost glabrous, with angular spreading distinctly zigzag branches: lvs. triangular-ovate, coriaceous or truncate at the base, long-stipitate, incised lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish
green, ¾-1¾ in. long; fls. white, about ¾ in. across, in terminal short, 8-12-fld., usually panicled racemes; stamens 10. June. Japan, Korea. Gn. 55, p. 141.

**Stephanandra**

*Stephanandra flexuosa* is closely allied to Spiraea and has the Spiraea style of beauty. It grows 2-3 ft. high and has long, slender branches which are densely and regularly interwoven in a fan-like manner. Its habit of growth is fountain-like, the branches being gracefully pendent. Its flowers are snowy white and, although minute, are so numerous that the plant becomes very showy. It is especially fitted for the back of herbaceous borders or for the front of larger shrubs. Its foliage, which is deeply toothed, is tinted red in early spring and deep glossy green during spring and summer. In the autumn it puts on unusual tints of redish purple. This species can be increased by cuttings, but is usually propagated by layers, which root readily and are easily transplanted. The foliage becomes so dense that the growth of weeds beneath its thickly set branches is effectively prevented.

**Stephanophyllum.** See *Kueelia*.

**Stephanotis** (from Greek words for crown and ear; alluding to the 5 ear-like appendages on the staminal crown). *Asclepiadaceae.* Twining glabrous shrubs of the Old World tropics, of about fourteen species, one of which, *S. floribunda*, is one of the best of greenhouse climbers. Lvs. opposite and coriaceous; fls. large and showy, white, in umbel-like cymes from the axils; calyx 5-parted; corolla funnelform or salverform, the tube cylindrical and usually enlarged at the base and sometimes at the throat, the lobes 5: crown mostly of 5 scales that are usually free at the apex and adnate to the anthers on the back, the anthers with an inflexed tip or membrane: fr. a more or less fleshy follicle.

**Sterculia** (Sterculius of Roman mythology, from sterco, manure; applied to these plants because of the odor of the leaves and fruits of some species). *Sterculiaceae.* Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the southern states and California. Fls. mostly polygamous, apetalous, the calyx tubular, 4-5-cleft, often colored; stamens united in a column which bears a head of 10-15 sessile anthers; pistil of as many carpels as calyx-lobes and opposite them, each carpel 2- to many-ovuled, the stigmas free and radiating: fr.
STERCULIA

follicular, each carpel distinct and either woody or membranaceous and sometimes opening and spreading into a leaf-like body long before maturity (Fig. 2399); seeds 1-many, sometimes arillate or winged, sometimes hairy. Sterculias have very various foliage, the leaves of different species being simple, palmately lobed or digitate. The flowers are mostly in panicles or large clusters, sometimes large and showy, varying from greenish to dull red and scarlet. The species are grown mostly for street and lawn trees. The only kinds that are generally known in this country are S. planifolia, S. diversifolia and S. acerifolia, the last two known in California as Brachychitons. All are easily grown from seeds. Sterculiaceous plants are allied to the Malvaceae.

2399. Mature follicles or fruits of Sterculia planifolia, bearing seeds on the margins. Natural size.

A. Carpels expanding before maturity into leaf-like bodies, exposing the seeds.

planifolia, Linn. f. (Firmiana planifolia, Schott & Endl.), Japanese varnish tree. Chinese parasol tree. Fig. 2399. Strong-growing, smooth-barked, round-headed tree of medium size, with deciduous foliage: Ivs. very large, glabrous, coriaceous-leafy, palmately 3-5-lobed like maple Ivs., the lobes sharp-pointed: Ivs. small, greenish, with reflexed calyx-lobes, in terminal panicles: carpels 4 or 5, bearing globose pea-like seeds. — Said to be native of China and Japan. Hemsley admits it to the "Flora of China," and Sargent says in "Forest Flora of Japan" that it is one of the several Chinese or Corean trees grown in Japan. Bentham, in "Flora Hongkongensis," says that it is native to China. Franchet and Savatier, in "Enumeratio Plantarum Japonicarum," admit it as an indigenous Japanese species. Now a frequent tree from Georgia south. Excellent for lawns and shade.

AA. Carpels not becoming leaf-like.

B. Ivs. all digitately compound.

fœtidula, Linn. Tall, handsome tree, with all parts glabrous except the young foliage: Ivs. crowded at the ends of the branches, of 5-11 elliptic, oblong or lanceolate, entire, pointed, thick leaflets: Ivs. large, dull red, in simple or branched racemes, appearing with the Ivs.: flowers large and showy foliaceous, glabrate and 3 in. or more in diam., and containing black seeds the size of a hazelnut. Tropical Africa and Asia to Australia. — Grown in southern Florida. In its native countries, the seeds are said to be roasted and eaten.

BB. Ivs. entire or only lobed (compound torus sometimes borne on S. diversifolia).

c. Follicles pubescent outside and corky inside.

alata, Roxb. Large tree, the young parts yellow-pubescent, the bark ash-colored: Ivs. large, coriaceous-ovate, acute, 7-nerved: Ivs. about 1 in. across, in few-flowered panicles shorter than the Ivs., and which arise from the leafless axis, the calyx tomentose and the segments linear-lanceolate: follicles 5 in. in diam., globose, with wide-winged seeds. India. — Introduced into S. Florida.

c. Follicles glabrous on the outside, usually villous within.

acerifolia, A. Cunn. (Brachychnon acerifolium, F. Muell.), Brachychnon. Flame tree. Evergreen tree reaching a height of 60 ft., glabrous: Ivs. petioloed, large, deeply 5-7-lobed, the lobes oblong-lanceolate to rhomboid, glabrous and shining: Ivs. brilliant scarlet, the calyx about ¾ in. long, in large, showy trusses: follicles large, globose, pubescent to stalked, Australia. — A most showy tree when in bloom, and planted on streets and lawns in California. Thrives in either dry or fairly moist places.

diversifolia, G. Don (Brachychiton populneum, R. Br.), Brachychnon. Tall tree, glabrous except the Ivs.: Ivs. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes variously 3-5-lobed on the same tree, all parts acuminate: Ivs. tomentose when young, bell-shaped, greenish red and white or yellowish white, in axillary panicles: follicles 5-31 in. long, ovoid, glabrous, stalked. Australia. — Planted in California, and commoner than the last.

Var. occidentalis, Benth. (Brachychiton Grégiori, F. Muell. S. Grégiori, Hort.), Ivs. deeply 3-lobed, the lobes narrow, sometimes with short lateral ones: Ivs. salmon-color: calyx smaller and more tomentose. West Australia. — Offered in S. California.

L. H. B.

STEREOSPERMUM (Greek; hard seed), Bignosae. About 10 species of tropical trees native to Asia and Africa, of which 2 are cult. n. S. fla. and S. Calif. They have handsome foliage, which is once or twice pinnate, and large flowers, of pale yellow or pale rose, borne in large, lax, terminal panicles; calyx ovoid, open or closed in the bud; corolla-lobes 5, nearly equal, round, crisped, toothed or laciniate; capsule long, terete, lenticulately 2-valved; seeds in 1 or 2 series. Stereospermum Sinicum seems to revel in the light sandy soil of the Florida gardens. Its abundant, large, fern-like, crimped bipinnate foliage and its luxuriant symmetrical growth combine to make it an object of great beauty. It grows to a height of 10 to 12 ft. in one season, and if not cut down by a severe freeze it attains a height of 20 ft. in two years, provided the soil is made rich by a good fertilizer. Planted out in a conservatory in the North it soon reaches stately dimensions. It is easily raised from cuttings placed in sand. S. suaveolens lacks the elegance of its congener, and it does not sprout as readily after it has been frozen down.

A. Foliage twice-pinnate: Ivs. pale yellow.

Sinicum, Hance. Tree, said to attain 60 ft.: Ivs. opposite, bipinnate; pinnae about 4 pairs, each pinna with about 5 Ivs.: Ivs. ovate-lanceolate, 2 × ¾ in.; corolla pale sulfur, 3 in. long; lobes 1 in. long, somewhat crisped. Hong Kong.

AA. Foliage once-pinnate: Ivs. pale or dark purple.

suaveolens, DC. Tree, 30-60 ft. high: Ivs. 12-18 in. long: Ivs. 7-9, broadly elliptic, acuminate or acute, 5½ to 3 in.: pinnae many-fid., viscid, hairy: Ivs. 3¼ in. long; lobes crisped-crenate. India.

N. Nehring and W. M.
STERNBERGIA (after Count Caspar Sternberg, a botanist and writer, 1761-1838). Amaryllidaceae. A genus of 4 species of low-growing bulbous plants, from eastern Europe to Asia Minor, with strap-shaped or linear leaves and bright yellow crocus-like flowers. Perianth regular, erect, funnelform; stamens inserted on the perianth-tube; filaments long, filiform; anthers dorsifixed, versatile; fr. small, scarlet or red, subglobose. The bulbs should be planted rather deeply, about 6 inches. J. N. Gerard says of their culture in G.F. 19:138 that they require a rather heavy soil, in a somewhat dry, sunny position where they will be well ripened in summer.

STEVIA. For the Stevia of florists, see Piqueria. True Stevias are described in horticultural literature, but it is not known that any of them are now in the American trade.

STEWARTIA. See Staugaardia.

STICK-TIGHT. Vernacular for hurs of Cynoglossum.

STIGMATHYLLON (Greek, stigma and leaf; referring to the leaf-like appendages of the stigmas). Sometimes written Stigmaphylum. Malphigiacée. About 50 species of tropical American woody vines with usually opposite, entire to lobed, petioled leaves and yellow flowers in axillary, peduncled umbel-like cymes: calyx 5-parted, glandular; stamens 10, of which 6 are perfect and 4 antherless or deformed; styles 3; stigmas produced into leaf-like or hooked appendages: ovary 5-loculed, 3-lobed.

ciliatum, A. Juss. A tender woody twining vine, lvs. evergreen, smooth, opposite, coriaceous, ciliate: frs. bright yellow, large, in peduncled axillary clusters of 3-6. P.M. 15:77. G.n. 33:637. - Apparently the only species in the trade and possibly the most handsome of the genus. G.W. 33:120.

STILES, WILLIAM AUGUSTUS, journalist, editor and park commissioner, was born March 9, 1837, at Deckertown, Sussex county, in northern New Jersey, and died October 6, 1897, in Jersey City, N. J. His grandfather settled on a farm near Deckertown in 1819, where his father, Edward A. Stiles, in 1833 founded Mount Retreat Seminary, a successful school of the highest rank during the following thirty years. Here William A. Stiles received his early education; as a boy he showed great love for classical literature and unusual proficiency in music and mathematics. He was distinguished as a student at Yale, graduating in 1859 in a class which included many men who have since attained high rank in public life, and from taking up the profession of law by constitutional weakness and defective sight, his many-sided nature found expression in diversified activities. He was later a teacher, assistant superintendent of public schools, surveyor on the Pacific coast, writer of political articles, secretary of the Senate of New Jersey, actuary of a life insurance company, and a gauge in the New York custom house. During a long period of illness and almost total blindness he acquired systematic knowledge of plant-life from readings by his sisters, and this gave impulse toward subsequent study on broader lines. He brought together many rare and choice species of plants and made interesting experiments on the farm. Love of nature was henceforth a dominant force with him. His articles in the daily press of New York on the various interests of country life attracted wide attention, and led to his appointment as editorial writer of the New York Times, a relation which continued throughout his lifetime. In 1883 he became agricultural editor of the Philadelphia Press. Keenly interested in introducing scientific discoveries by improved methods into general practice, he established relations with the foremost agriculturists abroad and at home, and made his department a useful and valuable exponent of the best knowledge of the time. He masterly conducted the page, long years set a high standard for journalism in this field, and established his reputation as a specialist in agriculture and cognate subjects. On the founding of "Garden and Forest" in 1888, William A. Stiles was invited to be the managing editor. For nearly ten
years, to the close of his life, he devoted himself to this journal through vigorous editorial writing and management, and steadily maintained the high character and influential periodical American horticultural journalism. His ripe scholarly, sound judgment, masterly use of English, and persistent energy, all contributed to the success of this paper, which is still a model and his sympathetic understanding of contact with nature as a human and spiritual need, characterized all his activities. For many years he rendered conspicuous service in working for the establishment of small parks easily accessible to the poor, and for the wise conduct of the larger parks and their preservation from invasion and despoilation. His special ability and influence received public recognition in 1855, when he was appointed a park commissioner, a position in which he rendered signal and valuable service until the time of his death. William A. Stiles was unmarried. He had a fund of inimitable wit and humor, and was the warm and honored friend of the best men and women in the communities in which he lived.

M. B. COULSTON.

STILLINGIA (after Dr. Benj. Stillinger, an English botanist), Emphedoboea. About 15 species of herbs, biennials, from North and South America. Alternate, stipulate leaves and small, monocious, aperalous flowers in terminal spikes. The genus is closely allied to Sapium, but differs mainly in the fruit, which in Sapium is a capsule, but in this a-seeded spike, the central axis remaining after dehiscence but with a large, persistent, 3-horned receptacle, while in Sapium the fruit dehisces by splitting down the back of each carpel, leaving a 3-winged central axis to which the seed is for a long time persistent; the large receptacle is also wanting in Sapium.

sylvatica, Linn. QUEEN'S DELIGHT. A half-hardy perennial herb with a woody root: stems clustered, 1-2 ft. high, Ivs. divided, the leaflets pubescent or sessile, linear-lanceolate to oblanceolate, obtusely serrate: fls. yellowish, in terminal spikes. Spring to fall. Southern states. According to Mueller's "Select Extra Tropical Plants," the root is extensively used for its emetic and purgative properties. C. D. Beadle reports that the plant has stood a temperature of -9° at Biltmore, N. C. The plant grows readily from seed, but does not bear transplanting well.

For S. sebborum, see Sapium sebborum.

F. W. BARCLAY.

STIPA (Greek, stipe, tow: in allusion to the plumeous awns of described species). The genus contains a large genus of about 100 species, throughout the world except the colder parts. They are particularly characteristic of the plains, savannas and steppes. The long, sharp-pointed awns of some species are troublesome on evens, and it is difficult to separate the single spikelets from the green, and the two white, or yellow, ovary of the flower. These species occur very generally, in the vector of their tendency to work through the skin and into the vital organs. Perennial grasses with narrow involucres of loose panicles; spikelets 1-fl.; empty glumes membranaceous, longer than the indurated fl-glu; fl-glume with a sharp hairy calyx below and a stout persistent twisted awn above. At maturity the fl-glume falls away from the empty glumes. The species here mentioned are cultivated for ornament, including the making of dry bouquets.

pennata, Linn. FEATHER GRASS. Culms 2-3 ft., in bunches: empty glumes narrow into an awn or more than fl: fl-glu 3/10 to 3/10; awn 1 foot or more, slender, lower portion smooth and twisted, the upper very plumeous, giving the panicle a very feathery ornamental appearance. Steppes of Europe and Siberia.


elegantissima, Labill. Stems 2-3 feet, erect from a horizontal rhizome: lvs. narrow and erect: panicle very loose: fls. long, very thin, spikelets 4-6 lines long; awn 1 3/4 in. long. Thrives in sandy soil. Australia.


The furnishes fiber from which are made ropes, mats, paper, etc. In Africa it is called Halfa or Alfa.

sparteae, Trin. PORCUPINE GRASS. Culms 2-3 ft., in bunches: panicles contracted; empty glumes broad, equal, about 1 3/4 in., tapering to a slender point: fl-glume nearly 1 in.; awn usually about 6 in. long, the lower half erect, pubescent and strongly twisted, the upper half bent to one side, rough. Illinois to California.

capillata, Linn. Similar to S. sparteae: flowers more numerous but smaller in every way: fl-glume about 3/4 in. long; lower part of awn only minutely pubescent, and the upper or bent portion sinuous. Plains, Europe.

A. S. HITCHCOCK.

ST. JOHN'S WORT. Hypericum.

STORBEA (after D. Stobaeus, a Swedish patron of Linnaeus), Compusita. This genus is included by Bentham and Hooker under Berkenya. About 70 species of South African herbs or somewhat shrubby plants, commonly with white flowers, aseeds as to the foliage. Lvs. usually decurrent, dentate, pinnatisect or pinnatifid, the lobes dentate and spiny; heads small to large, solitary or somewhat corymbose; rays usually yellow.

purpurea, DC. (Berkheya purpurea, Benth. & Hook.). Half-hardy, probably biennial plant 2-3 ft. high: lower lvs. about 1 ft. long, irregularly lobed, spiny on the margins, cottony beneath, dark green above: stem lvs. smaller, long-decurrent: fls. 1-3 in. across, purple or white, resembling Hypericum dahliae, &c.

To be recommended for growing with half-hardy alpines. It can be wintered in a coldframe. Prop. by seed and division.

F. W. BARCLAY.

STOCKS (for botany, see Matthioli, Fig. 240); also compare Figs. 124, 125, and 242. These are divided into two groups, Summer and Winter Stocks. The former are annuals and therefore bloom in the first summer; the latter are biennials and bloom in the second year, or, if sown very early, in the fall or the winter of the first year. Fall or intermediate Stocks are between these two groups; they bloom profusely in the autumn.

The seed of the Summer Stocks, or, as they are commonly called, "Ten Weeks' Stock," is sown from the end of February until April, mostly in a coldframe, which must be sunny and well aired. Good clean garden soil, well mixed with sand and free of manure, is the proper soil for sowing the seed in. The seed will germinate in 6-10 days, and the seedlings require quickening quicker than the dark-seeded kinds. Air must be admitted as soon as the seeds have sprouted, a great deal in warm weather and less when the weather is cool, and finally the sash of the coldframe will be entirely removed.

If the seedlings need water it should be given in the morning, so that they are dry at night. If the sun is hot the seedlings must be shaded. If the seed is to be raised from pot-grown plants a good, well-manured, sandy garden soil should be used which contains an admixture of well-rotted sod or the soil taken from river bottoms. The pots are about 6 inches high, with a diameter of 7 inches. When they show their fourth leaf the seedlings are planted firmly into these pots with a dibber, pots being well filled with the above soil; care should be taken that the roots are inserted vertically. From 6 to 8 plants are put into such a pot. These pots are then placed on sunny stages, usually protected by tilt-roofs. The development of the plants depends now principally on careful watering, which is done mostly with watering pots and at the beginning with a fine spray attached to the spout of the pot. After a crust has formed on the top of the soil, the spray is discontinued and the pots are watered with the pipe of the can. This watering is done at night during the former weather and morning when the weather is cold. Very little watering is done in continuously cloudy or rainy weather. The watering of the Stocks is the most particular and important part in the cultivation of pots, for if due care is not exercised a white maggots will make its appearance while the plants are in bud and destroy the roots. The common flea-beetle
is another of the enemies of Stocks; this often appears in large numbers and eats the leaves of the young plants. Frequent syringing with water is the only remedy found so far against these pests when they infest Stocks.

After the plants have been in bloom for some time the double-flowering specimens are cut out and the watering is continued carefully until the seed-pods which form on the single plants show indications of ripening, which is in October. The plants are then pulled and tied in bundles, which are hung up in dry sheds until the middle or the latter part of November and December, in which time the seed fully matures in the pods. Now comes the most important part of seed-saving of Stocks. The bundles of plants are taken down, the roots and part of the stems cut off, and the stalks are taken in hand by expert gardeners, who sort them, for common seed and also for the seed stock. The pods indicate by their shape, size and form whether the seeds contained therein will produce a high percentage of double flowers the following year, and the selection is done with care. The seed that will go on the market can be vastly improved by the removal of "wild" pods, which contain seeds that produce nothing but single flowers. The seeds are removed by hand from the pods, mostly by women and children.  

The double-flowered varieties of *Matthiola incana*, var. *annua*, commonly known as "Ten Weeks'" or "Summer Flowering Stocks," are among the most fragrant and pleasing of common garden annuals. They are readily raised from seed sown in a gentle heat about the first week in April, keeping them close for a few days until germinated, gradually purring them to an abundance of air as they increase in size, and finally, towards the end of May, transferring them to the flower garden or border where they are intended to flower, choosing a dull or showery day for the purpose.

The varieties of *M. incana*, though perennial in their native habitat, are best treated here as annuals, and are well worth growing as pot-plants, either for cutting or the decoration of the conservatory during the winter and early spring months. They are known in the trade in this country as "Boston Florists' Stock," "Princess Alice," "Cut-and-come-again," "East Lothian" and "Brompton Stocks." Though they are as readily propagated from seed as the "Ten Weeks' Stocks," they require a much longer period of time to grow; therefore, those intended for early winter flowering should be sown in June, while those intended for spring flowering should be sown about the middle of August. Fill a number of 3-inch pots with sifted loam and plant about three seeds in each pot; place them in a close shaded frame till germinated; as soon as they commence to grow reduce the seedlings to one in each pot. They must not be allowed to suffer for water at any time or they will lose their leaves. As soon as the pots are fairly well filled with roots (though they must not become potbound), they should be shifted on into larger sizes until they reach a 6- or 7-inch pot. The soil best suited to them is a rich, heavy loam. As soon as the plants show signs of flowering they are greatly benefited by an occasional watering of weak liquid cow or sheep manure water. Those sown in June should be grown outside until the approach of cold weather, when they should be transferred to the house where they are intended to flower, while those sown in August should be grown on in coldframes until very cold weather sets in, when they should be placed in a cool-house, keeping them at a temperature of about 45°. Stocks while growing in the greenhouse are very subject to the attacks of green- and black-fly; they should, therefore, be fumigated at least once in two weeks, or should have tobacco stems placed among the pots.

Seed of both *M. annua* and *M. incana* is imported from Germany, principally Erfurt and Quedlinburg, where plants are specially grown for seed which will produce double flowers (see Gardener's Chronicle, 1866, p. 74; also Dr. M. T. Masters' Vegetable Teratology Appendix).  

EDWARD J. CANNING.
STOCK

STOCK, TEN WEEKS'. See Stocks and Matthiola incana, var. annua.

STOCK, VIRGINIAN. Malcomia maritima.

STOKESIA (Jonathan Stokes, M.D., 1735-1831, English botanist). Composita. Stokes' Aster is one of the rarest, choicest and most distinct of American hardy perennial herbs. It is a blue-flowered plant about a foot high which at first glance has points in common with China asters, centaureas and chicory. The heads are 3 or 4 in. across in cultivation. The marginal row of flowers is composed of about 15 ray-like corollas, which have a very short tube at the base and are much broadened at the apex and cut into 5-lobed, narrow strips. Stokes' Aster is hardly as far north as Rochester, N. Y., and Boston, Mass. Probably many persons have been deterred from trying it because it is native only to South Carolina and Georgia, and because it is considered a greenhouse subject in some standard works on gardening. The fact that it is found wild in wet pine barrens is also deceptive, for the roots, as Woolson and Keller testify, will decay if water stands on the soil in winter. Moreover, the plant has been praised by Meehan for its drought-resisting qualities. Stokes' Aster should be planted in a well-drained, sandy loam, not in cold and heavy clay. It blooms from August until hard frost. According to Chapman, the heads of wild specimens are only an inch across, but the size of heads in cultivated plants is stated by many horticulturists and experts to be 3-4 in. across. J.B. Keller writes that Stokes' Aster is frequently used for cut-flowers. In the wild the heads are few in a cluster or solitary; in cultivation a good branch sometimes bears as many as 9 heads. No double form seems to have appeared. Measurements: heads many-flowered; margin of fls. much larger, deeply 5-cleft: involucre subglobose; outer bracts prolonged into a large, leafy, bristly-fringed appendage; alone 3-4-angled, smooth: pappus of 4-5 thread-like, deciduous scales.

cyanes. L'Hérit. Stokes' Aster. Fig. 2403. Much-branched, hardy perennial herb, 1-2 ft. high; branches often purplish; lvs lanceolate; radical ones entire, tapering at the base into long, flattened stalks; cauline lvs gradually becoming sessile, the uppermost with a few teeth near the base and half-clasping; fls. blue or purplish blue, 3-4 in. across. Aug.-Oct. Ga., S. C. B.M. 1966. Mn. s. p. 214. R.H. 1863:211. W. M.

STONECROP. See Sedum.

STORAGE. Various ideals are confused under the denomination of storage. There are two kinds of storage: (1) Common or non-refrigerator storage, employed mostly for holding perishable commodities temporarily; (2) cold storage, in which low and even temperatures are maintained by some refrigerating process. The common storage, without refrigeration, may be again divided into two species: (a) the storage may be only a temporary halt, or a half-way station, on the way to the shipping point, and where products are kept for a day or are sorted and packed; (b) it may be a storing of products that are waiting for improved market conditions, and in which an effort is made to maintain a relatively low and uniform temperature. In this latter kind of storage, the low temperature is usually secured (1) by means of a cellar or basement building; or (2) by means of controlling air-currents and ventilation. This second type of storage, under favorable conditions, reaches approximately the same efficiency as temporary cold storage.

A few specific examples will illustrate some of the ideals and the means of attaining them. Fig. 2404 shows a cellar storehouse, such as is used by nurserymen. Sometimes these buildings are employed for the storing of apples and other products. Usually the floor is two or three feet below the level of the ground.

The house shown in Fig. 2406 is built on a side hill, and the basement or cellar is used for the storage of grapes, the first floor is used for packing, and the second floor or attic for the storage of baskets, crates, and the like. This building measures 25 x 60 feet over all. The foundation walls are 24 inches thick, and the ceilal is provided with ample ventilation by several outside windows, and also by means of a chimney that runs from near the middle of the cellal up through the roof. The floor is of earth. By means of careful attention to ventilation, this cellar can be kept at 50° or below during September and October, and is frost-proof through the winter. The windows are provided with closed-fitting screens to keep out rats and squirrels. This cellar will easily hold fifty tons of grapes in the picking trays. The first floor is divided into two rooms, the front one being a packing-room 25 feet square, and the back room a storage and shipping department 25 x 35 feet. This front packing-room is provided with heat and is lighted by seven large windows. The floor above the cellar is double and made of 1½-inch match-pine, with an abundant air-space between the two layers. This, therefore, protects the cellar from sudden fluctuations of temperature. The building is also shaded, especially from the afternoon sun, by large trees. This building can be erected in New York for about $4,200. It has 18-foot posts, a tin roof, the two rooms in the first floor ceiled with pine, but the top floor not ceiled.

An apple storehouse in Grand Isle, Vt., is shown in Figs. 2406 and 2407, and is described by Waugh (Bull. 55, Vt. Exp. Sta.).

2403. Stokesia cyanne (X ⅔).

2404. A half-cellar storage.
"The fruit house is built on high and dry ground. The cellar was three feet, and dirt taken from this was used to bank up around the wall. The wall is solid stone and mortar, is 5 feet high, 2½ feet wide at the bottom, and 2 feet at the top; 2-inch plank for sills on this, beaded in mortar, doubled so as to break joints; 2 by 4 studing above this; outside of studing matched pine, then paper, and then clapboards, painted; in middle of studing, lath and plaster; inside of studing, matched pine, then paper, and then ½-inch sheathing, painted. This gives two hollow walls, or dead-air spaces. For ventilating, there is one ventilator from cellar to the observatory on top of building, which has four large window frames, with blinds, but no tight windows. The ventilator opens into both storerooms. We have three 18-inch windows on east and west sides of building in the cellar, and three large windows in west side, next to storeroom. Both floors are double, with paper between, and the second room is ceiled overhead with matched spruce, and painted. The two windows on east side show in cut, with the outside doors."

The following sketch of a home storage plant is reprinted from Bull. 74, W. Va. Experiment Station, by L. C. Corbett: "In localities where field stone are plentiful, a satisfactory, durable and moderate-cost house can be built in the form of a bank cellar by using these stone in cement, making a grout wall. Such a wall can be constructed by unskilled workmen if properly laid out in the beginning. The plan to follow is to use broad 2-inch planks, held in place by substantial staging to form a box having a width of the thickness of the desired wall—say 18 or 22 inches. Into this box lay the dry stones, arranging them somewhat if large, but if small they may be thrown in with a shovel. Put in a layer 6 to 10 inches thick, then pour in thin mortar composed of good lime and cement until the box is filled sufficiently to impede the stone. Repeat the operation, moving the planks upwards as the mortar sets until a wall of desired height has been built. Silo walls have been built in this fashion which were 22 feet tall, and were as solid as one continuous stone when completed. The mortar must be thin and rich in lime or cement. Lime will answer, but it is slower to set than cement, and for that reason less desirable. Such a wall can be built for about one-half the cost of the ordinary rubble wall, and will answer in every way as well."

"Ample means of ventilation must be provided in order that nature may be turned to assistance in reducing the temperature of the house as much as possible. Sewer pipes leading for some distance under ground and provided with proper stops or dampers can be very effectively used to assist in reducing the temperature during frosty nights. In addition to this the second story of the house should be provided with one or two ice rooms, according to the width of the house. The writer is inclined to favor two narrow ice rooms, one at either side of the building, with the storage room between and below the ice rooms. See plan of such an arrangement in Figs. 2408 and side elevation in Fig. 2409."

"The stone wall must have a lining in order to provide a dead-air space between it and the storage room. This can be seen by placing 2x4's in front of the stone wall, covering this with a durable waterproof paper, placing 1-inch strips outside of this and covering all with flooring. This will give two small air spaces between the stone and brick wall and the storage chamber. See Fig. 2409, cross section. The ice chambers should extend the whole length of the building or storeroom. They may be as narrow as six feet, but eight feet will increase their capacity and cooling power. The dead-air spaces where of metal overlaid with 2x4's on set on edge, the metal floor so arranged as to allow a free passage of air from the ice chamber into the storage room. As cold air naturally falls the slot floor in the second-story ware- room will give direct circulation into the lower ware- room, and both be cooled in consequence. The floor structure must be strong and well braced so as to carry the heavy load placed upon it. Heavy stacking carrying 2x12 joists 16 inches apart, and floor with 2x4's one inch apart, will give ample support for the ice chambers and second-story ware-room. The roof to the second-story room should be built so as to make it as near a non-conduc- tor of heat as possible. Dead-air spaces are the cheapest and most easily con- structed non-conductors. This is es- sential in the ceiling, as it has the double duty to perform of holding the cold in and keeping the heat out. A large, well-ventilated attic space should be provided and, if possible, a sub-floor or slate roof used in place of metal. The ceiling in the second story must be pro- vided with ventilator shafts carrying good dampers so that perfect ventilation can be secured during cold weather. Provision should be made the winter before for sufficient ice to cool the ware- rooms each fall before the fruit is brought in from the orchard. This will necessitate the construction of a reser- voir and ice house with capacity suffi- cient to fill the ice chambers. It is not advised to use the ice chambers for storing ice; they are merely ice chests to be used to cool the warerooms and fruit as it comes from the orchard. Consequently they can be made much smaller than would be neces- sary were they to serve the double purpose of cold chamber and ice house."

Many small storage houses, located near railway stations, are now to be seen in the fruit sections of the country. One of these is shown in Fig. 2410. In store- houses, apples are usually stored in barrels that are piled on their sides. Fig. 2411. It is a common practice to re-sort apples in storage. Fig. 2412.

Refrigeration or cold storage is the name given to the preservation of perishable products, such as fruits and other organic foodstuff, at a temperature so low as to arrest the action of ferment and mould, and yet not low enough to destroy the flavor or cellular structure of the material so stored.

This process of preserving organic substances has been known since the earliest civilization, and while it was used to a limited extent in ancient times, when an abundant supply of natural ice was available, the process did not come into general use until the machin- ery for producing artificial cold and artificial ice was perfected. Various principles have been used in the development of this machinery, but all have in- volved the fundamental idea of the condensing of a gas and the heating of it on again expanding, when it takes up the latent heat of compartments in which such expansion takes place. For this purpose carbon hydrate and ammonia hydrate have chiefly been em- ployed. After the cooling has been effected by artificial
means or by ice, cold storage can only be accomplished by maintaining a desired temperature over a long period. In order to secure this, the compartments in which the products for storage are to be held must be as perfectly insulated from outside heat as possible.

Successful experimental refrigeration by mechanical means was accomplished as early as the middle of the eighteenth century, but no successful commercial application of cold storage was made until after the invention of Lowe's "carbonic acid" machine in 1867, although the present growth of the industry is due to the invention of the ammonia compression machine by Professor Carl Linde in 1875.

The process was first extensively applied to the preservation of meats, fish, etc., but as early as 1881 the Mechanical Refrigerating Company of Boston opened a cold storage warehouse, which marks the beginning of mechanical refrigeration as applied to horticultural products. Other companies were then organized, until now there are about 1,200 refrigerating plants in the United States, of which about 600 are used mostly for horticultural products. Foreign countries are now following the example of the United States, and London, Liverpool, Glasgow, Paris and other European cities offer facilities for storing such products. In the United States, Chicago is the great center for fruit storage, single firms holding as many as 100,000 barrels a year. Apples are the principal storage fruit, good winter sorts holding their form, color and flavor better than any other commercial fruit when held for long periods in cold storage. Another reason why the apple is a favorite in cold storage is that people use it continuously over a long period. A good apple is always a relish. The apple, too, is the fruit which best pays the producer to hold in cold storage.

From the nature of the case, mechanical refrigeration will usually be confined to transoceanic trade, and to cities and towns where the principal business of the refrigerating machinery will be the production of ice for commercial and domestic use, the cold storage warehouse being a side issue to ice-making. The fruit-grower who wishes to avail himself of the advantages of cold storage must either ship his product to the city or depend upon natural ice to reduce the temperature of his warehouse. If he is in a climate where a supply of natural ice is available, his most economical plan is to make provision to use it. If in the far South he must own an ice plant or purchase artificial ice.

To successfully handle peaches and plums in carlots, one must nowadays have a supply of ice in order to avail oneself of the best service of the Fruit-growers' Express or other lines. The cars come iced, it is true, but before starting them on their journey it is safest for the grower to have a sufficient supply of ice to fill the pockets of the car.

To hold apples from harvest time until the oversupply of the season shall have been removed, requires storage rooms artificially cooled to a temperature sufficiently low to check the process of ripening, which is in reality the conversion of the starch of the immature fruit into sugar. As long as the starch remains as such, fermentation and decay cannot set in, but as soon as sufficient water and heat are added to convert the starch into sugar, ripening proceeds until fermentation and decay complete the work. The object of cold storage, then, is to check the ripening process, or, if the fruit is ripe, to maintain a temperature sufficiently low to check fermentation. Theoretically, then, green or immature fruits will keep better than ripe ones. Green fruits should keep as well at 36\(^{\circ}\) as a ripe fruit at 32\(^{\circ}\), and this is in accord with experience.

To successfully hold fruit in cold storage, three conditions are essential: (1) a low temperature; (2) an even temperature, and (3) sufficient moisture to prevent shrinkage, thus keeping the fruits plump and crisp. Even in storage rooms in which the humidity of the air remains saturated, as indicated by the ordinary wet- and dry-bulb thermometer, considerable loss of moisture will take place from fruits stored in crates or open bins, while much less is lost by those stored in tight receptacles. Individual Baldwin apples under observation in a room at 32\(^{\circ}\) F. from January 4 to
April 29, showed losses as follows: Open shelves, 5.364 grams; in sealed cans, .602 grams; or a difference of 4.762 grams in favor of the sealed cans. This at least suggests the possibility of checking loss in weight by the use of non-porous storage receptacles. Barrels do not have any marked effect in checking this loss, as fruits stored in headed and open barrels differed only one-half pound in amount of loss during a period of 147 days, the total loss being 4½ pounds on a barrel of 139½ pounds weight when placed in storage.

The efficiency of a cold storage house depends more upon the construction of the walls than any other single feature. Perfect insulation is the ideal mark at which to aim. The more perfect the house in this respect, the less wear upon the machinery when refrigerating apparatus is used, and the greater the economy in ice when ice is used. To accomplish this, non-conductors of heat should be used as far as possible in the details of construction. For this purpose brick is superior to stone, and wood is a better non-conductor than either. For permanence, however, efficiency in this respect must be sacrificed. But as confined air may be better than an artificial substance, by multiplying the layers or partitions in a wall "dead-air spaces" can be increased and nearly perfect insulation secured. For the practical orchardist, however, cost must be considered, and if wood and paper can be made to take the place of brick at a sufficiently less cost, permanence may be overlooked. This can be done, and with these cheap materials very satisfactory results obtained. After proper insulation comes ventilation. With ice-cooled houses advantage should be taken of all assistance which nature can lend. With proper ventilating shafts for carrying off heat and moisture and ample subterranean pipes arranged to admit chilled air from naturally cool places such as ravines, the temperature of the house can be greatly lowered during frosty nights, and the store of ice husbanded to that extent. During the winter months outside cold can be admitted and housed up to maintain a low temperature far into the summer. The cold storage of apples has now grown to be such an important factor in the markets that reports are made from time to time to give an idea of the quantity of fruit available, and to be used as a rational basis for fixing the selling price of apples at any given season.

The following figures, as reported by the National Apple Shippers' Association, will serve to show, not only the method, but the magnitude of the storage business as well:

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
<th>Barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 1</td>
<td>1898-9</td>
<td>$1.00 to $1.25</td>
</tr>
<tr>
<td>Jan. 1</td>
<td>1898-9</td>
<td>1.25 to 1.50</td>
</tr>
<tr>
<td>Feb. 1</td>
<td>1898-9</td>
<td>1.50 to 1.75</td>
</tr>
<tr>
<td>March 1</td>
<td>1898-9</td>
<td>1.75 to 2.00</td>
</tr>
<tr>
<td>April 1</td>
<td>1898-9</td>
<td>2.00 to 2.25</td>
</tr>
<tr>
<td>May 1</td>
<td>1898-9</td>
<td>2.25 to 2.50</td>
</tr>
</tbody>
</table>

The following table, which gives the range of prices paid for apples from the end of the picking season to the end of the storage season for the years 1898 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the American Agriculturist:

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
<th>Barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 1</td>
<td>1898-9</td>
<td>$1.00 to $1.25</td>
</tr>
<tr>
<td>Dec. 1</td>
<td>1898-9</td>
<td>1.25 to 1.50</td>
</tr>
<tr>
<td>Jan. 1</td>
<td>1898-9</td>
<td>1.50 to 1.75</td>
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<tr>
<td>Feb. 1</td>
<td>1898-9</td>
<td>1.75 to 2.00</td>
</tr>
<tr>
<td>March 1</td>
<td>1898-9</td>
<td>2.00 to 2.25</td>
</tr>
<tr>
<td>April 1</td>
<td>1898-9</td>
<td>2.25 to 2.50</td>
</tr>
</tbody>
</table>

Ben Davis ranged higher at the close of the storage season, but as it was difficult to secure consecutive reports of that apple the Baldwin was chosen instead.

This indicates the margin of profit there is for the producer in holding his fruit in cold storage. The average is $2.375 per barrel, which gives the aggregate of $2,899,375 in the apples in cold storage during the year 1900.

The apple, grape and pear are important cold storage fruits in the United States. The great profit of cold storage to the grower has come through enabling him to withhold high-grade fruits, and even varieties which keep poorly in common storage, from the market at harvest time. Desirable sorts which are normally out of market by Thanksgiving time can be held much longer in cold storage and the profit from them greatly increased. The idea that summer sorts can be made to do duty as winter sorts through the agency of cold storage cannot be realized. For the best results only the choicest specimens of the winter sorts should be allowed to go into storage outside the farm warehouse.

Besides the great revolution and development in apple growing, which has resulted from the addition of cold storage to the trade, a corresponding growth and spread of the pack, strawberry, cherry and plum industry have resulted from the development of the refrigerator car service. As early as 1865 attempts were made to carry perishable products such as peaches, raspberries and strawberries long distances in refrigerating boxes and artificially cooled cars. While these early experiments must be counted as failures, they led up to the present extensive fruit transportation business, which is conducted on the same line as the Pullman sleeping cars—that is, of providing refrigerating cars, which run over certain roads, gathering the fruit from areas having a large output, re-filling the cars at given points, and carrying the product to cities for many days in good order. The development of this industry was due to the skill of Mr. F. A. Thomas, of Chicago, in cooperation with Parker Earle, then of Cobden, Ill.

With the application of refrigeration to the storage room of ocean liners, Australia, Tasmania and New South Wales become our competitors in the apple and orange markets of the world. This business has long...
since passed the stage of an experiment, and the annual tonnage of such products is rapidly increasing. It is no longer ago than 1888 that the Oceanic carried the first cargo of apples in cold storage from Melbourne to England, and the first cargo of West India fruits was carried in 1886 by the ship Nonpareil. Now California is able to ship peaches and plums in refrigerator cars to New York, and thence to Liverpool by cold storage on shipboard. A crop of 1200 tons of the product on order on the English markets. With refrigeration, time is of less importance than handling, shaking, and a constant temperature.

Storage machinery has been greatly modified during the past two years. Small condensers, propelled by gas engines, water-motors and even windmills, are now available for use in hotels, meat shops and places where constant cold is needed. While these small plants have not been used in private storage houses with limited capacity, there is no good reason why they should not. In large cities central refrigerating plants distribute chilled brine through properly insulated pipes to dealers and commission men, much after the manner of water and gas. The dealer is then independent of the market, and if a consignment of fruit is received too late for the week's trade it can be held in the cold room with security for the Monday morning market.

With this plan, a large number of dealers in the business quarter of any city can be supplied with cold at a moderate cost from a single central station.

In modern cold storage two systems are in common use: one is known as the "direct expansion system," and operates by allowing the compressed gas to expand in coils of pipes placed in the room to be cooled; the other is known as the "brine circulation system," and operates by pumping chilled brine of one of the salts, sodium, calcium or potassium chloride, through coils of pipe in the room to be cooled. Both these systems present objections, which are of greater moment to the horticulturist than to any other class using cold storage. The temperature in the immediate neighborhood of the cooled coils is too low to allow the fruit stored there. In order to overcome this, a system in which no pipes are placed in the chilled or storage room has been devised. A coil of pipe is arranged for direct expansion and the air of the room to be cooled is drawn out by a fan, passed over the chilled pipes, the temperature lowered, and again carried back to the cold room into which it is distributed from the ceiling by large wooden conduits with numerous dampers and openings, so that the cold can be distributed evenly through the room by the constantly moving air. With this arrangement the temperature can be kept constant and uniform throughout all parts of the room, and there is no loss from freezing.

The following table of temperatures, compiled from experience of practical storage men, will serve as a guide for storing horticultural products:

<table>
<thead>
<tr>
<th>Articles</th>
<th>Remarks</th>
<th>Degrees F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td></td>
<td>32-34</td>
</tr>
<tr>
<td>Bananas</td>
<td></td>
<td>34-36</td>
</tr>
<tr>
<td>Berries, fresh…For three or four days</td>
<td>34-36</td>
<td></td>
</tr>
<tr>
<td>Canteloupes, Carrots—all about three weeks</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Cranberries</td>
<td></td>
<td>33-34</td>
</tr>
<tr>
<td>Date, figs, etc.</td>
<td></td>
<td>34-40</td>
</tr>
<tr>
<td>Fruits, dried</td>
<td></td>
<td>35-40</td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td>33-36</td>
</tr>
<tr>
<td>Lemons</td>
<td></td>
<td>34-40</td>
</tr>
<tr>
<td>Oranges</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Peaches</td>
<td></td>
<td>35-45</td>
</tr>
<tr>
<td>Peppers</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>Watermelons…Carry only about three months</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>Asparagus</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>Celery</td>
<td></td>
<td>32-40</td>
</tr>
<tr>
<td>Carrots</td>
<td></td>
<td>33-34</td>
</tr>
<tr>
<td>Celery</td>
<td></td>
<td>33-35</td>
</tr>
<tr>
<td>Dried apples</td>
<td></td>
<td>35-40</td>
</tr>
<tr>
<td>Dried corn</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Dried peaches</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Onions</td>
<td></td>
<td>32-33</td>
</tr>
<tr>
<td>Parsnips</td>
<td></td>
<td>33-34</td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td>34-36</td>
</tr>
<tr>
<td>Sauterfrut</td>
<td></td>
<td>32-39</td>
</tr>
</tbody>
</table>

"Asparagus, cabbage, carrots, and celery are carried with little humidity; parsnips and satisfy same as onions and potatoes, except that they may be frozen without detriment.

Apples when stored in barrels should not be stored on ends, but preferably on their sides. Fig. 2411. A temperature of 32° is considered most favorable.

In general, green fruits and vegetables should not be allowed to wither. Curious fruits and vegetables should be kept dry until the skin loses its moisture; then the drying process should be immediately checked. For bananas no rule can be made. The exigencies of the market must govern the ripening process, which can be manipulated almost at will.

Fruits, especially tender fruits, should be placed in cold storage just when they are ripe. They will keep better than if put in when not fully ripe. Pears will stand as low a temperature as 35°. Sour fruit will not bear as much cold as sweet fruit. Catawba grapes will suffer no harm at 26°, while 32° will be as cold as is safe for a lemon.

The spoiling of fruit at a temperature below 40° F. is due to moisture. In storing apples, eight to ten cubic feet storage room space is allowed per barrel, and twenty to twenty-five tons daily refrigerating capacity per 10,000 barrels."

L. C. CORBETT.

Treatment of Fruits Intended for Cold Storage.—Cold storage has come to be a factor of prime importance in the marketing of many fruits, especially in apples, pears and grapes. With the more perishable fruits, like berries, peaches and plums, it is but little used, largely for the following reason: The action of cold in preserving fruits depends on two things; first, it retards those normal bio-chemical changes in the tissues of the fruit that are concerned in the process of ripening; it is a matter of common observation that apples, for instance, stored in a warm room ripen and become mellow much quicker than those in a cold cellar. Second, if the degree of cold is sufficient, it prevents partially or entirely the growth of those bacteria and fungi that cause decay.

In peaches and other perishable fruits the changes concerned in the normal process of ripening take place much more rapidly than in winter apples or other fruits that are naturally good keepers. By the time the more perishable fruits reach market, in the ordinary course of events, these changes have already progressed so far that it is necessary to dispose of the fruit at once in order to avoid loss. If, now, market conditions are unfavorable and it is decided to place the fruit in cold storage to hold it for a better market, the chances are against success, for the ripening changes have already progressed almost to the limit of safety and, while the cold checks, it does not entirely prevent them. The usual result is that, even though they may look fairly well while still in the cold chamber, the goods go down quickly on reaching the warm outside air. When for any reason it is desirable to hold perishable fruits in cold storage, it is essential that great care be used in selecting only perfectly sound, full-grown but unripe specimens, and that these be placed as soon as possible after picking in a refrigerator car or an ice-box for
transportation to the storage rooms. No perishable fruit that has been exposed to ordinary temperatures for twenty-four hours after picking is in fit condition for storage. Too many people have made the mistake of supposing that by placing fruits on ice they could, as it were, rejuvenate them and that they would come out sound and firm even if at the point of decay when they went in. It should be borne in mind that the life or keeping quality of any fruit is self-limited, that the processes of ripening and subsequent deterioration are constantly going forward, and that the best that we can do by cold storage is to retard them; we cannot prevent them entirely.

These considerations apply with equal force to the storage of those fruits that are naturally good keepers. Grapes and pears, if the weather is warm, should always be shipped to the point of storage in refrigerator cars, and in many cases this would doubtless be profitable even with apples. A week of warm weather after apples are gathered and while they are in transit will inevitably so stimulate the ripening processes as to greatly impair their subsequent keeping quality, especially their ability to stand up and make a good showing after coming out of storage. Then, too, the exposure for even a few days to warm conditions after picking is sure to stimulate the growth of fungi and bacteria, thus starting many spells of incipient decay that cannot be entirely checked by subsequent refrigeration. It is probably safe to say that the keeping quality of any given lot of apples depends as much on its history during the period from the time of picking till it goes into storage as upon any other factor.

F. S. Earle,

Management, Temperatures and Prices.—The rapid advancement of the cold storage industry should be of great interest to the horticulturist. It is now possible to secure all the benefits, with a comparatively small investment. Mechanical refrigeration is best accomplished by employing what is known as the compression ammonia process. Anhydrous ammonia, i. e., ammonia free from water and held in liquid form only under great pressure, is allowed to expand and vaporize in pipes submerged in brine. The ammonia, in changing from a liquid to a gaseous condition, absorbs the heat from the liquid in which the pipes are submerged. In this manner it can be brought to a temperature of zero, or lower, if necessary. This cold liquid (brine) is circulated through pipes placed in the room or rooms that are to be refrigerated. The ammonia, after absorbing its quota of heat, is again compressed to a liquid condition by mechanical means and used over and over without limit. Any liquid that boils at a very low temperature can be substituted for ammonia, but at the present, viewed from an economical and practical standpoint, ammonia is given the preference. The temperature of a storage room is controlled by the volume and temperature of the brine circulated.

Apples are best preserved at a temperature of 30° F., two below the freezing point. It is generally conceded that they should be taken from the tree as soon as matured and colored, immediately put in a cold room and the above temperature maintained until they are taken out to be placed on the market. They will come out with a minimum amount of decay, crisp, full-flavored, and in condition to "stand up" much longer than if carried to a higher temperature. Bartlett pears put in white green and as soon as the stem will cleave from the twig, at a temperature of 32°-35°, carry for two months to ten weeks. Ventilated barrels are sometimes used, but slatted bushel crates are preferable. Winter or late varieties of pears will carry much longer.

Tomatoes, if sound, not broken or bruised, picked before they are thoroughly ripe, will, at a temperature of 40°, carry three to five weeks. Celery, if dry and sound, should, at a temperature of 34°, carry from three to four months. Vegetables, such as carrots, parsnips and turnips, at a temperature of 34°, carry successfully until June or July; if decay has set in before the products are placed in cold storage it will not be entirely stopped but only arrested in a moderate degree, and to obtain any measure of success nothing but sound, perfect goods should be placed in the refrigerating rooms.

The following are the charges usually applied by those conducting public cold storage: Apples, 15 cents per bbl. first month, 10 cents each additional month; celery, 10 cents per case first month, 6 cents each additional month; cherries, 25 cents per lb.; grapes, 12.5 cents per lb. first month, 5 cents each additional month; maple sugar, 0.25 cent per lb. first month, 0.2 cents each additional month; pears, 1.25 cents per bbl., same as apples; per 1/4 bbl., 10 cents first month; 7 cents each additional month; pears in bushel crates, same as in 1/4 bbls.; quinces, same as apples; vegetables, 25 cents per bbl. first month, 15 cents each additional month; vegetables, per case, 15 cents first month, 10 cents each additional month. If in very large quantities, season rates are sometimes made at comparatively lower rates.

Mechanical refrigeration is surely of paramount importance to the producers of vegetables, fruits, eggs, butter, etc. It provides a means by which they are not compelled to accept ruinous prices of run off the market, nor obliged to sell when products are harvested, regardless of price, nor to force their products on the market in such quantities as to cause a glut. Instead of having supplies that must be sold within a few days, the horticulturist can, by taking advantage of mechanical refrigeration, extend the market season fully 50 per cent, or until such time as the demand equals the supply.

Samuel R. Mott, Jr.

Practical Experience with Cold Storage.—The experience of those who have had occasion to use cold storage is remarkably varied, scarcely two of them having formed the same impression in regard to its effect. But the very fact that perishable articles have been preserved for long periods shows that there is at least one right way, and the managers of cold storage plants are learning what that right way is.

One great trouble has been that hardly two articles require the same temperature to keep in proper condi-
tion; in fact, the different varieties of apples require different degrees of temperature, and it took a long time to learn this. Again, it is almost impossible to maintain the same temperature in all parts of a large building or even in one large room. As a rule, each variety of fruit or vegetable should have a separate room, and the keeper should know what degree of temperature is best for each. Some varieties of apples have the reputation of keeping better in cold storage than others, but it is only because one had a temperature suited to it and the other did not. A car-load of apples may have come from the orchard where the fruit had been exposed to the hot sun and attained a temperature of perhaps 80° and was then placed in a room with other car-lots which were at the proper temperature. In twelve hours the temperature in the room would rise to 50°, and with the best of management it would require forty-eight hours to reduce the temperature to the proper mark; this could not be otherwise than injurious to the entire lot.

It has not yet been fully settled what is the proper degree of temperature to be used in keeping the various fruits and vegetables. Keepers of cold storage plants differ somewhat on this point, and it is probable they all try to maintain a degree too low for most of our products. The writer believes the temperature most suitable for all (if we must use one for all products) would be 34°.

It is not important what kind of a building is used, whether wool, stone or brick, but it is very desirable that it should be divided into many rooms, so that each product may be stored in a separate room; and where large quantities of apples are stored, each variety should occupy a separate room and the keeper should have perfect control of each room and know the required degree of temperature for each article and maintain it. When this is done, cold storage will be a great success.

J. C. Evans.

Refrigerator Cars.—The invention and development of the refrigerator car have proved to be very important factors in fruit production and marketing, making it possible to market in good condition the most tender fruits two to three thousand miles from where they are grown. Prior to the days of the refrigerator car, strawberries if shipped by freight more than one or two hundred miles usually arrived in bad order and were very unsatisfactory to both dealer and consumer, and, except for the best exposed to the hot sun and attained a temperature of perhaps 80° and was then placed in a room with other car-lots which were at the proper temperature. In twelve hours the temperature in the room would rise to 50°, and with the best of management it would require forty-eight hours to reduce the temperature to the proper mark; this could not be otherwise than injurious to the entire lot.

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J. C. Evans.
STORAGE

the car will hold, then close the doors, and, by lantern-light, work goes on inside till all these packages are placed, when more are handed in and the car quickly filled. In this way a car an hour is often loaded all day long in the smaller peach-cities. Where small cars are run by many different growers and the car is one or two days loading and opened many times, the fruit is not so quicky cooled down and, even with the same attention en route, never arrives in market in as sound condition as when the car is quickly loaded.

Another very important point is the first re-icing. When 400 to 700 warm packages of fruit are put into a refrigerator car, ice begins to melt very rapidly and in a few hours one-half or more of the ice has melted away, the upper part of the car inside is a steaming sweat-box, and it is of vital importance that ice-boxes be promptly refilled solid to the top, so that the whole in the car is kept at a low temperature as quickly as possible. Once get all the heat out of the fruit packages and the ice-boxes then full, and a car may go a long time without re-icing and yet carry fruit in good order. But neglect the first re-icing twelve to fifteen hours, and there is always danger, while for best service from start to finish the ice-boxes should be kept full all the time. The most ice will be consumed in fruit-loading and in the first twelve hours thereafter.

When well re-iced en route refrigerator cars arrive at destination with boxers nearly full of ice, and in many of the smaller markets, where a car-load of high-priced fruit cannot be sold in a day, dealers often use the cars for storage purposes, re-icing with solid ice every night before Georgia handled in this way have been sold in the smaller cities of New York and New England in perfectly sound condition ten days to two weeks after being picked ripe from the trees. J. H. Hale.

STORAX. See Styrrax.

STORK'S BILL. Erodium and other members of the Geranium family.

STOVE PLANTS. The term "stove" applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of brick or stone, called stove houses or stoves, and the plants grown in them "stove plants." (A "greenhouse" was in those days an unheated glass-hause in which plants were merely kept alive over winter.) These terms still exist in England, but are applied to large structures, called tropical houses, or stoves, and the plants grown in them "stove plants." (A "greenhouse" in England now means the coolest glasshouse only, while in this country the name is usually indiscriminately applied to all glasshouses.)

The names applied to plants in England and America are therefore: Stove, for tropical plants; intermediate house, for plants hailing from warm-temperate climates; greenhouse, for those plants requiring the least degree of heat and moisture or show house in which plants are placed while in flower and usually kept at a cool temperature.

In practice such terms may be greatly modified to suit local conditions; for example, at the Botanic Gardens of Smith College, Northampton, Mass., the glasshouses are named cool-temperate house, warm-temperate house, tropical house, palm house, acacia and succulent house, experimental house and propagating house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stove plants is too heterogeneous a subject to be treated exhaustively in a single book, being includes so many kinds of plants and subjects connected with plant treasures from the tropics, especially those found at low altitudes. In general, the stove is the house which requires the most expense and care, the greatest heat and the highest atmospheric moisture. For the general principles of its management, consult Greenhouse Management.

Edward J. Canning.

ST. PETER'S-WORT. Ascyrum stans.

ST. PETER'S WREATH. Spirea hybridaea.

STRIATIOTES (Greek, soldier; referring to the sword-shaped leaves). Hydrocharidaceae. The Water Soldier, or Water Aloe, is a hardy aquatic plant of small ornamental value but considerable botanical interest. It is native to Europe, has spread to Asia and has been carried to America. It is assumes to have come to America from Europe, and has a rootstock creeping in the mud, which produces at the bottom of the water tufts of long, narrow, sword-shaped leaves, bordered by small spiny leaflets. The flowers, if any, are not developed, but when the plants are in flower, the spikes are small, white, 3-petaled, and borne on peduncles which rise to a few inches above the water. The peduncle is much thickened at the top and bears a spike of 2 bracts about an inch long. The male flowers are several in a spath, stalked, and have usually 12 or more stamens. The female flowers are solitary and sessile in the spathe of 2 bracts, and do not abide of the same species; it is a distinct calyx, which is not the rule among monocotyledons.

Striatotes alicoides, Linnaeus, is the only species in the United States, and is commonly found in the backwaters of ponds and in the mud of shallow saltwaters. It is readily propagated by cuttings, and is a hardy overwintered plant, bearing a spathe of 2 bracts; ovary and stigmas nearly as in Hydrocharis, but the fruit is ovoid and somewhat succulent. It is introduced by one American specialist in aquatic plants. W. M.

One of the peculiarities of Striatotes is that in summer the whole plant rises to a point near the water's edge when it is only partly submerged, and later in the season it drops below the surface. Young plants do not act thus. It is propagated by side shoots from the base of the plants. Toward the end of summer these shoots are merely bulblets and are readily detached from the plant and are in a good condition for traveling.

W. M. Tovey.

STRAWBERRY. Plate XXXVIII. The Strawberry is an herbaceous perennial. It naturally propa -gated by means of runners that form chiefly after the blooming season. These runner plants, either transplanted or allowed to remain where they form, will bear the following year. Usually the plants will continue to bear for five or six years, but the first and second crops are generally the best. It is therefore the custom to blow up Strawberry beds after they have borne from one to three crops. The better the land and the more intensive the cultivation, the shorter the rotation. In market-garden -ing areas and in some of the very best Strawberry regions, the plants are allowed to fruit but once. The strawberry delights in a rich, rather moist soil and a cool season. It can be grown in the cool part of the year in the South and thereby becomes one of the most cosmopolitan of fruits. The young plants may be separated from the mother plant and put in boxes in which the fruit is likely to be too hot and dry in the late summer or fall. Plants that have not borne are best for setting. They are plants of the season, that is, plants which start in the spring of 1901 are fit for planting in the late summer or fall of 1901 or in the spring of 1902. These plants have many long, fresh, light-colored roots. Fig. 2314 shows such a plant, with the roots trimmed for planting. Fig. 2415 shows a plant that has borne. This plant bore fruit in 1900, and has thrown up a new crown in 1901. The old dead crowns remain, but the young crowns develop from the new roots of the crown. The burner resembles a long thread to this old crown. The roots are relatively few and are hard and black. These plants sometimes make good plantations under extra good care, but generally
Plate XXXIX. Strawberry test ground, with a truss of the Greenville variety
they should be avoided. Pots are sometimes plunged under the new runners in June and July, and they become filled with roots by August or September. These pot-grown plants are excellent for fall setting in the home garden, but they are seldom employed in extensive commercial practice. Fig. 2416.

In Florida, according to Rolfs, beds need to be reset annually, in September or October; plants set at this

time produce a good crop in the following February, March and April. The plants may be produced at home, or they may be secured from the North. Excellent plants for Florida conditions are procured from North Carolina.

For the very finest berries, each plant is allowed a space or hill by itself, and cultivation is given both ways. For general commercial results, however, plants are generally set in narrow rows. The old method was to plant in rows 3-3½ feet apart and the plants from 12-15 inches apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a matted row. In this system some plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits, and is now passing away. The up-to-date grower starts with the assumption that the largest and highest colored fruits are found on plants along the outside of the rows, and therefore he plans to have as many outside rows as possible. He accomplishes this by having his rows closer together and much narrower. The rows are made from 30-36 inches apart and the plants from 18-24 or even 30 inches apart in the rows, much depending on the prolificacy of the variety as a plant-maker. If the plants used for a new bed are strong and start into growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually “bedded in,” i.e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing. This system is shown, in a full-bearing bed, in Fig. 1486, Vol. III.

Strawberries are usually mulched in the fall in order to protect them in the winter and early spring and to prevent the soil from heaving. In some cases the mulch is allowed to remain on the plants rather late in the spring, in order to retard the season of bloom. Sometimes the crop may be retarded a week or ten days by this means, and cases are reported in which it has been delayed with commercial results somewhat longer than this. The mulch is usually more necessary in regions of light and precarious snowfall than in those in which the snow blanket is deep and lies all winter. In regions of deep and continuous snowfall, a heavy mulch is likely to prove injurious. Experience has shown that the best mulch is usually some strawy material. Along the seacoast, salt hay from the tide marshes is much used. In interior places clean straw, in which there is no grain to sprout and to make weeds, is very largely employed. Fig. 2417. In the South, pine needles are used. Sometimes loose strawy manure is used, and the mulch adds fertilizer to the soil as well as affords protection. Under ordinary conditions the mulch is three or four inches deep over the plants after it is fairly well packed down. It is not always possible, however, to mulch as heavily as this, since the material is likely to be expensive when one has a large area. The mulch is usually applied late in the fall after the ground has frozen, and if the material is abundant both the plants and the intervening spaces are covered. In the spring the mulch is raked from the plants as soon as they begin to start. Some persons allow it to lie between the rows as a cover to retain moisture and to keep the berries clean. The most expert growers, however, prefer to take the mulch from the field and to till the plantation once or twice before the plants are in bloom. The material is sometimes returned and spread on the loose soil between the rows. In the northern prairie states, heavy mulching is essential. Professor S. B. Green advises for western Minnesota and Dakota a covering of at least six inches of straw. This mulch is easily provided, since straw is so abundant in that country that it is often burned as the readiest means of getting rid of it. When not mulched in that region, the plants are likely to be killed outright or to start with a very weak growth.

Strawberry flowers may be either perfect or imperfect, and the nature of the flower is characteristic of the variety. In some kinds, the flower is perfect or hermaphro-dite (having both stamens and pistils) and is consequently self-fertile. In others it is pistillate, producing no pollen, and requiring a pollen-bearing variety to pol-

2414. Strawberry plant ready for setting.

2415. Old Strawberry plant, usually not desirable for setting.
mens that they are practically pistillate or sterile. Any variety will fertilize any other variety if it bears sufficient pollen and if the two kinds bloom at the same time. When planting pistillate varieties, every third row should be a pollen-bearing kind. The horticultural bearing of the sexual characters of the Strawberry flower seems to have been first clearly explained in this country by Nicholas Longworth, of Cincinnati (see Longworth; also his essay on the subject in his "Cultivation of the Grape," 1846, and the "Strawberry Report" of the Cincinnati Horticultural Society, 1848). When many of the flowers or "seeds" of the Strawberry are not fertilized or are killed by frost or other means, the berry fails to develop at that point and a "nubbin," or imperfect berry, is the result. Fig. 2419. Nubbins are usually most abundant late in the fruiting season, when the pollen supply is small and when the plants are relatively exhausted.

The cost of growing an acre of Strawberries under commercial conditions in Oswego county, New York (which is one of the leading Strawberry centers of the North) is approximately as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rent of land, two years</td>
<td>$81.00</td>
</tr>
<tr>
<td>Plowing and fitting</td>
<td>6.00</td>
</tr>
<tr>
<td>Plants</td>
<td>15.00</td>
</tr>
<tr>
<td>Setting plants</td>
<td>4.00</td>
</tr>
<tr>
<td>Cultivation</td>
<td>16.00</td>
</tr>
<tr>
<td>Straw for winter and fruiting mulch</td>
<td>15.00</td>
</tr>
<tr>
<td>Labor—hoeing, pulling weeds, etc.</td>
<td>10.00</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>$77.00</strong></td>
</tr>
</tbody>
</table>

Many growers raise berries at a much less cost, and a few exceed this sum especially when located near a large town where rents are high; but it would be safe for one about to engage in Strawberry-growing to figure close to this total, aside from the cost of fertilizer.

New varieties of Strawberries are raised from seed with the greatest ease. The generations of Strawberries are short and new varieties soon find favor. The varieties change so frequently in popular estimation that it is impracticable to recommend a list of them in a work like this. The first great American berry was the Hovey (Fig. 1088, Vol. II). Perhaps the most popular single variety has been the Wilson (Fig. 2419), now practically extinct. The accompanying pictures (Figs. 2421-2425) show types of American Strawberries.

The common garden Strawberries are the progeny of Fragaria chiloensis, native to the Pacific coast of America, and first introduced to cultivation from Chile nearly 200 years ago. See Fragaria. In Europe the Alpine and Hautbois types of Strawberries (F. vesca and F. moschatum) are highly prized as dessert fruits. These are sometimes grown in this country by amateurs, but they are unknown to commercial Strawberry culture. The native Fragaria Virginiana, everywhere common in fields in eastern North America, gives little promise under cultivation. It usually runs strongly to vine, at the expense of fruit-bearing.

There are several serious fungous diseases and insect pests of the Strawberry. The fundamental treatment for all these is to fruit the bed but once, or at most but twice, and to grow succeeding crops on other land, cleaning up the old plantation thoroughly after the last fruiting. Short, quick and sharp rotations and clean culture do much to keep all enemies in check. Most of the fungous enemies are kept in check with relative ease by spraying with Bordeaux mixture. Fig. 2426.

The American book writings on the Strawberry are:


L. H. B.

Culture of Strawberries. — The following article was written for the Editor some ten years ago by the late J. M. Smith, Green Bay, Wis., long known as one of the most expert Strawberry-growers. It has never been published. Mr. Smith was born at Morristown, N. J., Jan. 15, 1829, and died at Green Bay, Feb. 20, 1894.—L. H. B.

The Strawberry will grow and thrive in all parts of the United States where any fruit will grow, and yet, strange as it may seem to young readers, fifty years ago it was scarcely known except as a wild fruit. The writer has no recollection of ever seeing more than one small bed of Strawberries cultivated before he was 25 years old. In boyhood he often accompanied his father
to the New York market, yet he never saw cultivated Strawberries in that market before 1840, though there were probably a few before that time. It is probable that there are now more Strawberries carried to New York every fair day during their season of ripening than had ever been seen in that city during its entire history previous to 1840.

The introduction of Hovey Seedling about 1834 or 1835, and of the Jersey, or, as it was sometimes called, the Early Scarlet, a few years later, marked a new era in Strawberry culture. These were great improvements over the common wild fruit previously seen in the market; but it was not until the introduction of the Wilson, about 1854, that it became possible for almost every one who owned a small plot of land to have a supply of berries for himself and friends during the berry season. This modest little plant completely revolutionized Strawberry-growing. Its fruit was much larger than any other then in cultivation, being also very firm and able to bear transportation much better than any other, and it seemed to be perfectly at home in nearly every soil and climate from the Atlantic to the Pacific ocean, and from Lake Superior to the Gulf of Mexico. In addition to all these qualities, it was marvelously productive. Soon after this, new varieties began to appear in numbers greatly exceeding anything ever before known. This progress has been kept up until the present time, and each succeeding year many new varieties are brought to notice. The increase in the cultivation of this fruit was not rapid until 1858, when more attention began to be paid to it than ever before. Since the close of the Civil War the increase has been almost beyond belief, except to those who are familiar with its history.

Strawberry Soil.—If he could always choose, the writer would select a dark sandy loam, rather damp than dry, but this is by no means an absolute necessity, as Strawberries will grow in almost any soil, unless it be dry sand or an unstrained bed of muck. Any soil that will grow a good crop of corn or potatoes will grow a fair crop of Strawberries. This remark will apply throughout the United States; and not only that, but Strawberries will grow in some places where the nights are too cool and the seasons are too short for corn to ripen. Hence but few need have any fears about their success on account of climate, latitude or longitude. The richer the soil the larger the crop, hence the necessity of making it rich by extra manuring.

The first thing is to be sure that the land is thoroughly drained, as it is impossible to make Strawberries do even fairly well with the roots in land that is filled with water. Underdraining is not always a necessity, but good surface-draining is, and no land should be set with plants until it is so prepared that it can be thoroughly surface-drained and kept so. If the land is at all inclined to be wet, it will pay well to have it thoroughly underdrained, in addition to the surface-draining.

Next comes the preparation of the soil. The writer prefers spring setting. He has sometimes done well with setting in August or early in September, but has never failed in spring setting. As early as the land is fit to be worked, put on about twenty fair-sized two-horse loads of manure per acre and plow it in; then top-dress with as much more fine, well-rotted manure, and harrow it in thoroughly. If fine manure cannot be obtained, it would be better to plow all the manure under, as coarse manure on top of the beds would be an annoyance, and cause more or less trouble the entire season. Whether the manure is wholly or partially plowed under, the land must be made fine and mellow before putting in the plants.

Setting the Plants.—The plants should be taken from beds that were set the previous season, if possible. Use a common six-tined manure fork and take up a lot of the young plants, being sure to get only the runners of the previous fall. Pick them out of the loose earth, taking off all the old dry leaves, and if they have long, nice, light-colored roots (throw away all others), clip off about one-third of their length. Fig. 2414. Be careful not to let the sun shine on the roots for any length of time. During some of the hot sunny days of our spring weather, even ten minutes’ exposure to the sun would damage them so much that one should hardly dare risk setting them out. Mark off the beds in rows two feet apart each way. For this we use a marker made just like the common hand hay rake with the headpiece of pine or some other light wood, and about 32 feet long, the teeth set two feet apart and sloping a little backwards instead of forwards as in the common hay rake. With this a man should mark an acre in a half day, and do it easily. If the ground is still a little heavy, as it is likely to be if it is a clay soil, let a man go ahead with a hoe and strike it into the earth where the plant is to be set and loosen it so that it will be perfectly mellow. A boy follows with the prepared plants, and drops one at each crossing of the marks. He is followed by the setters, of whom there should be two to work to best advantage. They go on their knees between two rows, pick up the plants with the left hand and at the same time, with the fingers of the same hand, spread the earth into a fan shape, while with the fingers of the right hand the ground is opened sufficiently to allow the fan-shaped roots of the plant to go down in a perpendicular manner into the earth; then bring back the earth around the plant and, doubling up both hands, press down the earth firmly around the newly set plant. The crown of the plant when set should be a very little lower than the surrounding earth. Be careful not to have the crown covered with earth, as that would damage it. All this
can be done by men with a little experience in a small part of the time taken to write it out, but one must remember that the doing of this work well or ill will make the difference between success and partial failure. The writer has several men who will set half an acre a day, and do it easily and well. If the weather is dry and warm, it will greatly aid the young plants if half a pint of water is put around each one. When the beds are filled with plants, run through them with a hand-cultivator before they come into bloom. This may not be necessary, but in most cases it will be. If the plants start nicely, they will soon be in full bloom, but they must not be allowed to bear fruit this summer. Go through the beds and pinch off all the blossoms, and see that there are no stray plants among them of a different variety. The beds must be kept clean, free from weeds, and well cultivated as often as they require it. In July the runners will start. Before the runners take root they should be trained around the parent plant like the spokes of a wheel, having the parent plant for its center. Simply lay them out in equal distances around the parent plant and throw sufficient earth upon them to hold them. Otherwise the runners are likely to come out on one side and make almost a solid mass of roots on that side and few or none on the other, the result being that the crop the following season will not be as large or of as good quality as when they have been properly trenched. This is about all there is to be done until the ground freezes for winter, when the plants should be covered with marsh hay. Straw is as good, provided it is free from weeds and grass seed, but it is sometimes impossible to obtain such straw. In covering the plants, merely hide them from sight.

There are two objects in view: first, to protect the plants from the many sudden changes in our winter weather, and, second, for spring protection. During the thawing days and freezing nights in the early spring, the ground is likely to become "honeycombed." The top of the ground is a little raised from its natural position, and the plants are lifted up and their roots broken off in the frozen earth beneath. To avoid this danger, leave the cover upon the plants until all freezing nights are over. Some growers recommend leaving the cover on and allowing the plants to work through it. The writer has tried this plan, but the crop was only half of that obtained when the cover had been taken off and the ground kept cultivated. Better take the cover off, haul it away and stack it for another winter's use.

Some growers recommend that the mulch be retained in order to keep the berries from being soiled. If the plants grew last season as they should have done, they have by this time nearly or quite covered the ground, and the leaves and fruit-stems will so support each other that there will be very few berries in the dirt unless it rains almost constantly. When there are open spaces of any size, and the fruit is likely to get into the dirt, it is well to put back a little of the mulch after the thorough cultivation of the spring is done. For the spring dressing, wood ashes are to be preferred. If unleached, they should be applied at the rate of not less than 50 bushels to the acre. Twice that amount should be used if the ashes have been leached. If ashes are not to be had, put on well-rotted stable manure at the rate of about 20 wagon-loads per acre. The spring cultivation consists of pulling out by hand all the weeds that can be found among the plants and then hoeing over all the open spaces large enough to accommodate a common broad hoe. Do not work the ground more than half an inch deep, for the roots have much work to do within the next few weeks.

Now it is time to begin to count the cost. We will consider the land worth $200 per acre:

**Expense of an Acre of Strawberries**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest and taxes</td>
<td>$15.00</td>
</tr>
<tr>
<td>Plowing, harrowing and surface-draining</td>
<td>5.00</td>
</tr>
<tr>
<td>Value of 11,000 plants at $5 per 1,000</td>
<td>55.00</td>
</tr>
<tr>
<td>Manure, 60 loads, at $1 per load</td>
<td>60.00</td>
</tr>
<tr>
<td>Marking ground and setting plants</td>
<td>4.00</td>
</tr>
<tr>
<td>Summer cultivation</td>
<td>2.00</td>
</tr>
<tr>
<td>Training runners around the plants</td>
<td>3.00</td>
</tr>
<tr>
<td>Winter covering and cost of putting it on</td>
<td>6.00</td>
</tr>
<tr>
<td>Taking off winter cover and spring cultivation</td>
<td>5.00</td>
</tr>
</tbody>
</table>

**Total**                                    | **$61.00**    |

In a very dry and unpropitious year, the yield on the writer's place was 7,136 quarts, or 223 bushels per acre; the gross receipts in cash were a few cents over $500 per acre. In the year 1886 the yield was over 8,000 quarts, or something over 250 bushels per acre; and the gross receipts $905 per acre. These were both hard years for Strawberries. In 1876 exactly one-quarter of an acre yielded 3,571 quarts, or 111½ bushels, of marketable fruit. The average price was 12 cents per quart. In 1876 one-fourth of an acre yielded a fourth less than 100 bushels. These were both favorable seasons for berries. But we will take the first mentioned crop for our estimate, as it was the poorest of the four. The boxes and crates cost a fraction less than $1.00 per 100 quarts; picking, packing and carrying to the depot not to exceed $15 per 1,000.

**The story of an acre of Strawberries in an unfavorable season.**

<table>
<thead>
<tr>
<th>Gross receipts</th>
<th>$300.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of growing the crop</td>
<td>$161.00</td>
</tr>
<tr>
<td>Picking, crating and marketing (7,136 quarts)</td>
<td>157.00</td>
</tr>
<tr>
<td>Net profits above expenses</td>
<td>$182.00</td>
</tr>
</tbody>
</table>
These receipts are by no means the only ones from the land for the two years. For many years past the writer has been in the habit of planting other early crops between the rows of Strawberries after they are set. For instance, in the spring a plot of five acres is set with Strawberries. As soon as the Strawberries are set plant between the rows (which are two feet apart) a large lot of onion sets and lettuce. One may sow part of the land with radish seed and another part with cabbage seed for late cabbage, and thus fill the ground with quick-growing plants that will be off before the runners need the ground.

Market.-A home market is the best if one can have it, although it is a well-known fact that few Strawberries are eaten in the neighborhood where they are grown. Along the Gulf coast, Strawberries begin to ripen earlier than the berries shipped north, and the consumption continues until 46° north latitude is reached; hence the necessity of a variety that will bear shipping. If we had all cooling-houses for berries, and refrigerators to ship the fruit in, almost any variety would bear more or less transportation; but as most growers have neither, the berries must be picked as soon as colored, and some varieties before they are fully colored. Before the writer had a cooling-house, he placed the cases in rows on the floor of a general packing house, and then placed ice along upon the floor between the cases. This did fairly well, but not as well as the present cooling-house, which is a very plain cheap building 12 x 14 ft. and about 12 ft. high. The sides are covered with common sheathing paper and boards, with an air chamber of four inches. The floor overhead is covered with zinc to prevent its leaking, and is a little sloping to one corner, where a pipe catches the water as the ice melts, and carries it from the building. It has an open space of nearly 12 inches all around the building, which lets the cold air pass below, where the fruit is. There are six tiers of shelves, one above the other all around the room below. Upon the floor above the ice is placed, and on the shelves below are the cases of fruit. About 50° is the best temperature to keep the fruit; if much lower than this, it is found that the fruit will not keep so long after being removed from the cooler. It is best not to throw fruit on the market, but to try to have it so good that it recommends itself. Endeavor to have it engaged to the retail grocers in advance. Then there is but one profit between the consumer and the grower.

J. M. SMITH.

Strawberry Culture in the South.-If any fruit is at home in the South it is surely the Strawberry. It bears small fruits, and, admitting as competitors tree and vine fruits, it easily holds the place of first importance among the many things that commend the Strawberry favorably to southern land-owners who would grow fruit for home use or for market are the following: its comparative freedom from disease and insect enemies; the ease with which it adapts itself to different soils and varied conditions of climate; the small cost at-}


early fall. At such times it is neither a difficult nor a very expensive process to shift plants with earth adhering to the roots to nicely prepared soil near the old beds. From good prepared beds secured as early in the season as August or September, and with a long fall and mild spells during winter favoring vigorous plant growth and development of fruit-buds, the grower may reasonably expect the following spring one-half to two-thirds of a crop.

Being a water-loving plant and a liberal feeder, especially during fruiting season, the Strawberry accomplishes its best work in a soil capable of taking in the largest quantity of water and of holding during protracted drought the greatest amount of moisture within easy reach of the plant. This ideal Strawberry soil is found in the rather compact deep clay loams over the well-drained clay subsoils so abundant in most of the South Atlantic and the Gulf states.

As to fertilizers, much depends on the kind of soil and treatment. Where the cereals are benefited by the
use of certain fertilizers, such plant-food may be safely and profitably used for Strawberries. It is better to fertilize heavily the crop that precedes Strawberries than to apply in large quantities to land occupied by this plant. In no case should heavy applications of strongly nitrogenous fertilizers be made just before the blooming period nor during the hot summer months. In the first instance, an over-vigorous vine growth at the expense of fruit will be the result; in the second, the plant is rendered too tender and too sappy to resist the

nothing is better than cottonseed hulls. It is a fact worthy of note that as one goes south the picking season lengthens. Florida, southern Louisiana and other sections near the Gulf frequently begin shipping late in January or early in February and July-August. Strawberries for four or five months. In latitude 32° the writer has during several seasons in the past twenty-five years shipped Strawberries from about April 1 to July 1. In latitude 34° the picking season rarely lasts more than five or six weeks.

In recent years the rapid strides made in methods of picking and packing, in the construction, loading and lading of fruit cars, in shortening the time between grower and consumer, and in vastly better means of distributing fruits among different markets and of reaching all classes of consumers in the several markets, -all these things have made southern-grown Strawberries common in almost every city, town and village in more northern latitudes.

A. B. McKav.

To the foregoing advice may be added a sketch of some of the rotation practices in Georgia. Four systems of rotation exist: the annual, biennial, triennial, and what may be termed the perennial or permanent system. These terms are frequently, though quite unnecessarily, confused, and some growers, while prating, technically, a biennial rotation, call it annual, because they establish a new plat annually, although each plat, when plowed under or destroyed, is two years old.

To illustrate: A plat planted to marketed strawberries in March, or in April, is in June ready for a second planting of strawberry runners. Such a rotation is strictly an annual one. Logically, it could be nothing less, nothing more. If, however, this plat were cultivated through the season following its crop, suffered to bear a second crop the next spring, then used as before to reset a succession plat and turned under, such a process would be a biennial rotation, and, logically, could be nothing less, nothing more. Equally as logical would it be to call the rotation biennial had the plat been planted in November—instead of July, August or September—cultivated through the following summer and carried into the next year, bearing its main crop—its "money" crop—the second spring. The fact that its first crop was light and scattering would not make the rotation an annual one; for the essence of the difference between an annual and a biennial rotation consists in the plat, in the first instance, flowering but once, while in the second instance it passes two flowering seasons. In the first case, no cultivation is given after fruiting; in the second the plat is cultivated after fruiting, or after the fruiting season, whether it fruits or not. These two distinctions cause a rotation to fall

under the head of biennial even when the plat is set out as late as February or March, cultivated through the summer following and fruiting the next spring.

The biennial rotation (though often under the erroneous title of an "annual") is the method of culture that is almost universally employed, except on the coast, where the light, sandy soil, the humid climate and more

2425. Shuster Gem Strawberry (X 1/2).

long and sometimes hot and dry summers. The southern cow-pea is possibly the best crop to precede the Strawberry. The leaves of this plant are clean, neat, and in the very best condition for any crop that follows.

The soil is usually prepared in slightly elevated rows or beds 3½—4 feet broad. In making summer and early fall plantings with the view of securing a large yield the following spring, plants are set only 8 or 10 inches apart along the line of the row. The distance in the row for spring plantings ranges from 12—30 inches, depending on the tendency of varieties set to multiply runners. For heavy yields the properly matted row is best. In the ideal matted row each plant should be 5—7 inches distant from its nearest neighbor, and a space of 18—24 inches along the top of the rows should be so occupied with plants. Season, soil and treatment at the hand of the cultivator greatly modifies the degree of success in securing this ideal stand. Where irrigating facilities are to be had, the desired results may be obtained with certainty. In spite of the best efforts on the part of the grower, however, varieties like Michel, Downing and Cloud may set too many plants during wet seasons. In such cases any runners that encroach on the spaces between rows are treated as weeds, and such places along the line of plants or fruits from this time until the end of fruit harvest are pulled out or clipped off with sharp hoes without breaking the surface soil. Very little winter protection is necessary. It is well to delay mulching until after midwinter, or until there has been sufficient cold to drive insects into winter quarters. On clay soils inclined to heave during frosty weather a thin covering of barnyard litter or of short straw (pine straw is excellent) placed around and between rather than over plants is of advantage. For keeping fruit clean and, at the same time, adding almost, if not quite, its purchase value in plant-food,
regular rainfall render summer planting on a large scale an economic possibility. This, the stiff clay soil of the interior, the drier atmosphere and uncertain rainfall of early autumn, render impracticable. It is hence more economical to reset than to cultivate on the coast, especially as its comparatively subtropical climatic conditions tend to produce a vigorous development of the summer or fall-planted plant by the following spring. But, while the biennial rotation is recommended for the interior of the state, it must not be understood that a new plot is to be established only every two years. The plot runs through two seasons, it is true, but a new one must be set out each year.

If strawberry growing was commenced in 1899 under a biennial rotation, and the planting effected in November of each year, the following diagram would illustrate the necessary succession of plots:

<table>
<thead>
<tr>
<th>Year</th>
<th>No. 1</th>
<th>No. 2</th>
<th>No. 3</th>
<th>No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1899</td>
<td>No. 1, planted November, 1899.</td>
<td>No. 2, planted November, 1899, from new purchased plants.</td>
<td>No. 3, planted November, 1899, from runners of No. 1.</td>
<td>No. 4, planted November, 1899, from runners of No. 2.</td>
</tr>
<tr>
<td>1900</td>
<td>No. 1, fruited lightly spring, 1900; cultivated through season of 1900.</td>
<td>No. 2, fruited, November, 1900; from new purchased plants.</td>
<td>No. 3, fruited, November, 1900, from runners of No. 1.</td>
<td>No. 4, fruited, November, 1900, from runners of No. 2.</td>
</tr>
<tr>
<td>1901</td>
<td>No. 1, fruited main crop, spring, 1901; plowed under November, 1901, after resetting No. 3.</td>
<td>No. 2, fruited lightly, spring, 1901; cultivated through season of 1901.</td>
<td>No. 3, fruited, November, 1901, from runners of No. 1.</td>
<td>No. 4, fruited, November, 1901, from runners of No. 2.</td>
</tr>
<tr>
<td>1902</td>
<td>No. 2, fruited main crop, spring, 1902; plowed under November, 1902, after resetting No. 4.</td>
<td>No. 3, fruited lightly, spring, 1902, and cultivated through season of 1902.</td>
<td>No. 4, fruited, November, 1902, from runners of No. 2.</td>
<td>No. 1, fruited main crop, spring, 1902; plowed under November, 1902, after resetting No. 3.</td>
</tr>
</tbody>
</table>

And so on, indefinitely. In this way, while each plot runs two years, that is, biennially, a new plot is reset every year, that is, annually; yet the rotation must of necessity be termed biennial, though only one marketable crop results. And this would be equally true for a similar rotation where the planting was done in February or March instead of November, although no crop—not even a light one—could be obtained the same spring. Of course, if a plot is reserved for re-setting, after it has borne its main crop, it must be cultivated, more or less—at least by hand weeding—to prevent it from becoming too foul during the second summer; but the process of thinning out and the careful cultivation necessary for a crop expected to make a paying return in fruit, are eliminated.

The triennial rotation is followed when two "main" or "money" crops are secured from a plot before its abandonment, and the perennial system when the plot is suffered to bear as long as it proves profitable.

The "matted row" system stands successfully the test of practical experience in the South. "Stool culture," however perfect or ideal in theory, can be made profitable only under exceptional conditions. Under ordinary circumstances it cannot resist the cruel test of a prolonged drought.

H. N. Starnes.

Strawberry Culture on the Plains. — The fact that the Strawberry has been growing wild from time out of mind in the prairie regions of North America suggests that it may be cultivated there with success, and the thousands of car-loads of delicious berries annually produced in those regions are positive proof of it. The Strawberry did not grow naturally in all sections or soils, but chiefly in the moist creek and river bottoms and along the margins of the woodlands. The cooler climatic conditions of the northern sections are more conducive to the growth of wild Strawberries than those in the South; for instance, the prairies of Minnesota grow more thrifty and larger berries than those of Texas. Under cultivation the Strawberry is somewhat subject to the same conditions as when growing naturally, but the principle of conservation of moisture by tillage has enabled man to do much that nature could not, in growing Strawberries. Water is most essential in the culture of this fruit. The soil should not be wet, but it must be moist or the plants will not thrive; nor will they bear fruit abundantly or of good size and quality with a meager supply of water. During the fruiting season there is a heavy draft upon the plants for water with which to fill the berries to their proper size. Over most of the Plains region there is a sufficient amount of rainfall to produce good crops of Strawberries in ordinary seasons, provided proper care be given to tillage. Nearly all the failures to grow reasonably good crops are due to neglect of this all-important matter. The drier the climate or the season the more heed should be given to tillage.

The mere setting of plants and giving them ordinary care is not sufficient for the production of a really profitable Strawberry crop in the open prairie country. It may suffice where the rainfall is not only abundant but regular; but where the rains are fitful and often very scant, especially in the latter part of the summer, this will not do. The tillage should not be deep, but very frequent. Once each week during the growing season will be sufficient. The finer the surface soil is pulverized, the less water will escape from the subsoil, and this is the principal point to be attained so far as the purposes of tillage are concerned. Rich soil is beyond doubt one of the prime requisites of Strawberry culture. This is not difficult to find in most parts of the prairie regions. Some of it lies too flat for the best results and some is too steep, but very little is either too stiff or too sandy. The Strawberry is especially adapted to field culture. As the Plains country slopes up to the Rocky Mountains the climate becomes drier until there is so very little rain that nothing but a scant native vegetation will grow without irrigation. The soil is for the most part rich enough for Strawberries, and where water is applied in proper quantity as fine berries can be grown as in any part of the humid regions. As a matter of fact, there
seems to be more certainty in growing Strawberries under such conditions than in regions where the crop must depend upon rainfall. Some varieties that are usually a failure because of their deficient root-system, such as Juconda, are thus enabled to flower to a degree as to be among the most profitable. Whatever may be said of other parts of the continent of North America, it is an indisputable fact that the Plains region is very good for Strawberries. Good judgment in the selection of proper locations and the right varieties, thorough preparation of the soil and good culture will be abundantly rewarded.

H. E. VAN DENAN.

The Strawberry on the Pacific Coast. — California conditions include both those most favorable and most trying for the growth of Strawberries. There are situations where, through local topography and proximity to the ocean, winter temperatures are very seldom too low for the growth and fruiting of the plants and where, by summer irrigation to maintain this continuous activity of the plants, it is possible to gather fruit every month in the year. This fact is not, however, made of much commercial account, nor is it widely true that one can have Strawberries all the year round in the open air. It is true, however, that even on the lowlands, where the commercial crops are chiefly grown, the winter is so mild that Strawberries begin to ripen in shipping quantities as early as March and by proper cultivation and irrigation the fruiting is continued until late in the autumn, and the grower has therefore a very short closed season. The trying condition for the Strawberry is found in the long, dry summer, which enforces dormancy as early as June on light loams in the more arid localities of the interior. Such soils become dry and hot to a depth of several inches in spite of surface cultivation and cause the dwindling and death of a shallow-rooting plant like the Strawberry, unless frequent irrigation is begun in time. This trouble is less acute on more retentive soils in regions of lower summer temperature and greater rainfall, and plants in such situations may survive the summer dormancy, but it is true that everywhere in California and even in the more humid states on the north that Strawberries growing without irrigation results either in failure or only partial satisfaction and the venture is seldom to be commenced. It is, however, so easy, usually, to secure the small amount of water necessary for home production, and the plant when fairly treated is so highly productive, that a general exhortation to Strawberry-growing on an irrigation basis is fully warranted.

There are several species of Strawberries indigenous to California, and they are of both litoral and alpine types. Some interest has been shown in development of cultural varieties from these sources, but no commercial significance has as yet attached to them. The varieties chiefly grown are different from those popular at the East. New varieties from the eastern states and from Europe, which are tried, but few are successful, they retain local popularity after abandonment in their birthplaces. A striking instance of this fact is the continued popularity of Longworth Prolific, Sharpless, Monarch of the West, Wilson Albany, etc. Longworth has survived more than thirty years' continued growing. Other popular varieties are Melinda, Jessie, Triomphe de Gand, Brandywine, Marshall, Lady Thompson, etc. An English variety, Laxton Noble, has been largely planted in southern California but not always successfully, though it does well near the coast. The Arizona Everbearing is par excellence drought- and heat-resistant and is constantly increasing its area in interior situations. It has endured neglect which has actually compassed the death of other varieties. The Australian Crimson is a popular market variety in southern California, of which the first plants came from the southern hemisphere, but it has some appearances of being a re-named American variety.

The growth of Strawberries is almost wholly in matted rows, the rows usually occupying low ridges only sufficiently elevated to allow the slightly depressed intervals to serve as irrigation ditches and as walks during picking. The slight elevation of the plants also assists in surface drainage, when heavy rains fall during the early part of the fruiting season, and this promotes early growth and fruiting of the plants. Where the soil is too coarse to permit free rise of water from the depressed ditches the conditions are reversed and low levees are made to inclose blocks of plants which are irrigated by flooding the inclosures. In the chief commercial regions a fine loam is used and irrigation from the small ditches on both sides of the ridges, which are about 2 feet wide, is the ruling method. Nearly level land is selected and grading is done before planting to reduce dry knolls and fill low places so that the water will flow slowly and will evenly moisten the whole field. Subirrigation by tile has been often advocated but never has been employed to any extent.

One of the chief Strawberry-shipping districts in central California is characterized by a shallow loam underlaid by an impervious indurated clay or hard pan, which prevents the percolation of the irrigation water and enables growers to maintain a large acreage by means of the small water supply secured by windmills. In this case water is applied very frequently, even oftener than once a week in some cases, but the total amount for the season is small. Quite in contrast to this is the growth on light, deep loams where water sinks so rapidly that the plants suffer, although water is almost constantly running in the ditches. In such cases mulching and sprinkling are the price of success, and these are too costly except on a small scale for home supply. The largest producing districts have soils midway between the extremes above noted; viz., deep, retentive loams, situated rather low in the valleys and with irrigation available either by ditch system or by wells both flowing and pumped. The pump wells require usually only a short lift, and abundant water is secured cheaply by the use of modern pumps and motors.
In addition to supplying the home markets, which are very good, California Strawberry-growers find a good outlet for the fruit all through the region west of the Missouri river. Southern California supplies the southern portion of this district, while the growers in central California, chiefly near Florin in Sacramento county, make large shipments eastward as far as Colorado and northward to all the great interior states and to Oregon, Washington and British Columbia before the locally grown fruit in those regions is available.

The climate and soil in the areas lying west of the Cascade mountains have conditions excellently suited to the growth of the Strawberry. Their conditions more nearly resemble those in the eastern states than any other part of the coast. The cooler weather and more abundant moisture give a better spring season than that of California, but the season is on the whole much shorter because of the longer winter. Irrigation is also necessary in most places for continued fruiting during the summer. The most famous district is Hood River, Oregon, where arid conditions east of the Cascade mountains are modified by western influences which reach through the gap in these mountains where the Columbia river flows through. Irrigation is regularly employed and a large commercial product grown. The varieties chiefly grown in this region and in adjacent parts of Washington and Idaho are of local origin, the Hood River (Clark Seedling) and Macon Seedling being widely approved. Jessie, Sharpless, Wilson, Haverland, Crescent, Cumberland, Jucunda and Parker Earle are also commended by growers in the northwestern states.

E. J. WICKSON.

The Forcing of Strawberries for a Winter Crop has not as yet become of any great commercial importance in North America. Some gardeners grow a few potted plants for either Christmas or Easter decoration. Very few, if any, commercial growers are forcing Strawberries exclusively to any profitable extent. The few Strawberries that are forced are grown either in pots or planted out on benches. The former method is the one generally employed. There are several good reasons for this, some of which are: first, the confinement of the roots; second, the ability to ripen the crowns in the fall; third, the control of fertilizers and liquid manure; fourth, the privilege of having the crop grown in several houses at one time or brought from a coolhouse into heat; and fifth, the opportunity to supply particularly demand of the potted plants or their fruits. The first expense of the pot method is considerably more than when the plants are grown in the benches, but after the pots are once purchased the cost of each method should be about the same.

The pot method as practiced at Cornell University is about as follows: As early in the spring as possible large plants are set in well-enriched soil. The first strong runners made by these plants are secured and potted. Numerous 2- or 3-inch pots filled with good soil are plunged to the rim along the Strawberry row. The runners are trained to these pots, and a small stone is placed on each runner to keep it from growing beyond the pot. When the pot is filled with roots the young plant is cut from the parent stock, the pots lifted and taken to the potting shed or other convenient place, where they are at once shifted into the fruiting pots (usually a 6-inch pot). The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting soil should have mixed with it home flour or dissolver rock at the rate of about one pint to two bushels of soil. Ample drainage should be given, as through the season of ripening the crowns and the following forcing period a large quantity of water must be given and none should be allowed to stand around the roots.

The pots should then be plunged to near the rim in some coarse material, preferably coal ashes, which, if deep enough to extend from four to six inches below the plunged pots, will prevent the earthworms from entering the pots. The use of a frame in which to plunge the pots is recommended for protection against heavy rains or early frosts. Attention to watering is all that will be necessary through the season. Late in September or early in October the pots will be filled with roots and the plants will have attained their full growth. At this time larger and firmer crowns will be had by careful attention to watering and subsequent drying off to almost the wilting stage than by watering the plants up to the time of freezing weather. The drying process seems to represent the late fall season and causes the plant to store up material in the crowns at an earlier period. At the coming of cold weather the soil in the pots may be allowed to freeze. It is very desirable that the soil be on the dry side before freezing, for if the ball of earth is wet there is danger of breaking the pots when the cold becomes intense. The period of forcing from the time the frozen plants are brought in until the ripening of the fruits will be about eight weeks. The time will vary slightly under different conditions of heat and sunlight. When first brought in, the plants should be cleaned of all dead or diseased leaves. The pots should be plunged to near the rim in some material that will retain moisture, e.g., tan bark or coal ashes. The benches or shelves should be as near the glass as convenient. A thorough spraying with Bordeaux mixture or some other fungicide should be made at once. For the first few days the house should be held at about 55°, with little if any rise during the day. After a week a rise of 10° may be given. At the end of the second week open at night with a rise of 10-15° through the day, will be about right.

2430. The forcing of Strawberries under glass.

2431. A good winter Strawberry plant in bloom.
STRAWBERRY

Strict attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel-hair brush is useful for distributing the pollen. A lady or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. During the first week give one dilute application. After this give two applications a week, increasing the strength of the manure liquid each time. Well-rotted cow manure or sheep droppings furnish good material for this purpose. When the fruits are coloring the liquid manure should be withheld and only clear water given. As they swell, the fruits will need support, and the best method of furnishing this is probably by using small-meshed window-screen wire cut into suitable squares. These squares may be laid on the pot, under the clusters of fruits. They hold the fruits away from the sides of the pots, protect them from any water or liquid manure that is given to the plants, and enhance the beauty of the potted plant. After one fruiting, the plants are worthless.

C. E. HUNN

STRAWBERRY BUSH. See Erubinurus.

STRAWBERRY GERANIUM. Saxifraga sarmentosa.

STREPTOCARPUS

STRAWBERRY-RASPBERRY. Rubus rosaceus. STRAWBERRY TOMATO. Physalis Alkekengi and other species of Physalis.

STRAWBERRY TREE. Arbutus Unedo.

STRELETTIA (after the wife of King George III, Charlotte Sophia, of the family Mecklinburgh-Strelitz, a patron of botany). Streletzzia reginae or a New Paradise Flower. A South African genus of 4 or 5 species of perennial herbs, with generally large, long-petioled leaves and showy flowers of peculiar form: rhizome subterranean or produced into a hairy woody root; pedicels short: spathe long or short, peduncled. Streletzia reginae requires a good strong soil, a copious supply of water and considerable sunlight. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A temperature of 50° is sufficient. This plant may be induced to set seed if the flowers are hand-fertilized.

a. Plant nearly stemless.

Reginæ, Banks. Bird of Paradise Flower. Fig. 2432. About 3 ft. high; roots large, strong-growing; lvs. oblong, about 1 ft. long, stiff, cone-leaf; leaf-stalks all radical, twice to three times as long as the lvs.; scape higher than the lvs.: spathe about 6 in. long, nearly horizontal, purplish at the base, about 6-dia, the fls. orange and blue-purple, winter. B. M. 119, 120.

aa. Fls. pale blue and white.

Reginae, Banks. Bird of Paradise Flower. Fig. 2432. About 3 ft. high; roots large, strong-growing; lvs. oblong, about 1 ft. long, stiff, cone-leaf; leaf-stalks all radical, twice to three times as long as the lvs.; scape higher than the lvs.: spathe about 6 in. long, nearly horizontal, purplish at the base, about 6-dia, the fls. orange and blue-purple, winter. B. M. 119, 120.

bb. Fls. pale blue and white.

Nicola, Regel & K. Koch. Resembling S. Auguste in habit and foliage, but the fls. and spathe are much larger and the petals are hastately combined and blue in color. B. M. 7053.

P. W. BARCLAY

STREPTOCALYX (twisted calyx). Bromeliaceae. There are 7 species of Streptocalyx according to Mez (Dep Monogr Phaner. Vol. 9) of Brazil. The genus differs from Bromelia in having strongly imbricated broad sepals and long corolla-tube. No species are in the American trade, but S. Fürstenbergii, Mor., is described in horticultural literature (sometimes under the name of S. fürstenbergii, Mor. & Wittm.). It is a stemless pineapple-like plant, with 30-40 rigid lanceolate leaves in a dense rossette: cluster a central dense panicle 1-1½ ft. long, with many 2-sided spikes of rather dull flowers.

STREPTOCARPUS (Greek compound, meaning twisted fruit). Gesneriaceae. Cape Primrose. In October, 1826, there bloomed at Kew a most interesting gloxinia-like little plant, seeds and specimens of which had been collected in South Africa by Bowie, on the estate of George Rex, at Knysna. The plant was described as Didymocarpus Rezii. It is a stemless plant, with one, or rarely two, long-tubular nodding pale blue flowers on each of several short scapes, and with several clustered root-leaves. It proved to be a profuse bloomer and easy to grow. "So abundantly does it produce seed," wrote W. J. Hooker, in 1830, "that new individuals come up as seeds in the neighboring pots, and flowers may be obtained at almost every period of the year." In 1828, John Lindley made the genus Streptocarpus for this plant, calling it S. Rezii, the name it now bears. It appears to have been nearly three years after the introduction of S. Rezii that another Streptocarpus bloomed in England. This second species was S. polyanthus, which may be taken as the type of a group that has one leaf lying on the ground and from the mid-
rib of which arise successive several-flowered scapes. The introduction of this curious plant seems to have revived the interest in Streptocarpuses, an interest that has been kept alive by the frequent introduction of other species. The chief stimulus to the systematic breeding of these plants seems to have been the introduction of S. Dunnii, said by J. D. Hooker to be "quite the monarch of its beautiful genus" (but now excelled by S. Wendlandii). Seeds of this species were sent to Kew in 1884 by E. G. Dunn, of Cape Town. It is one of the monophyllous section to which S. polyantha belongs. In the meantime, S. parvitlora, a species allied to S. Rezii, had been introduced from the Cape region. With the three species, S. Rezii, S. parvitlora and S. Dunnii, W. Watson, of the Royal Gardens, Kew, set to work systematically to breed a new race of Streptocarpus, and his efforts met with unqualified success. When the hybrids came to notice in 1887, the Gardener's Chronicle made the following comment on the value of the work: "The results are very striking, and we can hardly doubt that Mr. Watson has set the foundation of a new race of plants, parallel in importance to the Achimenes and Tysanthes." Several hybrid races have now been produced and several interesting species have been introduced from the wild, so that Streptocarpus seems to be destined to become a very important and popular garden genus.

Bentham and Hooker's treatment divides the Gesneraceae into two great tribes: Gesnerace, with ovary more or less inferior and fruit a capsule; Cyrtandreae, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. B. Clarke in vol. 5 of De Candolle's "Monographie Phanerogamarum," contains the genera Streptocarpus, Episcia, Cyrtandra, Eschynanthus, Ramonda, and others. The Streptocarpuses are stemless or nearly stemless herbs, bearing 1 or more tubular nodding fls. on short scapes that arise either from the crown of the plant or from the midrib of a flat prostrate leaf: corolla-tube cylindric, the limb 5-lobed and somewhat 2-lipped; perfect stamens 2, included; pistils with ovary linear, usually hairy, with style as long as or shorter than the ovary, and stigma capitate or indistinctly 2-lobed: fr. a linear 2-valved capsule, the valves twisting. The flowers are usually showy, blue or lilac, rarely yellow. The species are of three groups: the stemless monophyllous species, with one prostrate leaf from the midrib of which the scapes arise (this leaf is really an enlarged cotyledon, the other cotyledon not enlarging); the stemless species, with several or many radical more or less primula-like leaves (whence the English name "Cape Primrose"); the stem-bearing species, with opposite cauline leaves. The cultivated species chiefly represent the first two sections. In the American trade, only four specific names occur, S. Rezii, S. Galpinii, S. Dunnii, and S. Wendlandii; but since the hybrids represent several other species, these additional species are inserted in the following account. Streptocarpus is an African genus. The stem-bearing section is confined to central Africa and Madagascar, and the others to South Africa. Clarke's Monograph, 1883, describes 19 species, but S. Dunnii, S. Wendlandii, S. Galpinii and others have since been discovered. There are 25-30 known species.

Streptocarpuses are not difficult plants to grow. They are usually raised from seeds, the seedlings blooming in 8 to 15 months from starting. The seeds are very small, and care must be taken not to cover them too deep. Give an open sunny place in an intermediate temperature. They are not to be or warm house plants. Of the new hybrid forms, seeds sown in February or March should produce plants that will bloom the following fall and winter; after blooming, the plants may be discarded, for better results are usually secured from new plants than from those more than one season old. The season of most profuse bloom is summer, but the bloom continues until winter. The monophyllous species can be propagated also by cuttings of the leaf. Some fanciers of Cape Primroses advise propagating select types by leaf cuttings or by division.

A. Streptocarpus species, or those forms introduced from the wild.

b. Leaf one, prostrate on the ground, usually very large.

c. Fts. red.

Dunnii, Hook. f. Soft-hairy: leaf becoming 3 ft. or even more in length and 10 in. wide, thick-nerved, reddish tomentose beneath, rounded at base, obtuse at apex, coarsely toothed: scapes severable to many, in a row beginning at the base of the leaf, erect, 1-3 ft. tall, many-fl.: corolla long-tubular, curved, 1½ in. long, the limb narrow, bright rose-red. Transvaal. B.M. 6963. G.F. 3:609. — A very floriferous species, one plant sometimes bearing more than 100 flowers.

cc. Fts. blue, mauve or lilac.

Saundersii. Hook. Hairy: leaf 1 ft. by 9 in., oblong, or ovate, coarsely serrate, yellowish-green above and purple rose beneath: scapes 10-16 in. tall, bearing a com-
**STREPTOCARPUS**

*polyantha*, Hook. Hairly: as compared with *S. Saunderii*, the leaf is smaller and the fls. bluer and borne in a compound racemose panicle; corolla-tube curved, shorter than the large, wide-spreading toothed pale blue limb. Natal, Orange Colony. B.M. 4850.

*Gälpinii*, Hook. f. Hairly: leaf ovate-oblung, obtuse, entire: scapes several to many, glandular-pubescent: fls. short and broad, being nearly or quite bell-shaped, the limb broad and subequal, rich mauve, with a white eye. Transvaal. B.M. 7250. G.C. III. 11:139.—Named for Ernst E. Gälpin, who discovered the plant.

*Wendlandii*, Damman. Fig. 2433. Hairly, usually bearing a rosette of very small lvs. at the base of the radical one: leaf broad, often becoming 24 x 30 in., sometimes narrower, rounded at both ends, crenate-undulate, red-purple beneath: scapes several, forking, bearing paniculate racemes; corolla-tube about 1 in. long, curved, pubescent, the limb large and oblique, with broad entire lobes, the whole effect violet-blue and whitish. Transvaal, Natal. B.M. 7447 (part of which is copied in Fig. 2433). G.C. III. 22:275. Gn. 45, p. 511; 50, p. 394. J.H. III. 25:223.—Probably the finest species yet introduced.

**BB.** Leaves several, rising from the crown.

*Rezii*, Lindl. Fig. 2434. Hairly: lvs. ovate-oblong, 6-8 in. long, short-stalked, obtuse, crenate; scapes several, 3-5 in. tall, 1-fl.; or rarely 2-fl.: fls. 2 in long, 2-3 in. wide, the tube downy and nearly white, the large spreading limb pale blue to purple. S. Afr. B.R. 11:1173. B.M. 3965. L.B.C. 11:1365.

*parviflora*, E. Mey. Soft-hairy all over except the corolla: lvs. ovate, obtuse, sessile or nearly so, crenate, appressed to the ground: scapes 6-10 in. tall, reddish, bearing corymbose racemes: fls. small, 6-10 in. tall, red, the corolla-tube about ½ in. long and purplish and curved, the spreading broad limb nearly white and with orbicular lobes. Cape. B.M. 7036.

2433. *Streptocarpus Kewensis* (x ½).

**STREPTOSOLEN**

*Watsonii* (S. lutec × pollen of *S. Dunii*). The single fl of this is similar to but rather smaller than that of *S. Kewensis*. It is exceedingly floriferous, having numerous flower-stems, bearing 10–16 fls. about 1½ in. long and 1 in. in diam., of a bright rose-purple, with a white throat striped with brown-purple. *N. E. Brown*. G.C. III. 2:247. I.H. 58:133.

*Watsonii* (S. lutec × pollen of *S. Dunii*). The single fl of this is similar to but rather smaller than that of *S. Kewensis*. It is exceedingly floriferous, having numerous flower-stems, bearing 10–16 fls. about 1½ in. long and 1 in. in diam., of a bright rose-purple, with a white throat striped with brown-purple. *N. E. Brown*. G.C. III. 2:251. I.H. 58:134.—One of the finest of garden forms. Said to be sterile with its own pollen.

*Dyeri* (S. Wendlandii × S. Dunii). Leaf single, 2 ft. long and 15 in. wide, olive-green above and vinous purple beneath, soft-hairy: scapes 1-2 ft. or more tall, bearing many long-tubular red-purple flowers. G.F. 851.—One of W. Watson's hybrids.

*Bruntii* (S. Rezix × *S. polyantha*). Fls. larger than those of *S. Rezii*, 4-6 on each scape, mauve-blue, with whitish yellow throat.

*S. billora*, Duch., mentioned only in Horticultural literature, and perhaps a form of *S. polyantha* type. It is of the *S. polyantha* type, with several blue fls.—S. *billora-polyantha*, Duch., is a hybrid of *S. billora* and *S. polyantha*, with several large light blue fls. F.S. 22:232.—A peculiar dark blue, with sessile species, with opposite elliptic-oblong entire hairy lvs., the stem swollen, the fls small (½ in. across) and pale lilac.


L. H. B.

**STREPTOPUS** (Greek, twisted stalk: referring to the peduncles). *Liladret*. Twisted Stalk. A genus of 3 or 4 species of perennial herbs, from the temperate regions of Eu., Asia and Amer. with aspect of Polygonatum, from which it differs in having a 3-cleft leaf and perianth in separate segments. Woodland plants with slender branching stems; lvs. alternate, clasping or sessile, prominently nerved; fls. rather small, rose or white, nodding, slender-pedicelled; solitary or in pairs in the axils of the leaves; fr. a many-seeded berry. The closely related genus Disporum has terminal flowers, while those of Streptopus are axillary.

**AA.** Fls. purple or rose.

*rosens*, Michx. Rootstock short, stout: stem 1–2 ft. high: lvs. sessile, 2–4 in. long; peduncles less than 1 in. long, mostly 1-fl.; fls. about ½ in. long; berry red, ½ in. thick. May–July. Moist, rich woods in the northeastern states. B.B. 1:435.

**AA.** Fls. greenish white.


F. W. BARCLAY.

**STREPTOSOLEN** (Greek, strypos, twisted, solen, tube, with reference to the form of the corolla-tube). *Salviadcc*. Lvs. on long petioles, ovate, acute at both ends, entire, bullate-rugose: fls. rich orange-colored, pedicellate, in terminal corymbose panicles; calyx tubular-campanulate, nearly 5-cleft; corolla-tube elongated, widening above, spirally twisted below; petals 5, broad; perfect stamens 4. A monotypic genus from the United States of Colombia.

J. BURR. DAVY.

2436. Streptosolen Jamesonii (× 3).

STREPTOSOLEN (Greek, cone and flower, re- ferred to the inflorescence). Acnacteae. A large genus containing about 130 species inhabiting the warm re- gions of Asia and the Malay Islands to Madagascar. They are mostly erect, half-shrubby plants cultivated for their flowers and foliage. Only young, well-grown plants are attractive, the older ones becoming weedy and unattractive. Some species are grown as ornamental foliage bedding plants, but they are not as desirable for general use as the colaus, the slightest cool weather changing the color of their leaves to a very undesirable shade. In the greenhouse they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much syringing. Under unfavorable conditions they lose their leaves and become unsightly.

Lvs. opposite or rarely scattered, entire or toothed: fls. blue, violet, white or yellow, in terminal or axillary spikes or heads, or in loose cymes, mostly large; calyx deeply 5-parted, with linear lobes; corolla-tube narrow at base, straight or curved, enlarged above, limb of 5 spreading ovate or rotund equal lobes, or the dorsal pair united; stamens 4, perfect, or only the 2 lower perfect and the upper pair sterile and aborted, included; anthers with 2 parallel cells; capsule oblong or linear, slightly contracted at the base, 2-loculed; ovules 2 (rarely 3 or 4) in each locule.


CALLISUS, Nees. Shrub, 6–8 ft. high: lvs. elliptic-lanceo- late, acuminate, puberulent, narrowed into a long, slender peduncle which is winged to the middle; fls. in short, oblong spikes, large, pale violet-blue; corolla-tube very short, dilated into a subcampanulate throat and expanding into a limb 3 in. across; lobes orbicular, undulate. B.M. 3358.—A native of western India, where it forms a shrub 6–8 ft. high; said to flower in its third year.

ISOPHYLLUS, T. Anders. (Goldfissia isophylla, Nees). A low, much-branched, bushy shrub, 2–3 ft. high, swollen at the joints: lvs. short-petioled, opposite, nar- rowly lanceolate, distantly serrulate or entire: peduncles axillary, shorter than the lvs., bearing several fls.: corolla 1 in. long, funnel-shaped, blue and white; limb 5-lobed; lobes emarginate. India. B.M. 4363. B. 5:244.—Used either for bedding or for pots. Blooms profusely either in winter or summer, according to treat- ment.

ANISOPHYLLUS, T. Anders. (Goldfissia anisophylla, Nees). Branches somewhat zigzag: lvs. broadly lanceo- late, acuminate, serrulate, ovate but one of each pair much smaller than the other: fls. purplish and white; corolla funnel-shaped, very broad at the mouth, with a somewhat irregular 5-lobed limb. India. B.M. 3404. B.R. 11:395 (as Ruellia perreticulata). Similar to the preceding in habit and use.

HEINRICH HASSELBERG.

STROMANTHIS (couch and flower; said to allude to form of inflorescence). Sclatomineae. Five tropical American plants (according to Petersen in Engler & Prantl’s Naturpflanzenfamilien), closely allied to Cal- athea, Maranta, Phrynium and Thalia. It agrees with Maranta and Thalia in having a 1-loculed capsule, and thereby differs from Calathea and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segments not stand- ing opposite each other. From Thalia it differs, as does Maranta, in having 2 side stamens rather than one. For culture, see remarks under Calathea.

PORTÉNA, Griesch. (Marantá Porténa, Horan.). Two to 4 ft. high, with maranta-like lvs., the blades long-elliptic or ovate-lanceolate, varying from acuminate to almost obtuse, purple beneath, bright green above, with transverse orbars of silvery white: fls. solidary or twin en the racix, blood-red, the in- florescence simple or compound. Brazil. Lowe 26.

SANGUINEA, Sonder. (Maranta sanguinea, Hort.). Leaf-blades about 1 ft. long, oblong-acuminate, purple at the top, bearing a panicle of bright red and red-bracted fls. Probably Brazilian. B.M. 4616. F.S. 8:785.—An old garden plant. Thrives in an intermediate house and frequently attains a height of 5 ft. when planted in a border.

L. H. B.

STROPHOLIRION (Greek for twisted rope and lily, referring to the twining stem). Liliaceae. Very like Brodiaea, and sometimes referred to that genus, differing in always having 3 stamens and a perianth which is contracted at the throat and saccate at the base. The only species is S. Caliornicum, Torr. (Brodiaea volubilis, Baker). In many ways it resembles Brodiaea occinea, except that the scape is climbing to a height of 3 or 4 feet, and bearing an umbel of delicate rosy pink flowers. The scape twines readily about any stick or bush that stands near it. Lvs. 1 ft. long, keeled, or less broad, about 1 in. in diam. Central Calif. B.M. 6123. G.C. Ill. 20:687.—Culture as for Brodiaea occinea.

CARL PUDY.

STRYPHNOZONDON is a genus of tropical Ameri- can unarmmed trees belonging to the legume family. Two species are known, one of which is a native of Guiana, the others of Brazil. They are usually small
trees with bipinnate foliage, numerous leaflets, and small fls. borne in axillary, cylindrical spikes. Fls. sessile, 5-merous; petals often connate to the middle, valvate; stamens none, free: pod linear, compressed, thick. Here belong S. Guianense and S. Borisuspended, both of which are known as Acaicas, the latter as A. putcheriana. Neither species is known to be cult. in America.

STUARTIA (in honor of John Stuart, Earl of Bute, a patron of botany; 1713-1792). Sometimes spelled Steuartia. Ternstroemiaeceae. Ornamental deciduous shrubs or trees, with alternate, short-petioled serrate leaves and large showy white flowers solitary on short stalks in the axils of the leaves, followed by capsular fruits. S. pentagyna and S. Pseudo-Camellia are hardy as far north as Mass., while S. Malachodendron is tender north of Washington, D.C. They are very desirable ornamental plants, with handsome bright green foliage which turns deep vinous red or orange and scarlet in fall, and they are very attractive in midsummer with their white cup-shaped flowers, which are in size hardly surpassed by any others of our hardier shrubs. The Stuartias thrive in deep, rich, moderately moist and porous soil, preferring a mixture of peat and loam, and, at least in more northern regions, a warm, sunny position. Prop. by seeds and layers; also by cuttings of half-ripened or almost ripened wood under glass.

Five species occur in N. Amer. and E. Asia. Shrubs or trees, with smooth flaky bark: fls. axillary or subterminal, with 1 or 2 bracts below the calyx; sepals and petals 5 or sometimes 6, the latter obovate to almost orbicular, usually connate, with crenulate margin, connate at the base with each other and with the numerous stamens; styles 5, distinct or connate; fr. a woody, usually hirsute capsule, loculicidally dehiscent into 5 valves; seeds 1-4 in each locule, compressed, usually narrowly winged.

A. Styles united: petals always 5.
b. Stamens purple, spreading: capsule subglobose.

Malachodendron, Linn. (S. Virginica, Cav.). Shrub, 6-12 ft. high: Ivs. oval to oval-oblong, acute at both ends, serrulate, light green, pubescent beneath, 2½-4 in. long: fls. 2½-3 in. across, with obovate spreading petals: seeds wingless, shining. May, June (July and August in the North). Va. and Ark. to Fla. and La. Bot. Gea. 14:136; 18, p. 628; 34, p. 280. G.C. II. 8:433.—This species has the largest and showiest flowers.

STURTEVANT, EDWARD LEWIS, agricultural experimenter and writer, was born in Boston, Mass., January 23, 1842, and died at South Framingham, Mass., July 2438. Stylophorum diphyllum (X ¼).

BB. Stamens with whitish filaments, incurved: capsule ovate, pointed.
c. Bracts beneath the calyx large and leaf-like.

monadéphs, Sieb. & Zucc. Shrub or small tree: Ivs. oval to oval-oblong, acute at both ends, remotely serrate, slightly pubescent beneath, light green, 1½-2½ in. long: fls. white, 1½ in. across, with flat, spreading obovate petals; anthers violet. Japan. S.Z. 1:96.—This is the least desirable species and probably as tender as the preceding; it is doubtful whether it is in cultivation. Specimens recently introduced seen by the writer proved to be the following species.

cv. Bracts small, shorter than calyx.

Pseudo-Camellia, Maxim. (S. grandiflora, Briot. S. Japonica, var. grandiflora, Hort.). Shrub, with upright branches, or tree attaining 50 ft. or more in Japan; trunk with smooth red bark, peeling off in great thin flakes; Ivs. elliptic to elliptic-lanceolate, acute at both ends, or often acuminate at the apex, thickish, bright green, glabrous or nearly so beneath, 1½-3 in. long: fls. hemispherical, 2-2½ in. across; petals almost orbicular, concave, silky-pubescent outside; anthers orange-colored; seeds 2-4 in each cell, narrowly winged, dull. July, Aug. Japan. B.M. 7045. R.H. 1879:430. G.C. III. 4:187. Gm. 43:899. G.F. 9:35. M.D.G. 1900:480.

AA. Styles 5, distinct: petals often 6.

pentágyne, L’Herit. (Malachodendron ovatum, Cav.). Fig. 2437. Shrub, 6-15 ft. high: Ivs. oblong-ovate, acuminate, usually rounded at base, remotely serrate, sparingly pubescent and grayish green beneath, 2½-5 in. long; fls. cup-shaped, 2-3 in. across; petals obovate, with wavy crenulate margin; stamens white, with orange-yellow anthers: capsule ovate, pointed, sharply 5-angled; seeds narrowly winged. July, Aug. N. C. and Ga. to Tenn. and Fla. B.M. 3918. Br. 13:1104. M.D.G. 1900:479.

ALFRED REHDER.
STURTEVANT

30, 1898. Though holding the degree of M.D. from the Harvard Medical School, Dr. Sturtevant never practiced the profession of medicine, but devoted his life to agricultural work, first specializing on Ayrshire cattle, then on pedigree corn (Waushakum) and muskmelons (New Christiana), and afterward devoting particular attention to the modifications which cultivated plants have undergone, as shown by ancient records and some older books. In connection with these studies, Dr. Sturtevant brought together a rare collection of books dealing with horses preserved at the Missouri Botanical Garden in St. Louis, Mo.

As first director of the New York Experiment Station, at Geneva, Dr. Sturtevant drew the broad plans on which the successful work of that establishment has been conducted and which have served largely as models for subsequently organized agricultural stations over the country. He was a man of active mind, and his contributions are a tribute to an unusual degree. A biographic sketch and a list of his principal writings are printed in the Tenth Report of the Missouri Botanical Garden.

Wm. Trelease.

STYLOPHORUM (Greek, style and bearing, in reference to the persistent style). Papaveraceae. A genus of probably 3 species of perennial herbs, one American and the others from southeastern Asia and Japan. Herbs with stout rootstocks and yellow ssp.: lvs. lobed or cut; fls. yellow or red, rather long-stemmed, solitary or clustered; sepal 2; petals 4; stamina numerous; placenta 2-4; style distinct: stigma 2-lobed, radiate: capsule linear or ovoid, dehisc. to the base.

diphyllum, Nutt. (Papaver Stylóphorum). Celandonum Pursh. Fig. 2438. A hardy perennial about 1 ft. high, forming large clumps: stem with 2 lvs. at the summit: lvs. light green, pinnately parted: fls. yellow, 2 in. across, in clusters of 3-5. May, June. Moist shade, W. Pa. to Wis. and Tenn. B.B. 2:102. J.H. 111. 34:475. -An attractive plant of easy culture in any rich, rather loose, moist soil in either shade or open, but preferably in partial shade.

F. W. Barclay.

STYRAX (ancient Greek name of Styrax officinalis). Styraceae. Styrax. Ornamental deciduous or evergreen trees or shrubs, with alternate, simple, serrate or entire leaves and white or pendent flowers in axillary clusters or terminal racemes, followed by dry or fleshy fruits. Styrax officinalis, American and Japonica are the hardest and stand the winter in sheltered positions as far north as Massachusetts; S. grandifolia is hardy about Philadelphia and S. Califoranicus only south. The Styraxes are handsome shrubs of graceful habit, usually loose and spreading. Their flowers are numerous, white and mostly fragrant. They are well adapted for borders of shrubbery or as single specimens on the lawn, and thrive best in a light, porous soil. Prop. by seeds sown soon after ripening and by layers; sometimes grafted on Halesia tetraphylla.

About 60 species in the tropical, subtropical and warmer temperate regions of America, Asia and Europe. Tropical or shrub forms: lvs. long-stalked, more or less covered, like the inflorescence, with stellate hairs: fls. white; calyx campanulate, obscurely 5-toothed or truncate; petals 5, connate only at the base; stamens 18; ovary united at the base with the ovary, 18-loculicid. The fruits are largely the chin of some kind of a sweetish and usually somewhat connate pulp. The species are: S. officinalis yields the benzoin, a balsamic exudation of the wounded tree; styrax, a similar gum-resin, was formerly obtained from S. officinalis, but the styrax of to-day is a product of Liquidaeulmar.

STYRAX 1749

a. Fls. in many-flowered racemes: lvs. 2-10 in. long.

b. Young branchlets, petioles and racemes grayish tomentose.

grandifolia, Ait. Shrub, 4-12 ft. high; lvs. oval to oblong, shortly acuminate, usually narrowed toward the base, denticulate or almost entire, glabrous above, grayish pubescent or pubescent below, 2½-6 in. long; fls. fragrant, in loose racemes 3-6 in. long or sometimes in clusters; corolla fully ¼ in. long, with spreading, oblong petals; fr. subglobose, about ½ in. across. May, S. Va. to Fla. L.B.C. 11:1016 (poor). B.B. 2:599.

bb. Young branchlets, petioles and racemes soon glabrous.

Obassia, Sieb. & Zuec. Shrub or small tree, 30 ft. high: young branchlets and petioles covered with a quickly disappearing floccose rusty tomentum; lvs. orbicular to broadly ovate or oval, abruptly acuminate, usually rounded at the base, remotely dentate above the middle and sometimes tricuspid at the apex, glabrous above, pubescent beneath, 6-10 in. long; fls. fragrant, in racemes 5-7 in. long; rachis glabrous; pedicels and calyx finely tomentose; corolla ¾ in. long, with slightly spreading obovate-oblong petals: fr. ¼ in. long, ovoid, pointed. May, Japan. S.C. 1-16. B.M. 7029. G.C. 1.11. 4:131 (not correct in regard to habit). A.F. 12:90. M.D.G. 1898:16.

AA. Fls. in few-flowered clusters or short racemes: lvs.

b. Petals 5-8; branchlets and lvs. beneath pubescent.

Californica, Torr. Shrub, 5-8 ft. high: lvs. broadly oval or ovate, obtuse, entire, stellate pubescent, at least when young, 1-2½ in. long; fls. in few-flowered clusters; pedicels about as long as calyx; corolla ¾ in. long, with 5-8 ob lanceolate petals; stamens 10-16, with the filaments pubescent and connate about one-third. April, California.

BB. Petals 5: lvs. almost glabrous, acute.

c. Pedicels about as long as calyx, puberulous.

Americana, Lam. (S. glabra, Cav. S. lavandulum, Ait.). Shrub, 4-8 ft. high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1-3 in. long: fls. nodding, in few-flowered clusters; pedicels about as long as calyx or little longer, puberulous; corolla about ¾ in. long, almost glabrous, with spreading or reflexed, lanceolate-oblong petals: calyx-teeth minute, acute. April-June. Va. to Fla. west to Ark. and La. B.M. 921. L.B.C. 10:960. B. R. 11:932 (as Halesia parviflora).
STYBAX, n. ilil., cacti, "pedicels late; but tree, family, or important. mum lous, crenately bescence, pages specialized as 1750 in Japanica, SUGAR SUGAR SUNDROP.

SUKSDROFIA violacea, Gray, and Sullivantia Ore- gana, S. Watson, are two small perennial herbs of the saxifrage family native to the Columbia river region. They were once offered by western collectors but are not known to be in cultivation. They are fully described in Proc. Am. Acad. Arts, Sci., the former in 15:41, the latter 14:292.

SUMACH. See Rhus.

SUNDEW. Drosera.

SUNDROP. Yellow-flowered diurnal primroses (see Primula); also Enothera triloba.

SUNFLOWER. Species of Helianthus. The common Sunflower of gardens is Helianthus annuus. This is grown for ornament, and the seeds (fruits) are also used as poultry food. Sunflower oil, produced in Russia, is much used in salads. The oil, or rather mixtures of it with other vegetable oils, is sold as "Russian oil." U. S. Dept. of Agric., by Harvey W. Wiley, on "The Sunflower Plant, Its Cultivation, Composition, and Uses," 1901.

SUN ROSE. Helianthus annuus.

SUNRIM CHERRY. Eugenia Micheli.

SULBERLAND (James Sutherland, one of the earliest superintendents of the Edinburgh Botanic Gar- den, author of "Botanical Dictionary," 3rd ed., 1874:391; "Leguminosae, Sutherlandia trutescens, the BLADDER Senna of the Cape, might be roughly described as a red-flowered Swayson. It is a tender shrub said to grow 3 ft. high or more in South Africa. Each leaf is com- posed of about 9-11 leaflets. The flowers are very small. The fls. are bright scarlet, drooping and in the best variety an inch or more long. The blossoms are not peaked; the standard is oblong, with reflexed sides; the keel is longer than the standard, and the wings are very short. The fls. are numerous and borne in axillary racemes, 5-11 in a raceme. An interesting feature of the plant is its large bladder-like pod, which sometimes measures 2 1/4 x 1 1/4 inches.

Botanically Sutherlandia is very imperfectly under- stood. There are at most 5 species, or S. trutescens may be the only one. Generic characters: fls. as described above; calyx campanulate, 5-toothed; stamens 10; ovary stalked; style usually preceded; pod many-seeded, indehiscent: seeds reniform.

At the Cape S. trutescens runs into two forms. The common or typical one has the leaves glabrous above, while in the seaside form, var. parviflora, they are very white on both sides. In cultivation there seem to be three forms: (1) the typical species, which is generally treated as an annual in France. (If Sutherlandias are kept for several years in greenhouses the plants become woody and unsightly and lose some of their foliage. Young, compact and bushy specimens are preferred.) (2) A form with larger red fls. (var. grandiflora), which in France at least does not flower until the second year. (3) A white-flowered form, which is probably one of two different things cultivated under the name of S. floribunda, but which is here called S. trutescens, var. alba.

Sutherlandias are highly esteemed by French connois- seurs. They are propagated by seeds and are said to be readily raised by cuttings. Seeds of the typical form are sown in March or April under glass and the plants bloom the same summer for several months. They seem to thrive very well kept in pots and flowered in greenhouses, terraces, etc., but could probably be grown in the open in the border during the summer. The seeds of var. grandiflora are generally sown in June or July, and the plants flowered in a greenhouse. They bloom toward the end of May, which is earlier than the typical forms, for winter treatment the French advise very moderate water- ing and as much air and light as possible. In America the Sutherlandias seem to be known only in California, though an eastern dealer has recently offered one under the name of "Scarlet Bush." The var. grandiflora is worthy of trial by northern florists. Flora Capensis 2:212. The species is hardy at San Francisco.

S. trutescens, R. Br. BLADDER Senna of the Cape. Though South African and shrub described above, Harvey calls the typical form var. communis; it has mats, glabrous above, elliptical or oblong; ovaries and pods glabrous. B. M. 181 (as Cotula trutescens). R. H. T. p. 296. Var. tomentosa, var. lanata, var. hispida, and var. sericea, are broader, obovate or obcordate, silvery white on both sides; ovaries and pods hirsute. Var. grandiflora, Hort. (S. floribunda, Carr., not Vilm.), has large red fls. and does not bloom until the second year. R. H. T. 171:619. Var. alba (S. floribunda, Vilm., not Carr.) has white fls. Ernest Braunton, of Los Angeles, received in 1900 a plant called S. spectabilis, of which little is known. W. M.

SUIWARRO. Cercus gigantes.

SWAINSÔNA (Isaac Swainsson, an English horti- culturist of the latter part of the eighteenth century). Often spelled Swainsonía. Leguminosae. About 25
Australian undershrubs and herbs, differing from Colutea chiefly in smaller stature and the larger lateral stigmas. Flowers pea-like, in axillary racemes, purple, blue, red, yellow or white, often showy; standard or vexillum large and showy, orbicular; wings oblong, twisted or falcate; stamens 9 and 1; fr. a turbid or inflated pod, which is sometimes divided by a partition and sometimes with the upper suture depressed; seeds small and kidney-shaped: Ivs. unequally pinate, usually with several or many small leaflets. Now and then various species are seen in the collections of nursery or botanic gardens, and 8 species are offered by one German dealer, but by far the most popular kind is S. galegifolia, var. albiflora.

SWEETHERBS. 1751

SWAINSONA

SWEET CLOVER. Melilotus alba.

SWELL HERBS. The term “Sweet Herbs” has long been applied to the fragrant and aromatic plants used in cookery to add zest to various culinary preparations, principal among which are dressings, soups, stews and salads. At the commencement of the nineteenth century many were to be found in gardens and kitchens that now have been dropped entirely or have but very limited use. Perhaps no group of garden plants during this time has been marked by so little improvement. Except in parsley, very few distinctly new or valuable varieties have been produced or disseminated. This is mainly due to the prevailing ignorance of their good qualities, to which ignorance may be charged the improper handling, not only by the grower, but by the seller and often by the final purchaser. With the public
duly awakened to the uses of herbs, improvements in growing, handling, and in the plants themselves will naturally follow, to the pleasure and profit of all.

In this country the herbs best known and appreciated are parsley, sage, thyme, savory, marjoram, spearmint, dill, caraway, basil, marjoram, and tarragon, arranged very naturally much in order of their importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs combined. Hence some seedsmen do not rank parsley with Sweet Herbs. Sage is the universal seasoning for sausages and the seasoning par excellence for rich meats such as pork, goose and duck. It is more widely cultivated than thyme, savory and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken and veal. With the exception of spearmint, without which spring lamb is deemed insipid, and the famous mint julep, a thing of little worth, the remaining herbs mentioned above are scarcely seen outside our large city markets, and even there they have only a very limited sale, being restricted mainly to the foreign population and to such restaurants and hotels as have an epicurean patronage.

In many market-gardens both near to, and remote from, the large cities, sweet herbs form no small source of profit, since most of them, when properly packed, can be shipped in the green state even a considerable distance, and when the market is over-supplied they can be dried by the grower and sold during the winter. Probably more than one-half the quantities used throughout the country are disposed of in the latter manner.

As a rule, the herbs are grown as annuals and are propagated from seed sown in early spring, though cuttage, layerage and division of the perennials are in favor for home practice and to a certain extent also in the market-garden. Commercially they are most commonly grown as secondary crops to follow early cabbage, peas, beets, etc. In the home garden they are frequently confined to a corner easily accessible to the kitchen, where they remain from year to year. In general, herbs should be planted on good light garden soil of fine texture, kept clean by frequent cultivation, gathered on a dry day after the dew is off, dried in a current of warm, not hot air, rubbed fine and stored in air-tight vessels.

For specific information see articles on the following:

Anise, Angelica, Balm, Basil, Caraway, Catnip, Coriander, Dill, Fennel, Horchow, Hyssop, Marjoram, Mint, Parsley, Peppermint, Sage, Summer, Savory, Tarragon, Thyme.

M. G. Kains.

SWEET LIME. See Lime.

SWEET MARJORAM. See Origanum.

SWEET PEA (Lathyrus odoratus. See Lathyrus for botanical account). For structure of the flower, see Legume). Figs. 2441-44. For its beauty and fragrance, the Sweet Pea is the queen of the large genus to which it belongs. Long a common garden annual, within recent years it has been brought to a high degree of development, until it ranks with the most popular garden favorites. It is also grown for high-class exhibitions and horticultural competition.

Its early botanical history has been traced back to 1630. The whole history of the Sweet Pea is elaborately treated by S. P. Dicks, of London, in American Gardener, July 24, 1897. The origin of the Sweet Pea is divided principally between Sicily and Ceylon, the original purple variety being indigenous to the former island and Sardinia. Sicily was also the native habitat of the modern, but all obtainable testimony credits Ceylon with the original pink and white variety known as the Painted Lady. Thence also came the original red out of which the crimson-scarlet sorts have come. Father Francisca Caprari, a Jesuit of Italian monk and enthusiastic botanist, is credited with being the first cultivator of this flower, at Panumors, in Sicily, in 1669, and the seed of the purple variety was sent by him to England and elsewhere. The seed of this flower became an article of commerce as early as 1730. In 1732 a London seed catalogue listed 5 varieties, the black, purple, scarlet, white and Painted Lady. About 40 years later the striped and yellow are found named on the list. Not until 1860 do we find any further advance, when a blue-edged variety was offered, since known as Butterfly. In 1865 Invincible Scarlet won a certificate. In 1868 Crown Princess of Prussia appeared in Germany, and gave us the first light flesh-pink. Adonis in 1862 gave a new color in rose-pink, which was soon followed by a better shade in what was afterwards named Princess Beatrice. Several others of less value helped to prepare the way for the modern Sweet Pea as it has come from the skilled hands of Henry Eckford, the prince of specialists in this flower.

About 1876 Henry Eckford, of Shropshire, England, after long experience and signal success as a specialist in other florists' flowers, took up the Sweet Pea. He began with the 6 or 7 common sorts, working patiently by means of cross-fertilization and selection for seven years before he had anything of merit to offer. By that time he began to get new colors and a somewhat improved size and form. Orange Prince, the dark maroon Boreatton, and the deep bronze-blue of Indigo King, were among the cheering signs of his success in originating colors. But his novelties did not meet with popular appreciation till about 1896, when their merit of size and grandiflora form and originality of color began to excite a new interest in this flower, especially in America. Up to 1898 Eckford put out about 75 varieties, the product of 22 years of patient labor. A large portion of his introductions has received certificates and awards of merit from the Royal Horticultural Society and at other English shows. Laxton, of England, and J. C. Schmidt, of Germany, are among those who have done special work in originating varieties.

At the time when this new interest in Sweet Peas awoke in America the increased demand for the seed led to the successful experiment of growing it in California. The demand soon increased till 125 tons of this seed were produced by the California seed-growers, and now practically the world's supply comes from that source. This also led to the production of American novelties in this flower, the extensive seed-growers having unequalled opportunity for finding new sorts and also of making them by cross-fertilization. The American novelties have the advantage of being introduced with stronger seed than the Eckfords. The complete list of varieties in 1898 numbered about 150 named sorts. The colors now represented are white, light primrose,
Plate XL. Sweet Pea, Lathyrus odoratus
primrose-cream, buff-cream, buff-pink, various shades of light pink, flesh-pink, rose-pink, several shades of bright rose, scarlet, crimson of rich flowers, light blue, mauve-blue, dark blue, lavender, salmon-pink and also light rose, with more or less rich infusion of orange, purple, magenta, maroon with bronzy cast or rich velvety effect, and shades of violet. All of these are found in passably good selfs and also in contrasted and blended colors, and all these colors are now found in stripes and flakes. In 1893 the first dwarf Sweet Pea called Cupid was found in California, the white first appearing, and now practically all colors have been found in this diminutive form. In this form of sporting the plant totally abandons its vine habit, making a mat of dwarf foliage, the blossoms being of the usual size, but with very short stems.

The best canon of judgment gives no encouragement to the so-called "double" Sweet Pea, the grandiflora single form being the approved type, as it certainly is the most graceful and best adapted to the flower. The highest form of development which the Sweet Pea takes is first in bringing the single flower to the best grandiflora size and form, and then in adding to the number of flowers on the stem. The improved Sweet Pea now takes on 4 blossoms to a stem to some extent, and even 5 blossoms to a true single stem are not unknown. The length and diameter of the stem are also important in determining merit. Stems 14 in. long are occasionally exhibited, and the flower cannot be said to have high culture unless the stems are well on towards 10 inches in length. The finest grandiflora type of blossom has a standard which when pressed out will be nearly circular and will cover a silver dollar. The finest exhibition stock will now show some blossoms that measure 1 ½ in. across.

Now that this flower is grown for the highest competitive test of skill, the rules for judging an exhibit are of importance. Although no scale of points has received general recognition, yet, allowing that each variety must be judged according to the correct individual type under which it was introduced, size of blossom, color, form, substance, number of blossoms on the stem and size of stem, are the essential points. The retrograde of stock is easily shown by the loss of full rounded outline, reflected standard and deteriorated substance. Descriptive terms have been adopted by the growers to some extent, e.g., blossoms take the old common form, or are semi-expanded, boldly expanded, hooded, notched, shell-shaped, or grandiflora. Position of blossoms on the stem is also a point aimed at by the specialist.

A good degree of success is now reported from ordinary gardens everywhere in the growing of this flower. Yet since it has been brought to its present highly hybridized and developed stage some of its hardy advantages that formerly made it easy to grow have been reduced. Closer attention must now be paid to such rules of culture as have been found necessary. Tolerably rich soil inclining to a clay loam is best. Over-enriching will be likely to cause an excess of vine growth at the expense of blossoms. On light soil, firming the ground by treading or rolling will be found a preventive of the early blight. The time for planting is as early as possible, the ground having been prepared in the fall, and the seed going in as soon as the frost is out. This first planting should be covered one inch, the place where the row comes being hollowed out about three inches to hold moisture. A later planting needs to be covered with three inches of soil. Slow germination and almost a standstill condition through the month of May is better than any forcing process. Only the thinnest top-soil should be disturbed in hoeing and no soil filled in earlier than June, if at all. Cutworms must be shown a quarter. A light mulch is excellent for shading the ground. Whatever support is given the vines must be strong and six feet high. A wire trellis answers well, but good birches give the vines a chance to ramble and they are cooler and more airy. Rows should run north and south. All the strength of the vines should be conserved by keeping the pods removed.

California's Contributions to the Sweet Pea.—The pink and white Sweet Pea, or, as it was popularly known, the "Painted Lady," is an old-time garden favorite which was greatly esteemed by flower lovers for its beautiful coloring and delightful fragrance. This type, with the old style white-flowered kind and a few small-flowered sorts of dull and unattractive coloring, constituted for many years the entire assortment of varieties known to gardeners. When any one spoke of the Sweet Pea the Painted Lady was understood, in the same way that in speaking of a tea rose the favorite Safrano was the variety always referred to. In the past twelve years all this has been changed by the wonderful improvements made by specialists in the development of this flower and its consequent popularity. Our list of varieties of the tall-growing or running type now numbers over 180 varieties.

This great improvement is due primarily to the work of Henry Eckford, of England, who has improved the Sweet Pea mainly by selection. The Laxtons also sent out a number of crosses, which were very distinct in coloring but of small size, and though the colors were rich they were not attractive. Owing to the climatic conditions under which he worked and his greater interest in the improvement of the flower, Mr. Eckford has not produced seed in sufficient quantities to greatly cheapen the price, and this element of popularity has been supplied by our own wonderland of flowers—California. In California, finely ripened seed can be produced in such large quantities that in two
years after Mr. Eckford's introduction of a new variety our seedsmen are able to offer to the public a choice of a great variety of the vine. The Sweet Pea is a hardy annual, and there is no lack of electricity in the reach of every gardener. For a small outlay these novelties can be planted in masses unthought of by European gardeners.

California has done much more than this for the Sweet Pea. It is the sweet cup of California. The Sweet Pea likes a cool soil and climate, the vines shriveling up during midsummer and succumbing to the red spider during the hot, dry weather which prevails over a very large portion of our country. To a certain extent, therefore, the popularity of this flower has been confined to the cooler northern states. In the nature of things to adapt the plant to changed conditions, an entirely distinct type of growth soon appeared in the California fields, having a compact, deep green foliage, lying closely to the soil, serving to mulch, shade, and protect the strong network of roots lying beneath the surface. This type is known as the Cupid Sweet Pea. That it is apparently due to climatic influence is readily shown by the large number of distinct varieties we now have with this type of growth, many of which originated directly from the tall varieties, and not from sweet peas at all. The Cupid and tall Peas are a great success excellently in hot, dry weather, and exposed dry locations where success with the tall varieties is exceptional. Conversely, the Cupid type does not succeed in cool, moist locations where the tall sorts do best, as the dense foliage does not dry out readily and is inclined to mildew.

Two other distinct types have been originated in this country, the Bush Sweet Pea, which stands half-way between the Cupid and tall Sweet Peas in growth, needing no trellis or support but with the foliage held well above the soil and the flower-stems of greater length than in the compact Cupids. This type is also especially adapted to hot weather and dry soils, having a splendidly developed system of fine fibrous roots. The second type is the result of breeding and selection, as exemplified in Burpee Earliest of All, which has the true vine-like running growths only 18 inches high and comes into full flower greatly in advance of the taller varieties of Sweet Peas without any sacrifice of size in the flower or of length in the stems. With this variety and early planting a great show of flowers may be had even in the southern states. Its early flowering habit makes it the most desirable of all varieties to grow under glass for winter flowering. Herefore, the enthusiasm for Sweet Peas has been limited in the cooler northern states, but with fall planting of the tall sorts and the adoption of the Cupid and Bush varieties for summer flowering in the hotter locations, there is no reason why they cannot be grown under more widely varying conditions than any other popular flower.

E. D. DARLINGTON.

SWED POTATO. Ipomea Batatas, which see for botanical account. An edible tuberous root, much prized in North America, a staple article of food in all the southern states, and also much consumed in the North. The Sweet Potato plant is a trailing vine of the morning-glory family. The branches root at the joints. The edible tubers, Fig. 244, are borne close together under the crown and unlike the common potato they do not bear definite "eyes." The varieties differ greatly in size and in leaves. The "Vineless" Sweet Potato has a bushy habit. Good commercial varieties that are well cared for rarely bloom, and even then the flowers may not produce seed. The plant is tender to frost. The species is certainly distantly related but is supposed to be of American origin. It has been cultivated from prehistoric times by the aborigines. The plant is exceedingly variable in its leaves (Fig. 244), and the varieties are sometimes as many as the characters. Burpee states that the word "potato" usually means sweet potato, the potato of the North being known as "Irish," "round" and "white" potato.

The Sweet Potato is grown to fifty million bushels annually. Large quantities are grown in the Carolinas, Georgia, Texas, Alabama, Mississippi, Virginia and New Jersey, the last state being the farthest point north where the crop is raised on a large scale. In California the yield is also large, particularly in the interior valleys and in places removed from the influence of the coast climates. The Sweet Potato is propagated by means of its tubers, usually from the slips or cuttings from which a new plant is secured. A bush of ordinary Sweet Potatoes will give from 3,000 to 5,000 plants, if the sprouts are taken off early. An average good yield of Sweet Potatoes is 200-400 bushels per acre. Yields twice as high as these are sometimes secured.

In the northern states amateurs occasionally grow Sweet Potatoes of the southern types in small way, ridges in the garden, but it is usually for the pleasure of the experience rather than for profit. A warm, sunny climate, long season, loose warm soil, liberal supply of moisture in the growing season and a less severe weather when the tubers are maturing—these are some of the requirements of a good Sweet Potato crop. The crop should be gathered immediately after the first frost. In the South a soft and sugary Sweet Potato is desired. In the North a firm, slightly tuberous, stewing type. Certain varieties of Sweet Potatoes are called "yams" in the South, but this name belongs historically to a very different kind of plant, for an account of which see Dioscorea.

There are two special American books on Sweet Potatoes, by Fitz and Price. For history, see Sturtevant in Amer. Nat., Aug., 1891, pp. 698, 699. Some of the most important bulletins are Farmers' Bull. 26, U. S. Dept. Agric., and Ga. 25 by Hugh N. Burpee, Maine, No. 60 deal with the insects and diseases.

L. H. B.

COMMERCIAL CULTIVATION OF THE SWEET POTATO. — The cultivation of the Sweet Potato as a staple crop is confined almost exclusively to the southern states. While it is true that the Sweet Potato occupies large areas in New Jersey and is also planted more or less extensively throughout portions of Illinois, Indiana and Ohio, by far the greater bulk of the crop is to be found below the 38th parallel of latitude. Hence the cultural details here given, as well as the remarks on diseases, are compiled from a strictly southern standpoint. Methods vary from place to place. Local methods are of less as a factor into Sweet Potato culture than into any other horticultural industry of the country. For this very reason it is remarkable that there should occur such extraordinary variations in type as are everywhere so marked, and for which local environment, if not cause, should be held responsible. So marked are these variations that without apparent cause any given "variety" so-called—more correctly, perhaps, "selection"—will develop, when transplanted a few hundred miles from its place of origin, after a few years of cultivation in the hands of half a dozen different growers, just that many distinct types, each differing materially from the original in its means important characteristics—flavor, size, maturity, foliage, fruiting and habit of growth. This difference extends, sometimes, even to a change in the form of the leaf itself from possibly an ovate shape with margin entire and with no more trace of a lobe than an apple leaf has, to a sagittate or halberd form or even to one deeply cleft or indented. See Fig. 244.
Propagation is effected altogether by means of shoots, mostly those from the root. While blooms are often found on the vines—particularly in the extreme South—they are nearly always imperfect and invariably drop from the pedicle. No ovaries ever develop. Therefore the remarkable series of rapid transformations observable in the Sweet Potato must be credited entirely to an active and persistent tendency in the plant to bud variation—in effecting which it must be admitted to be a very prolific kalescope.

**Propagation.**—"Draws," or developed sprouts from root-buds, supply the readiest and, indeed, the only practicable means of propagation. Tubers of the last season's crop are "bedded" for this purpose; that is, an outer border is constructed in which the tubers are placed in a single layer, close together, and covered with several inches of soil early in spring. In a few weeks the latent buds of the tubers, under the stimulus of the heat from the fermenting manure, will have sprouted, and by the time all danger from frost has passed a dense growth of "draws," or "slips" will cover the bed. These are removed from the tubers, set by hand in the field in rows four feet apart—the plants eighteen inches, generally, in the row. The size of the bedded tubers does not affect the crop. As good results are obtained from small as from large potatoes. Even the smallest tubers of "strings" consistently planted from 1 to 2 year, provided heavy, the choicest selections. This is but logical if we remember that the Sweet Potato is merely an enlarged, inaxial, fleshy root, and heavy tubers, when sprouted, should have little or no tendency to produce a crop of corresponding size, particularly when the subsequent cultivation is indifferent.

For later plantings the "bed" may be supplemented by cutting "slips" 12 or 14 inches long from the young vines after growth commences in the row, and using them as "draws." While the "slips" do not live quite so readily as the rooted "draws," they are said to make somewhat slightly tubers—due doubtless, to the fact that by this method the myriads of the black rot is not conveyed from the bed to the field.

**Soil and Fertilization.**—Although a gross consumer of nitrogen, the Sweet Potato cannot advantageously occupy "bottomland." With this reservation it may be said that almost any land will produce potatoes. Yet a slight, sandy loam is best. Still, red soil is to be avoided, as in it the potato splits, cracks and "roughens," say the suspended and sudden resumption of growth during variable weather.

The most approved fertilizer formula has been found to be, per acre, as follows:

<table>
<thead>
<tr>
<th>Lbs.</th>
<th>Nitrogen (ammonia equiv. 50 lbs.)</th>
<th>50</th>
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<tbody>
<tr>
<td></td>
<td>Phosphoric acid</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Potash</td>
<td>90</td>
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<tr>
<td></td>
<td>High-grade acid phosphate</td>
<td>610</td>
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<tr>
<td></td>
<td>Nitrate of soda</td>
<td>380</td>
</tr>
<tr>
<td></td>
<td>Sulfate of potash</td>
<td>180</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>1,000</td>
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</tbody>
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Cottonseed meal has been found in many localities preferable to sodium nitrate, as it is not so readily soluble and therefore more gradual and continuous in action through the season. It may be substituted in the formula for sodium nitrate in the ratio of two pounds for one. Potassium muriate produces as heavy a crop as potassium sulfate, but the latter considerably increases the tenacity of the roots in the warm, grown potatoes is unusually large. For potash, kainit may be substituted in the proportion of four pounds of kainit to one of either potassium sulfate or muriate. Stable manure of normal composition produces excellent Sweet Potato crops of great size, too variable in character and too uncertain in quantity to be generally available. A complete summary of methods employed in Sweet Potato culture would occupy too much space. They are, moreover, too complex and too uncertain to require any detailed elaboration. They are desirable to call especial attention to certain points which have been insufficiently discussed in previous publications. First among these is the practice of premature planting. Against this tendency earnest protest should be entered. It is the cause of much loss. When an early market crop is not the object there is no need for haste in putting out the draws, since the season is abundantly long for leisurely planting. Plant in June, and when the tubers have matured. If planted in May, or earlier, with the long southern season, the crop is likely to mature before the approach of cold weather permits the proper housing. The consequent and usual result is a "second growth," which predisposes the tubers to the inroads of the "soft rot," which causes great loss.

A deep, mellow soil-bed, with an extended season, unquestionably will produce more and larger, but later, tubers. Shallow preparation will yield an earlier crop. It is possible that the deeper the soil the earlier the planting may be effected.

**Preservation.**—Were it possible to successfully and inexpensively preserve through the winter the Sweet Potato crop, southern agriculture would be practically revolutionized. Land capable of producing a bale of cotton, worth, say $40, will readily yield 300 bushels of potatoes, at half the cost for cultivation, worth, at 20 cts. per bus., $60. This the planter would gladly take, at harvest time, but there is then no market at any price. Yet six months later he cannot supply the demand at 60 cts., or $180 per acre. These figures are conservative. Even on poor soil, producing 500 pounds seed cotton (one-third of a bale) per acre, the yield in Sweet Potatoes—100 bushels, a very small output—could be sold in the spring for $60 were it possible to successfully keep the tubers through the winter. Many succeed in so doing, and reap the reward, but it is still an unsolved general problem. Methods, too, are variable in the extreme—and this is the one notable exception to the rule of uniformity prevailing in Sweet Potato culture. Climate and local environment seem here to play an important part, and means of preservation found successful in one place prove entirely unserviceable in another—personality, even, entering as a factor in the problem, one man failing where another, by the same methods, succeeds. Many ways have been devised and practiced, some simple, some elaborate; but each said by its enthusiastic originator or advocate to be absolutely infallible.

Nothing has yet been found that will effectually supersede the well-known popular method of "bucking" or "hilling" in quantities of from 30 to 50 bushels, according to the different local customs which prevail in each community. The ordinary practice is to heap the draws in a conical pile around a perforated wooden flue, covering them with a few inches of dry pine straw, then a layer of corn stalks, and finishing with three inches of dry sand and afterward two or three inches of clay or other stiff soil. The hill may be constructed either under shelter or out-of-doors. If the latter it is well to protect with a covering of boards to keep off the rain, though not absolutely necessary.

**Diseases and Maladies.**—A few of the most important maladies of the Sweet Potato—the cause, indeed, of nine-tenths of the loss experienced in attempts to winter the crop—will be noted in the probable order of their importance:

1. **Soft Rot** (Rhizopus nigricans): This is the most common form of rot, and the one that produces the most damage. It is due to a fungus or mold on abraded places, chiefly of the tuber, especially when the potatoes...
are stored in large bulk, without sufficient opportunity to dry out; the main cause of loss with stored potatoes, developing rapidly and immediately, under favorable conditions, and reducing, sometimes in a few weeks, the entire contents of a bin or hill to a rank, musty odor, emitting a most disgusting odor. A few simple remedial measures will greatly reduce loss from this cause: (1) Dig only when soil before tubers become sappy from a "second growth." (2) Remove all affected tubers before storing. (4) Use padded baskets in handling to avoid abrasion. (5) Store in small bulk and keep dry and well ventilated.

(b) Black Rot (Ceratoysis fimbriata): This fungus producing this affection does not depend so much on the conditions of moisture and abrasion, and is slower in making its appearance than is the soft rot, continuing to develop, however, all through the winter and often destroying the destruction the other has begun. It is all the more to be dreaded because it is not so immediately noticeable, and tubers containing its spores are more likely to be housed. The black rot does not produce a pulpy mass, though effectually destroying the entire tuber. It frequently makes its appearance on the young draws at "setting-out time." Hence careful selection—1st, of sound tubers for bedding; 2d, of perfectly healthy draws for setting; 3d, where these conditions cannot be fully complied with, by planting the bulk of the crop with cuttings from the vines, thus minimizing the damage. The use of copper sulfate, or any of the standard fungicides, either as a spray or for soaking the tubers, is not advisable; for since the mycelium of most of the fungi causing decay in the Sweet Potato is lodged in and protected by the interior cells of the tuber, surface treatment would prove more or less futile.

(c) Soil Rot (Acreosytis Batatae): This fungus, as its name implies, is a resident of the soil rather than of the tuber, and hence cannot be readily guarded against. It is responsible for most of the decay observed in the crevices or cracks of split tubers. Sudden expansion of vegetable tissue due to a resumption of rapid growth when wet weather follows a period of drought, particularly when the soil is a stiff clay, produces the primary "cracking" and the spores of the fungus, finding a ready lodgment, start the process of decay. As for remedies, heavy applications of sulfur to the soil have been found to check its ravages in a measure, but this method of operation is not practical. That is to say, while checking the fungus the result is not commensurate with the cost. The surest preventive—and this is true for any and all rots—is rotation. The same areas should never be planted to potatoes two years in succession, nor should the same spot be used twice for a hoed to furnish draws, even at the cost of great inconvenience in establishing the bed in another place.

(d) Other Fungi: Several other fungi are serious enemies of the Sweet Potato, as the stem rot, white rot, dry rot, potato scurf, leaf blight, etc.; but their ravages will not compare with the damage produced by the first three—soft rot, black rot and soil rot.

As for the first three, it matters little to the practical grower whether or not he is able to distinguish one from another. After the conditions favoring the spread of one of them have been permitted to develop and the resulting decay once appears, it is usually too late to put remedial measures into effect. Remedies in this case must precede manifestation of disease. Every possible precaution should be observed at one and the same time against all. Proper preventive effort during the growing season will be found a sure guarantee against loss from decay than the most elaborate structure or the most carefully detailed method of housing yet devised, and when thoroughly enforced little apprehension need be felt as to results, no matter what plan of preservation is adopted.

To this end the following summary of procedure will be found serviceable:

b. Rotate the bed. Never use old soil or old manure a second season.
c. Dig only when the soil is dry.
d. Dig before tubers are rendered moist and sappy by a "second growth," and to this end never plant too early in spring.
e. Use padded baskets in handling to prevent bruising and abrasion.
f. Handle with scrupulous care.
g. Reject all affected tubers before storing.
h. Store dry, in small bulk; if in bins erect bulkheads and use flues for ventilation.
i. Use only perfect tubers for bedding, rejecting any showing symptoms of decay.
j. Use only healthy and unafflicted draws for setting out.
k. When draws in bed are affected with diseased roots (black rot) and cannot be thrown away, plant in a separate plot and take cuttings from their vines later for the main crop.

Varieties. Since new varieties of the Sweet Potato can originate only by bud variation, it is a marvel where and how all of the different types arise. The writer has personally observed and tested some fifty odd kinds, and there doubtless exist, in all, 75 or 80—the number still increasing. But one uniform method of classification exists—that by the "leaf" and "bunch" types. "Leaves entire," "Leaves whole," and "Leaves cleft"—commonly termed "round-leaved," "shouldered," and "split-leaved," respectively. Of these the second type is the most numerous, containing probably two-thirds of the entire list. As for the best variety, the "all-round" potato has not yet been found, nor is it likely to be, since such a type should be a tremendous yielder, of first quality, a safe keeper and free from disease. No potato needs superlatives. All of these characteristics. All of the heaviest yielders belong, unfortunately, to the "milky" or "turpentine" group—as Nor- ton, Hayman, Southern Queen, White St. Domingo, Early Golden, etc.—and their sappy consistency prevents them from keeping well, while their quality is uniformly poor. Regarding quality, however, tastes differ. The northern grower prefers a dry, mealy potato, represented by the Jersey or Nansen second strain. The southern market, on the other hand, demands a rich, sugary potato, like the Georgia or Yellow Yam, which is generally considered.
to be the standard of excellence, and is a good keeper though yielding very lightly. The market it is intended to supply should, therefore, be specially planted for. If for northern shipment, the Jersey Sweet is preferable. For early local sale Orleans Red ('Nigger-killer'), Earle Golden or Bermuda Red head the list. For winter storage and local market in spring it is best to rely on the good old popular standard—the Georgia Yam—despite its light yield, or reinforce it with Vinegar, which frequently approaches it in quality and is a much heavier cropper. HUGH N. STARNES.

SWEET SCABIOUS. See Scabiosa.

SWEET-SCENTED SHRUB. See Calycanthus.

SWEET-SOP. Anona squamosa.

SWEET SULTAN. See Centaurea moschata.

SWEET VERNAL GRASS. See Anthoxanthum.

SWEET WILLIAM is Dianthus barbatus.

SWÉRTIA (after Emanuel Swert, a bulb cultivator of Holland and author of Florigenum, 1612). Gentianáceae. About 10 species, widely scattered about the world but mainly from S. Asia, of annual or perennial herbs with simple leaves, mainly radical in the perennial species, and yellow, blue or white flowers in loose or dense corymb.s. Calyx 4-5-parted: corolla rotate, with a very short tube and glandular pits at the base of each lobe; lobes 4-5, overlapping to the right; ovary 1-loculed: capsule dehiscent by 2 valves at the sutures.

dités, Benth. & Hook. (Ophiopogon dités, Lede.). A tender perennial about 1 ft. high: stem winged and angled, branching from near the base: lvs. glabrous, ovate-lanceolate, 3-nerved, rather obtuse, rounded at the base; disk pilose: fls. 4, numerus, blue, in a loose, fastigate umbel; corolla-lubes ovate, rounded at the apex and bearing at the base a single ovate, nectariferous pit destitute of a fringe. E. Asia, Japan.

perennis, Linn. A hardy perennial ½-1 ft. high: lower lvs. oblong-elliptical, long-petiolated; stem-lvs. ovate-oblong, obtuse; fls. mostly 4-numerous, blue to white, in a thyrs.: corolla-lubes elliptical-oblong, acute, bearing at the base 2 orbicular nectariferous pits crested with a fringe. Colo., Utah and northward; also in the alpine regions of Europe and in Asia.—N. perennis is an alpine bog plant and should be given a cool, deep, moist soil. F. W. BARCLAY.

SWIÆTENIA (Gerard van Swieten, 1700-1772, physician to Empress Marie Theresa in Vienna). Meliáceae. This genus contains the mahogany tree, a tree of high importance in the furniture trade. The young trees are offered by nurserymen in S. Fla. and S. Calif. A tropical genus of 2 or 3 species of tall trees, with abruptly pinnate leaves with opposite petiole obliquely ovate, long-acuminate leaflets and small flowers in axillary or somewhat terminal panicles: calyx small, 5-parted; petals 5; spreading; staminal tube urn-shaped, 14-toothed, disk annular: ovary ovoid, sessile, 5-loculed: capsule about 3 in. through.

Mahagoní, Jacq. Mahogany. A large tree with hard dark red wood of well-known value for furniture, etc. Lfts. 6-10: fls. greenish yellow. Tropical regions? of North and South America, West Indies and S. Florida.—Corish-Qu Am Hark-er's "Scots Extra" Tropical Plants. The degree of endurance of the tree is not sufficiently ascertained. In Jamaica it hardly reaches an elevation of 2,000 ft. It requires rich soil. According to Reasoner Bros., the tree will bloom at small size when grown in pots. F. W. BARCLAY.

SWISS CHARD. See Beta, Greens, Salad Plants.

SWORD LILY. Gladiolus.

Stamens and style exerted.

occidentalis, R. Br. WOLFPERRY. This may be considered as the western form of our eastern species, but it is less attractive than the preceding, as it is less fruitful and the individual berries are not as clear and waxy. Lvs. ovate: fls. in spikes, both terminal and axillary; stamens and style exerted: fr. the same dimension, same color, white. July, Mich., north and west. G. F. 3:297. B. B. 3:236. A shrub of about the last and closely resembling it, the exerted stamens and style being the most obvious distinction.

AA. Fruit red.

vulgaris, Michx. INDIAN CURRANT. Coral Bells, Fig. 2448. Lvs. ovate: fls. in dense axillary and terminal spikes; style and stamens included: fr. dark red, July. Along rivers and rocky places N. J., to Dakots, south to Ga., and Tex. Mn. 1, p. 84. G. n. 34, p. 290.—A rather more compact bush than the two previously described species. Valuable because of its abundant persistent fruit and foliage. Var. variegatus, Hort., has the leaves marked white and yellow and is the same as var. folis variegatis. Var. glomeratus, Hort., is a form with longer terminal spikes.

JOHN F. COWELL.

SYMPHYANDRA (Greek: authors grown together). Campanulacea. Symphyandra Holmmani is a hardy perennial herb, 1-2 ft. high, with pendulous bell-shaped flowers 1½ in. long and an inch or more across. The fls. are borne in a large leafy panicle. Under favorable conditions in England this plant has maintained a succession of bloom from July to December. T. D. Hatfield finds that in this country "the plant is liable to exhaust itself in blooming, thus behaving like a biennial. It has large, fleshy roots, needs a dry position and sows itself."

Symphyandra is a genus of about 7 species of perennial herbs found in the region of Asia Minor. Its special botanical interest lies in the fact that the anthers are grown together into a tube, which character tends to annul the distinction between the Campanula and Lobelia families. Otherwise the genus is much like Campanula.

Generic characters: caudex thick: lvs. broad, usually coriaceous, dentate; radical lvs. long-stalked; stem-lvs. few or small: fls. white or yellowish, usually nodding, racemose or loosely paniced; inflorescence centrifugal: calyx-tube adnate, hemispherical or top-shaped, with or without reduced appendages between the lobes; corolla bell-shaped, 5-lobed: ovary 3-located.

Höfmanni, Pant. Much branched, pilose; branches decumbent; lvs. ob lanceolate, acute, doubly dentate: calyx with large, leafy, coriaceous segments, hemispherical tube and no appendage; corolla hairy inside. Bosnia. B. M. 7298. G. n. 57, p. 385. G. C. III. 4:761.—This desirable heliophyllum has been cult. by amateurs in the East. It sometimes spreads rapidly in half-shaded rockeries and sows itself.

W. M.

SYMPHYTUM (Greek: to grow together, in reference to the supposed healing virtues). Borraginaceae. COMFRET. About 16 species of perennial herbs from Europe, Asia and N. Africa, with usually tuberous roots; lvs. simple, often decurrent, and with rather small yellow, blue or purplish flowers pedicelled in terminal, simple or branched cymes: calyx 5-cut or parted, lobes linear; corolla tubular, lobes very short and erect; stamens 5, attached to the middle of the corolla-tube, included; nectaries 4; seeds nearly globular.

Of easy culture in any good soil. The shade of overhanging trees is not objectionable. When grown for the beauty of the variegated foliage the flowering stems may be removed with advantage.

AA. Lvs. decurrent on the stem.

officinale, Linn. A barely branching perennial, about 3 ft. high; root thick, lower lvs. large, broadly lanceolate; upper lvs. narrower: fls. small, pale yellow or purplish, in drooping cymes. June, July, Ew., Asia.

Var. variegatum, Hort., has leaves widely margined with creamy white. A beautiful variegated plant especially attractive in spring, when the coloring of the leaves is brightest and the large rosettes have not yet sent up any flower-stems. F. S. 18:1901–1902.

AA. Lvs. not decurrent on the stem.

asperimum, Dorn. PRICKLY COMFRET. Fig. 2449. A hardly perennial, more vigorous than S. officinale, often 5 ft. high: lvs. ovate-lanceolate, prickly on both sides: flowers resembling blue, smaller than in S. officinale. June, July. Canasus, B. M. 57, —Var. variegatum, Hort., has leaves distinctly margined with yellow.

J. B. KELLER and F. W. BARCLAY.

SYMPLOCARPIUS. See Spathycarpus.

SYMPLOCOS (Greek, symplocos, entwined or connected, the stamens being connate at the base). Including Hopea and Lodoth, Styraxes. Ornamental deciduous or evergreen trees or shrubs, with alternate, entire or serrate lvs. and usually white or, in panicles, rarely solitary, followed by berry-like, black, red or blue fruits. Only the deciduous S. crataegoides is hardy north; it is a shrub with abundant white fls. in spring and bright blue fruits in autumn. It thrives in well-drained soil and sunny position. The half-evergreen S. tinctoria, which seems not hardy north of its natural habitat, prefers moist soil and shady situation. The evergreen species are all tender and little known in cultivation. Prop. by seeds, which usually do not germinate until the second year, and by greenwood cuttings under glass; also by layers.

About 100 species widely distributed through the tropical regions except Africa; only a few outside the tropics. Mostly trees: fls. in terminal or axillary racemes or panicles, rarely solitary; calyx 5-segmented, lobed; corolla 5-parted, often almost to the base; stamens numerous, usually connate at the base of the style filiform: ovary 2-3-located. Inferior; fr. a drupe, with 1-5-1-seeded stones. Several species have medical properties. Some of S. tinctoria yields a yellow dye.

crataegoides, Buch.-Ham. (S. paniculata, Wall. Lodoth crataegoides, De Cree.) Deciduous shrub or sometimes tree, attaining 40 ft., with slender, spreading branches, forming an irregular open head; young
SYMPLOCOS

SYRINGA

SYMONIUM

SYNONYM (Greek name, said to refer to the color of the ovaries of the species. About 10 species of tropical American woody climbing or creeping plants, with milky juice and stems rooting and leaf-bearing at the nodes: ivy, sagittate, bearing with age pedately 5- or 8-parted, on long petioles, with a persistent accrescent sheath; peduncles; spathes of whitish green; tube small, ovoid, persistent: spadix shorter than the spathe: staminate fls. with 3-4 stamens, pistillate fl. with oblong-obovoid 2 or abortively 1-located ovary; seeds solitary in the locules, obovoid or globose, black. All the aroids are monographed in Latin in DC. Mon. Phan. vol. 2, 1879.

podophyllum, Schott. A tender creeping plant: ivy, becoming 5-7-flowered, 4-6 in. long; petioles becoming 15-20 in. long: tube of the spathe 1-1.5 in. long; blade of the spathe 2/3 in. long, greenish outside, white within. The typical form is probably not in cult.

Var. albolineatum, Engl. (S. albolineatum, Bull.), has whitish costae and lateral nerves. Offered by John Saul, 1893, presumably as a tender foliage plant.

F. W. BARCLAY.

SYNTHYSIUM (Greek, together and little door or valve, the valves of the capsule long adhering below to the short placentaferous axis). Scopulilariaceae. Six species of hardy herbaceous perennials, native to western North America. S. thunbergii is a tufted shrub with a feathery appearance of a foot high. Synthesis is nearly related to Wulfenia of southeastern Europe and the Himalayas, but the author-cells are not confluent and the cells are disodialized. In their natural region they are summer-blooming plants with small purplish or flesh-colored spikes or racemes. Generic characters: Plants glabrous or pilose: rhamnoid thick: radical ivy, petiolo, ovate or oblong and crenate or incised-pinnatisect: bracts 5-4-petalled, to almost 4: style entire at apex: capsule compressed.

reniformis, Benth. Larger and robust shrubs than the next, with more acutely cut, leathery ivy, longer and stouter scapes and racemes, shorter and more robust seeds and corolla-lobes, globose corolla-tube and more seeds in the cells. Offered by Wodson, Passaic, N. J. 1871.

rotundifolia, Gray. Smaller, with weak, slender scapes 3-5 in. high, shorter than the membranous, broadly ovate, small few-seeded, rounder and smaller corolla-lobes, fewer seeds in the cells and capsule divaricately 2-lobed instead of merely emarginate. Shady coniferous woods of Oregon. Offered in 1881 by Edward Gillett.

W. M.
The Lilacs are very showy in bloom, especially when massed in groups, and these, a rule are the more effective for different varieties they contain. The mixing of species and varieties differing in habit and blooming season only spoils the effect, and so does too great a variety of colors. Some species, as the tree-like S. japonica, S. Pekinensis and S. villosa, are very handsome as single specimens on the lawn. S. japonica is the only tree of the genus; it attains a height of 30 ft. S. vulgaris, Amurensis and Pekinensis sometimes grow into small trees or at least large shrubs 10-20 ft. high. S. Persica is the smallest species seldom more than 6 ft. The first in bloom is S. oblata, followed closely by S. vulgaris, Chinesis, pubescens, Persica, villosa and Josikae; after the middle of June S. Amurensis and Pekinensis come into bloom, followed at the last by S. japonica, which begins to bloom in the North in the beginning of July. S. Amurensis and Pekinensis sometimes bloom sparingly a second time in fall. The foliage is bright green and handsome, and drops comparatively early in fall, especially in the case of S. japonica, giving the plants assuming any fall coloring as a rule. In S. oblata the foliage turns to a deep vinous red and remains until November. In S. Pekinensis it is retained until late in fall and finally assumes a purplish blue or turns pale yellow.

The foliage is not much attacked by insects, but a fungus, Microsphaera alni, late in summer often covers the whole foliage of S. vulgaris and also of S. Chinesis and Persica with a white mealy coat, while S. oblata is but rarely troubled with this fungus and the other species never. Much damage is sometimes done by a borer, Tropilium dematiatum, which lives in the stems and branches of S. vulgaris, but is rarely found in any other species.

After blooming, the inflorescence should be removed if possible and the pruning done as fast as necessary. Pruning in winter or spring would destroy a large part of the flower buds for the coming season. Lilacs grow in almost any kind of soil, but a rich and moderately moist one is the most suitable. They are easily transplanted at any time from fall to spring. S. vulgaris and its numerous varieties are the most popular of the Lilacs on account of their early and profuse blooming, their sweet fragrance and the variety of colors ranging from dark purple to lilac, pink and white. The double-flowered varieties keep the blooms longer, but the panicles are less graceful and they usually do not bloom as profusely as the single ones; they also remain mostly dwarfer and have a more compact habit. The faded ffs. do not fall off, but remain on the inflorescence; this gives the plants a very unsightly appearance if the faded panicles are not removed. W. J. Stewart suggests a word of warning against Lilacs not on their own roots, because of the attacks of borers and the bad habit of suckering in some cases.

Some of the best single-flowered var. are the following:

**Single-flowered Lilacs.**

**White:** Alba grandiflora; Alba pyramidalis; Frau Bertha Dammann, A.F. 12:1078; Madame Moser; Marie Legraye, one of the very best, B.H. 29:135; Princess Marie.

**Blue, lilac or pink:** Ambrosie Verschaffelt, pale pink; Dr. Lindley, pinkish lilac, F.S. 14:1881; Géant des batisses, bluish lilac; Geheimrath Heyder, light lilac; Gigantes, bluish red; Glorie des Mouflins, pale pink; Goliat, purplish lilac; Lovaniensis, light pink; Macrostatyca, light pink (Princess Alexandrina is a favorite variety of this class in America); Sibirica, purplish lilac; Triannoniana, bluish lilac.

**Red:** Aline Moequeris, dark red; Charles X (Carolis), dark lilac-red, A.F. 12:1076; P. 1873, p. 76; Marygern, sometimes called Rubra de Marley, lilac-red; Rubra insignis, purplish red.

**Dark purple:** Philomen; Ludwig Späth (Andenkunf an Ludwig Späth, Louis Späth), very large panicles, the best of the dark vares

**Double-flowered Lilacs.**

**White:** Madame Abel Châtenay, compact panicles; Madame Casimir-Perier, large, graceful panicles; some of the best; Madame Lemoine, large ffs. in dense panicles; Ophélie; Virginité, white and pink.

**Blue, lilac or pink:** Alphonse Lavallé, bluish lilac, A.F. 12:1077; Belle de Nancy, ffs. pink with white center; Charles Baltet, lilac-pink; Cendreron, blue, A.F. 12:1074; Doyen Ketekée, lilac-blue; Jean Bart, pinkish violet; Lamarek, pale lilac, large, rather loose panicles; Lemoinei, lilac-pink, B.H. 28:174; Leon Simon, changing from pinkish to bluish lilac. Gt. 13:1467; Maxime Corm, pinkish lilac; Michel Buchner, pale lilac, large and very double ffs.; President Carnot, pale blue.

**Purple:** Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d'Auvergne, violet-purple.

The Lilacs have been favorite forcing plants in France for more than a century and are nowadays among the most important cut-flowers during the winter season in France as well as in Germany and England. They are on the market from the end of September until they bloom outdoors. Charles X is considered one of the very best for forcing. Marygernis, Marie Legraye, Alba virginiana, Ludwig Späth and other varieties are also good for forcing. Of the double-fldd. varieties the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Leon Simon, Chinesis duplex and others. Either grafted plants or plants on their own roots are used. Both force equally well, but grafted Lilacs can be grown into plants well set with flower-buds and suited for forcing in two or three years, while plants grown from cuttings take four or five years. Marygernis is always used on its own roots and prop. either by seeds, cuttings or division. Special attention must be given to pruning in order to have well-branched plants of good, compact habit (see Fig. 851, Vol. II, p. 600).

The Lilac has nothing like the commercial importance for forcing in America that it has in Europe, but the appreciation of it for winter bloom is on the increase in this country.

Lilacs are generally forced in pots, being potted usually in July or in the forepart of August, that they may fill the pots with new roots before winter. Some grow-
of the albuminoids in the plant has been stated recently by other botanists also.

Lilacs may be propagated by grafting or by forcing. This method is usually practiced only with the more common typical species. The many varieties and rarer kinds are usually propagated by forcing greenwood cuttings under glass in June (or in early spring from forced plants), by budding or grafting and also by suckers and division, especially in the case of *S. Chinensis*, *Persica* and *vulgaris*.

As a stock *S. vulgaris* is mostly used and sometimes *Ligustrum*. *S. Japonica* will probably prove to be a good stock. *S. villosa*, though readily growing from seed and of vigorous habit, is not to be recommended. Budding in July and August is the most extensively practiced method. Grafting is done either in April or May in the open or in February or March in the greenhouse on potted stock. Almost any kind of grafting may be employed, as the Lilac unites readily. Crown-grafting is to be preferred in order to avoid the troublesome suckers. Plants intended for forcing but deficient in flower-buds are sometimes grafted in October or early in November with branches well set with flower-buds and forced in January or later.

About 11 species from southeastern Europe to Himalayas and Japan. *Lvs.* exstipulate, deciduous, evergreen only in *S. sempervirens*; *fls.* in panicles; *calyx* small, campanulate, 4-toothed; *corolla* salverform, with cylindrical tube and 4-toothed limb; *stamens* 2: *ovary* 2-locular, *ovules* 4, *ovary* capsule, loculicidally dehiscing, with 2 winged seeds in each locule. *Fig.* 2449. In *S. sempervirens* (not yet introduced), the capsule is fleshy, one-seeded and drupe-like.

**ALFRED RHEDE**.

**Forcing Lilacs.**—Most of the Lilacs used by American commercial florists for forcing are imported. Care should always be taken to procure pot-grown plants, that is, plants that have been grown in pots the previous summer. The florist who wishes to grow his own plants should lift them in the field in April or before the growth starts and pot them without losing much root. Plunge them out-of-doors during summer and give them plenty of water. This treatment will insure a good growth and the

2452. **Syringa vulgaris**, the common Lilac (× 3/4).

rather dry in fall, so that the wood may ripen thoroughly and early. When the leaves have fallen off, the plants are stored away in convenient places, where they are sheltered from severe frost. Sometimes the Lilacs, especially *Marlyensis*, is forced from balls of earth which are not potted, but this does not always give satisfactory results.

About three to four weeks is required to force the plants into bloom with the temperature recommended below. The first days after bringing the plants into the forcing room, a temperature of 55-60° may be given, gradually raising to 78-88° and maintained as equally as possible until the panicles are fully developed and the first flowers begin to expand; then the temperature is lowered to 60-66°, and when the panicles are about half open the plants are transferred to a cool greenhouse. Hardening-off is essential to ensure good keeping qualities of the flowers. The red-flowered varieties are often forced in darkened rooms in order to have the flowers blanched or only slightly colored. The shade of color depends entirely on the time when full light is given and also on the temperature. Show plants in pots should be grown in full light to have the foliage well developed. While the temperature is higher than 76°, frequent syringing is necessary. It is, of course, possible to force Lilacs in a lower temperature, and this will be even advisable if the longer time required does not count. Full advice for commercial Lilac forcing is given by Fr. Harms in "Flieder und Asparaguss," a book devoted almost exclusively to Lilac forcing.

Interesting experiments recently conducted have shown that the Lilac is more readily forced when the plants are subjected to the influence of ether during forty-eight hours shortly before forcing. An account of these experiments by W. Johannsen is entitled "Das Ætherverfahren beim Frühstück mit besonderer Berücksichtigung des Flieders." That the ether has a particular effect on the metamorphosis and regeneration

2453. **Capsule of Syringa vulgaris (× 3).**

2454. Winter twig of *Syringa vulgaris* (× 3/2). Showing the absence of a terminal bud, and the persistent dehisced pods.
check the plants receive from lifting will induce them to form new flower-buds. These plants will force with the greatest certainty. It is well to allow five weeks for the earliest forcing. A strong heat is necessary, beginning at 60°F for the first few days and increasing to 75° or 80°, with a daily watering and syringing several times. After the flowers begin to open the syringing can be discontinued and when fully expedient the plants are better removed to a cool house, where they will harden off and be much more serviceable when cut. As the season advances, say March and April, less heat is needed. They will then force in any ordinary house where the night temperature is about 60° F. The Persian Lilac on account of its abundance of bloom and delicate truss is very desirable, but this must be forced almost in the dark to produce white flowers. Marie Le Graye is for all purposes the most useful Lilac which the undersigned has used for forcing.

WM. SCOTT.

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A. Tube of corolla much longer than calyx: author’s sessile, not exserted.
B. Prunices on lealy branches, usually terminal: lvs. whitish beneath.
C. Stemms inserted near the middle of the tube
D. Stemms inserted near the mouth of the tube
E. Prunices from lateral buds, without lvs.; terminal bud of branches suppressed.
F. Under side of lvs. green, pubescent at the midrib when young
G. Under side of lvs. green, quite glabrous.
H. Lvs. truncate or cordate at base.

| Shape of lvs. roundish or broadly ovate | 4. oblata |
| Shape of lvs. ovate | 6. vulgaris |
| Shape of lvs. ovate-lanceolate | 7. Chinensis |
| Shape of lvs. lanceolate | 8. Persica |

AA. Tube short, little longer than calyx: stemms exserted: lvs. with long stalks.
BB. Base of lvs. usually narrowed.
CC. Base of lvs. usually rounded.

| Josikaea, Jacq. Shrub, attaining 12 ft., with upright, stout, terete branches: lvs. broadly elliptic to elliptic-oblong, acute at both ends, finely ciliate, dark green and shining above, glabrous or pubescent on the midrib beneath, 2½–5 in. long; fls. very short-pedicled or almost sessile, clustered, in rather narrow panicles 3–7 in. long; stemms inserted somewhat above the middle of the tube; sepals half-upright. June, Hungary. B.M. 3278. B.R. 20:1726. It is handsome than most other species, but valuable for its late blooming season. Var. pellida, Hort., has pale violet lvs.; var. rubra, Hort., reddish violet. |

2. villosa, Vahl, not Deene, nor Hooker, nor Kochne. Figs. 2450, 2451. Bushy shrub, 8 ft. high, with rather stout, upright, terete and warty branches: lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent on the midrib or glabrous beneath, 3–7 in. long; fls. pinkish lilac or whitish, short-pedicled, in broad or somewhat narrow panicles, 3–7 in. long; stemms inserted near the mouth; sepals half-upright. May, June. China to Himalayas. The common form, var. rosea, Cornu (S. Bréschneideri, Lemoine), has broadly elliptic or elliptic lvs. and pink fls. in rather large panicles with leafy bracts at the base. B.R. 1888:422. G.F. 1:521. Gs. 39, p. 91. Qt. 44, p. 500. Var. Emodi, Rehd. (S. Emodi, Wall.), has narrow elliptic to oblong lvs., more whitish beneath; fls. whitish or pale lilac, in rather narrow panicles, usually with large lvs. at the base, Himalayas. B.R. 31:6. K. H. 1876. p. 368. Gs. 39, p. 106. Not quite hardy north. There are also vars. with yellow lvs. (var. aurea, Sim.-Louis) and with yellow variegated lvs. (var. aureo-variegata, Hort.). Hybrids with S. vulgaris and S. Josikaea have been raised at the Botanic Garden at Paris.

3. pubescenta, Turcz. (S. villosa, Deene., not Vahl. S. villosa, var. ovatifolia, DC.). Shrub, 6 ft. high, with slender, somewhat quadrangular branches; lvs. roundish ovate to rhombic-ovate or ovate, or shortly acuminate, ciliate, dark green above, 1–3 in. long; fls. pale lilac, fragrant, short-pedicled, in ovate, not very large, but numerous panicles; tube very slender; apex of anthers not reaching the mouth. May. N. China. G.F. 1:415; 6:266. B.M. 7064 (as S. villosa).—Free-flowering shrub of graceful habit, with handsome dark foliage.

| Oblata, Lindl. Shrub or small tree, 12 ft. high: lvs. roundish ovate or reniform, often broader than long, coriaceous, short-acuminate, bright green, 2½–4¼ in. across: fls. purple-lilac or purple-violent, in rather loose, pyramidal panicles, 3–6 in. long; pedicels about as long |

2455. Syringa Persica, one of the common Lilacs (X ½).
Syringa

as calyx. May. N. China. G.F. 1:221. A.G. 92:183.—The earliest of all to bloom and handsome, with its vinous red foliage in all. Var. alba, Hort., has white flowers.

5. hyacinthiflora, Hort. (S. oblata × vulgaris). Intermediate between the parents, with broadly ovate lvs., turning purplish in fall. Only known in the double form, var. plena, Lemoine. Many or perhaps most of the newer double-flowered var. have originated by recrossing this form with var. vulgaris.

6. vulgaris, Linn. Figs. 2453, 2454. Upright shrub or small tree, 20 ft. high; lvs. ovate, truncate or slightly cordate, acuminate, bright green, 2-4 in. long; fls. lilac, blue, purplish white, or white, in large panicles. May. Southeastern Europe to Caucasus and Afghanistan; sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. N.D.G. 1890-205.—The most important of the older original var. are the following: Var. alba, Dietr., branches yellowish gray; fls. white; buds yellowish green; blooms a week earlier than the other. A.F. 12:1081. Var. caerulea, Dietr. Fls. blue, in rather loose panicles. Var. purpurea, DC. (var. rubra, Loud.). Fls. purplish red, in large and rather dense panicles. Here belong also var. Marlyensis, Hort., and Charles X. Var. violacea, Dietr. Fls. violet-lilac, in rather loose panicles. Var. plena, Hort. With double fls. There are several var. with variegated lvs., but these are hardly worth cultivating.


8. Persica, Linn. Fig. 2455. Shrub, attaining 5-10 ft., with slender, arching branches; lvs. lanceolate, acuminate, 1½-3 in. long; fls. pale lilac or whitish, in rather loose, broad panicles, about 3-4 in. long; pedicels as long as or longer than calyx. May, June. Caucasus to Afghanistan. B.M. 486.—Var. alba, Loud. [S. Steinitzii, Hort.]. Fls. white. Var. iaciniata, Vahl (S. polioides, (f. filifolia and pinfata, Hort.). With pinnately lobed or pinnatifid lvs., of dwarfer habit and with smaller panicles. R.H. 1878, p. 452, 453; 1883, p. 89; 1901, pp. 40, 41.

9. Pekinensis, Rupe. (Syringa Amurensis, var. Pekinensis, Maxim. Syringa Pekinensis, Regel.) Large shrub, attaining 15 ft., with slender, spreading branches, brownish red when young; lvs. ovate to ovate-lanceolate, usually narrowed at the base, acuminate, rather dark green above, pale or grayish green and glabrous beneath, 2-4 in. long, 1½-2½ in. broad; fls. yellowish white in large panicles, usually in pairs at the ends of branches; stamens about as long as limb. June. N. China. G.F. 3:165; 7:285. M.D.G. 1899:455.—Large shrub, of excellent habit, with handsome foliage retained until late in fall; flowers profusely only when older. Var. pendula, Hort. With very slender, pendulous branches.


TABEBUÍA (Brazilian name). Bignoníaceae. Ornamental evergreen trees with opposite, long-petaled, simple leaves and showy flowers in terminal, few-fl. racemes. Only T. leucózyla seems to be introduced. It requires the same cultivation as the tropical species of Tecoma, which see. The genus contains 5 or 6 species, inhabitants of tropical America, closely allied to Tecoma, but, according to recent monographs, distinctly distinguished by the simple leaves and the irregularly splitting tubular calyx; formerly also species with digitate foliage were included, for which see Tecoma.

T. leucózyla, DC. (Bignonia leucózyla, Veill. B. pelícida, Linn.). Evergreen tree or shrub: lvs. elliptic-oblong to obovate-oblong, obtuse or sometimes emarginate at the apex, glabrous, dark green with distinct pale midrib, 4-7 in. long: fls. in few-fl. terminal racemes; corolla funnel-shaped, about 2 in. long, with yellow tube and pale lilac limb. Brazil. B.R. 12:965.

ALFRED REHDER

TABERNÉMontANA (J. T. Tabernámontanus of Heidelberg, physician and botanist, author of Kräuterbuch mit Künstlichen Figuren; died 1590). Apocynáceae. A genus of more than 100 species of trees or shrubs widely scattered in tropical regions. Lvs. opposite, pinnel-nerved: fls. white or yellow, in terminal or sometimes apparently but not truly axillary cymes; calyx usually short 5-lobed or parted; corolla salverform; stamens inserted on the corolla-tube, included: berries large and globose or small, oblong and recurved. See Genioma for distinctions from this genus.

A. Fls. white.

coronária, Wildl. Crape JASMINE. NERO'S CROWN. A tender shrub, 6-8 ft. high: lvs. glossy green, oblong to oblanceolate: fls. white, fragrant, 1-2 in. across, in 1-8-fl. clusters in the forks of the branches: petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. hortícola, with double, somewhat larger, very sweet-scented flowers, seems to be far more common in cultivation. P.M. 16:554. B.M. 1865 (as Nierium coronarium).—Cult. in the more southern states and also in greenhouses. Also known as Adam's Apple and East Indian Rosebay.

AA. Fls. yellow.

grandiflóra, Jacq. A small, tender shrub: lvs. oblong-ovate, sharply acuminate, 2-3 in. long, thick; fls. yellow, long: lobe-clusters in the forks of the branches: corolla lobes oval, obtuse, entire. Early fall. Carthagea, Guiana. B.M. 5236.—Rarely cult. in the more southern portions of the United States.

T. Camássí, Regel. See Genioma Camássí.

F. W. BARCLAY

The East Indian Rosebay, Tabernámontana coronária, is one of the best ornamental shrubs for subtropical gardens. This species and T. Camássí, referred in this work to Genioma, flourish everywhere in Florida from Jacksonville southward. If they receive proper attention, tiny cuttings soon develop into dense, bushy plants 3-5 ft. high, covered with deliciously scented flowers throughout the summer. Indeed the plants are so densely covered with buds and flowers that it is often difficult to find sufficient space for cuttings for propagation. T. coronária has larger leaves than T. Camássí and the flowers are much like those of the double white oleander, while T. Camássí has smaller and smaller blossoms. Both do well under the same treatment. In order to enjoy the beauty of the East Indian Rosebay to its fullest extent, it must be planted in rich, sandy soil, not too wet and not too dry, and in places fully exposed to the sun. There are many strong-rooted plants that should be set out in the garden. This should be done during the rainy season. Avoid breaking the ball in transplanting. It is useless to transplant in November, the time when most evergreens and other plants are most successfully set out. The plants at this season have no time to become established before the first sharp frost comes, and a weakened Tabernámontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bougainvilleas, ceasums, Poinciana regina, Tristania conferta, grevilleas, eucalypti, etc.) are banked about 18 inches to 2 feet high with dry sand, and they always come through without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The Tabernámontanas look best in groups by themselves or in front of other glossy-leafed evergreens.

H. NEHRING

TACAMAHAC. Populus balsamifera

TACCA (Malayan name). Taccaceae. A genus of 9 species from tropical regions. Perennial herbs from a tuberous or creeping rhizome with large, radical, petioled leaves and umbels of lurid brown or greenish flowers in a dense umbel borne on a leafless, rigid scape. The flower-cluster is subtended by a few, usually 1, leaf-like or colored bracts, and intermixed with the flowers are more or less numerous, long and conspicuous, sterile, filiform pedicels, which usually droop below the flower-cluster.

A. Lvs. much lobed.

piñatitíada, Jack. Tender perennial herb, about 2 ft. high: rootstock globose, becoming 1 ft. through: lvs. large, usually 3-branched, the divisions pinnaately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate: fls. greenish, 8 lines across, many with the sterile pedicels purplish: berry nearly globose, 1 in. through. Afr., India and Australia. L.B.C. 7: 862. B.M. 7299; 7300.—According to Von Mueller's Select Extra-tropical Plants, the Fiji Arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

AA. Lvs. not lobed.

cristáta, Jack. (Atácia cristáta, Kunth). Rootstock a short conic corm, marked with leaf-shears: lvs. 1-2 ft. long, oblong, acuminate, dark purplish green: scape shorter than the lvs. 8 lines across, dark purplish, with a somewhat one-sided umbel, with numerous pale sterile pedicels 9-10 in. long: involucreal bracts 4, conspicuous, the 2 inner elliptical, narrowed to a petiole, the 2 outer redivuare. Malay. B.M. 4589. F.S. 9:260, 261. Gn. 45, p. 415; 49, p. 432.—It requires, according to Gn. 45, p. 415, a good, rich, open soil, with ample drainage, plenty of water, and a stove temperature. During the winter season the plant should be kept in a state of partial rest.

P. W. BARCLAY

TACSONIA (from the Peruvian name of one of the species). Passifloráceae. From Passiflora, Tacsonia differs in having a long-tubular calyx, styles 3, stamens and petals 3 or 5, the latter never wanting, corona of taberoules or very short threads, and in a short reflexed corolla near the base of the flower-tube. However, the line of demarcation between the two genera is often not well marked and Harmas (Engler & Prantl's "Pflanzenfamilien") unites Tacsonia with Passiflora. Masters accepts (Trans. Linn. Soc. 27: 25) Apocynáceae. See Genioma, relegating the intermediate forms largely to Passiflora. Other species have been discovered subsequently, making the total number in the genus above 30. The species are all South American, inhabiting the Andes. They are being tended as climbing shrubs or herbs, requiring the treatment given Passiflora. Tacsonias are cultivated freely in the open in middle and northern California.
Jamesoni, Mast. Lvs. sub-orbicular, 3-lobed, glabrous; fl. large, bright rose or cherry red, with a cylindrical tube 4 in. long. Peru.

dd. Foliage downy beneath at maturity.

Exoniënsis, Hort. (hybrid of T. van Volxemii and T. mollissima). Fig. 2458. Lvs. downy, cordate, ovate-oblong, divided nearly to base into 3 lanceolate, serrate segments: fls. 4½-5 in. across; sepals brick red outside, brilliant rose pink within; throat violet; tube white inside, 2½ in. long. Resembles T. van Volxemii in having peduncles as long as lvs.; linear stipules; free downy bracts, filamentous corona near base of tube and violet color of throat. - Resembles T. mollissima in having downy lvs., long flower tube, color of fl. and aristate sepals.

bb. Bracts beneath the flower more or less united.

c. Leaf-lobes short and obtuse.

manicata, Juss. Pubescent. Lvs. broad-ovate to orbicular-ovate in outline, about 4 in. long, the oblong obtuse serrate lobes reaching to the middle of the blade: fl. 4 in. across, bright scarlet; tube ½ in. long, inflated and ribbed at the base; corona double, the outer series composed of blue hairs. Colombia and Peru. B.M. 6129. - D ignea, Hort., is a form of this species.

c. Leaf-lobes long-acute.

mixta, Juss. Glabrous or somewhat pubescent; lvs. orbicular-ovate, thick, 3-lobed to the middle, the lobes long-acute and serrate; fl. 3½ in. across, rose-pink, the oblong sepals not equaling the green scarcely saecate tube; corona a short multiple rim or disk. Andes.

mollissima, HBK. Pubescent; lvs. cordate-ovate in outline, very pubescent beneath, the lobes extending nearly to the base of the blade and ovate-lanceolate in shape and serrate, the stipules linear; fl. about 3 in. across, rose-color, the green tube exceeding the sepals and swollen at the base; corona a short rim. Andes. B.M. 4187. B.R. 32:11. F.S. 2:178. - S. tubiflora, offered in California, is said to be similar to this, but of deeper shade.

Smythiana, Hort. Seedling of T. mollissima or hybrid with it, with very brilliant orange-scarlet or rose-crimson fls. G.C. III. 12:704.

T. Buchanani, Lem. See Passiflora vitifolia, p. 1221. I.H. 14:597. - T. horripulda was once advertised in the American trade, but it was probably not the T. horripulda, Masters of Columbia. - T. pinstipatula, Juss. Resembles T. mollissima, but the bracts are free; stipules pinnaeate; fls. rose-colored. Chile. B.M. 4682. B.R. 18:1536.

L. H. B.
Tagetes (Tagus, an Etruscan god). \textit{Compositae. Marigold.} A genus of some 20 species of tropical American herbs. Lvs. opposite, pinnately cut or rarely simply serrate; fls. of various sizes, yellow or orange, marked in some species with red. The popular annual species known as "African" and "French" Marigolds have been derived respectively from \textit{T. erecta} and \textit{T. patula}, both of which are native to Mexico. According to \textit{Sweet's Hortus Britannicus}, these two species were introduced into cultivation in 1596 and 1573.

For garden purposes Tagetes may be divided into two groups, based upon habit of growth. \textit{T. erecta} and \textit{T. lucida} are of upright and somewhat open growth; while \textit{T. patula} and \textit{T. signata} are spreading and bushy, the lower branches lying close to the ground and often rooting.

The \textit{French} Marigolds, \textit{T. patula}, are valuable bedding plants. Good garden forms are of even height and bushy, compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 ft. apart. This species also makes attractive specimens in small pots in a few weeks from seed. Mixed seed of the double sorts will give a large percentage of good double flowers, while the seed of special named double sorts is remarkably fine. Some of the single forms are very finely colored.

The African Marigolds, \textit{T. erecta}, are not well suited to bedding purposes, the growth being too open, but for the mixed border or shrubbery they are excellent late-blooming subjects. This species should be grown with plenty of root room, air and rich soil from start to finish if the largest and most double flowers are desired. The African Marigolds are very useful as cut-flowers except under circumstances where their odor is objectionable.

For Pot Marigolds, see Calendula.

\begin{itemize}
  \item \textbf{a.} Fls. generally marked with red.
  \item \textbf{b.} Lvs. pinnately divided.
  \item \textbf{c.} Rays numerous.
\end{itemize}

\textit{patula}, Linn. \textit{French Marigold.} Fig. 2459. A hardy annual, usually about 1 ft. high and much branched from near the base, forming a compact, bushy plant; lvs. darker green than in \textit{T. erecta}, pinnately divided; lobes linear-lanceolate, serrate; fls. smaller than in \textit{T. erecta} and borne on proportionately longer peduncles. P.M. 150; 3830 (as \textit{T. erythrophylla}).—Both the single and double forms are grown. The species is very variable as to the color markings of the flowers, which range from almost pure yellow to nearly pure red.

\begin{itemize}
  \item \textbf{a.} Fls. not marked with red.
  \item \textbf{b.} Lvs. pinnately divided.
  \item \textbf{c.} Rays numerous.
\end{itemize}

\textit{erecta}, Linn. \textit{African Marigold.} Fig. 2460. A hardy annual growing about 2 ft. high, erect, branched; lvs. pinnately divided, segments lanceolate-serrate; fls. 2-4 times as large as in \textit{T. patula} and of one solid color, the typical color, according to De Candolle, being a lemon-yellow.—The rays are sometimes rather two-lipped and in one of the garden forms they are quilled.

The color ranges from a light sulfur-yellow to a deep orange, many of the light yellow shades being rare amongst flower colors. This is the common marigold of old gardens in America. Foliage very strong-scented.

\begin{itemize}
  \item \textbf{a.} Fls. generally marked with red.
  \item \textbf{b.} Lvs. pinnately divided.
  \item \textbf{c.} Rays numerous.
\end{itemize}

\textit{signata}, Bart. An annual branching species: lvs. pinnately divided into usually 2 oblong, linear, sharply serrate segments, the lower teeth awned; rays 5, yellow, roundish-ovate. Var. \textit{pumila}, Hort., a dwarf, bushy form, usually less than 1 ft. high, seems to be the only form in the trade. The flowers are bright yellow and small but numerous.—The species is suited for massing or for borders. R.H. 1895, p. 505.

\begin{itemize}
  \item \textbf{a.} Fls. generally marked with red.
  \item \textbf{b.} Lvs. lanceolate, simply serrate.
\end{itemize}

\textit{lucida}, Cav. \textit{Sweet-scented Marigold.} A tender perennial plant, entirely distinct from the foregoing annuals in the sessile, lanceolate lvs. and small, usually 2-3-rayed fls. in dense, terminal corymbs. The flowers have a much more agreeable odor than the other species cultivated. Chile. B.M. 740. R.H. 1895, p. 505.—Sometimes used as a substitute for Tarragon, which see.

\textit{T. hiera} is a species discovered about 1896 by T. S. Brandegg in Lower California. It makes a compact bush 4-5 ft. high, bearing a profusion of yellow flowers borne in winter. Small plants flower well in pots. See G.F. 9:67.

P. W. Barclay.
TALAUMA

finely with the ivory white of the petals. This species is a native of the Himalayas, a region which is perhaps richer in handsome Magnolia-like trees than any other area of equal size in the world. Hooker ranks this species second in beauty only to Magnolia Campbellii. T. Hodgsoni grows at an elevation of 5,000 to 6,000 feet. This fine tree has been flowered at Kew and perhaps elsewhere in Europe, but never in America, so far as is known. Time and time again seeds were received at Kew from India, but they never germinated, the reason being the rapid decay of the albumen, involving that of the embryo. The trees now cultivated in Europe have been derived from young plants sent from India in Wardian cases at considerable expense and risk.

Talauma is closely allied to Magnolia, but the carpels are indehiscent and deciduous, while those of Magnolia dehisce dorsally and are persistent. Talauma is a genus of about 15 species of trees and shrubs, mostly natives of the tropics of eastern Asia and South America; also Japan. Leaves, inflorescence and seeds as in Magnolia: sepals 3; petals 6 or more in 2 or more whorls; stamens very numerous, in many series; ovaries indehiscent, 2-ovuled, spiked or capitate; carpels woody, separating from the woody axis at the ventral suture and leaving the seeds suspended from the latter by an elastic cord.

Hodgsoni, Hook. & Thom. Tender, evergreen tree, 50-60 ft. high, producing lvs. and fls. at the same time: lvs. 8-20 x 4-9 in., obovate-oblong, cuspidate or obtuse, leathery, glabrous: fls. solitary, terminal; sepals 3-5, purple outside; petals about 6: fr. 4-6 in. long, Hima-
layas. B.M. 7992.

W. M.

TALIUM (possibly a native name in Siam). Pota-
talae. A dozen or more species of these herbs widely scattered in the warmer regions. With age they sometimes become woody at the base. Lvs. alternate or subopposite, flat: fls. small, in terminal cymes, racemes or panicles, rarely solitary, axillary or lateral; sepals 2; petals 3, hypogynous, epipetalous: stamens 5-9; ovary many-ovuled; style 3-cleft or 3-grooved at apex; capsule globose or ovoid, chartaceous, 3-valved; seeds subglobose or laterally compressed, somewhat kidney-shaped, shining.

patens, Wild. Erect subshrub: stem almost simple, 1-3 ft. high, leafy to the middle, where the panicle begins: lvs. mostly opposite, oval, abruptly tapering at the base: panicle terminal, long, leafless, bearing di-
chotomous cymes; fls. carmine; petals 3 lines long; stigmas 2 lines wide. West Indies and east coast of S. Amer. to Buenos Ayres. Var. variegatum, Hort. ("Talinum variegatum," Hort. Basilia variegata, Hort.), is the plant described as Sweet Malabar Vine in Vol. I, page 195, of this work.

W. M.

triangulare, Wild. Lvs. alternate, obovate-lanceo-
late cymes euryphorous; pedicels 3-cornered (in T. patens they are filiform): fls. red or white. West Indies, Brazil, Peru. Var. crassilobum, Hort. (T. crassilobum, Hort.), is said to be taller and more branched: lvs. larger, often emarginate and mucronate.

Talinum patens, var. variegatum, is a handsome greenhouse shrub, with foliage marked white and sometimes also pink. The young stems are pink and succulence, but they become woody with age. The plant is allied to Portulaca and will endure much heat and drought, but is very impatient of overwatering and lack of drainage. The plants bloom freely, the fls. being small, light pink and followed by small, yellow, oval, seeds filled with an indefinite number of little brown seeds. Some prefer to retain the sprays of blossom, but to make the best show of foliage the flower-shoots should be cut off as soon as they appear. Talium is a satisfactory house plant. It should be placed in a window with a northern exposure or in some other shady position. Talium may also be planted out during the summer.

W. C. STEELE.

TALIPOT PALM. See Corypha umbraculifera.

TALLOW SHRUB. Myrica cerifer. TALLOW TREE. Chinese. Sarpent seifatum.

TALLOW WOOD. Eucalyptus microcorys.

TAMARACK. See Larix.

TAMARIND. See Tamarindus.

TAMARINDUS (From Arabic, meaning "Indian date"). L Egyptinus. The Tamarind, Fig. 2461, is an exceptionally beautiful and useful tropical tree. It attains a great height, has acacia-like foliage and yellow flowers about an inch across in clusters of 8 or 10. The Tamarind is cultivated in the tropics but its native country is uncertain, probably either Africa or India. As an ornamental shade tree it is considered by travelers as one of the noblest in the tropics. Hooker has well described its "vast, dense and bushy head of branches, thickly clothed with light and feathery foliage." The Tamarind is grown out of doors in southern Fls. and Calif., and young plants are said to be desirable for the decoration of windows and conservatories in northern countries.

The pods of the Tamarind, which are thick, linear and 3-6 in. long, contain a pleasant acid pulp much used throughout the tropics as the basis of a cooling drink. The pulp is also used in medicine, being rich in formic and butyric acids. It is laxative and refrigerant, and is also used to prepare a gargle for sore throat. The pulp of the Tamarind is generally called the "fruit" or "Tamarind" and the pod is spoken of as the "shell." In the East Indies the shell is removed and the pulp is simply grilled and put into sugar as a mass. The Tamarinds of the Malay Archipelago are considered better than those of India. They are preserved without sugar, being merely dried in the sun. They are exported from one island to another and when sent to Europe are cured in salt. In the West Indies the fruit is prepared by removing the shell and placing alternate layers of fruit and sugar in a jar and then pouring boiling syrup over the mass. McFadyen says that in
order to prevent fermentation, the first syrup, which is very acid, is poured off and a second is added. Also that an excellent preserve is imported from Curacao, which is made from the unripe pods preserved in sugar with the addition of spice. The East Indian Tamarind has long pods; the West Indian short ones.

The Tamarind tree yields a handsome furniture wood. It is yellowish white, sometimes with red streaks, hard and close-grained; heart-wood dark purplish brown.

Botanically, the flower of the Tamarind is rather difficult to understand. It is far removed from the sweet pea type, which is the one a northerner commonly thinks of as typical of the tropic family. At first glance it is a pale yellow flower about an inch across with 6 or 7 petals, of which 3 are veined with red. On closer study it seems that 4 of the showy parts are sepals, which are all pale yellow. The three red-veined parts are petals, while the other two petals that the student expects to find, are reduced to mere bristles hidden in the flower at the base of the staminal tube. Only 3 of the stamens are fertile, the other 6 being small and rudimentary. These floral characters distinguish Tamarindus from allied genera, of which only Schotia seems to be cult. in America.

Tamarinds can be raised from cuttings but more easily by seeds, although they grow slowly.

Indica, Linn. (T. officinalis, Hook.). Tamarind. Fig. 2461. Tender evergreen tree, attaining a height of 80 ft., with a circumference of 25 ft. IVs. abruptly pinnate; fls. 20-40, opposite, oblong, oblique; fls. pale yellow, the petals veined with red. B.M. 4563. The fls. are said to vary to white or pinkish.

W. Harris, E. N. Reasoner and W. M.

TAMARISK. See Tamarix.

TAMARIX (ancient Latin name, Tamarischée, Tamarisk). Ornamental shrubs or trees, with minute, alternate, scale-like leaves and small, usually light pink flowers in racemes or terminal panicles, followed by small capsular fruits. None of the species are quite hardy north, but T. Oles ana, Gallica and parviflora are fairly hardy as far north as Massachusetts. All Tamarisks have graceful and distinct appearance, with light and feathery foliage and large, loose panicles of pinkish flowers. Several of the species bloom late in summer and are a welcome addition to our autumn-flowering shrubs. As they are inhabitants of warmer arid regions, they are well adapted for countries of similar climatic conditions. They are also excellent for various other uses as well. They grow well in saline and alkaline soil and thrive in the very spray of the salt water. Prop. by seeds, which are very fine and slightly plati. They are covered, or usually by cuttings of ripe wood or greenwood cuttings under glass.

About 15 species from the Mediterranean region to E. India and Japan. Shrubs or trees; ivs. alternate, scale-like, often amplexicaul or sheathing; fls. small, short pedicel-ed or sessile, in rather dense racemes; sepals and petals 4-5; stamens usually 4-5, rarely 8-12, sometimes slightly connate at the base; ovary one-celled, surrounded at the base by a disk; styles 2-5: fr. a capsule, dehiscence into 3-5 valves; seeds many, minute, with a tuft of hairs at the apex. Several species have medicinal properties and yield dyes-stuffs. The punctures of an insect, Pulicaria minuscula, cause T. minuscula to produce "manna."

T. Germanica, Linn., is now referred to the genus Myricaria, which is chiefly distinguished by the 10 stamens connate one-third to one-half and with the 3 sessile stigmas. Ten species are known, all shrubby or suffrutescent, with the fls. in terminal, often panicled racemes. M. Germanica, Desv., is a glabrous subshrub, 4-6 ft. high, with upright, wand-like branches: IVs. minute, bluish green, lanceolate, glandular-dotted, fls. light pink or whiteish, in 4-6 in. long terminal racemes, usually with lateral ones at the base; stamens connate about one-half. M. and S. Eu., W. Asia. M. Dahurica, Ehrenb. (Tamarix Dahurica, Willd.), is very similar, but racemes usually solitary and stamens connate only one-third. Dahlania, Transbaikalia. The culture is the same as of Tamarix; they prefer sandy, moist soil.

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Carnarvan, 3.
Castica, s. L
Chinesis, 5.
Japonica, 4.
juniperina, 4.

A. Fls. 4-merous; racemes lateral on last year's branches.
B. Petals spreading, persistent
BB. Petals erect, deciduous

AA. Fls. 5-merous, usually in terminal panicles.
B. Lvs. glabrous.
C. Petals deciduous
CC. Petals persistent
D. Racemes lateriflorae
DD. Racemes paniculatae, terminal
E. A tree
EE. A shrub
BB. Lvs. pubescent

1. parviflora, DC. (T. tetrandra, var. parviflora, Boiss. and Kotschy). Fig. 2462. Shrub or small tree, 15 ft. high, with reddish brown bark and slender spreading branches; IVs. ovate, acute, acuminate, often spine-bearing, rather scarious at the apex when older: fls. pink, very short pedicel-ed, slender in racemes about 1 in. long, along last year's branches; petals spreading, persistent; calyx very small, sometimes only 3-parted; styles usually 3, much shorter than ovary. April, May. S. Eu. F.S. 9:89. R.H. 1855:101. Often confounded with the following species, also with T. Africana and Gallica and cult. under these names. T. tetrandra, var. parviflora, probably belongs here.

2. tetrandra, Pall. Shrub or small tree, attaining 12 ft., with almost black bark; IVs. ovate-lanceolate, somewhat narrowed at the base, with diaphanous margin; fls. light pink or almost white, in racemes 2-1 in. long along last year's branches; disk usually 4, about as long as ovary. April, May. S. Eu. W. Asia.—Doubl. Whether in cultivation in this country; all plants seen under this name by the writer belong to the preceding species.

3. Gallica, Linn. (T. pentandra, Pall. T. arboresca, Sieb. T. Cuspidata, Willd., T. Anglica, Weh.). Shrub or small tree, with slender spreading branches; IVs. dull to bluish green, closely imbricated, rhombic-ovate, acute or acuminate, keeled, semi-amplexicaul, with scariosity near the base; fls. small, white or pinkish, almost sessile, in slender, panicled racemes; petals deciduous; filaments dilated at the base; disk usually deeply 5-lobed; styles 3. May-July. W. Eu. Mediterranean region to Himalaya. Described in Fig. 2462, p. 229.—Var. Indica, Ehrenb. (T. Indica, Willd.). With slender, upright branches; IVs. dull green; racemes longer and slenderer: fls. pink; disk obscurely and
Ivs., I., - ii

TAMARIX

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petals;

Vahl.

Stev.

1

TAMARIX

Shrub

1

Japan,

S.W.

Himalayas.

TARAXACUM

Fig. 2463. Stem robust, erect, 2-3 ft., leafy to the summit: lvs. pinnately di-

vided into linear-lanceolate segments which are serrate

or pinnately cut: fl.-heads ¼-½ in. across, numerous,

in a dense, flat-topped cyme. July.-Sept. Europe. Ad-

dventive in the eastern U. S. Var. crispm, DC., has the

leaves more cut and crisped. According to B.B. 3:460,

this variety is in some places more common than the

type.

T. vulgare, Linn. TANSY. Fig. 2463. Stem robust, erect,

2-3 ft., leafy to the summit: lvs. pinnately di-

vided into linear-lanceolate segments which are serrate

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leaves more cut and crisped. According to B.B. 3:460,

this variety is in some places more common than the

type.

F. W. BARCLAY.

TANGIERINE. See Orange and Citrus

TANGIER PEA, Scarlet. Lathythus Tingitanus.

TANSY (Tanaacetum vulgare, Linn.). Fig. 2464. A

curse-groving, herbaceous perennial naturalized from

middle Europe, and a familiar occupant of our old gar-

dens, waste places and roadsides. Its common name is

said to be derived from anathem, immortality, an idea

suggested to the ancient Greeks by the characteristic

inflorescences which possess a head of the flower at the

upper, usually unbranched stems, which rise about 3

feet from the perennial root, bear greatly divided,

devy cut, compound, bitter, aromatic leaves and

rather dense corymbs of numerous small yellow

flowers-heads which appear in midsummer. The seed,

which is small, is marked by 5 rather prominent gray-

ish ribs and retains its vitality for about two years.

Formerly its leaves were in great favor as a seasoning

for various culinary preparations, especially puddings

and omelettes, uses now almost obsolete. By the medi-

cal profession, its tonic and

stimulant properties and its efficacy in hysterical

and dyspeptic disorders are still recognized, though

other medicines are more popular. In domestic prac-

tice it played an early role as an an

themintic and

stomachic and is still some-

what popular as a local

agent to relieve the pain of

muscular rheu-

matism,

bruises and chronic ulcers.

The wild plants usually

satisfy all demands, but

when no wild supply is at

hand seed may be used to

start the half-dozen speci-

mens that a family should

need. Easily started, read-

illy transplanted or divided.

Tansy requires no special

care in cultivation except
to keep it clear of weeds and to prevent its spreading

and thus becoming troublesome as a weed. It will

thrive in almost all soils and situations that are not too wet. For botanical account, see Tanaacetum.

M. G. KAINS.

TAPE GRASS. Vallisneria.

TAPIOCA. See Manihot.

TARAXACUM (ancient name of doubtful origin, probably associated with supposed medicinal proper-
ties. Compositae. DAXLEIEN. Low nearly or quite

stemless herbs of cold and temperate regions, mostly of

the northern hemisphere. The plants are exceedingly

variable and there are consequently great differences

of opinion as to the number of species. Bentham &
TARAXACUM Hooker would reduce them to about 6, and others would retain 25 or more. Taraxacums are distinguished by having large many-flowered ligulate yellow heads solitary or naked and hollow scapes; involucre with one inner series of erect narrow bracts and outer caespitose spreading sometimes reflexed bracts; pappus simple and capillary, borne on a slender beak terminating a fusiform elongated angular achen; flowers opening in sunshine.

The common Dandelion is **T. officinale**, known also as **T. dens-teotonis**. See Dandelion. It varies immensely in stature and form of leaves, as shown in Figs. 2465-68. For history, see Sturt-vant, Proc. 6th Meeting Soc. Prom. Agr. Sci., and Amer. Nat., Jan., 1886. For an account of the red-seeded Dandelion, **T. erythrospermum**, see Fernald, Bot. Gaz. July, 1895:323. From the common Dandelion it differs in having smaller sulfur-yellow heads, smaller and very deeply cut leaves, outer involucres scales not reflexed and somewhat glaucous; achenes red or red-brown and shorter beaked; pappus dirty white. It is known to occur in New England, New York and Pa., perhaps naturalized from Europe.

L. H. B.

TARE, TARES. To the modern English farmer the word "Tare" means the common vetch, **Vicia sativa**, although Tare is also applied loosely to other species of **Vicia** and **Lathyrus**, particularly **Vicia hirsuta**. The celebrated passage in Matthew xiii, 25, "His enemy came and sowed tares among the wheat," refers probably to the darnel, **Lolium temulentum**. The original Greek word in Matthew is **Zizania**, a name which in botany refers to the wild rice. Darnel belongs to the grass family and its seeds were long thought to stupefy those who ate them unwholesomely. Recent investigations have proved that darnel seeds have no narcotic properties.

**TARRAGON** (**Artemisia dracunculus**, which see) is a close relative of wormwood (**A. absinthium**). It is a perennial composite herb native of the Caspian Sea region and Siberia, and is cultivated as a culinary herb in western Europe. Its lanceolate, entire leaves, and small, inconspicuous and generally sterile blossoms are borne upon numerous branching stems, 2-3 feet tall. Its green parts, which possess a delicate, aromatic flavor resembling anise, are widely used for seasoning salads and for flavoring vinegar, pickles and mustard. The essential oil of Tarragon and Tarragon vinegar are articles of commerce, the crop being grown extensively in southern France for that purpose. The former is obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather the crop for distillation or infusion is when the first flowers begin to open, since the plants have then a larger percentage of oil than before or after. From 200 to 250 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated Tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for division is when the plants have just commenced to grow in the spring. Tinchy-trenchant roots should be avoided and only loams of medium texture and of poor quality in sunny situations chosen. The plants may be set, either in the spring or in the autumn, one foot apart and cultivated like sage or mint. The flower-stems should be removed as soon as seen, as this will force greater growth of leaves, etc. The green parts may be gathered at any time, after the plants have become established, and used fresh. Dried Tarragon is nearly as useful as green, but there is little market for it, less even than for the leaves. At the approach of winter, especially in cold and snowless climates, the stems should be cut down and the plants covered with litter or leaves. The position of the beds should be changed every three or four years. Tarragon is less cultivated in America than it deserves. Most of our Tarragon vinegar comes from France.

**Tagetes lucida** is much like Tarragon in flavor and has been used as a substitute for it.

M. G. Kaigh.

**TASMANNIA** (after Abel Jansen Tasman, Dutch captain who discovered Van Dieman's Land, or Tasman, **Magnoliaceae**). This genus is included under Drimus by Bentham and Hooker. A small genus of orange or yellow-green aromatic, globular trees or shrubs with simple, short-petalled flowers, with transparent dots and terminal clusters of greenish yellow, rose or white flowers.

**D. aromatica**, F. Muell. (**T. aromatica**, R.B.), is a shrub or small tree cultivated in a few north-
ern greenhouses; lvs, rather small, oblong or oblong-lanceolate, usually obtuse, narrowed to a short petiole: fls. \(\frac{3}{4}\)-1 in. across, in small, terminal clusters. Spring. Tasmania. B.R. 31:43 (white, tinged pink).

F. W. Barclay.

TASSEL FLOWER. See Emilia flammea and Brickellia.

TAU-KOK BEAN. See Dolichos.

**TAXODIUM** (alluding to the similarity of the foliage to that of Taxus). Glyptostrobus, Schubertiæ. Conif. Tall ornamental deciduous or evergreen trees; with distinctly 2-ranked, small, linear leaves and globose or ovoid cones not exceeding 1 in. across. The Bald Cypress, *T. distichum*, is well known in cultivation and is hardy as far north as New England. It is a very desirable tree for park planting. Its light green foliage and the narrow pyramidal habit which it usually retains in cultivation give it a very distinct appearance. In its native habitat it forms in old age a broad, round-topped head sometimes 100 ft. across and has the trunk much enlarged at the base by huge, often hollow buttresses projecting in all directions and termi-
of which the following are the most important: Var. fastigiatum, Knight. With slender, upright, virgate branches sparingly ramified. Var. microphyllum, Carr. Shrub, with short spreading branches; the lateral branchlets with typical foliage, those of the longer branches gradually passing toward the end into small, scale-like, imbricate lvs. Var. acutum, Carr. Dwarf, shrubby form, with numerous short branches. Var. alatum, Ait. Branches splitting long and slender, nodding at the tips. Var. pendulum növum, P. Smith. A graceful form with slender, pendulous branchlets. Var. pyramidatum, Carr. Narrow pyramidal form with short ascending branches. T. mucronatum, A. Ten. (T. Maximowiczii, Carr.). Tall tree, occasionally 170 ft. high, with a trunk 20 ft. or more in diameter, evergreen. M. D. G. 3:135. T. heterophyllum, Bronn. (Glyptostrobus heterophyllus, Endl.). Shrub, 10 ft. high: lower branches pendulous: lvs. linear and sedge-like on the same plant: cones ovoid, 4½ in. long, China. Tender and rarely cult. Often ramified with var. of T. distichum.

ALFRED REHDER.

TAXUS (ancient Latin name of the Yew). Coniferæ. Yew. Ornamental evergreen trees or shrubs, with 2-ranked linear leaves, insignificant flowers and showy berry-like red fruits. The best known species is T. baccata, which is hardy as far north as Rhode Island and northwestern New York, while T. cuspidata and T. Canadensis are considerably harder and thrive as far north as Canada; the other species are little known in cultivation. The Yews are very desirable evergreens for park planting; they are densely clothed with dark green foliage and the pistillate plants are particularly beautiful in autumn when loaded with scarlet fruits. They are well suited for hedges and easily trimmed into any desired shape. They are formerly much used for fantastic topiary work (see e. g., G. C. I. 2:264, 265).

That the typical tree-like form of the Yew is nowadays not much planted, is chiefly due to its slow growth, but the numerous mostly shrubby garden forms are popular plants for small gardens. The Yews thrive best in a moderately moist sandy loam and endure shade well. Large plants may be successfully transplanted if it is possible to secure a sufficient ball of earth with the roots. Prop, by seeds, which do not germinate until the second year, and by cuttings taken early in autumn and kept during the winter in a cool greenhouse or frame; the varieties often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow much slower than grafted ones and cuttings of the type rarely grow into trees but usually into low-spreading shrubs (see M. D. G. 1899:565).

Six species are known. They are distributed through the northern hemisphere and in America south to Mexico. They are all very closely allied and could be considered geographical varieties of a single species. Trees or shrubs: lvs. linear, without resin-ducts, pale or yellowish green beneath, usually 2-ranked: fts. usually dioecious, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globose, composed of 4–8 stamens each, with 3–8 anther-cells attached to the peltate connective; pistillate consisting of a single terminal ovule with several bracts at the base; seed a bony nut surrounded or enclosed by a fleshy, rounded, scarlet disk; cotyledons two. The wood is heavy, hard, close-grained, strong, elastic and of reddish color. It is highly valued for cabinet-making and turning, and before the invention of gunpowder was in great request in England for the manufacture of bows. The foliage is poisonous to horses and cattle but the berries are not.


cuspidáta, Sieb. & Zucc. (T. baccata, var. cuspidáta, Carr.). Tree, attaining 50 ft., with a trunk usually 2 ft.

2469. Bald Cypress — Taxodium distichum. (Natural size of lvs. is 5½–8½ inch long.)

2470. Old English Yews that have reached maturity — Taxus baccata.

"Addison’s Walk," at Glasnevin, Ireland.
in diameter; bark bright red; branches ascending; lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous cotton or pale green beneath, ½-1 in. long: fr. like that of T. baccata, Japan. Very similar to T. baccata, but branches more upright, stouter and lvs. somewhat broader, more abruptly mucronate and thicker in texture. Var. nana, Hort. (T. brevifolia, Hort., not Nutt.), is a dwarf compact form with shorter leaves.

**Canadensis**, Marsh. (T. baccata, var. minor, Michx. T. baccata, var. Canadensis, Gray. T. minor, Britt.). Fig. 2471. Prostrate shrub, with wide-spreading slender branches, rarely more than 3 ft. high: lvs. shorter and narrower, less crowded and of a lighter, more yellowish green than those of T. baccata, assuming in winter usually a reddish tint: fr. ripens about 2 months earlier than that of T. baccata: ils. monocious (at least usually). Newfoundland to Manitoba, south to Va. and Iowa. B.H. 1:61. V. 14:232. —In cultivation it becomes usually a more upright and less straggling shrub.


**Alfred Rehder.**

**TEA.** The Tea plant is described in this work under *Camellia Thea*, together with its varieties *Boheia* and *viridis*, of which the former was supposed to yield black Tea and the latter green Tea. Both kinds can be produced from either variety, the difference lying in the process of manufacture, as an agricultural or horticultural crop. It is fully treated in general cyclopeas and elsewhere. For these reasons no general article on Tea is here included. The following article gives an idea of the present condition of the tea-growing industry in America. The Tea plant is shown in Fig. 2472.

**L. H. B.**

**AMERICAN TEA.**—Previous to the inauguration of the Pinchurst experimentation in South Carolina, it had been abundantly demonstrated that parts of the southern states were well adapted for the growth of those varieties of the Tea plant which do not require a tropical climate; and before the Civil War many families supplied themselves with Tea grown and made at home, the result of the distribution of oriental Tea seed throughout the southern states by the national government. But it remained to be solved whether Tea might be produced on a large scale at a profit. The Pinchurst experiments have shown that American tea-gardens are capable of yielding as much as the average Asiatic, and that the quality of the leaf is not less satisfactory.

The advantages in favor of raising Tea in this country are the avoidance of long transportation, which generally induces deterioration in quality; security from the interference of war with the importation of foreign Teas; and the protection of the industry by a duty which shall offset the difference in the price of labor. That some sorts of Tea do not keep well, that the high "firing" of Tea to prevent mildew, necessarily deprivates it of much of its flavor, and that for these reasons the best of the oriental Teas are rarely exported, least of all to the healthy, civilized region, affording lucrative employment to thousands of Europeans and natives. As much can be brought about in many neglected parts of the southern states; but probably, as was the case in Assam, only through the long category of persistent labor, severe trials, frequent mistakes, temporary depressions, and final success.

The disadvantages which operate against the establishment of an American Tea industry are, chiefly, an insufficient rainfall, the higher price of labor, and the conversion of tea-drinkers to the taste of a new sort of Tea. Of secondary importance is the disinclination of capital to embark in the undertaking which, although apparently new, has, undeservedly as we think, the stigma of previous failures. Further experiments to relieve the burden of the above objections will, it is believed, pave the way for a hearty endorsement of the practicability of the industry, and then there will be no withholding of the requisite means.

The Pinchurst experiments have shown, other things being equal, the dependence of the productiveness of the tea-plant upon an abundant supply of moisture, whether of precipitation or production, or by artificial irrigation. The yearly rainfall in the oriental Tea countries varies from 60 to 150 inches, and even more. Almost all of it occurs in the leaf-producing months; whereas here the annual rainfall, during the same season amounts to about thirty inches. It becomes necessary, therefore, that the American tea-planter should conserve and supplement this supply to the utmost, by a system of drainage which shall absorb and yield to the plant as much as possible; by the distribution of the trenches and the terracing of the land with a view to preventing the denudation of the surface and the loss of water during the heavier rains. These objects are largely attained by placing the tea-gardens on well-drained, flat lowlands or former pond-beds. Very recently special attention has been paid to the

**2471. Spray of Taxus Canadensis (× 1/2).**
artificial irrigation of tea fields, whereby it is designed to better approximate to the oriental supply of water during the cropping season, although, of course, it will be needless to attempt to imitate the tropical deluges which not only run off from, but with the soil.

The selection of the most suitable location for the establishment of a tea estate, becomes, then, of the greatest importance. The choice of fertile, flat lands, underlaid by a porous subsoil, susceptible of irrigation by gravity, as a safe-guard against droughts, will obviate the necessity of applying artificial enrichment, of underdrainage, and of elevating by applied power the water needed for irrigation. By a careful observance of these details and the selection of the right sort of seed, the American tea-garden may be made to yield as much or more than the parent bushes from which it sprung. And as the successful commercial tea estate must be on a large scale, like similar undertakings in sugar, whether beet or cane, it will be necessary to consider the means of transportation and accessibility to markets, abundant supply of labor and healthfulness of situation.

The part played by purely manual labor in the cultivation and manufacture of black Tea upon the best equipped British tea estates in India, is being steadily encroached upon by mechanical appliances until now it has been almost relegated to its last functions of planting and leaf-plucking, where it is probably secure. It is true that the cultivation of the soil on the above-mentioned gardens largely depends on manual labor with the hoe, spade and fork. This is the natural sequence of the heavy rains which otherwise denude them of a uniformly well-pulverized surface soil. By avoiding hill-sides and by planting sufficiently far apart it is possible to use plows and cultivators, and thus reduce the cost of cultivation. As yet no mechanical contrivance has been found for dispensing with human labor in the pruning of the tea bushes and the gathering of the leaf. But a ten cent duty on foreign Tea should in many sections of the southern states somewhat compensate for the difference in the cost of these operations here and in the Orient. The testimony before the U. S. Labor Commission has shown that where the negro population is congested, their wages, beyond a scanty supply of food and clothing, are strictly nominal.

very recently the manufacture of green Tea has required a large amount of handwork for the roasting and rolling of the leaf. But most recently it has been demonstrated at Pinehurst that green tea of a high quality may be made solely by machinery, by means of the "Rotary Witherer," invented by the writer, in conjunction with the previously employed rolling and drying machines. And thus, by the substitution of mechanical operations, not only should the output be increased in a scale commensurate with the cost of such an establishment, be made cheaper, but the product should be more uniform and free from the possible contamination of frequently unclean hands (and feet).

It was to be expected that the different climatic conditions should exert their effect on the foreign tea plants and somewhat alter the taste of their product. This experience has been the rule with Tea, and it has cost a considerable, oftentimes disheartening, effort to successfully launch upon the market the output of each new locality. The very limited production at Pinehurst has probably prevented any obstacle to the sale of its crops; the novelty of its product may have largely assisted in readily disposing of it. But were the production of American Tea to suddenly rise into the millions of pounds, it would most certainly have to fight against the prejudice of taste and the established trade in Asiatic teas. The naturally tender and delicate leaves would require an absolutely perfect adaptation to already formed habits of taste and a lowering of price. Time, study, perseverance and money are necessarily demanded, but success seems to be reasonably assured.

It should not surprise anyone familiar with the Teas consumed in the United States and Great Britain that the sorts most highly valued in the Orient, the product of one thousand or more years of differentiation and race, highly prized as often to be commercially unattainable, rarely commend themselves to the tea-drinkers in the former countries.

For nearly ten years the experimentation at Pinehurst was mainly carried on without outside assistance. The National Department of Agriculture, however, contributed very welcome assistance by the gift of tea-seed, publication of reports and other important ways; and for the past two seasons has rendered most effectual pecuniary aid, under the direction of the Secretary of Agriculture, the Hon. James Wilson, who has enlisted the interest and support of Congress in the work. The proprietor of Pinehurst appreciates most deeply this assistance, both in money and sympathy, which he recognizes as being indispensable for the ultimate inauguration of the hoped-for industry. Under the instructions of the United States Department of Agriculture he will diligently continue the experiments which seem most calculated to produce at low cost the medium grades of both black and green Teas, not losing sight, however, of the possible growth and manufacture of the finer varieties.

The first tea plant in this country was set out by the French botanist, Michaux, about 1800, at Middleton Barony, on the Ashley river, distant some 15 miles from Charleston and 10 from Pinehurst plantation. As seen a few years since, it had grown into a small tree about 15 feet high. The reports of the U. S. Patent Office and the Department of Agriculture record the results of many subsequent attempts to introduce and cultivate the tea plant in the southern states. In plant in the southern states, Mr. Junius Smith, of Greenville, S. C., being convinced from the letters of his daughter, then in British India, of the feasibility of raising Tea in this region, began his well-known experiments in this direction. In spite of many varying difficulties and losses, he continued his work to the time of his death, which occurred a few years later. It required only slight encouragement from the Government, by the distribution of plants and seeds, to carry into active practice the experiments of the farmer who has long called for assistance. The Government has also contributed living plants and plants for experimental purposes, and engaged by means of the Government to gather Chinese tea seed, which was distributed in 1858 and 1859 throughout the southern states. The outbreak of the Civil War, shortly thereafter, seriously interfered with the prosecution of these
experiments. Nevertheless, the resultant patches and larger gardens unquestionably produced Tea of fine flavor, although very generally devoid of that strength of liquor which latterly, and especially since the introduc-

tion of the Indo-Ceylon Teas, appears to constitute a most desirable quality for many consumers. It may be presumed, however, that this failure in pungency was largely due to defective care, particularly in inadequate rolling of the leaf, in consequence of which the cup qualities of the Tea were not fully developed.

So far as is known, it remained for the National Department of Agriculture to begin, twenty years ago, the first serious attempt to produce American commercial Tea. In April of that year, the Commissioner Wm. G. Le Duc, to whose great interest in this subject the inception of the experiment was due; the serious prostration by illness of Mr. John Jackson, who had cultivated Tea in India, and under whose management the seed was obtained and the gardens established; the great distance of the station from its source of control (Washinton), as also the unfavorable opinion of a subsequent commissioner as to the ultimate success of the undertaking; combined to cause the total abandonment by the government of the tea-gardens which it had established on the same "Newington" plantation that embraced the adjoining site of the later formed Pinchur est. The Pinchurst investigation owed its origin to the belief that the previous attempts to demonstrate the feasibility of American Tea culture had been arrested before reaching definite conclusions. More careful cultivation and manipulation, the result of protracted observation, with the consequent production of a higher class of Teas, might reverse the generally entertained opinion that the cultivation of Tea, as an industry, in this country must always prove a failure. It was hoped that success in this field of agricultural enterprise would furnish employment for thousands who are now idle and give a value to vast acres at present worthless. The local experiments, begun about ten years ago, were wisely on a small scale; but they have been gradually increased until they now embrace about sixty acres planted in different varieties equipped with the requisite mechanical appliances, facilities for the application of irrigation to some of the tea-gardens, and a well-trained corps of youthful tea pickers. When the experiments have reached their full development, the annual crop should exceed 12,000 pounds of dry, high grade Tea, and this quantity should suffice for the object in view: viz., to determine whether commercial tea may be profitably grown under the local conditions of soil, climate and labor. It was obviously desirable to conduct experiments with as many varieties of seed and on as different sorts of soil and location as possible. To this end, partly by the kind assistance of the U.S. Department of Agriculture and partly by purchase from domestic and foreign producers, a considerable variety of seed, representing many of the choicest sorts of Tea, was obtained. Gardens were established on high and on rolling land, in drained swamps and ponds, and on sandy, clayey, loamy and rich bottom soil.

It was from the outset expected that many of those attempts would prove either partially or wholly unsuccessful, but with very few exceptions the gardens are fully answering the expectations. The annual crop has gradually, but steadily, grown from less than one hundred pounds up to several hundred pounds of leaf. In several years of experimentation have developed a system of pruning in keeping with the local climate. The hopefully crucial trial occurred on February 14, 1899, when the thermometer fell to zero, Fahrenheit—the lowest recorded temperature of the year (December, however, was the month of lowest temperature). The experimentally few exceptions the tea-gardens escaped serious injury, although followed by a diminished yield for two years in some instances. A Rose (Assam Hybrid) tea garden at Pinchurst is shown in Fig. 2473.

Charles U. Shepard.

Tea, Oswego. 

Monarda didyma.

Tea, Paraguay. 

Ilex Paraguariensis.

Teasel. The species of Dipsacus. See p. 491 and Fig. 739.

2473. Assam-Hybrid Tea garden at Pinchur, South Carolina.

TeoMA (abridged from the Mexican name Tecomaxochil). Including Campsis, Campsisradicans, Convolvus, Pandorea, Stenolobium and Tecomaria. Bignoniaceae.

Trumpet Vine. Ornamental evergreen or deciduous, climbing or upright shrubs, or sometimes trees, with opposite, odd-pinnate or digitate leaves and showy white, yellow, scarlet or violet flowers in panicles or racemes, followed by mostly elongated cylindrical pods. Many of the species are suited only for greenhouse cultivation in the North, or for outdoor cultivation only in subtropical or tropical regions. The hardest species is T. radicans, which may be grown as frost hardy as Massachusetts, at least in sheltered positions. The closely allied T. grandiflora is somewhat more tender. The latter, as well as T. radicans var. spectabilis, can be grown as bushy specimens and will bloom freely on the young shoots, even if cut back almost to the ground by frost. Such plants can be easily protected during the winter by laying them down and covering them with earth.

The following are well suited for cultivation in the southern states and California or in the North in the cool greenhouses and will stand a little frost: T. australis, Capensis, Jasminoides, mollis, Ricasoliana, Smithii and stans. T. Amblofisunitis, filifolia and lenuncylayem can be grown only in tropical regions or in the warm greenhouses. The Tecomas, with the exception of the first 5 species described below, are very ornamental climbing plants. T. radicans is particularly adapted for covering walls and rocks, as it climbs with rosettes and clings firmly to its support. The Tecomas require rich, rather moist soil and sunny position. Propagated by seeds, by greenwood cuttings under glass, or by hardwood and also by root cuttings and layers. See, also, Bignonia for culture.

The genus contains more than 100 species, chiefly natives of tropical and subtropical America, also found in Polynesia, S. Asia and Africa. Climbing or upright shrubs, sometimes trees; lvs. odd-pinnate or digitate, opposite, estipulate; fls. in racemes or panicles; calyx campanulate, 5-toothed or irregularly 2-lobed; corolla funneliform, with 5- or rarely 4-lobed limb; stamens 4, 2 longer and 2 shorter; style slender; ovary 2-loculed,
surrounded at the base by a disk: fr. an elongated capsule, loculelally dehiscent, with 2 valves separating from the septum, to which the seeds are attached: seeds numerous, compressed, with 2 large, thin wings. The genus is divided into several natural subgenera, which are considered by some botanists as distinct genera.

Alfred Rehder.

2474. Tecomia Smithii (x 34).

TRUMPET VINES IN THE SOUTH.—All the Tecomias, the climbing species as well as those growing in bush form, are very successfully cultivated in Florida, being well adapted to the soil and climate, but most of them, to do their best, need to be planted from the start in rich soil, and in addition they should be well fertilized at least once a year. They prefer a fertilizer rich in nitrogen, and a heavy mulch will also prove very beneficial. The bushy kinds can be grown in groups or as single specimens on the lawn, while the rampant climbing species, such as T. radicans and T. grandiflora, should be grown on posts and tall stumps, or they may be trained over small oaks, persimmon trees or catalpas.

T. Capensis, a half climbing species, is effectively used for decoration of the veranda, its glowing scarlet flowers contrasting well with the exquisite blossoms and the tropical foliage of the allamandas, thunbergias and Clerodendron Thompsonii, which all flower at the same time. Tecomia stans and T. grandiflora are the two shortest species of the genus, the latter being a climber, flowering abundantly in May and June, while the first one is a large-growing bushy species opening its immense corymbs of vivid yellow flowers the latter part of November and early in December.

The Yellow Elder, T. stans, grows exceedingly well on high pine-land and is perfectly at home in Florida, attaining an immense size if well fertilized and mulched, dense masses 18-25 ft. high and as much through being not at all rare. This Tecomia is the glory of the south Florida gardens in autumn, as is the beautiful Bauhinia purpurea in April, never failing to call forth enthusiastic admiration from all beholders. No shrub is better adapted for the new settlers in the sandy pine-

land gardens. When covered with its large, fragrant flowers it is visited by numbers of hummingbirds and insects. Owing to its rapid growth and dense foliage from the ground, the Yellow Elder is highly valued as a screen for unsightly fences and buildings. This Tecomia ripens its seed a scanty but that the seedlings come up around the old plant. The value of this shrub, blossoming so late in autumn, cannot be overestimated.

T. mollis, incorrectly known to the trade as T. stans, var. velutina, also does well, but being a native of Guatamala it is much less hardy than the former. The growth is more upright and stiff, the fits are much larger, less serrate and much darker green and the flowers, which are borne in terminal panicles, are smaller and without fragrance and the color is a much lighter yellow. It also flowers several weeks earlier than T. stans. The foliage looks crisped and often blackish, being attacked by a kind of aphids and by several fungi.

T. Smithii is said to be a hybrid between T. mollis and T. Capensis, raised near Melbourne, Australia, by Mr. Edwin Smith. The plant comes true from seed, and seedlings flower when about a year old, beginning to open their large clusters of yellow and reddish trumpets in April and continuing with short intervals until cut down by frost in December.

The Cape Honeysuckle, T. Capensis, is another species which grows most luxuriantly in Florida gardens and in those all along the Gulf coast. It is usually grown on trellises on verandas and piazzas with a southern exposure. Of all the species this is the best and most suitable for verandas, being a dense and compact grower, evergreen, almost constantly in flower, easily kept in health and readily trained into shapely specimens. If the long shoots are cut back severely, the plant can be easily trained into shrub form. These long shoots, usually lying flat on the ground, readily strike root, and form an excellent material for propagation. T. Capensis and T. Smithii are the only Tecomias which grow and flower fairly well as pot-plants in northern greenhouses. They need good soil and rather large pots to do well. If not well cared for they lose most of their foliage and look poor and unshapely.

The Chinese Trumpet Creeper, T. grandiflora, is the most floriferous and gorgeous of all the climbing species. In the writer's garden a large pine stump, about sixteen feet high, in May and June is completely covered with masses of brilliant fiery orange-scarlet flowers which can be seen at a distance of half a mile. The flowers are much larger, more brilliant and much more abundantly produced than those of our native T. radicans. While all the other Tecomias are almost free from the attacks of insects, this one is infested by a voracious caterpillar, which devours the leaves completely. The hunger grasshopper also attacks the lower foliage. T. grandiflora grows well in the poor sandy soil, perfectly luxuriant shoots 25-30 ft. long in one season if well fertilized. Like our native species, this one is deciduous.

Our native Trumpet Creeper, T. radicans, is very common in the southern woodlands and fields. There is a great variety in the brilliancy of the blossoms. This is an excellent plant for covering the bare trunks of palmtrees.

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

The Bower Plant of Australia, T. Jasminoides, is a tall, rampant climber, reveling in the Florida sunshine, but it needs a very rich soil and during dry weather an abundance of water. A heavy mulching also proves very beneficial. Plants only two feet high have flowered profusely. In good soil it grows in one season 20-30 ft. high, clambering from the ground or a tree trunk. T. Mackennii, from Natal and Ceylon, demands a very rich soil and a heavy mulch of stable manure. Its leaves easily drop from the woody branches after a
cold night, and 6 or 7 degrees of frost kill the plant down to the ground. For this reason the vine should be banked with dry sand every fall and if killed down to the banking it must be cut off immediately or the entire plant will die. Plants raised from seed received under the name of T. Ricasoliana, from Italy, are much harder and more floriferous than those obtained from seed imported from South Africa, but the flowers of both are exactly alike. In order to flower profusely this species must be planted in tall stumps, or on arbors and sheds by itself, never mingled with other species. This species is properly T. Ricasoliana.

T. filicifolia, from the Fiji Islands, has never flowered in the writer's garden and is cut down by frost almost every winter, but it is a strong grower and worth planting for the foliage alone.

T. Valdiviana has proved to be a very poor grower and is very difficult to keep in health for any length of time. Apparently not in the trade. — H. Nehrino.

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(Including some names from other genera. s. l. = supplementary list.)

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<td>cheynesiana, s. L.</td>
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<td>filicifolia, 13</td>
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<td>serratifolia, s. L.</td>
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<td>Thurtugali, 8</td>
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<td>Valdiviana, s. L.</td>
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<td>velutina, 4</td>
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A. Habit upright.
B. Foliage digitate; fls. pink.
C. Panicot few-fld. — 1. leucoxylon
CC. Panicot many-fld. — 2. rosea
BB. Foliage pinnate; fls. yellow.

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<tr>
<th>Name</th>
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<tr>
<td>adpecus,</td>
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<td>oregnano, s. L.</td>
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<td>ricasshiana, 10</td>
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AA. Habit climbing or prostrate, rarely suberect.
B. Stems exserted. (Teocarumia.) 6. Capensis
BB. Stems included.
C. Pairs of lfts. 2-2.
D. Fls. in racemes, orange, red or scarlet. (Campsis.)
E. Lfts.; sepals; racemes terminal.
F. Corolla-tube much longer than calyx. ... 7. radicans
FF. Corolla-tube little exceeding the calyx. ... 8. grandiflora
EE. Lfts. entire or sinuate; racemes axillary. ... 9. Ambonensis
DD. Fls. in terminal panicules, white or light pink (Pandorea.)
E. Margin of lfts. serrate. ... 10. Ricasshiana
EE. Margin of lfts. entire.
F. Corolla 2½ in. long. ... 11. australis
FF. Corolla 1½-2½ in. long; 12. jaminoides
CC. Pairs of lfts. 9-20. (Campisidium.) ... 13. filicifolium

1. leucoxylon, Mart. (Bigoniia leucoxylon, Linn.). Evergreen tree; lvs. long-petioled, digitate; lfts. usually 5, stalked, long-oblanceolate, entire, glabrous, 1-2½ in. long; fls. terminal, in few-fl. racemes or solitary; corolla funnelliform, with large, spreading limb, rosy pink, 2-2½ in. long; calyx 2-lipped; capsule linear, 6-8 in. long. W. Indies, Guiana.

2. rosea, Bertol (Tabebuia rosea, DC.). Evergreen tree; lvs. digitate; lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, entire; fls. in many-fl. terminal panicles; corolla funnelliform-campulaceous, with short tubular, spreading lobes, rosy pink; calyx campulaceous, obscurely 2-lobed, almost truncate. Guatemala.

3. stans, Juss. (T. sambucifolia, Humb. & Bonpl. Stenolobium altum, Seem.). Yellow Elder. Upright shrub; lvs. odd-pinnate; lfts. 5-11, almost sessile, ovate-lanceolate to narrow-lanceolate, acuminate, indecisely serrate, glabrous, 1½-4 in. long; fls. in large, terminal racemes or panicles; corolla funnelliform-campulaceous, yellow, 1½-2 in. long; capsule linear, 5-7 in. long. Spring to Sept. S. Fla. to Mex., W. Indies. B. M. 3191. — Sometimes called yellow begonia. Fls. fragrant.

4. mollis, Humb. & Bonpl. (T. velutina, Lindl. T. stans, var. velutina, Hort.). Similar to the preceding, but pubescent; lfts. 5-9, oblong-ovate, acuminate, less deeply serrate or almost entire, villous pubescent on both sides or only beneath, 2-4 in. long; fls. like those of the preceding, but little or not at all fragrant. Mexico to Chile and Peru.

5. Smithii, W. Wats. Fig. 2474 (adapted from The Garden). Upright shrub; lvs. odd-pinnate; lfts. 8-17, oblong, obtuse or acute, serrate, 1-2 in. long; fls. in large, compound panicles, sometimes 8 in. long and as broad; corolla tubular-funnelliform, with 5 reflexed, rounded lobes, bright yellow tinged with orange, 1½-2 in. long. Sept.-Jan. Intro. from Australia and supposed to be a hybrid of T. mollis and Capensis. G. C. III. 14:649. Gn. 48:1022. L. H. 45:55, 107. Gt. 48, p. 52. G. M. 36:627. — Blooming in the greenhouse in winter and well suited for cultivation in pots.


7. radicans, Juss. (Bigoniia radicans, Linn. Campsis radicans, Bur.). TRUMPET CREEPER. TRUMPFET VINE. TRUMPET HONEY-SUCKLE. Figs. 2475, 2476. High-climbing shrub, clinging with rootlets; lvs. odd-pinnate; lfts. 9-11, oval to ovate-oblong, acuminate, serrate, dark green above; glabrous and pubescent beneath, at least along the midrib, 1½-2½ in. long; fls. in terminal racemes; corolla tubular-funnelform, with 5 broad spreading lobes, usually orange with scarlet limb, 2-3 in. long, tube almost thrice as long as the 5-toothed calyx; fr. cylindrical-oblong, keeled along the sutures, stalked.

8. grandiflora, Del. (T. Chinensis, C. Koch. Big- nonia Chinensis, Linn. Octopus, L. Chinese Trumpet Creeper. Fig. 2477 (adapted from Gardening). Climbing shrub, with few or no aerial rootlets; lvs. odd-pinnate; lfts. usually 7–9, ovate to ovate-lanceolate, serrate, glabrous beneath, 1½–2½ in. long; fls. in terminal racemes; corolla funnelform, campanulate, shorter and broader than that of the preceding species, scarlet, about 2 in. across; calyx 5-lobed to the middle, as long as the tube of the corolla: fr. obtuse at the apex. Aug.–Sept. China. Japan. B.M. 1398; 3911. F.S. 11:1124, 1125. Gn. 27, p. 94; 33, p. 348; 47, p. 373. G.F. 3:398. F.R. 2:27. G.N. 4:139.—Less high-growing and sometimes shrubby; flowers when quite small and can be grown as a pot-plant, also suited for forcing. Var. astrosanguinea, Hort. With deeper scarlet fls. Var. Thunbergii, Hort. (T. Thunbergii, Sieb.). Fls. bright scarlet, with very short tube and reflexed lobes. Often a var. of T. radicans is cult. under the name T. Thunbergii. There are probably also slight differences of this and the preceding species. Var. praecox is advertised.

9. Ambonensis, Blume. Evergreen climbing shrub; lvs. odd-pinnate; lfts. 3–7, elliptic-ovate, acuminate, sinuate or almost entire, puberulous beneath, 3–3½ in. long; fls. in lateral racemes, corolla tubular-funnelform, with erect or slightly spreading 5-lobed limb, red, 3–4 in. long. Ambon.

10. Ricasoliana, Tanfani (T. Macbainii, W. Watson. Paniculata Virgata, Bailey.). Evergreen climbing shrub; lvs. odd-pinnate; lfts. 7–11, short-stalked, elliptic-ovate, acute or acuminate, serrate, dark green above, pale beneath, glabrous, about 1 in. long; fls. in loose, terminal panicles; corolla funnelform, campanulate, with spreading 5-lobed limb, light pink, striped red. 2 in. long; calyx 5-toothed: fr. linear, terete, 10–12 in. long. S. Africa.

11. australis, R. Br. (Bigonia Pandorii, Sims. Wonga-wonga Vine. Evergreen climbing shrub; lvs. odd-pinnate; lfts. 3–9, elliptic-ovate to ovate-lanceolate, acuminate but bluntly pointed, entire or sometimes coarsely crenate, shining above, glabrous, 1–2½ in. long; panicles many-fl.; corolla funnelform-campanulate, with 5-lobed spreading limb, yellowish white, spotted violet in the throat, ¾ in. long; fr. ob- long, pointed, 2–3 in. long. Spring. Australia. B.M. 863. Gn. 27, p. 94.


2477. Tecomia grandiflora on a clothes post.

13. Hillicolia, Nichols. (Campsisflorum: Hillicolia, Van Goor.). Climbing evergreen shrub, oval, lvs. odd-pinnate, 5 in. long; lfts. 19–25, ovate, with 2 or 3 lobes on each side, the larger lobes sometimes dentate. Fiji Islands. F. 1874:280.

T. esculenta, DC. (Tabebuia asculifolia, Hemsd. Bigonia asculifolia, Linn. and Salm-Dyck.). Tree, about 20 ft. high; lvs. digitate, with 7 oblong-obovate lfts., pungent above, tomentose beneath: fls. in terminal panicles, subcapitate, orange-red, with yellow spots on the 3 lower lobes. Mexico. — T. chrysanthus, DC. (Tabebuia chrysanthas, Nichols.). Evergreen tree; lvs. digitate, with 5 ovate entire, tomentose lfts.; fls. in terminal racemes, yellow, funnelform, 2 in. long, fragrant. — T. fulva, Don (Tecomaria fulva, Bbll.). Evergreen upright shrub to 15 ft. high; lvs. odd-pinnate, with 9–13 small, ovate, toothed lfts.; fls. in terminal panicles, tubular-funnelform, slender, yellow, tinged red, ½ in. long; stamens slightly exserted. Pers. B.M. 4986. F. 8. 11:1136.—T. ser-

2476. Trumpet Vine—
Tecomia radicans (X ¼).

TECOPHILAEA (named for Tecomphi Billotti, daughter of a botanist), Homodendron. CHILEAN CROCUS. Two Chilean bulbous early-flowering plants, useful for pots or for forcing, one of which is called the "yellow bulb" and the other "white bulb." They look like blue crenices. They are stemless plants, with 1–few-fl. scapes and linear or lanceolate leaves arising from succulent corms. The flowers are blue, campanulate, with 6 segments, per- fect stamens and 3 staminodia, a single style and a 3-loculed ovary. The botanical position of Tecomphi is open to discussion, but the inferior ovary seems to take it out of the Liliaceae, with which it has been placed by some writers. The plants are useful for blooming in pots indoors early in spring. T. violeteflora, Bertonio, does not appear to be the introduction. The one in cultivation is—

cyanocrocus, Leyb. (sometimes written T. cyanocrocus). Scapes 1–3, erect, 3–6 in. high, 1-fl.; lvs. 2-3 linear-campanulate and undulate; fls. azure blue with white throat, about 1½ in. long, with a narrow tube and obovate segments. Var. Leichleini, Hort., has fls. deep blue with no trace of yellow; sepal and petals same color, 1½–2½ in. long, with a short tube and obovate segments. Species hardy at New York city in protected places, but usually the plants do not thrive more than a season or two; they do not do better farther south. Blooms very early in spring. Fls. violet-scented.

ALFRED REHDER.

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L. H. B.
TEEDIA (J. G. Teede, German botanist, who lived some time in Portugal and died at Surinam). _Serophidium_. Three species of South African plants, with pink 5-lobed fls. 3/4 in. across. They are tender to frost. _T. lucida_ was introduced to southern California in 1900, and Franceschi records that it blooms all the year. The larger-flowered species, _T. pubescens_, seems not to be known to the American trade. Both plants emit the rank herbaceous smell peculiar to henbane when its foliage is bruised, and _T. pubescens_ has the same rank of greasy pubescence. The plants have a wonderful worth cultivating in the northern greenhouses. When they were new to cultivation they were supposed to be biennial herbs, but Bentham and Hooker call them shrubs. Franceschi writes: "_T. lucida_ acts like an annual in southern California. It is rather pretty but weedy. It seeds freely. Seems to prefer half shade. The smell of the foliage is very objectionable."

Generic characters: calyx deeply 5-cut; corolla-tube cylindrical; lobes 5, rounded, subequal; stamens 4, didynamous, included; anther-cells parallel, distinctly ovulate numerous in each locale: berries subglobose, indehiscent.


TELANTHERA (name refers to the fact that all ten parts of the staminal cup are equally developed). _Amaranthaceae_. Alternanthera. Apparently all the Alternantheras used by gardeners as bedding-plants belong to the genus Telanthera, which is distinguished from the true genus Alternanthera by having 5 anther-bearing stamens and 5 elongated antherless staminodia united into a cup or tube. In Alternanthera the tube is short or almost none, the anther-bearing stamens sometimes less than 5, and the staminodia short or none. Of Telantheras there are 40 to 50 species, mostly herbs, in tropical America and one in western Africa. The leaves are entire, ovate to elongated, opposite; fls. small, usually in dense heads in the axils, white or sometimes colored, perfect, each subtended by 2 bractlets.

The Alternantheras of gardeners are much used in carpet-bedding and for ribbon-borders, because of their low, compact growth, the bright colors of the foliage, which lends its character throughout the season, and the ease with which they withstand shearing. They are usually kept within six inches of the ground. They are tender to frost, and grow best in warm sunny places. The flowers are inconspicuous and of no account to the gardener. They comprise the stock plants for the foundation work in carpet-bedding.

The plants are propagated by cuttings or division. In either case, they must be carried over winter in the greenhouse or in hot-baths, preferably in the houses at the North. The plants should be kept at 60° or 65° during winter, and rather dry to hold them more or less dormant. Place them where they will receive only enough light to keep them healthy. (1) Cuttings are usually made in August from strong plants growing in the open. The cuttings are stuck in shallow flats and then wintered in these flats without transplanting. The cuttings should be well established before winter sets in, else they will remain weak. In March or April they may be potted off, preparatory to using them in the open. (2) Division is usually preferred by gardeners who have much bedding to do. The plants are lifted after the first frost, cut back to three or four inches long, and planted in flats. In March or April, the plants are divided and the parts (with the old roots shortened in) are potted or transplanted to other flats. However grown, the plants should have four to six weeks in a heated if possible, before they are placed in the open ground. Even in the warm greenhouse they usually make slow growth in March and April.

The botanical status of the garden Alternantheras is imperfectly understood, and the group needs careful study from living plants. Various garden names cannot be accounted for at present. The common garden Alternantheras appear to have issued from the three following Brazilian species.

A. _Lvs. essentially lanceolate or elliptic._

**amena**, Regel. Fig. 2478. Very dwarf: lvs. long-lanceolate or oblong-lanceolate, sometimes elliptic, acuminate, very short-petioled, the under color mostly green but velvety and blotched with red and orange; fls. sessile, single, in pairs or 3’s, terminal and axillary. 1H. 12:347; 15:558.—To this apparently belong the garden names amabilis, spectabilis, sessilis, rosea, Reichei.

AA. _Lvs. essentially spatulate._

Bettziehiana, Regel (_Alternanthera paronychoiodes, Hort._). Fig. 2478b. Lvs. narrow, spatulate, gradually narrowed into a long petiole, orange-red shaded with green; fls. sessile, single, in pairs or 3’s, terminal and axillary. 1H. 12:445.—To this species appear to belong the garden names pieta, tricolor, aurea, aurea nana compacta, paronychoioides, versicolor aurea and _p. major Kanitzii_, magnificat.

**versicolor**, Regel. Fig. 2478c. Usually becoming taller, much branched, and apparently less used for carpet-bedding than the others: lvs. round-spatulate, narrowed into a short petiole, the colors mostly in shades of copper-red or blood-red, with patches of green between the veins; fls. sessile, single or in pairs. 1H. 12:440. — _T. lucida_ is probably to be referred here.

L. H. B.

2478. Spray of Telanthera amena; also leaf outlines of (a) _T. amena_, (b) _T. Bettziehiana_, (c) _T. versicolor_.

**TELEGRAPH PLANT.** Desmodium gyrans.

**TELEKIA** is referred to _Biphalalmum_. _T. speciosa_ is _B. speciosum_.

3679
TELFAIREA (Charles Telfair, 1778-1833, Irish botanist; died in Mauritius.). Cucurbitaceae. Telfairea pedata is a tall-growing climber from tropical Africa with digitate leaves, large, purple-fringed flowers of curious appearance, and huge gourds which sometimes weigh as much as 60 pounds. It contains 100 to 300 edible seeds. It has been cultivated in English stoves, a single shoot attaining a length of 56 ft. in a year or so. The male and female fls. are borne on separate plants. The fruits are in racemes, containing 3-5-petaled, star-shaped flowers. They have been used as food and are good as almonds. It was introduced into southern California in 1900, presumably for its economic interest. The seeds are roundish, about an inch across, and the kernels are sweet to the taste and are easy to be eaten as such.

Telocea (Greek; seen at a distance). Proteaceae. Telocea speciosissima is one of the showiest shrubs of New South Wales. It grows 6-8 ft. high and has dense terminal globular heads of blossoms. The heads are 3 in. across and 3 or 4 in. deep and bear a rough resemblance to a florist's chrysanthemum. The showiest parts, however, are involucral bracts. This plant is known as the Waratah. It is one of the most distinct members of a horticultural class, the Cupressaceae, which see Protea. In the early part of the nineteenth century, when proteas and other shrubs from Australia and the Cape were in great favor, the Waratah made a vivid impression. The "Waratah" chrysanthemum and other florists' flowers of the period took their name from the distinct and fashionable color of the Waratah. Ever since this era the Waratah has been considered a rare and difficult subject, and occasional flowering has been signaled at the exhibitions. The old "stoves" in which proteas thrived so wonderfully were never cultivated with the modern hothouse with its perfected devices for maintaining a hot and moist atmosphere. These plants have now been brought into the garden room and are too long and uncertain in blooming ever to become popular subjects for northern conservatories, but they are splendid plants for exhibitions. Ernest Backhouse writes that the Waratah is imported every year from Australia into California but is very hard to grow. All accounts agree that proteas should have good drainage and plenty of water while growing. When once established, Telopea can probably be propagated by layering.

Telopea is a genus of 3 species, 2 Australian, 1 Tasmanian. Perianth irregular, the tube open early on the under side, the laminae broad and oblique; flowers sessile at the base of the laminae; the petals united into a short, oblique, nearly complete ring; fr. a recurved, leathery follicle; seeds flat, winged. Closely related to Euphorbia, being distinguished chiefly by disk and style. Flora Australiensiis 3:53 (1879).

speciosissima, R. Br. (Echium microphyllum, speciosissimum, Studio Waratah). Stout, glabrous shrub, 2-3 ft. high; lvs. cuneate-oblong, 5-10 in. long, mostly toothed in the upper part, cuneate-oblong, crenate, in a dense ovate or globular head 3 in. across; involucral bracts colored, the inner ones 3-4 in. long. B.M. 1125. G.C. II. 17-677. Gn. 22:361. I.H. 34:29. -Hylogyne speciosa, Salisb., is an older name for this plant.

TEMPERATURE. See Conservatory and Greenhouse.

TELPEUTIA (J. Templeton, botanist of Belfast, early part of nineteenth century.). Loganiaceae. The Coral Bush of Australia, Tempeputia retusa, is a tall shrub with shrowy scaret fls. 1-½ in. long. The flower presents a very different appearance from the papilionaceous or sweet pea type, the floral parts being all separated and solitary, the last carine. The petals are standard strongly reflexed. This plant was formerly cult. in European greenhouses, where it generally flowered in April or May. It was usually planted in the greenhouse border rather than in pots and thought to prefer a compost of peat and loam. It was slowly propagated by cuttings and went out of fashion along with Australian shrubs in general. It has lately been offered for outdoor cultivation in southern California, where many choicest plants of its class are being cultivated. T. retusa is probably the most desirable species of the genus.

Generic characters: shrubs or subshrubs; lvs. when present alternate, simple, entire; fls. axillary, solitary or 2 or 3 together, red or yellow; standard orbicular or obovate, usually reflexed; wings narrow; keel as long as the standard or shorter; stamens all united in a
sheath open on the under side; anthers alternately long and erect and short and versatile; pod sessile or stipitate, flattened, ovate-oblong or linear, completely dehiscing. *Flora Australiaca* 2:108 (1864).

**Reynolds, R.**, p. 379. (F. glauca, Sima.) **CORAL BUSH-TALL**, glabrous or glaucous shrub; its, broadly obovate to narrowly-elliptic-oblong, sometimes all under 1/4 in., sometimes all over 1 in, marginate or mucronate, coriaceous: its, red (or rarely white); calyx with 4 very short, horn-like teeth, the tube 1/2-in. long. B.M. 2334; 2988. B.R. 5:583; 10:859. L.B.C. 6:526; 7:644.

**TENNESSEE**, **Horticulture IN.** Fig. 2479. The horticultural products of Tennessee are greatly diversified on account of the varied soil and climatic conditions. A knowledge of the natural divisions of the state is essential to a thorough understanding of its adaptability to the various branches of horticulture.

The Unaka region, on the eastern border, contains about 2,000 square miles. Some of the peaks are over 6,000 feet above sea level, and the average elevation is 5,000 feet. The soil is gravelly and thin, but contains areas that are highly productive. Apples are grown to a limited extent.

The valley of East Tennessee is the next division. It contains 9,300 square miles and an average elevation of 1,000 feet. The soils are generally well adapted to fruits. Records taken at Knoxville during a period of six years show an average annual rainfall of 49.02 inches.

A thousand feet above the valley of East Tennessee lies the Cumberland Tableland, containing 5,100 square miles. This section for the most part is sterile, the soils being sandy and thin. There are, however, areas of land which produce fruits and vegetables of the highest quality. The climate is particularly healthful.

The western section of the state is the most fertile. The soil is well adapted to a great variety of fruits, some of which are highly fertile and well suited to orcharding. Numerous streams cut the land into valleys, which are generally deep and narrow.

The Central Basin, in which Nashville is situated, contains 5,300 square miles, with elevations of 200-300 feet above the general level. The soil is fertile and well adapted to small fruits and vegetables. The average annual rainfall at Nashville is 49.34 inches.

The next natural division is the valley of the Tennessee river. It has an elevation of about 360 feet and an area of 1,290 square miles.

The Plateau, or Slope, of West Tennessee is the most important horticultural region commercially in the state. It contains 8,550 square miles and has an average elevation of 500 feet. The soils are generally light, fertile and easily cultivated, but demand careful treatment to prevent serious damage by washing.

The last natural division, the Mississippi bottoms, has an area of 950 square miles and an average elevation of 295 feet. It is little used for horticultural purposes.

The possibilities of Tennessee for the cultivation of fruits is important. The climate and soils are well adapted to the production of most of the cultivated varieties. Wild strawberries are found throughout the state. Blackberries thrive everywhere. In favorable localities they attain a very large size, supporting this respect, some of the cultivated varieties. Wild blackberries are marketed in large quantities in many sections. Red and black raspberries grow in most parts of the state; and in some sections the best of the wild blackcaps when transplanted to the garden give better results than any of the cultivated varieties. Wild grapes abound throughout the state. Plums are also found in profusion; and the Wild Goose variety is said to have originated in Tennessee. Other wild fruits are dewberries, cherries, crab apples, Juneberries, pampaws, persimmons, and huckleberries. Of the nuts, chestnuts are most plentiful, especially in the hilly and mountainous sections. The chinakipn flourishes in East Tennessee. Black walnuts are exceedingly numerous. Pecans thrive in the low sections. Hazelnuts, and butternuts or white walnuts, are also plentiful.

Some of the native seedlings are highly valued. This is especially true of apples, peaches and strawberries. Many well-known varieties introduced in other states are not satisfactory. As a rule, the introduced kinds are not so well adapted to the climate and soils as those of local origin. This fact is becoming more and more evident as the best stock is being replaced by the best methods of cultivation.

**2479. Map of Tennessee, suggesting main horticultural features.** Fruit trees succeed throughout the state, but eastern Tennessee (between the mountain ranges) is best adapted to large fruits and grapes. The shaded areas indicate localities in which small fruits and vegetables are grown as field crops for market.

**TENNESSEE**

1781

*TEMPLETONIA*

1781

*TEMPLETONIA*
TENNESSEE

TEN-O'CLOCK

Ornithogalum umbellatum

TEN-WEEKS STOCK

Mathiola incana, var. annua

TEOSINTE

is an annual grass of immense value for forage in the South. It is very much like maize in general appearance and in the structure of the flowers, but differs in not forming an ear, the slender jointed spikes being separate from another. This botanists it is considered the original form of maize. It is known to catalogues as Rehia luxurians, Dur., but is properly Euchroma Mexiciana, Schrad., for the botany of which see B.M. 6414, where the plant is given and Euchroma luxurians. The plant is pictured in Bull. 14, Div. of Agricost., U. S. Dept. of Agric., and in Farmers' Bulletin No. 102, from which a few points are here abstracted.

Teosinte probably produces a greater bulk of fodder per acre than any other grass. In the Louisiana Experiment Station it has yielded the enormous amount of 50 tons of green forage per acre; this crop was sold in the field to dairymen for $2.50 a ton. The plant grows 6-12 ft. high and freely sends up 20-50 stalks from the same root. One hundred stalks from one seed have been recorded. It may be cut several times during the season, but nearly as good results will be obtained from a single cutting made before there is any frost. The stalks are tender and there is no waste in the fodder when dry or green. One pound of seed to the acre, planted in drills 3 ft. apart and thinned to a foot apart in the drill, is recommended. Teosinte is a native of the warmer portions of Mexico and Central America. The seed rarely matures north of southern Florida.

F. LAMSON SCHIRNER

TEPHROSI (Greek, tephros, ash-colored, hoary; referring to the foliage). Leguminosae. Tephrosia Virginiana is a hardy perennial herb which grows 1-2 ft. high, has many narrow, ash-gray leaflets and flowers, and as sweet, pale yellowish white, marked with purple. The plant grows in dry sandy soil over a wide range in the U. S. and blooms in June. The racemes may contain 20-50 flowers each 1|-4 in. across. This species is offered by collectors of native plants. In spite of the large size of the flowers, the species is not likely to become a garden favorite, as the colors are not pronounced and the flowers are more or less hidden amid the foliage. In some English works this plant is sometimes rated as half-hardy.

A much shoverier species is T. macrantha, a Mexican shrub 6-10 ft. high, which bears its large purple and white flowers to the number of 75 in a diffuse panicle about a foot long. It was collected by C. G. Pringle, but it is doubtful whether the plant is in cultivation. It would be a hardy addition to southern shrubberies.


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is that part of the biological sciences which is concerned with unusual forms of the whole body or any of its organs. These, by comparison with the normal forms, are called malformations or monstrosities. Malformations among plants are due to a disturbance of the ordinary course of the growth and development of the organs. Such a derangement of function may be looked upon as disease. The malformation may be occasioned by merely local disease, or it may be a symptom of general disease. Malformations may be brought about (a) by the direct influence of external physical conditions; (b) by the action or presence of some other organism—plant or animal; (c) by the operation of unknown internal causes. The experimental study of the causes of malformations is yet in its infancy, and in only a few cases can specific explanations of their origin be given. Having once occurred, malformations may be inherited and the form, at first unusual, may be fixd by selection and become characteristic of a race. Thus the cockscomb (Celosia cristata) shows a hereditary and fixed fascination; and double flowers are so common as hardly to be esteemed malformations.

The distinction between malformation and variation is very indefinite. On the one hand, the various forms of root, stem, leaf and flower in cultivated plants are extraordinary as compared with the wild types from which they were derived, but having diverged from the type by relatively small increments, they are not looked upon as monstrosities. Suddenness of appearance, therefore, is one of the criteria of malformation. Even with this criterion it is quite impossible to distin-

2480. Extra free pistils of the orange persisting even in fruit.

1. ALTERATION IN THE NUMBER AND SIZE OF ORGANS. Pleiomery is the term applied to the increase in the number of leaf-like organs. The number of members of a whorl may be increased; or the number of whorls; or the number of distributed organs may become greater than usual. Double flowers often show pleiomery. Fig. 2003. Extra free pistils of the orange, persisting even in the fruit, are shown in Fig. 2480. More regular polyxyary appears occasionally in the tomato, and constantly in the "two-story" apples (St. Valery). It is a fixed race character in the Washington or Navel orange, in which it is associated with seedlessness. A similar example of polyxyary is shown at Fig. 2481, in which the abnormal growth is an extension of the axis of growth with additional carpels.

2. Abnormally profuse branching of the stem is often produced by a fungous parasite. The branches are usually irregular and more or less fasiclate, producing what is called "witch brooms." These are not uncon-
mon on conifers (especially Abies) and some deciduous
trees. Similar deformations are sometimes due to in-
sert agency, or to unknown causes. For example, a
simple inflorescence may develop flower-clusters instead
of single flowers, e.g., in the common plantain.

3. Proliferation is continued
growth of the axis or the de-
velopment of a branch from
growing points which usually
either do not form or remain
dormant. For example, the
growing point of the axis of the
flower is usually obliterated in
the formation of the pistil, but
in the pear, apple and straw-
berry curiously enough its growth through the flower
and may even become a leafy shoot beyond the fruit.

Proliferation may also occur by
the continued growth of the
axis through a compact flower-
cluster, like the head of Com-
posite; or by the development of branches in the axis of the
petals and sepals, e.g., in cauliflower;
or the rose shown in
Fig. 2482. Some double flowers are made "extra dou-
tle" by this sort of proliferation. Proliferation is said
to occur in almond embryos, one or more smaller
embryos arising from the normal one; but the state-
mant lacks confirmation and such an origin is highly im-
probable. When proliferous branches show a tendency
to separate easily and to develop roots, or when they
become bulb-like, so that they reproduce the plant readily
when separated, the plant is said to be viviparous.

4. By various causes complete non-development of
organs (suppression) may occur; or an organ may be
arrested at any stage of its growth or be dwarfed.
Correspondingly, extraordinary growth of any part
(hypertrrophy) is common. Arrest or suppression is
often ascribed to the influence of other organs, but
these alleged causes are in few cases supported by ex-
perimental evidence. Thus, it is commonly believed
that the absence of seeds in the banana and pineapple
is due to the excessive development of the flesh in
these fruits, but this is a mere conjecture as yet. Some-
times spurs and nectarines do not develop. Figs. 2486-7.

2481. Another example
of poly Cary.

In this case the excre-
cence may be considered
an extension of the axis
of growth with an added
whorl of carpels.

11. Alteration of Form, involving no considerable
change in nature or function of the organs.

1. Fasciation in stems (Fig. 2483) produces a broad-
ened and fluted form, often curved, frequently dini-
tion. The apex is furnished with several buds (rarely
only one), and the arrangement of the leaves is quite
anomalous. Fasciation is especially common in rapidly
growing stems when an abundant supply of both water
and food is available. Asparagus, dandelion and
sucker shoots arising from trees after topping or se-
vere pruning, frequently furnish examples. Although
the fasciated stem seems to have been formed by the
early union of several stems, this is rarely the case;
rather the growing apex develops extraordinary in
one (transverse) dimension or organizes several buds
which grow in unison.

2. Longitudinal growth in stem parts which normally
remain short leads to the unusual separation of the
leaves. This is especially noticeable when the floral
leaves become thereby more or
less widely separated. This is
likely to be accomplished by
transformation of the floral into
green leaves, and sometimes by
proliferation.

3. Unequal growth lengthwise produces apparently twisted
stems, with irregular displace-
ment of the leaves. Such dis-
placement is especially notice-
able when it affects clustered
leaves, the whorls being
stretched out into irregular spirals. Unequal growth in two di-
ensions by the tips of a single
leaf produces the "early" or
crispate leaves, characteristic of
many cultivated plants. Fig.
1267, Vol. 2.

4. Local deformities, such as
swellings, tuberules and galls
of various forms, are usually
due directly to the presence of
a plant or animal parasite. Fungi,
either inhabiting the particu-
lar region deformed, or
more widely spread through the
plant but forming reproductive
bodies at the seat of the swell-
ing, occasion excessive growth of
some or all of the tissues. The "black-knot" on cherry and
plum trees, the "plum pockets,"
the tuberules on the roots of
clovers, peas and their kin, are
a few out of the hosts of de-
formities of this kind, due to
plant parasites, and known by
various names.

Many insects, either in the
course of feeding on plant
juices, or by laying eggs on or
in plants, or by reason of the
temporary occupation of the
part by the larval insect, bring
about the formation of galls of
various kinds on leaves, stem, or roots. The malforma-
tions produced are of the most varied shapes. Sometimes
they are merely the production of an unusual number
of hairs of special form; sometimes a leaf bulges out
at one spot to form a deep pocket or pouch; sometimes
the blade of a leaf is rolled or folded, with or without
thickening; all degrees of thickening or outgrowths
are produced, from a slight tumor to a perfectly globu-
ar apple-gall or even a cylindrical tube-gall; sometimes
a bud has the number of its scales greatly increased to
form a cone-like gall; or a flower is distorted until its
nature is almost unrecognizable. The variety of form
is almost as various as the insects and plants concerned.
Indeed, the same insect at different stages of its de-
velopment may produce galls of different sorts on the
same plant. All orders of true insects except the
Orthoptera and Neuroptera may produce galls. The far
larger number are due to the gall-flies and saw-
flies of the order Hymenoptera. The gall-apples of
the oaks, the prickly galls of the rose, the irregular brown
swellings on canes of the blackberry, and the smooth
gall-apples of the willow leaves and twigs are well-
known examples. The gall gnats among the true flies (Diptera) also produce a large variety of malformations, of which the cone-like galls resulting from deformed buds of the willow and the goldenrod are best known. Plant lice (Aphidza) are responsible for the large smooth red galls on the petiole of sumachs, and for the flattish serrated galls on elm leaves. The fusi-
larva, together with the chemical stimulus from its various excretions, in which case the gall develops after the hatching of the egg.

5. Branching of leaves is not infrequent, and its cause is unknown. "Four-leaved clovers" offer well-known examples, and the normal number of leaflets is often increased to six or even more. Fig. 2484 illustrates leafbranching in the dahlia. Branching in the plane of flattening, both in foliage leaves and petals, has also been observed, and the branch described as an "outgrowth."

6. Peloria. When usually irregular flowers, such as those with some spurred or saccate petals or sepals, develop all the parts of each set alike, thus becoming radially symmetrical, the phenomenon is called peloria. It was first observed by Linnaeus in Linaria vulgaris, Fig. 2485, and the term peloria, derived from the Greek word for monster, was given by him. Flowers often become peloric on account of changes in their relations to light, but other causes certainly cooperate. A reverse change, by which radial flowers become zygomorphic, occurs in many Compositae when the corollas of disk florets become strap-shaped, as in the cultivated asters and chrysanthemums, but no notice seems to have been taken of it as a malformation. Sometimes, on the contrary, all spurs fail to develop. Figs. 2486-7.

III. Transformation of Organs: i.e., alterations more profound than those of form, which result in the production of organs different from those which normally occupy the position; often called metamorphosis. (The term substitution would be preferable at present, because non-committal as to processes and causes,) It is common to speak of progressive and retrogressive metamorphosis, but these terms involve assumptions as to the origin of foliage leaves and floral parts which are not justifiable in the present state of knowledge. Transformations occur chiefly in the region of the flower, though they are not found exclusively there. Examples are to be found in the development of leaves or leaflets as tendrils (Fig. 504); of sepals as petals; and of petals as stamens or pistils. These transformations are usually more or less imperfect. On the other hand, the pistils and stamens often develop as petals (Fig. 367), and many double flowers owe their fullness chiefly to such transformations, though other changes may cooperate as noted above. Fig. 2485. Petals may develop as sepals, bracts, or even imperfect foliage leaves, while sepals and bracts frequently become foil
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ose. Indeed, all parts of the flower, even to the ovules, may appear as green leaves of more or less irregular shapes. To this category belong the so-called green roses, which are not uncommon.

IV. CONCRESCENCE. The actual union of parts may take place in the course of their development, though usually the apparent unions are to be explained quite otherwise (see Flower, p. 392), also Fig. 2489 (after Dudley).

The above include only the more common malformations, but on account of the extreme sensitiveness of plants to their environment and their great plasticity, all kinds of strange and curious deformities are possible. Malformations have little or no significance in elucidating the obscure problems connected with the historical origins of organs, or with their homologies, though many arguments, more ingenious than sound, have been based upon them.

The most important general works are the following: Moquin-Tandon, "Éléments de tératologie végétal," Paris, 1841; Masters, "Vegetable Teratology," London, 1865; Penzig, "Pflanzen-tératologie," Géona, 1890-4; in the latter the whole literature to date is cited.

CHARLES REID BARNES.

TEREBINTH TREE. See Pistacia Terebinthus.

TERMINALIA (alluding to the leaves being borne on the terminus of the shoot), Combrévées. Nearly 100 trees or shrubs, with mostly opposite leaves which are sometimes crowded at the tops of the branches, giving them a whorled appearance. The flowers are small and sessile, mostly green or white, borne mostly in long spikes, perfect or polygamo-dioecious; petals none; calyx tubular and constricted above the ovary, the upper part urn-shaped or bell-shaped and 5-lobed; stamens 10, in 2 series; ovary 1, with a long style, 1-loculed. The fruit is a compressed winged nut-like body containing a large and often edible seed. Terminalias are tropical plants, chiefly of the Old World. One of them, T. Catappa, is widely cultivated in tropical countries. Two other names have appeared in the American trade: T. elegans, which is Polyscias punctulata; and T. elliptica, which is unknown to the writer and which is very likely to belong to some other genus.

Catappa, Linn. TROPICAL ALMOND. DEMERARA ALMOND. MYROBALAN. Fig. 2490. Tall deciduous tree (sometimes 80 ft.), with leaves and branches in horizontal whorls or layers; lvs., broadly obovate-obtuse, the narrow base slightly auricled or cordate, simple and entire, very short-petioled, 6-9 in.

2487. Normal columbia flower, with spurs present.

long; spikes solitary from the axils, not exceeding the leaves: fls., greenish white, the upper ones staminate and the lower ones perfect; fr. almond-shaped, 1½ in. or less long, 2-edged, indisciscent, glabrous, with a hard shell, containing an edible meat. Asia, but widely cult. B.M. 5084.—Cult. in South Florida. Useful both as a street tree and for its filbert-flavored nuts. The nuts are eaten either raw or roasted. Folliage is usually brilliant in autumn. As seen in the market, the outer brown skin or covering of the nuts is often removed. T. Catappa is sometimes called "Olive-Bark Tree." The tree is extensively planted in Porto Rico, where the nuts are called "almonds."

L. H. B.

TERNSTREMA (Christopher Ternstrom, Swedish naturalist; traveled in China, died 1745). Ternstrémiaceae. About 25 species of tender evergreen trees and shrubs mostly native of tropical America, a few being native to Asia and the Malay Archipelago. They have shining, leathery foliage and small, white, 5-petaled, drooping flowers, which are solitary or clustered in the axils and borne on unbranched peduncles. Other generic characters: (a) petals connate at the base; (b) stamens numerous; (c) ovary 2-3-loculed; (d) oenoles 2-ovuled: fr. indisciscent. The following species is offered by importers of Japanese plants.

Japónica, Thumb. (Cleyera Japonica, Thumb.). Small tree or shrub, 10-12 ft. high; lvs. alternate, short-stalked, entire, ovate-oblanceolate, glabrous, feather-veined; fls. clustered; berries about the size of peas. Japan. S.Z. 1:81.

W. M.

This rather showy and interesting evergreen shrub of dense bushy growth is flourishing finely in the writer's garden in Florida, in company with other choice shrubs and trees introduced into this country from Japan and China. The tree thrives well in light, rich soil and attains finally the habit of a small, bushy tree. The young leaves have a reddish color, which changes to a dark glossy green when reaching their full size. My plants, raised from seed in the greenhouse and planted out in the garden when about ten inches high, have attained a height of six feet in five years. The plants have not yet flowered, but they seem to revel in the climate of Florida, being neither influenced by the occasional frosts in winter nor by the heavy rains in summer. In poor soil the color of the leaves has a yellowish hue, but as soon as they have received their share of bone or cottonseed meal they change to a fine deep green.

H. NELKING.

TERRACE. Consult Landscape Gardening.

TESTUDINARIA (name explained below). Dioscoréeceae. The Hottentot's Bread, Tortoise Plant or Elephant's Foot, is a curious South African plant with a great globular yam-like bulb or roostock which sometimes attains a diameter of 1-3 ft. and a weight of a hundred pounds. Half of this rootstock lies above ground and looks something like the back of a tortoise, whence the generic name Testudinaria. The popular name "Elephant's Foot" refers to the uncouth and mas-
sive appearance of the same thing. From the top of the root-stock grows a twining vine which attains a height of 8-10 ft., flowers from July to Nov., and dies down each season. The plant twines by means of the tips of the slender branchlets. It is a weak-looking growth to issue from such a mighty tuber.

The inner part of this "bulb" has been compared to a turnip for texture and color. The Hotton-tots used to cut it in pieces, bake it in the embers and eat it. Cow and grotesque bulbs have from time to time been brought from the Cape as curiosities. A large specimen recently sold for $100. There are probably no large bulbs in the U. S., but seeds and seedlings are procurable in this country. The plant is of easy cultivation in a cool greenhouse. No method of propagating by the bulb is known.

Testudinaria is a genus of 3 species, all South Africa, and is closely related to the important genus Dioscorea, differing essentially in the seeds, which are samara-like, having a broad wing at the apex, while in Dioscorea the seed is winged all around or only at the base. Also the tubers of Dioscorea are all below ground and fleshy, while those of Testudinaria are half above ground and woody outside. Other generic characters of Testudinaria: fls. dioecious; male perianth bell-shaped, with a short tube and 6 subequal, ob lanceolate segments; stamens 6; female perianth smaller: ovary 3-loculed; ovules 2 in a locule, superposed; stigmas 3, recurved, 2-lobed: capsule rigid, acutely triquetrous. Flora Capensis 6:252 (1836-97).


TETRADYMIA is a genus of low, rigid shrubs of the composite family native to the arid regions of western North America. The original species, T. campestris, is the best known. Its heads have only 4 flowers. They are yellow and about ½-¾ in. long. This plant was offered in the East in 1881 for western collectors but has not gained much standing. For a full botanical account, see Gray's Synoptic Flora of N. A.

TETRAGONIA (Greek, four-angled: referring to the usually 4-angled fruit). Foliacea or Mesembryanthemaceae. Herbs or sub-shrubs from the southern hemisphere and Japan. Usually denudant: lvs. alternate, short-petioled, somewhat fleshy: fls. yellow, green or reddish, axillary, apetalous; calyx 3-5-lobed. Only one species known in cultivation.

expansa, Thum. New Zealand Spinach. New Zealand Ice Plant. Fig. 2491. A hardy or half-hardy annual 3-6 in. high, often spreading 4-6 ft.: lvs. triangular, larger ones 4-5 in. long by 2-3 in. broad: fls. small, yellowish green. New Zealand. B. M. 2962.

New Zealand Spinach is chiefly useful for furnishing greens during the summer when the common spinach cannot be grown. It tastes a good deal like Spinach but is somewhat tougher as a rule. It is grown to some extent in California both for man and sheep. It readily self-sows.

For an early outdoor crop fresh seed should be sown in m. h. soil in a warm room early in January. The seed usually requires about 4 weeks to germinate. After growing about 2 weeks the seedlings should be transplanted to thumb pots and about a month later to 4-inch pots. Growing vigorously in this condition they will be large enough to move into the garden toward the end of April, where they should be set 3-4 ft. apart each way, and as the plants grow will entirely cover the ground. They should be handled with great care in transplanting, otherwise growth will be so checked that it will require several weeks for recuperation. Again, plants should never be allowed to become potbound, as this will immediately bring them into flower and fruit and thus stunt their further growth, as well as greatly shorten their period of productiveness. Well-grown plants should be ready for use by June 1 and, if they continue vigorous, nearly a peck of greens can be gathered from each plant once a week until heavy autumn frosts. In gathering only 4 or 5 inches of the tip ends of the larger plants should be taken. In the South, it is usually dwarf, not generally exceeding 6-8 inches.

There is another and somewhat easier method of growing the crop, though a given area will be less productive. Inasmuch as the plant is a hardy annual, many seeds which ripen late in autumn will fall to the ground and germinate early in spring, though not early enough for the plants to be injured by spring frosts. These will be large enough for use toward the end of June. Annual crops are thus grown on the same ground several successive seasons with no care except removing old plants and keeping the new ones free from weeds.

For the forcing-house crop, seed should be sown during July in seed-beds where the plants remain until the latter part of September; when they should be taken directly to the benches and will be ready for use early in November. It is best to set the plants about 18 in. apart in benches at least 6 in. deep. No further attention is necessary except to give plenty of water, and under good conditions good greens will be produced once a week on 4 square feet from November to May inclusive. A crop may also be grown beneath the benches near the walls, as well as in the grapevay borders. Space that cannot be used for other purposes may thus be utilized to very good advantage, though they will not produce as abundantly.

This crop may also be grown in houses with portable roofs by starting the plants during summer in houses with the roofs removed, the roofs being replaced on the approach of cold weather. The plants will continue producing the entire winter and following spring, when they should be uncovered and will reproduce themselves in the same manner as the summer crop.
TETRANEMA (Greek name refers to the four stamens). Scrophulariaceae. A single little Mexican perennial herb, with many nodding purplish flowers crowned on the tops of radical scars, and grown under glass or in the open for its true stem very short or almost none: lvs. crowded at the crown or opposite on the very short stem, obovate or oblong-obovate, shallowly crenate-dentate; fls. purplish or violet spotted with white, in a simple raceme; calyx 5-parted, throat elliptic-oblong, upper lip white, almost corolla-long, tubular, 2-lipped, the upper lip emarginate, the lower longer and 3-lobed; stamens 4; stigma capitate; fr. a 2-valved capsule. T. Mexicanus, Linn. Is the only species known as the "Mexican Foxglove" and formerly as Penstemon Mexicanus. The pretty flowers are borne in profusion on the summits of slender purple spikes 6-8 in. high. Although essentially a summer bloomer, with good care it will bloom from spring almost to the close of the season. It is usually regarded as a warmhouse subject, but makes a very good window plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds.

TETRATHÉCA (Greek, 4-celled; referring to anthers). Tremandraceae. T. ericifolia is a heath-like Australian shrub which grows about a foot high and bears in July numerous 4- or 5-petaled pink fls., speckled with purple. The pale green pedicels and stamens are solitary in the axis. This plant is cult. in S. Calif., having been introduced about 1880 by Mrs. T. B. Shepher, who recommends it both for outdoor culture and for pot culture in the greenhouse, and adds that the fls. are pink or white, ½ in. across.

Tetratheca is the largest genus of the family Tremandraceae, of which a short account is given under Platytheca. It is an Australian genus of subshrubs with red or purple flowers. Eighteen species are discriminated in Flora Australiensis 1:129 (1863). They vary greatly in foliage, the lvs. being alternate, whorled or scattered, heat-like and entire, or flat and toothed, or reduced to minute scales. Generic characters: stamens apparently in a single series, the anthers contiguous with the filament, 2-celled, or 4-celled with 2 of the cells in front of the 2 others, more or less contracted into a tube at the top; capsule opening only at the edges; seeds appendaged.

In European greenhouses all the plants of this family are considered difficult of cultivation. They are treated like many other Australian heath-like plants, being potted in fibrous peat and placed in a sandy and watered care-fully at all times. It is said that only soft rain water should be used. They are usually propagated by greenwood cuttings, but in California the seeds are offered.

eréctifila. Sm. This species is distinguished from its companions by the fact that the ovary is wholly verticillate and linear with revolute margins. Heat-like, tender subshrub, much branched and diffuse; sepals not reflexed; ovary with 2 superposed ovules in each locale or rarely a single ovule attached below the top of the locules. Very abundant about Port Jackson, N.S. Wales. W. M.

TEUCRéUM (Teezer was the first king of Troy). Labiáte, Germ. One hundred or more perennial herbs or undershrubs, mostly of the Old World, four of which are offered in the American trade. Lvs. opposite, entire or dentate: fls. mostly purple or pinkish, in whorls forming a terminal interrupted spike; calyx campanulate or tubular, more or less equalys 5-toothed, 10-nerved; corolla with large lower lip, and the upper lip very small or split so as to appear to be wanting; stamens 4, in 2 pairs, exerted through the split or notch in the lower lip. The Germardens are hardy herbs, with aromatic foliage, suitable for the wild garden or rockwork. They are little known horticulturally.

AA. Fls. in distinct 2-3-fld. whorl, forming a lax terminal inflorescence.

Chamiédrys, Linn. One to 2 ft. tall, from a decumbent base, branching, with age becoming woody below, pubescent or villous: lvs. ovate or obl-un, petiolate, incise-crenate, cuneate at the base, somewhat crenate-growing fls. bright rose, with red and white spots, ½ in. long, rather showy, in many 2-6-fld. whorls. Europe.—A good border plant for late summer bloom.

AAA. Fls. solitary or not more than 3 at a short, forming a long terminal spike.

Canadéus, Linn. Erect, 1-3 ft. tall, soft-pubescent or pubescent: lvs. obl-un, ovate, oblong, obovate, or oblong-obovate, mostly serrate: fls. purple to cream-color, the corolla about ½ in. long, the calyx crenate and the 3 upper lobes ob- turate. Low ground, eastern states, from north to south. N.r 8:97. — Offered by dealers in native plants. Useful for low grounds and moist borders. In general habit resembles a Stachys.

AAA. Fls. on opposite axillary 1-fld. peduncles.

fruticáns, Linn. Shrubby, 2-3 ft., wide-branched: lvs. ovate, obtuse, entire, white- or brown-pubescent beneath: fls. on 1-fld. peduncles which are shorter than the calyx; fls. blue, forming terminal or lateral clusters. Europe.—Recommended for dry places South. Has a long blooming season.

bicólor, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, obl-un or lanceolate, obtuse, entire or incised, with a purple tinge, on axillary 1-fld. peduncles. Chile.—Offered in S. Calif.

L. H. B.

TETRÁMCRA 1785

TETRÁMCRA (Greek words, referring to the four small divisions of the anther). Orchidáceae. A genus of small terrestrial or epiphytic herbs of slender habit bearing racemes with few fls. produced in spring. The erect stems, which are not pseudobulbous, grow from a creeping rhizome and are 3-6 thin, linear lvs. and a slender but rigid, terminal raceme: sepals and petals nearly equal, spreading; labelium joined to the base of the column; lateral lobes large, spreading or small, acuminate; calylic lobes at base, column with 2 wide wings; pollinia 4 perfect and 2 imperfect. Six species in Brazil and West Indies. Culture as for Laelia (p. 872).

bicólor, Rolfe (Leptófiles bicólor, Lindl.). Lvs. solitary on the stem. Raceme-coryne, with a few fls. in front, 3-4 in. long; raceme few-fld., shorter than the lvs.: sepals and petals white, linear-incurred, over 1 in. long; lateral lobes of the lip small, folding over the column: terminal lobe oblong-lanceolate, bright rose, with white tip and margins. A pretty plant. B.R. 19:1623. A. F. 6:633. Var. glaucóphylla, Hook. Lvs. glaucous. B.M. 3734. HENRICH HASSELBERG.
also the Honey and Pecan types, succeed well. Japanese plums, persimmons, and various American and foreign grapes also succeed, the latter requiring to be grown in the most sheltered places and on a south, or south-eastern exposure, which are found in the numerous wild vines of the state.

Ornamental horticulture, in all its branches, is here characterized by a profusion and luxury of growth in foliage and flower of a semi-tropical nature. The blooming roses continue to flower much of the winter. Broad-leaved evergreens trees and shrubs, known in the North only in conservatories, are here seen in all well-appointed private grounds and in parks and cemeteries. Cape Jasmine hedges, with their dark glossy green foliage and pearly white, camellia-like, sweet perpetual flowers, are very popular. Commercial plant-and cut-flower growers do a good business in the cities of the northern part of the state. Extending westward from the Sabine river on the east to the Navasota river on the west, over 150 miles, and northward to Red river about 300 miles, narrowing somewhat in its northern parts, is the heart of the grand and magnificent woods in America. Three species of pine, loblolly pines are most abundant. Numerous oaks, hickories, elms, maples, beeches, white and black walnuts, gums, poplars, pecans, hickories, magnolias, holly, persimmons, and numerous kinds of shrubs and perennial flowers are found almost everywhere, but especially along the streams. The soil is generally very sandy, underlain with red and yellow clay, and well adapted to almost any kind of crops. The rainfall varies from 100 to 600 feet. The rainfall is ample—from 40 to 60 inches annually—the climate is very mild, and altogether it is an almost ideal land in which to live easily and have a very paradise of a home, with a moderate activity of mind and body. Owing to the great lumbering-interests, and lack of market facilities, nearly all horticultural pursuits have been overshadowed until recently. But at Palestine, Tyler, Troup, Longview, Nacogdoches and some other points, large commercial peach orchards, berry plantations, and canneries have been in very successful operation for a number of years and these interests are rapidly increasing. Stockraising facilities are growing, and almost every East Texan has a grander, brighter and more promising future. Trucking of nearly all kinds, and fruit-growing, with berries, peaches, plums, apples (especially in northern parts), and pears, could hardly ask for better natural conditions. Until recently the settlers of this region were almost entirely from the older southern states and not very enterprising, yet very sociable, and their houses, yards and gardens are of the southern type. They earnestly desire enterprising, intelligent people from the North and East to take up their excellent, though cheap lands, and improve them.

3. The Red River Valley is a long extension to the westward—some 250 miles—of the soil, climatic and forest conditions of East Texas. Vines, gums, and some other trees in its western parts. But, as the Red river runs eastward in a broad, deep, heavily timbered valley, its southern bluffs, some 5 to 10 miles wide, enjoy peculiar luxuriantly from latitudinal reasons. Here apples flourish as well as in northern Arkansas, and peaches have not failed entirely in fruit during the twenty-five years of residence of the writer at Texarkana.

With the exception of a few of the tenderer shrubs, everything is grown here as well as in East Texas, and apples, grapes and some other fruits grow better and acquire higher color and flavor, owing to a less humid atmosphere. In this belt below the Seminole and Choctaw counties of Texarkana, Paris, Sherman, Denison and Gainesville, in which are found many beautiful residences and grounds, many orchards, vineyards, and berry plantations. Railway facilities are excellent, and good markets lie in every direction. Trucking is also extensive. Cut-flower and general nursery business flourish in the places named. The people, coming from all directions, are mostly enterprising, with the northern types prevailing and northern ideas generally appear in the architecture and gardening, yet fine samples of the southern style and westward influence are seen.

4. The Black Waxy Prairie Region of Texas lies next to East Texas on the west and to the Red River Valley on the south, extending west to about 98° and south from the Red River to the winter of the 30th parallel. It is the grandest and most beautiful region of the state, about 300 miles wide north and south, and 300 miles westward between it and the Coastal Plain. This region has an altitude in its southern parts of 400 to 500 feet and rises in the northwest to 1,000 feet or more. The rainfall varies from 50 inches or more in its eastern parts to 30 inches in the western parts. The foundation is white, chalky lime-rock, the soil very black, sticky and exceedingly rich, highly adapted to grass production, but not well suited to grain and other fruits. The stone crops and blackberries do best. Onions are largely grown in Collin county, of which McKinney is county seat. Most shrubbery does well. Cherries, plums, mulberry, grapes, prunes and more or less, will flourish and are the almost exclusive lawn grass. Very handsome yards are made by some of the farmers and many who live in the towns and cities; but most farmers in Texas have done little or nothing to beautify their homes horticulturally. Nowhere is this more apparent than in the Black Waxy Lands, the home being generally surrounded by cornfields, stock pens, cottonbines, and exposed farm machinery. There are splendid evidences of demonstrating that very beautiful homes can be made even in the black lands of the state, where the richest general farming region exists.

5. The Brown, or Chocolate Plains Region of Texas, devoted principally to grazing and small grains, lies to the westward of the Black Land Region, is about 200 miles wide by 600 long, extending from Oklahoma on the north to the Rio Grande on the south, running from 1,000 feet altitude on the south and east to 3,000 feet on the west, where it ends suddenly against the cliffs of the still higher Staked Plains Region. Horticulture is in its infancy in all this vast semi-arid, high, rolling prairie country, and can do little without irrigation. Yet many enterprising farmers, with very beautiful grounds surrounding their homes, and grow their home supplies of very fine fruits. Of commercial horticulture there yet is none. The same may be said of the Staked Plains Region, but its soil is dark rich loam, the country瞄a great dead level, except where canyons have cut it into, its altitude from 3,500 to 4,500 feet, its climate dry and very salubrious. Irrigation-horticulture in a small way is sustained from driven wells, which strike plenty of water at 10 to 30 feet. Stock-grazing is the only commercial occupation. Five or six counties northwest from Austin, in the central parts of the Chocolate Belt, are very broken, hilly and picturesque, well adapted to fruits. Nearly every home there is supplying fruits, but stock-grazing is the chief occupation.

6. The Pecos Valley lies just west of the Staked Plains, and east of a spur of the Rocky Mountains. In place it is in latitude 31° to 32°, longitude 103° to 105°, N. M., and Pecos City, Texas. Commercial fruit-growing is considerable in this valley, especially at Roswell and Pecos City. At the latter place is a vineyard of 40 acres of the vine that can be grown here, doing finely on their own roots and very profitable, as the fruit goes to market in northern cities before any grapes are ripe in California. A vast mountainous and dry plains region extends from the Pecos to the Rio Grande, devoted to goats, sheep and cattle, yet at Ft. Davis, on a beautiful mesa, some 5,000 feet altitude, among mountains, 2,000 to 4,000 feet higher, are a good many very beautiful homes, and fruits do finely, as there is sufficient rain-
The Rio Grande Valley is much warmer in the same latitude than the Pecos valley, otherwise the horticultural conditions are pretty much the same.

At El Paso and Ysleta, a little way south on the Texas side, considerable quantities of vinifera grapes of table varieties are grown under irrigation and shipped to other Texas and northern cities in August and September. Peaches and plums are also grown to some extent. Further down on the Rio Grande, at Del Rio, Eagle Pass and Laredo, grapes, figs and onions are considerably grown and shipped to the larger Texas cities and the North. The grapes are of the Old World varieties, and ripen in June; consequently have no competition and bring fine prices. The conditions are such that immense quantities of as fine grapes of this class can be grown in this part of Texas as in the best regions of California, and the cost of getting to market is not more than half as much. Undoubtedly the triangular region between San Antonio, Laredo and Del Rio will in the near future have extensive commercial vineyards of vinifera grapes.

The Spanish taste in home grounds among the wealthy of southwestern Texas, who are chiefly stock-growers and merchants, prevails largely. It consists of a plaza, or open square in the center of the residence, having fountains (where water is to be had abundantly), and borders, beds and vases of rare tropical and subtropical flowers, shrubs and fruits. Around this highly artistic garden the house is built, often of adobe, sometimes of stone, cut and carved, in large rooms adjoining and opening into each other, all on the ground-floor and one large door opening out to the street or small front yard from a big hall, sometimes having grand arches and marble columns. No windows are in the outside walls, except perhaps in the front, the rooms all being lighted from within the plaza. Thus great seclusion is secured and a perpetual conservatory scene is had from every room. Paved walks, usually covered, run around the plaza next the rooms and similar walks cross through the plaza.

The plaza-park prevails also in the finer hotels, as seen in San Antonio; and these, on an enlarged scale at various places in the denser parts of the city, give a very refreshing appearance. In the central and western parts of the state the northern and eastern style of park, cemetery and private grounds decoration is mostly copied, as is also the architecture. Some very creditable examples are seen in Dallas, Waco, Austin, Paris, Sherman, Gainesville, Fort Worth and other places. There are numerous small, and a few fair-sized nurseries scattered over the state, chiefly in the Red River Valley and eastern Texas, as at Houston, or near there, Brenham, Austin, Dallas, McKinney, Ft. Worth, Denison, Bonham, Paris, Tyler, Gainesville.

Plant and cut-flower business is developing rapidly in the larger cities.

Seed business is almost entirely commercial or jobbing, few being engaged in growing seeds of any kind as a business and the supply comes from northern and eastern growers.

The Texas State Horticultural Society, organized in 1882 or 1884, is in a flourishing condition and meets annually with the Texas State Farmers' Congress, at College Station. There are several local horticultural societies in the state, and some 40 or 50 Fruit and Truck-Growers' Associations for commercial purposes, with one general head to look after freight rates, distribution of products and placing in market. No state aid is given to any of the horticultural societies, yet during the last twenty-five years great developments in the various lines of horticulture have been made. Along with these developments have come varieties specially suited to the climates and soils, as few of the eastern
and northern varieties were found adapted, or profitable. Some of these varieties, or species of fruits that have originated in the state are given in the following lists.

T. V. MUNSON.

SOME FRUITS THAT ORIGINATED IN TEXAS.

Apples.

Aaron Holt, Hamilton, Heime, Shirley, Steward, Stevens.
Bledsoe, Jones (Jones' Favorite), Talbot.
Bruce (Bruce's Summer), Lincoln, Texas Red.
Doyle, Knottidge.
Gray.

Peaches.

Alice Hant, Evening Star, Family Favorite, Pearson, People (People's Cling).
Barnes, Governor Hogg, Great Llano, Phillips Houston, Ramsay (Ramsay's Early).
Bell (Bell's Octo-
ber), Guadalupi, Holler.
Bessie Kerr, Joe Johnson, Dorsa Star.
Bonanza, Maggie Burt, Miss Rose.
Burnet, Lisa, Miss Lolo.
Caldor (Caldor's Indian), Morning Star, November.
Caruth (Caruth's Late), Old Amealde, Onderdouk.
Carman, Orna.
Chilow, Old Kealde, Orna.
Chlor, Old Amealde, Orna.
Coleman, Old Kealde, Orna.
Crimson Beauty, Old Kealde, Orna.
Delice.
Early China, Old Kealde, Orna.
Early Beauty, Old Kealde, Orna.
Elbred (El Sbre a Cling).

Grapes.

American, Elivcand, Mrs. Munson, Muench.
Atoka, Fern, Perry.
Ball, Gold Coin, Presley.
Beacon, Headlight, Presley.
Bell, H. Jaeger, Rommel.
Big Hope, Hopkins, R. W. Munson.
Bliss, Rusmann, San Jacinto.
Carman, W. B. Munson.
Champelan, Wapamunka.
Chenango, W. B. Munson.
Delicious, Wapamunka.
Dr. Collier Ching.

Pears.

Amalo.

Plums.

African, Golden Beauty, Piram.
Atoka, Gonzalez, Pontocot.
Bailey, Roosevelt, Preserves.
Beaute, Holland, Ragland.
Beutcfall, Kanaawa, Roulette.
Caddo Chief, Lone Star, Sanders.
Campa, Marianaan, Saffold.
Captain (Colum- bin), Mason, Transparent.
Clara, Motesney, Texas Belle.
Clark, Micca, Waddell.
Clifford, Mioso, Watson.
Colletta, Nima, Wayland.
Crimson Beauty, Nimo, Whitaker.
Drexel, Nima, Wooten.
Early Red, Nima, Yates.
Early Sweet, October Red, Ohio Profiti.
El Paso, Ohio Profiti, Maliberry.

Spalding.

Spalding, Travis, Victoria.

Strawberries.

Parker Earle, Hobson.

Blackberries.

Dallas, Robinson.

Deberries.

Dorothy.

Austin-Mayes, Pink, White.
McDonald.

THALICTRUM.

(Thalictrum, from Thalysius, a German botanist, and author of Sylvia Horecia, a catalogue of the plants of the Harz mountains; died 1588.) Seilaminiaeeae. About 7 species of tender American perennial, stemless, marsh

herbs with large, long-petioled, often canna-like leaves and long scapes bearing large panicles of spikes of usually purple flowers. Fls. commonly 2 together in a 2-valved spathe; calyx minute, corolla tubular, with 6 divisions, of which the 3 interior are unequal; style thick, spiraled; stigma 2-3, the lower lip long and pendulous; capsule inflated, 1-loculed, 1-seeded.

A. Plant covered with a white powder.


AA. Plant not powdery.


F. W. BARCLAY.

THALICTRUM (ultimately probably derived from Greek thalysus, to grow, but explanation doubtful. Romanichaeae). MEADOW RUE. Erect perennial herbs: lvs. ternately compound and decompound; stem-lvs. alternate; fls. dioecious, polygamous, or perfect in some species, rather small, generally greenish white or sometimes purplish or yellow, borne in a panicle or loose raceme; sepals 4 or 5, deciduous; petals wanting; stamens many, showy; carpels usually few, I-seeded. This group includes several forms which are well suited for the mixed border and rock garden. The robust forms are desirable for the wild garden. Many are very hardy, and only the more southern forms of those given below are at all tender. Thalictrums are valued for their showy heads of flowers, contrasting with their handsome stems and leaves, which are often of a purplish cast. They may be propagated by seed or by division of roots in early spring, just as growth begins. Any good loamy soil will suit them if well drained.

The latest monograph of the entire genus was published in 1885, by Lecover, in Bull. Soc. Roy. de Bot. de Belgique, where he describes 69 species. In 1886 Wm. Trelease published a fine treatment of "North American Species of Thalictrum" in Proc. Soc. Bost. Nat. Hist. 23:263-304, in which he recognized 11 species and 4 varieties north of Mexico. His treatment is rather closely followed by Robinson in Gray's Syn. Flora, 1896. Since that time at least 10 new species have been described—chiefly from Mexico—several of which are by J. N. Rose, in Cont. U. S. Natl. Herb. 5:185, Oct. 31, 1899. All North American forms were treated by the present writer in Minn. Bot. Studies, Aug, 1907. Besides several native species, about 5 have been introduced to our gardens from other countries.

INDEX.

adiantifolium, 3. Ferralii, 12. parparasaeae, 5.
adiantoides, 3. glaneum, 4. purpurascens, 5.
aquilinum, 7. minutus, 3. purpureum, 3, 5.
A. Fls. perfect.

Chelidonium, 11. saxatilis, 5. speciosum, 2.
Carnotii, 7. petaloides, 1. speciosum, 4.
Delavayi, 10. polycarpum, 12. venulosum, 9.
dioicum, 8. polycarpum, 6.

INDEX.

b. Filamenta widened near the anthers: authors ovate, obtuse.

C. Akenee arnes, in a head, ovate-oblong, spreading, straight along dorsal margin, linear, acutie or mucronate.

b. Filamenta fimbriata; authors.

3. minus

3. minus

3. minus
THALICTRUM

cc. Fruits longitudinally veined: stigma terminal, minute, not dilated, style ± filiform

AA. Fls. polygamo-dioecious.
B. Anthers linear, mucronate: filaments thread-like. 5. purpurascens
BB. Anthers oblate, obtuse. Flaments broadened above. 6. polygamum

AAA. Fls. dioecious, with rare exceptions.
BB. Filaments widened above. 7. aquilegifolium
CC. Fruits, less firm, thin-walled, either flattened or turgescent. 2. dioicum
DD. Filaments firm. 9. venulosum

1. petaloidem, Linn. Stem round, nearly 1 ft. high, almost naked; lvs, 3-5-parted; Hts, smooth, ovate, entire or 3-lobed: fls, corymbose, perfect; sepals white, rather pointed; petals pink; anthers yellow; fr. ovate-oblong, striated, sessile. June, July. N. Asia. L.B.C. 9:891. Not yet in American trade lists but well worth cultivating.

2. sparsiflorum, Turez. Stem erect, sylactate, 2-4 ft. high, branching, usually glabrous; lvs, triternate, upper ones sessile; Hts, short-stalked, round or ovate, variable in size and shape of base, round-lobed or toothed; fls, in leafy panicles on slender pedicels, perfect; sepals obovate, whitish, soon reflexed; filaments somewhat widened; anthers very short; achenes short-stalked, obliquely obovate, flattened, dorsally margined, 8-10-keeled; styles persistent. N. Asia. Through Alaska to Hudson Bay, in mountains to Colorado and southern California.


5. purpurascens, Linn. (T. purpureum, Hort.). A polymorphic species, allied to T. polygamum: stem 3-6 ft. high, branching above, leafy, pubescent or glabrous, sometimes glandular; Hts, larger than in that type: fls, in a long, loose, leafy panicle, polygamo-dioecious; filaments narrow; anthers rather long, taper-pointed: achenes slightly stalked, ovoid, glabrous or pubescent, with 6-8 longitudinal wings: style slender, persistent; stigma long and narrow. Canada to Fl., west to the Rockies. June-Aug.

6. polygamum, Muhl. TALL MEADOW RUE. Erect. 3-8 or more ft. high, branching and leafy, smooth or pubescent, not glandular: lvs. three to four times terminate or terminally pinnate; Hts, oblong to orbicular, bases variable, 3-5 apical lobes: fls. in a long, leafy panicle, polygamo-dioecious; sepals white: filaments broadened when young; anthers short: achenes ovoid, stipitate, 6-8-winged or ribbed, with stigmas as long, which become curled. July, Aug. Low or wet grounds. Canada to Fl., westward to Ohio.

7. aquilegifolium, Linn. Feathered Columbine. Fig. 2963. Stems large, hollow, 1-3 ft. high, glaucous: lvs, once or twice 3-5-parted; Hts, stalked or the lateral ones nearly sessile, slightly lobed or obtusely toothed, smooth, suborbicular: fls. in a corymbose panicle, dioecious; sepals white; stamens purple or white: fr. 3-angled, winged at the angles, May-July. Eu., N. Asia. B.M. 1818; 2025 (as var. formosum). Gn. 47, p. 357; 99, p. 177. The old name T. Cornutii, Linn., may be a synonym of this, and if so it is the older name, being published on a preceding page, but T. Cornutii was described as an American plant, while T. aquilegifolium is not. As the description and old figure of T. Cornutii do not agree with any American plant, the name may well be dropped. Those plants advertised as T. Cornutii are probably T. aquilegifolium or T. polygamum.

8. dioicum, Linn. Rather slender, 1-2 ft. high, glabrous: lvs. three to four times 3-parted; Hts, thin, orbicular, several-lobed or revolute, bases variable: fls. in a loose, leafy panicle with slender pedicels, dioecious; stamens much longer than the greenish sepals; anthers linear, obtuse, exceeding their filaments in length: achenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Early spring. Woods, Labrador to Alta., west to the foot of the Rockies.

9. venulosum, Trelease. Allied to T. dioicum: stem simple, erect, 10-20 in. high, glabrous, glaucous, bearing 2-3 long-petioled lvs. above the base: lvs, three to four times 3-parted; Hts, short-stalked, rather firm, rounded and lobed at the apex, veiny beneath: fls. in a simple panicle, dioecious, small; sepals ovate; stamens 10-20, on slender filaments; anthers oblong, slender-pointed: achenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. Dak. westward and southward in the mountains.

2493. Thalictrum aquilegifolium (× 3/4).

10. Delavayi, Franchet. Slender, 2-3 ft. high, glabrous: lower lvs. on long, slender petioles, two to three times 3-5-parted; Hts, long-stalked, 3-5-lobed, base cuneate, rounded or cordate: fls. pendulous, dioecious; sepals purple or lilac, ½ in. long, equaling the slender stamens, anthers linear: carpels 10-12: fr. winged at

11. occidentale, Gray. Allied to T. dioicum, which it closely resembles, but it is more robust and taller; lvs. glandular-puberulent; achenes long, slender, thin-walled, 2-edged, ribbed, not furrowed.

12. Fendleri, Engelm. Fig. 2494. A variable species. Plants 1–3 ft. high, rather stout and leafy; lvs. four to five times pinnatifid, upper stem-lvs. sessile; lfts. rather firm, ovate to orbicular, usually with many shallow rounded or acuminate lobes; bases variable: fls. dioecious, in rather compact panicles; stamine many, anthers long; achenes nearly sessile, obliquely ovate, flattened, 3–4 ribs on each face. July, Aug. W. Texas to Montana.


K. C. Davis.

THAMNOCALAMUS. See Bamboo, p. 127.

THAMNÓPTERIS (Greek, bushy form). Polypodiaceae. A genus of simple-leaved ferns growing in crowns, sometimes united with Asplenium. The elongate indusia are in parallel rows on the veins of the banana-like lvs., often extending nearly to the margins. The veins are free below but united at the apex by a transverse intramarginal vein.

Nidus, Presl. (Asplenium and Thamnópteris Nidus-Aris, Hort.). Bird’s Nest Fern. Lvs. bright green, growing in a crown, 2–4 ft. long, 3–9 in. wide, the midrib rounded and usually green. Japan. East Indies. T. strictum, Hort. (Aspleniumdrium strictum, Hort.), is a more slender, upright form said to be a garden hybrid between T. Nidus and Selendrium crispum.

T. Australasicum, Hook. Differs from the above in its midrib, which is keeled on the back and often black. Sometimes regarded as a variety. Australia.

L. M. Underwood.

THÁSPIUM (name a play upon Thapsia, another genus of the same family). Umbellifers. Meadow Parsnip. A genus of 3 species of hardy perennial herbs of eastern North America with ternately divided leaves (or the lower undivided), and terminal umbels of yellow or purplish flowers.

abunam, Nutt. Stem branched, 1½ ft. high; root-lvs. mostly cordate; stem-lvs. 1 ft. long; lfts. ovate to lanceolate, serrate; fls. yellow. June, July. Var. trilatum, Coulth. & Rose, with crenate lvs., is a common western form. Var. atropurpuream, Coulth. & Rose, fls. dark purple. The species is of easy culture in any ordinary soil. In the wild state the plant grows in at least partial shade. Well-grown plants, especially of var. atropurpuream, make attractive specimens.

F. W. Barclay.

THEA. See Tea and Camellia.

THELESFRÉMA (Greek, scaly, seed; the seeds are often papillose). Composéae. A genus of about 8 species of annual or perennial herbs, rarely shrubby at the base, native to the extra-tropical regions of North and South America. They are smooth herbs with aspect of Coreopsis, with much cut leaves and long pedunculate flower-heads, typically yellow rays and yellow, sometimes purplish or brownish, disk flowers. The genus may be separated from Coreopsis by the form of the involucre, which is in 2 series of bracts with the inner series united to about the middle into a cup, while in Coreopsis the 2 series are distinct and united only at the very base. The seeds, especially the outer ones of the head, in Thelesperma are often tuberculate.

hybridum, Voss (Cosmosium Burridgeanum, Hort.). Fig. 2495. A hardy annual, 1½ ft. high, a hybrid of T. tilifolium and Coreopsis tinctoria, from the latter of which it acquires the brown-purple color of its rays. Lvs. bimarginated into filiform lobes not wider than the stem.

F. W. Barclay.
THEOBROMA

oiosa, T. angustifolia and T. bicolor. Theobroma syly-
vestris, Aubl. (T. Martiana, Dietr.) is sometimes re-
ferred to as the main type, but darker and more be-
specialized to have been recorded by modern writers for Central America and the
West Indies.

Theobroma pentagona is a species which in vigor of
growth and produce is equal to or superior to four
tropical species. It resembles to a very
degree the generally cultivated varieties of T.
Cacao, but it differs in the flowers, in the size of the
beans, especially in the shape of the pods. The
beans are larger in size than those of T. Cacao, fully
equal if not superior in flavor, and are capable of
being worked up in the same way as the commoner
species. This kind is known on the mainland as "Alli-
gator" Cacao, from the fancied resemblance of
the pod to that of an alligator. The outside of the
pod is soft and easily broken, and does not afford such good protection to
the interior as the harder shell possessed by T. Cacao. In Nicaragua T.
Cacao and T. pentagona are grown together, and the
produce is mostly a mixture of the two species.
From the presence of T. pentagona, it is pos-
sible that hybridization has taken place be-
tween two species. It has been noted that the
pods of T. Cacao produce much larger seeds or
beans in Nicaragua than in countries
where this species is not grown in company with T. pentagona; and the beans of the two
species are almost impossible to distinguish
when cured together. The product of Nicara-
guan plantations also requires much less time
for fermentation than the produce of Granada,
Trinidad or Venezuela, some forty-eight hours being
the usual period, while more than four times that
number of hours will be required for the proper fer-
mentation of the produce of the last mentioned country.

Theobroma bicolor is a plant that produces the
"Monkey Cacao" of the mainland. This is never made
into market Cacao, as it is very inferior in quality and
has a disagreeable flavor. The pods are hard, much cor-
rugated, warty, and of a dirty brown color when ripe.

Theobroma biostera is a very distinct species in every
way. The leaves are large, and in the juvenile stages
of growth are broadly cordate in form, and only assume
the mature or oblance form on reaching the third or
fourth year's growth. The pods are oval, ribbed and
netted, hard and woody, with an outer shell half an inch
in thickness which can only be cut with a saw. The
seeds are oval, much flattened, with a dark, hard and
smooth exterior. The interior themselves has a some-
what nutty flavor. They are used in sweetmeats in
the same way as almonds, but cannot be made into com-
mercial Cacao, suitable for the manufacture of cho-
colates. This species, though without doubt a true Theo-
bra, is widely distinct from any of the varieties of
T. Cacao which produce commercial Cacao. The
produce of T. bicolor is known in some parts of Central
America by the names of "Wariba," "Tiger," and "Fan-
taste" Cacao. In Nicaragua T. Cacao and T.
pentagona are grown together.

Many names have arisen for the varieties of Theo-
broma Cacao which are in cultivation, as many as forty
having been listed by a Trinidad cultivator of large
experience. Looking at the matter from a practical
point of view, all these are merely strains of the one
species, produced by natural cross-fertilization of the
older types. According to Hart's "Cacao," Trinidad,
1909, there are but three major strains or classes of T.
Cacao, respectively, "Criollo," "Forastero," and "Calaba-
cillo." The type of the first is found indigenous in
Trinidad and various places on the mainland, its
distinctive character being its bottle-necked pod, with a
theodromal black spot near the tip of each seed, as
well as the white or whitish seeds or beans, which are mild in
flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corru-
gated pod or heavy, almost hardwood, slightly fluted,
dark brown, and often slightly mottled with white or
purplish color. It is a tree having greater vitality than
"Criollo," and gives a much larger crop. "Foras-
tero" means foreign, and this type is said to have been
found on the mainland of South America, whence it was
imported to Trinidad by Arragoneso Capuchin Fathers
about 1757. (De Vertueil, History of Trinidad, 1881.)

"Calabacillo" is the third form, its chief charac-
teristics being the vigor of its growth and its small flat and
strongly flavedored bean. By some it is considered as a
degraded form of Forastero.

While the above gives a brief sketch of the chief
characters of the principal types, it must be understood
that there are varieties intermediate between the forms;

in fact, on the majority of estates it is impossible to
find any two trees exactly alike in all their botanical
characters, occurring, without doubt, from the un-
terrupted cross-fertilization which has taken place.
Still, each country appears to maintain certain charac-
ters more permanent than others, and thus secures for
itself a name upon the markets of the world. It is
probable that this is due, in a measure, to the uncon-
cious preference taken by some to distinctive features
of the produce by the continuous cultivation of a fairly
fixed strain which has arisen. It may also be due in
some measure to the influence of climate and environ-
ment. Certain it is, however, that there are to-day
strains of Cacao which are possessed of distinctive
characters, not readily produced by any process of
preparation in places other than that in which they are
grown. A fine set of illustrations of varieties common
to different countries has lately been published in a work
by Dr. Paul Freuss, who recently traveled in Cacao-pro-
ducing countries on behalf of the German government.

These different brands are bought by manufacturers
and blended to suit their particular market, but there
are certain kinds possessing special flavor which are
readily sold at high value. The value of the commercial
product fluctuates and the price rules considerably
lower than some years ago. Whether this results from
increased production or from a deterioration in the
quality cannot be ascertained. It is clear that if culvi-
vators grow Cacao for seed without regard to the best
rules of selection, the quality must deteriorate. What
mitigates this fact is that all the Cacao world's, up
to a recent date, followed the same practice. The pro-
cess of grafting, to which the Cacao tree readily sub-
mits, as was recently proved in Trinidad, will enable
operators to make large fields of the choicer varieties,
and it may be confidently expected that in a few years
a great improvement will be shown in the various
grades placed upon the market. But little Cacao is
manufactured in the countries where it is grown, except
for home use, and then generally in a crude manner.

Chocolate is the term used for sweetened and hardened
preparations of the roasted and ground Cacao bean, with
THEOBROMA

THEOBROMA (Theobrasia was a Greek naturalist and philosopher, 370-285 B.C.). Myrsinaeae. According to Bentham & Hooker, this genus has but a single species, T. Jussiaei, of San Domingo. J. Decaisne, in Annales des Sciences Naturelles for 1876 (ser. 6, Bot. 3) contrasts three species. F. Pax, in Engler & Prantl’s “Pflanzenfamilien,” written later than either of the above, recognizes four species. Five names occur in the American trade, only one of which is a true Theobroma, according to any of the above authorities. This is T. Jussiaei. Three of them are to be referred to the related genus Clavija, and one (T. imperialis) is now regarded as a species of Chrysophyllum (or C.) species that belong to the same tribe. The chief and most important differences between Theobroma and Clavija are in the flowers and fruits. In Theobroma the corolla is cylindrical and shallowly 5-lobed; staminodia attached on the base of the corolla; fr. large and many-seeded. In Clavija the corolla is subrotate and deeply 5-lobed; staminodia attached on the tube of the corolla; fr. 1-many-seeded. Theobroma itself includes a glabrous shrub with erect, nearly simple stem, the simple lvs. crowded at the ends of the branches, the fls. large, white, in racemes. The fls. are perfect and gamopetalous; calyx and corolla with 5 divisions that are imbricated in estivation, the corolla bearing a corona in the throat; stamens 5, fixed at the bottom of the corolla-tube; pistil one, with short style and capitate stigma. Fr. fleshy and apple-like, many-seeded. The species referred to Theobroma in the American trade are handsome large foliage plants for greenhouse culture.

A. Juice milky.

imperialis, Linden (properly Chrysophyllum imperialis, Benth.). Lvs. ovate-oblong to oblong-ob lanceolate, 4-6 in. long and about one-sixth as wide, obtuse, strongly spinose-dentate, with black-tipped teeth, the midnerv very strong and the secondary one confluent at the margins; inflorescence racemose, the racemes axillary and loose-dill; fls. rather long-pedicelled, bracteate, the calyx-lobes ovate and erose-dentate, the corolla tubular-campanulate, white, the corona annular and entire. San Domingo. G. C. III. 2:429.—It is not known to the writer whether the plant is cult. In this country under this name belongs to this species or one of the two following.

n. Corolla mostly deep and shallow-lobed: fr. often 1-long-seeded (Clavija).

THERMOPSIS

n. Corolla mostly shallow and deep-lobed: fr. often 1-long-seeded (Clavija).

m. Leaves obtuse.

macrophylla, Hort. (properly Clavija grandi folia, Deene.). Lvs. large, areuate, obovate, spatulate and obtuse, entire or sinuate-repand; petiole thick and dark violet, the secondary nerves slender and simple or forked: fls. orange-yellow, in short, erect racemes; calyx-lobes orbicular and nearly glabrous, the corona 5-lobed. Braz. B. M. (as Clavija macrophylla) 5829.

m. Lvs. acute.


The species seems to be imperfectly known to botanists.

L. H. B.

THERMOPSIS (Greek, lupine-like). Leguminosae. A genus of about 15 species of perennial herbs native to North America and northern and eastern Asia. They are erect plants with large, 3-foliolate, stipulate leaves and showy yellow or purple flowers in terminal or axillary racemes. The following species are all handsome hardy perennials bearing yellow flowers in early to late summer. They are not particular as to soil or position, but do best in a deep, light, well-drained soil. They are generally deep-rooted plants and endure drought very well.

Propagation may be effected by division, especially in T. montana, T. fabacea and T. rhombifolia, which species, extensively used in the florist trade, are found to belong to Clammyphyllum, a genus of the family Sapotaceae.

A. Pod strongly recurved.

rhombifolia, Richards. Plant about 1 ft. high, branched: lfts. usually oval or obovate, 1/2-1 in. long: fls. in a compact spike, pod glabrous. June, July.

Thermopsis

AA. Pod straight or only slightly curved at the apex.
   b. Plant 2-5 ft. high.

Caroliniana, M. A. Curtis. Stem stout, smooth, simple:
   i. long-peduncled; ii. obovate-oblong, silky beneath;
   stipes large, clasping; raceme 6-12 in. long, erect, rigid, many-flled; pod 2 in. long, erect, villous and hoary. June, July. Mts. of N. C.

BB. Plant 1-3 ft. high.
   a. Stipules longer than the petiole.

Montana, Nutt. Plant 1½ ft. high, somewhat silky-pubescent; fls. obovate-oblong, 1-2 in. long; raceme 6-10 in. long; pod slightly curved at the end, 2-4 in. long. May-July. Western. M's. B. M. 3611. B. R. 15:1272
   (both erroneously as T. fabacea). Sometimes called "Buffalo pen" in the west.

CC. Stipules shorter than the petiole.
   a. Racemes axillary.

Fabacea, D. C. Resembles T. montana and has possibly been confused with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

DD. Racemes terminal.

Mollis, M. A. Curtis. Stem erect, branched, 2-3 ft. high, pubescent; fls. obovate-oblong, 1-2 in. long; raceme 6-10 in. long; pod slightly curved at the end, 2-4 in. long. May-July. Va. and North Carolina.

T. Cassiniana, Hort. Saul, does not appear to be known to botanists.

J. B. Keller and F. W. Barclay.

Thespesia (Greek, divine; application doubtful). Malvaceae. A genus of a few species of tall trees or shrubs native of tropical Africa, Asia, and the islands of the Pacific. They have the aspect of Hibiscus and may be distinguished by the conical stigmas, more woody capsule and the obovoid compressed seeds.

Populnea, Soland. A small tree with the younger portions covered with peltate scales: lvs. long-peduncled, ovate, cordate, acuminate, 3 in. across; fls. axillary, 2-3 in. across, yellow. Trop. Asia, Africa and the islands of the Pacific.— Cult. in S. Calif., where, according to Franceschi, it succeeds only in warm and moist locations. He also notes the fls. as varying from yellow to purple.

F. W. Barclay.

Thevetia (André Thevet, 1562-1599, a French monk who traveled in Brazil and Guiana and wrote a book on French Guiana in which the plant is mentioned). Apocynaceae. A tropical American genus of about 7 species of trees or shrubs with alternate, 1-nerved or lightly pinnate leaves and rather large yellow flowers in terminal few-flowered cymes.

Thevetia nereifolia, the Yellow Oleander of Florida gardens, is a very ornamental small evergreen shrub, growing luxuriantly in rich, sandy soil, not too moist and not too dry, ultimately attaining a height of 6 to 8 feet and almost as much in diameter. The foliage is abundant, light glossy green and reminds one of the oleander, but the lvs. are narrower. The pale yellow flowers are abundantly produced. The fruit, which is of the size and somewhat of the form of a hickory nut, is regarded as poisonous by the negroes. The Thevetia can stand a few degrees of frost, but it was killed outright on February 7, 1885, when the thermometer went down to 15° F. If banked with dry sand in fall it does not suffer much, though the top may be killed.

A. Lvs. 8-10 in. long, about 2 in. wide
   a. Tender shrub. Lvs. oblong-lanceolate, acuminate, margins revolute; fls. rather large; corolla white, with a yellow throat. West Indies; cult. in southern Calif.
   b. Lvs. 3-6 in. long, less than ½ in. wide.

Nereifolia, Juss. Known locally in Florida as "Trumpet Flower" and incorrectly as "Yellow Oleander." A tender shrub, 3-4 ft. high, margins revolute; fls. about 3 in. long, yellow, fragrant. West Indies, Mexico. B. M. 2399 (as Cerbera Thevetia).— Cult. in S. Fla. and S. California.

F. W. Barclay and H. Nehrung.

Thinning Fruit

Thinning Fruit. All fruit grows larger and better, and often becomes more highly colored, other things being equal, when it has an abundance of readily available food. The supply of crude food materials is increased by allowing room enough to each plant and by enriching the soil and keeping it sufficiently moist. The plant may set so many fruits, however, that it cannot possibly grow all of them to large size even though an abundant supply of crude food material is readily available. The leaves build up the crude materials taken from the soil and air into organic compounds which the plant must have to sustain its life and support its growth. Fruit-growers often fail to recognize that the fruit depends upon the leaves most intimately connected with it for elaborated food, which alone can nourish it. It is nevertheless true; and for this reason, even when there is no crop on the rest of the tree an overloaded branch needs to have its fruit thinned to secure the highest possible number of the large fruits.

By reducing the number of fruits the proportion of elaborated food for those which remain is increased. Sometimes checking the too vigorous growth of the vegetative parts is also resorted to for the same purpose. The latter practice is properly considered under the subject of Pruning; the former may be treated under the topic of Thinning Fruit.

In its broad significance Thinning Fruit includes not only picking off some of the immature fruit, but also any pruning of bearing wood to reduce the number of fruits which a plant is allowed to produce. Such pruning is usually done when the plant is in a dormant condition, though it may be performed on grapes in autumn as soon as the leaves fall. It is then easy to cover the vines if winter protection is needed. The more hardy orchard fruits may be attended to at any time when the leaves are off; the more tender kinds should be left until the severities of winter have passed, so that the amount of bearing wood is not reduced. Fruits which are taken off may be varied in proportion to the loss of fruit-buds by winter injury. The work on peaches and apricots is thus sometimes deferred till the trees bloom, or even later.

The sooner a fruit can be relieved from struggling with other fruits for its food the better its chances are for reaching extra large size. The large separate fruits indicate the relative gain in size in thinning plans. The right-hand twig shows relative stage of development at which peaches should be thinned; the twig at the left indicates relative distance between thinned peaches.
Very often the mistake is made of deferring it too long. The labor spent in late thinning is usually wasted as far as improving the grade of fruit is concerned. Although the yield is thus lessened, the ripe fruit generally averages but little if any larger than unthinned fruit.

No definite rule can be given as to the amount of fruit to be left in thinning. This should be determined according to the environment, vigor and productive habits of the plant. Generally speaking, fruits should be thinned so that those which are left are separated from each other by a distance of at least three times the diameter of the largest fruit at maturity. Under irrigation, or where a constant plentiful supply of soil moisture can be depended on, the number of fruits which the plant may be allowed to bear is much greater than, in some cases even twice as great as, the same plant could bring to large size if it were located on drier soil. Fig. 2497 shows the stage of development of peaches for early thinning and indicates the percentage removed and distance apart of those which are left.

Immature plants should not be allowed to bear a full crop. It is generally best that the plant carry but few fruits for the first crop. Afterwards it may be hardened more heavily, till finally, when a vigorous mature plant is developed it may safely bear a full crop. In consequence of overbearing, immature plants are often so weakened that they are easily winter-killed; or they may be left in an unthrifty condition from which they do not recover in several years if at all. In thinning fruit on immature plants, the natural ability of the plant and the influence of environment should be even more carefully considered than with mature plants.

This work requires skill and good judgment, which can only be acquired by experience, study and careful observation.

The question of what kinds of fruit it is best to thin should be considered briefly from the standpoint of the commercial grower. If the markets which are accessible do not pay more for the better grades of fruit there can be no profit in thinning except in preventing the breaking down of the tree by heavy crops and, possibly, from increasing the tendency to annual bearing. The crop of thinned fruit may sometimes exceed the measure that the unthinned fruit would yield, but not enough to pay for the cost of thinning if the crop is sold at no advance in price over unthinned fruit.

Where fancy prices are obtained they are brought by evenly graded packages of the larger specimens. Varieties which at their best run small or medium size do not usually pay for thinning. It does not pay, for instance, to try to increase the size of Damson plums by thinning them. Plums like Lombard or Burbank, which have medium to large fruit, may pay for thinning.

An exceedingly heavy crop of fruit may so exhaust a tree that it either fails to fruit the next year or produces less than an average crop. Such a result is more often seen with some kinds of fruit than with others, and different varieties of the same kind of fruit may vary much in their natural tendencies in this direction. By judicious selection of varieties and by skillful management much may be done towards securing more regular bearing and more abundant crops. Thinning fruit has a place in the management of the commercial fruit plantation, along with the maintenance of soil fertility, tillage, pruning and spraying. It is a mistake to depend too much on the results which may with difficulty be obtained by all these methods combined. In some careful experiments vigorous, mature, well-nourished trees on which the fruit had been systematically thinned annually, bore no more regularly than corresponding trees on which the fruit was not thinned. In other cases the beneficial effects of thinning were unmistakably apparent in somewhat increased fruitfulness the following season. The profit from thinning fruit in any one season comes largely from the increased amount of the better grades of fruit which are obtained by the process. The yield the succeeding year may or may not be greater because the fruit was thinned.

S. A. BEACH.

Thinning Fruit has now come to be an established horticultural practice with those who eat to the best markets and aim at the highest ideals in fruit culture. Thinning assists the grower in securing several results, chief among which are the following: (1) in maintaining the vigor of the tree; (2) in producing fruit of maximum size, appearance and quality; (3) in securing annual crops instead of alternate, and (4) in preventing the spread of parasitic diseases.

It does not pay to thin all classes of fruit. Only early or fancy varieties of apples will reward the cultivator for the expense and labor of thinning, though it usually pays to pick the earliest varieties, removing the largest and best colored specimens first, which in effect is a process of thinning. Standard pears are to be classed with apples; dwarf pears are partly thinned by winter pruning, and partly by the removal of surplus fruit in summer. Stone fruits pay for thinning more amply than other kinds. Peaches and plums may be thinned by winter pruning, but this is often inadequate. Our best peach-growers now thin to 6 and 8 inches apart and find that when this is coupled with high culture the results are usually satisfactory. Whether it will pay to thin plums or not will depend upon the variety and the market. The Japanese varieties are much improved in appearance and quality by judicious thinning. The larger varieties of the domestics may under favorable circumstances be profitably thinned, but the wisdom of thinning the smaller varieties of natives and domestics must be determined by the individual grower. Many varieties have a natural tendency to overbear; these should be thinned in the interest of the health and vigor of the tree. Grapes respond to thinning by increased size of bunch and berry, but there is little or no advantage in the earlier stage where the fruit is grown for a very special market or for exhibition purposes. Thinning the grapes should be accomplished by close winter pruning. Strawberries are thinned by special methods of mowing, as growing in hills and narrow matted rows. The way in which the operation is performed varies somewhat with
Plate XL I. Prominent American Horticulturists
THINNING FRUIT

the fruit. Sometimes small shears are employed, but as a rule the fingers and thumbs of an active man are the most effective instruments available. Practice gives dexterity. Eight to ten mature peach trees occupy a day's work. As to time, while it is important to thin early in the season, experience has shown that much labor is saved if the work is deferred until the "June drop" or first drop after the setting of the fruit occurs. After this, thinning should be done promptly.

JOHN CHAUNCEY


THIADIANTHA (Greek, to crush and flower; the author of the genus is said to have named it from pressed specimens). Cacembilicéae. A genus of 4 species of tender, dicotyledonic, herbaceous vines with tuberous roots, usually ovate-cordate leaves and axillary, yellow flowers. The genus is native of southern and eastern Asia and the island of Java. Male fls. solitary or ra-
eeed; calyx-tube short, bell-shaped, the bottom shot by 4 horizontal scale; segments 5, lanceolate; corolla bell-shaped, 5-lobed, the lobes revolute half way down; stamens 5; female fl. with calyx and corolla of male; ovary oblong; style 5-ent; seeds many. Thiadianna has not been offered in this country under the name of Golden Creepers.

dubia, Bunge. A tall climber with light green foliage and numerous yellow bell-shaped flowers: male fls. soli-

tary in the axis without bracts: fr. ovoid-oblong, about 3 in. long, red; seeds black, smooth. Summer. N. China, 28-2970. B. M. 3609 (male f. only).—According to R. I. Lynch, in Gn. 56, p. 518, the plants are of easy cultivation and by planting both sexes and artificial pollination the fruit may be grown. He further states that a rootstock, native with flowers, but form buds just before growth commences, as does a root-cutting. According to Danske Dandridge, the plant is hardly in W. Va., increasing rapidly by tubers and becoming a pest when planted with choicer plants.

F. W. BARCLAY

THLASPI (Greek, crushed; referring to the strongly flattened pods and seeds). Cruciferae. A genus of 25-30 species of annual or perennial herbs, mostly from the temperate and alpine regions of the northern hemisphere. Mostly inconspicuous plants with the radicle rose of leaves and nearly scapes of small white, rose or pale purple flowers. T. arvense, Linn., known as Penny Cress, is a naturalized annual weed from Eu., 4-12 in. high, simple, with terminal clusters of small flowers; sepals green, petals white. T. alpestre, Linn., is a perennial species native of the Rocky Mts. An early flowering alpine plant of a tufted habit, variable but usually 2-4 in. high: sepals purplish; petals white. Has been offered by collectors and is a neat little rock plant. It should be given shade and a cool, moist soil. V. 23:299. It differs from the European T. alpestre, but apparently not by any good specific character.

F. W. BARCLAY

THOMAS JOHN JACOBS (Plate XLI), one of the three pioneer settlers who may be said to have started the science in this country (the others being Patrick Barry and the elder Downing), was born January 8, 1810, near the lake in central New York—Cayuga—on the shores of which he passed his life, and died at Union Springs, February 22, 1895. He was much more than a pomo-

nist, his studies covering nearly every branch of rural industry except the breeding of live stock, and his labors in the direction of adorning the surroundings of country homes are as much worthy of mention as those of the younger Downing. Two of his works, "Farm Implements and Machinery," and the series of nine volumes called "Rural Affairs," deal with the practical every-day life on the farm, and in a manner once pleasing and original, there being nothing that could quite fill their place in the whole range of our agricultural literature; and his incessant stream of in-spiring editorials in "The Cultivator" and "The Country Gentleman" for nearly sixty years covered a wide and diversified range of rural topics. But pomology was his chief delight, and his fame rests mainly on his treatise on that subject, "The American Fruit Culturist." This immensely useful work, 4to of 222 pages, with 36 wood-cuts, which must have been well received, inasmuch as a fourth edition (dignified with muslin binding) was published in the following year, and in 1849 another, enlarged to 524 double-handed, and entitled "The American Fruit Culturist," has been much used. This edition appears to have been reissued a few years later, with slight modifications and on larger paper, and was then called the seventh.

Up to this time, the work had been chiefly in the direction of natural growth. But horticultural knowledge was undergoing great modification; and in 1867, the public still calling for the book, it reappeared in different form, with new arrangements, filling, now considerably more than 500 pages, and accompanied by almost that number of illustrations. Rather unfortunately, this was called "the sec-

ond edition," all its predecessors being regarded as different forms of the same book, while this was substantially new.

The next edition, called the "eighth revised," appeared in 1875, and had nearly 600 octavo pages and over 500 engravings,—not to mention a colored highly pictorial binding; and this was followed, ten years later, by a revised reprint in plainer and more tasteful style, illustrated with the largest number of engraving yet reached for this subject, and issued during the life of the author, sold well, like all the others, and was long out of print and much sought for.

So-called "twentieth" edition, revised and enlarged by Mr. William H. S. Wood, a lifelong friend of the author, with the assistance of a number of high authorities, appeared in 1897, and contains over 700 pages and nearly 800 illustrations. Personally, Thomas was one of the most lovable of men. A consistent but very liberal-minded member of the "society of Friends," he exemplified in a marked degree the peculiar virtues, both robust and gentle, which so commonly command, for the adherents of that simple and unobtrusive faith, the respect and admiration of those who know them.

GILBERT M. TUCKER

THORNBURN, GRANT (Plate XLII), founder of the seedhouse of J. M. Thorburn & Co., New York, and horticultural author, was born in 1775 in Dalkell, Scotland, and early came to New York to seek his fortune. His father was a wrought-nail maker, and the son en gaged in the same trade in this country. He soon mar-
rried the wife attanta of the founder of the "sect of Friends" in the Society of Friends, he exemplified in a marked degree the peculiar virtues, both robust and gentle, which so commonly command, for the adherents of that simple and unobtrusive faith, the respect and admiration of those who know them. He therefore gave attention to other means of livelihood. The women of the city had begun to show a taste for flowers. These were grown in pots, and were sold by grocers. In the fall of 1802, there being various pots in his stock, Thorburn thought to attract the attention of purchasers by painting the pots green. Four pots were first painted. They sold quickly. Then he painted twelve. They sold; and thus the pot business grew. Thorburn had been in the habit of buying his meat at the Fly Market, at the foot of Maiden Lane. In April, 1803, he bought a rose geranium thorni, thinking it pleasant to have plants to offer for sale. He also bought a potted rose geranium thorni, and Thorburn quickly returned to the market and bought two more plants. These sold; and thus the plant business grew.

The man, George Inglis, of whom Thorburn bought the plants, was also a Scotchman, and it was soon agreed that one should grow the plants and the other sell them. But the other also grew the rose geranium thorni, and they asked for seed; and as there was no
seed store in New York, it was arranged that Inglis should grow seeds also. This was in 1805; and in that year Inglis, as an experiment, had grown a lot of seeds. Thorburn bought these seeds for $15; and thus arose the first regular seed store in New York, and one of the first in the United States.

The seeds and plants continued to sell, and Thorburn was obliged to import seeds. In 1805 or 1806 he obtained a catalogue of William Malcolm & Co., London, the first plant catalogue he had ever seen, and he then published one of his own. This led to more pretentious writing, and "The Gentleman and Gardener's Kalendar" was the first outcome. The third edition of this, in 1821, by "Grant Thorburn, Seedsman and Florist," contains the advertisement of "G. Thorburn & Son," dealers in seeds, implements and rural books.

Grant Thorburn was a prolific writer for the current press on a variety of topics, under the nom de plume of Laurie Todd. He was a unique character, and his history," mixed with much fiction," as he himself says, — was the basis of John Galt's tale in three volumes (London, 1839) of "Lawrie Todd, or Settlers in the Woods." Thorburn left a most interesting autobiography, which was published in New York in 1822. He died in New Haven, Conn., January 21, 1863, at the age of 90. The portrait in Plate XLI is reproduced from his autobiography.

L. H. B.

THORN. See Crataegus. Christ's T. is Paliurus Spinia-Christi. Jerusalem T. is Paliurus Spinia-Christi; also Parkinsonia acutata. Swallow T. is Hippophae rhamnoideæ.

THORN APPLE. Datura Stramonium; also Crataegus.

THORN BROOM. Ulex Europæus.

THOROUGHWORT. Eupatorium perfoliatum.

THRIFT. Armeria.

THRINAX (Greek, fan). Palmaeæ. About 10 species of fan palms native to the West Indies and Florida. Spineless palms: trunks low or medium, solitary or cespitose, ringed below, clothed above by the fringed leaf-sheaths: lvs. terminal, orbicular or truncate at the base, flabellately plicate, multifid; segments induplicate; leaf-blades rather short or none; ligule free, erect, concave; petiole slender, biconvex, smooth on the margins; sheath usually beautifully fringed: spadix long; axis clothed with tubular sheaths; papery-coriaceous, split: fls. on rather long, slender pedicels, the pediciled with a caducent bract at the base: fr. the size of a pea. For the new Porto Rician species, see Cook, Bull. Torr. Bot. Club, Oct., 1901.

One of the best groups of palms for pot-culture. The species are of slow growth, but succeed with indifferent care. They are mostly of elegant form and habit. A good specimen is shown in Fig. 2499.

For T. Chuco, see Acanthoriza Chucor.

A. Under surface of leaves green.

b. Ligure with a blunt appendage at the middle .......................... 1. radiata

bb. Ligure bluntly deltoid .................. 2. parviflora

bbr. Ligure obsolete, truncate .......... 3. Barbadénesia

AA. Under surface of leaves silvery or glaucous.

b. Leaf-segments connivent at base. 4. argentea

b. Leaf-segments connivent for one-third their length .......................... 5. excelsa

bbr. Leaf-segments connivent for one-half their length ................................. 6. multiflora

1. radiata, Lodd. (T. elegans, Hert.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; segments united to or beyond one-third length, ligule broadly rounded, with a short, blunt appendage at the middle. Cuba to Trinidad.

2. parviflora, Swz. Caudex 10-20 ft. tall: lvs. 10-25 in. long, minutely pubescent: becoming glabrous, green beneath; segments united one-fourth or one-sixth their length: ligule bluntly deltoid, 1½ lines long, Bahamas, Jamaica, Florida. S.S. 10:510.


4. argentea, Lodd. Caudex 12-15 ft. high, 2-3 in. thick: lvs. shorter than the petiole, silvery gray beneath; segments united at the base; ligule conic, semi-lunar, crenate. West Indies.

5. excelsa, Lodd. Lvs. pale green above, hoary-glaucons beneath: segments united one-third: ligule bluntly deltoid; sheath densely buff-lunate, Jamaica, British Guiana.


THYRTÔMÈNE (Greek word said to refer to the low-heath-like appearance of the plant). Myrldæcæ. About 18 species of heath-like shrubs from Australia, with small, opposite leaves and small or minute flowers, which are solitary in the axils or fasicled.

Mitchelliána, P. Muell. A compact, bushy shrub with slender branches: lvs. oblong, flat, ¼-½ in. long; fls. in the upper axils solitary or in clusters of 2 or 3, white. Offered in southern Calif. Introduced by Mrs. T. B. Shepherd, who says the plant rarely exceeds 4 ft. in height, blooms in midwinter and is good for cut-flowers.

F. W. BARCLAY.

THUJA. See Thuja.

THUJÔPSIS. See Thyopsis.

THUNDRÉOGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnaeus; died 1828). Acanthoriza. Mostly tall perennial greenhouse climbers producing flowers in great profu-
sion: lvs. opposite: fls. blue, yellow, purple or white, solitary, axillary or in racemes, calyx entire and scarcely lobed or toothed or 10–15-toothed, surrounded by 2 large bracts which often inclose also the corolla-tube; corolla-trumpet-shaped, with a spreading limb, tube of two parts, subconic, depressed, enlarged toward the mouth; stamens 4, didynamous, fixed near the base of the tube, filaments thickened at the base, above are easily raised from cuttings or layers in summer. T. erecta is a more upright but has a somewhat straggling habit. It has small, dark green lvs. and large, deep purplish blue gloxinia-like fls. which are white at the base. There is a pure white variety of it. It blooms all summer and autumn. It is readily raised from cuttings during the rainy season.

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1. a. affinis, 1
b. alata, 2
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A. Fls. axillary, solitary
B. Lvs. entire
C. Petioles winged
D. Color of fls. white, corolla-lubes truncate and sinually toothed at the apex
E. Plant suberect
F. Throat of the corolla yellow

2. a. alcata, Boj. Fig. 2500. Stem square, climbing-hairy; lvs. opposite, triangular-ovate, hastate, repent-toothed, rough-pubescent, tomentose beneath; petioles winged, about as long as the lvs.; fls. solitary, on axillary peduncles; calyx very small, surrounded by 2 large inflated bracts; corolla-tube somewhat longer than the involucre, dark purple within, limb rotate, oblique, of 5 rounded segments, suffused dark red. S.E. Africa. B.M. 2501. P.M. 2:22. B. 5:228 (not good), L.B.C. 11:1045.—A perennial climber which may also be treated as an annual greenhouse plant. Usually propagated by seeds. It is used either as greenhouse climber or to grow on trellises outdoors. Outside it flowers mostly in August, but by propagating at various times they may be had in blossom nearly the whole year in the greenhouse. There are many varieties, some of which have been described as species.


3. frargrans, Roxb. Stem slender, climbing; lvs. lanceolate to triangular-ovate, cordate or subcordate, mostly angularly toothed on each side of the base, rough on both sides, petiolate: fls. white, axillary; corolla-tube narrow; limb spreading, 1½ in. across, lobes truncate and repandently toothed at the end. Summer, India.
THUNBERGIA


6. \textit{grandiflora}, Roxb. Fig. 2501. Stem tall, climbing: lvs. broadly oval, angularly cordate and toothed or lobed, somewhat roughened on both sides, petiolar: fls. solitary or in short, stout racemes in the leaf-axils, bright blue, becoming whitish in the throat; corolla-tube bell-shaped; limb 5 in. across, of 5 large, spreading rounded lobes, Bengal. B.M. 2566. P.M. 7:221. L.B.C. 4:324. B. 2:76. B.R. 6:495. Ga. 47:1003. I.H. 42:32. G.C. III. 9:789.—A very large perennial greenhouse climber; flowers during the summer or autumn. There is also a white-flowered var. G.C. IV. 3:189. Var. \textit{grandiflora}, Wall. Stem terete, smooth except the youngest, twining: lvs. long-petiolate, ovate-oblong to oblong-lanceolate, acuminate, rounded at the base, smooth, entire or slightly toothed: fls. 3 in. across, pale blue, white or yellow in the throat, borne in axillary whorls or in a raceme in which they are also clustered or whorled; corolla with wide, white, campanulate throat. Thunia

8. \textit{Myborenia}, T. Anders. (\textit{Hexacanthus Myborenia}, Wight). Climbing shrub, with long, slender branches: lvs. opposite, petiolate, oblong-lanceolate, acuminate, entire or somewhat distantly toothed; racemes long-pendulous; fls. in several, the tube green or green-yellow, surrounded by the spathé-like bracts; limb 4-lobed, the upper lip concave, with reflexed side lobes, lower lip of 3 subequal, spreading lobes. India. B.M. 4786. F.S. 8:732. B.M. 2, p. 130.—A tall greenhouse climber which flowers, according to treatment, at all seasons.

9. \textit{coccinea}, Wall. (\textit{Hexacanthus coccineus}, Nees). A very tall climber; stem much branched, 4-angled: lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cordate angled base, the upper ovate, cordate, all angularly toothed or the upper entire: fls. in terminal or axillary racemes, 1½-2 ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B.M. 5124. F.S. 12:1195. F.S. 23:2447. R.H. 1860, p. 197.

HEINRICH HASSELBERG.

THUNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the 19th century). Orchidaceae. A small genus of which at present only 9 species are known. All are tall plants with annual leafy stems terminating in a raceme of showy flowers. The genus was formerly united with Phalaenopsis, from which it differs by the terminal inflorescence. Sepals and petals similar, spreading; labellum convolute over the column, united below, with several crests constituting the line of separation. Thunia

8. \textit{alba}, Reichb. f. (Phalanthus \textit{albus}, Lindl.). Fig. 2502. Suberect, 2-3 ft., clothed with sheathing, oblong-lan-
ceolate, striate lvs. 6 in. long; raceme drooping at the end of the stem, 6-12 dm. ft. white, 3-4 in. across while sepals and petals sub-long-lanceolate, acuminate; labellum shorter than the segments, not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wavy and finely crisp. The color of the labellum is white violet-purplish, labellum with purple veins, throat with 5-p <br>yellow or yellow fringed keels. Wings of the column entire. April-Aug. Burma and S. Himalaya region. B.M. 3991. B. R. 24:33. P. S. 5:125. F. C. 3:253. Gt. 47. p. 228. There are several varieties of this species. The throat of the labellum is often yellow.

Bensonie Hook. (Phaius Bensonie, Benth.). Stems fascicled, I-2 ft. high, leafy: lvs. linear-lanceolate, 8-10 in. long, the base of these of T. alba but of a pale purple color; labellum large, 3-lobed, deep purple in front with a yellow erose disk, with 6-7 rows of fringe-like golden yellow hairs; spur short, slender, India. July-Aug. B.M. 5981. G. M. 31.337. The most showy species of the genus.

Marshallana, Reichb. f. (Phaius Marshallana, Nichols.). Closely related to T. alba. Stems somewhat stronger; segments pure white, acuminate; labellum evidently 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisped. The color of the labellum is yellowish white with five orange-fringed keels in the throat; wings of the column toothed. May-Aug. India. R.G. 21.229. Gt. 47. p. 235. A var. Ionantha Reichb. f., has the center of the labellum bright yellow, paler toward the margin.

HEINRICH HASSELBERG.

THURBER, GEORGE (Plate XLI), botanist, naturalist and editor, was born in Providence, R. I., September 2, 1821, and died at his home near Passaic, N. J., April 2, 1890. He obtained his early education at the Universal Classical and Engineering School of his native city. Afterwards he served an apprenticeship as pharmacist, at the termination of which, he began business for himself in partnership with Joshua Chapin. During these years he devoted himself eagerly to the study of chemistry and natural sciences in general, but especially to botany, so that at an early age he was already well known as one of the most prominent botanists of the country. This brought him in close intimacy with Drs. John Torrey, Asa Gray, George Engelmann, Louis Agassiz and other eminent scientists, whose warm friendship he enjoyed until his death. In 1850 he obtained the appointment as botanist, quarter master and professor of the new University of the United States Boundary Commission for the survey of the boundary between the United States and Mexico. During the following four years his botanical work consisted mainly in the exploration of the native flora of these hiterto unknown states. His herbarium comprised a large number of species new to scientists, some of which have been named after their discoverer, Ceres Thurberti being one of the most important; it is now cultivated for its fruit in the desert regions of North Africa. This historical herbarium formed the subject of Dr. Asa Gray's important work "Planta Novae Thurberianae," published by the Smithsonian Institute. After his return to New York in 1853, Dr. Thurber received an appointment to the United States Assay Office, of which Dr. John Torrey was the assayer. In this position he remained until 1856, when owing to his aggressions with Government, he was the first presidential candidate of the Republican party, he preferred to resign rather than sacrifice his principles. This incident well illustrates his perfect candor and characteristic, uncompromising spirit. Upon his resignation he was connected with the Cooper Union and the College of Pharmacy of New York city as lecturer on botany and materia medica. In 1859 he was appointed professor of botany and horticulture at the Michigan Agricultural College, which position he held for four years. Here his wide and varied knowledge, of which he had ready command, his alertness of brain, clearness and vigor of speech, humor and enthusiasm made him a successful and ideal teacher. Many of his students and those who studied under his students are now filling important professional and editorial chairs throughout the country. This position he resigned in 1861 to accept—the urgent invitation of the "American Agriculturist," which he held to within a few years of his death, when failing health prevented him from continuing his ardent labors. In this position he performed his most essential work and the real mission of his life, for which his previous training, his vast and varied knowledge of natural sciences, arts and industries, his quick perception and rare judgment as to cause and effect had fitted him so admirably. Few men have exerted so powerful and effective an influence on progressive horticulture and agriculture as has Dr. Thurber. During his connection with the "American Agriculturist", he was a most painstaking and scrupulous editor and would not accept any article or statement about the correctness and accuracy of which he was not fully convinced. In order to convince himself to his own satisfaction of the value of new plants, fruits and vegetables, he established an extensive experimental and botanical garden in connection with his home on the Passaic river, which he named "The Pines," after a clump of tall white pines growing in front of it. The results of these observations and experiments formed the basis of a regular and valuable series of "Notes from the Pines." But in no part of his editorial work has he taken so much delight as in the "Doctor's Talks," and thousands of now gray-haired men and women will long hold in grateful and affectionate remembrance "The Doctor," who through his letters to the "boys and girls" has added so much to the delights of their childhood days. Although Dr. Thurber was never married and had no children, he was always fond of young people and was never happier than when he could teach and assist them in whatever lay in his power. The amount of his writings in the "American Agriculturist" during the twenty-two years of his connection with it was enormous, but as his name but rarely appeared with his articles it would be impossible to estimate the aggregate, yet whatever he wrote bore the stamp of accuracy of detail and naturalness of style. While in Michigan he revised and partly rewrote Darlington's "Agricultural Botany," which was published under the title of "American Weeds and Useful Plants." He wrote also the entire botany of Appleton's "New American Encyclopedia." An important part of
his contributions to horticultural literature consisted in editing, revising and bringing out the horticultural and agricultural books of the Orange Juif Company. After the death of Dr. Torrey, he was elected president of the Torrey Botanical Club. He was also president of the New Jersey Horticultural Society; vice-president of the American Pomological Society for New Jersey; and honorary member of many scientific societies throughout the world. The honorary title of doctor of medicine was conferred upon him by the University Medical College of New York. During the latter years of his life he suffered severely from chronic rheumatism, which finally resulted in heart degeneration and his death. Personally, Dr. Thurber was one of the most genial of men, gentle, sweet-tempered, with a considerable share of good-natured humor, always ready to help those whom he felt needed assistance, liberal-minded and generous to a fault; but a relentless foe to frauds, shams and impostors of every kind.

F. M. HEXAMER.

THUYA (Thuya or Thuya, an ancient Greek name for a resinous tree or shrub). Also spelled Thugia or Thusa. Including Biota. Conifere. ArborvitaE. Ornamental evergreen trees of narrow pyramidal habit, with much ramified branches, the branches arranged frond-like, flattened and clothed with small scale-like leaves; the fruit is a small strobile or cone not exceeding 1 in. in length. The well-known T. occidentalis is hardy north and also T. Japonica. T. gigantea and several forms of T. orientalis are hardy as far north as Mass. Thuyas are favorites for formal gardens. They are all of regular, symmetrical habit. Their numerous garden forms vary greatly in habit and in color of foliage. For planting as single specimens in parks they are mostly too stiff and formal, but they are well suited for massing on borders of streams or lakes. The most beautiful and the most rapidly growing species is T. gigantea. Thuyas are well adapted for hedges and wind-breaks. They bear pruning well and soon form a dense hedge. They thrive best in somewhat moist, loamy soil and are easily transplanted. Prop. by seeds sown in spring. The varieties, especially those of T. occidentalis, are usually prop. by cuttings, except the juvenile forms of the latter, as var. decussata and Meldensis. Consult Retinisp. and Retinisp. of Arborvitaes.

Five species occur in N. America, E. and Cent. Asia. Resiniferous trees with short horizontal, much ramified branches; the branches flattened and frond-like ar-

2504. Seeding of Thuya occidentalis (× 1 3).
 occidentalis, Linn. COMMON ARBORVITA E. erroneously but commonly called WHITE CEDAR (which is properly Chamaecyparis). Figs. 2503-4. Tree, attaining 60 ft. and more, with short horizontal branches ascending at the end and forming a narrow pyramidal, rather compact head: lvs. ovate, acute, usually glandular, bright green above, yellowish green beneath, changing in winter usually to dull brownish green: cones oval to oval-oblong, about ½ in. long, brownish yellow: seeds ½ in. long. New Brunswick to Manitoba, south to N. C. and Ill. S.S. 10:532.— Much used for telegraph poles. A great number of garden forms, about 50, are in cultivation. The best known are the following: Var. Alba, Nichols. (var. albo-epica, Beissn. Var. Queen Victoria, Hort.) Tips of young branches white. Var. argentea, Carr. (var. albo-variegata, Beissn.). Branchlets variegated silverly white. Var. aurea, Nichols. Broad bushy form, with deep yellow foliage; also var. variegata, Douglas' Golden and Meehan's Golden are forms with yellow foliage. See also var. tuta. Var. aureo-variegata, Beissn. (var. aurea maculata, Hort.). Foliage variegated with golden yellow. Var. conica densa, var. aurea, 2505. The ArborvitaE—Thuya occidentalis. Nearly full size. HorT. "Dense conical form." Var. Columbia, HorT. "Strong habit; foliage broad, with a beautiful silvery variegation." Var. cristata, Carr. Irregular dwarf, pyramidal form with stout crowded, often recurved branchlets. Var. Douglasii, Rehd.-Bushy form, with


of foliage; the younger and lower branchlets with spreading acicular ivs. like those of var. *ericoides*, but thicker in texture; the upper branchlets slender and sparingly ramified much like those of var. *Douglasii*.


BB. *Lvs. with whitish markings beneath.*


AA. "Cones upright, the thickened scales with a prominent horn-like process below the apex; seeds wingless: branchlets ramified in a vertical plane with both sides alike, (Biot)."

*orientalis*, Lindl. (*Biotia orientalis*, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches; branchlets thin: ivs. rhombic-ovate, acute, bright green, with a small gland on the back: cones globose-ovate, ½-1 in. long; usually 6 ovate scales, each with a horn-like process, the uppermost pair sterile. From Persia to E. Asia, in Japan probably only cult. There are many garden forms, of which the following are the best known: Var. *athrotaxoides*, Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. R.H. 1861, p. 230. Var. *aurea*, Hort. Low,
bescents; lvs. small, seldom ½ in. long, narrow-oblong to oval to nearly ovate, obtuse, narrowed into a distinct petiole, the margins sometimes slightly revolute: fls., minute, lilac, much shorter than the lvs., in axillary whorls. Temporally parts of Europe, Asia and N. Africa.

—A common plant in old gardens, prized as an evergreen edging and as cover for rockwork and waste places; also run wild. The leaves are sometimes used for smoking in those of T. montana. The nodes are short, making it a very leathy plant. Variable. Some of the cult. forms are: var. citriodorus, Hort. (T. citriodorus, Schreb.), the Lemon THYME, has small, strongly scented lvs. and a pronounced lemon odor; T. montana, Benth. (T. montana, Waldst. & Kit. T. Chamædrus, Fries), has larger lvs. and longer, somewhat ascending branches. Var. laugnus, Hort. (T. laugnus, Schh.), is a form with small roundish lvs., and a grayish-green covering, making it a handsome plant for edgings. Var. aureus, Hort. Foliage golden, particularly in spring. Var. argenteus, Hort. Lvs. variegated with silvery white. Var. variegatus, Hort. White-variegated, lvs. Var. coccineus, Hort. Lvs. crimson, scarlet. There is a form with white fls. (see Gt. 45, p. 108). All forms are hard.

Côrcius, Pers., is properly Calamínta Côrcius, Benth. Prostrate, small, glabrous or nearly so: lvs. very small, 2 lines or less long, nearly orbicular, petiolate; fls. small, light purple, in whorls, the floral leaves similar to the others. Côrcius — A good little plant for edgings, with very aromatic herbage.

L. H. B.

THYRSACANTHUS (Greek, thyrse and flower). Acanthaceæ. About 20 species of tropical American herbs or shrubs with opposite, often large leaves and red, tubular flowers in fascicles which are arranged in a terminal simple or panicked thyrsus. Calyx short, 5-parted; corolla long-tubular, the limb 4-cleft, slightly 2-lipped; stamens 2; staminodia 2, small, at the base of the filaments: capsule oblong; seeds 4 or fewer by abortion.

Schomburgkiàus, Nees (T. râlius, Planch.). Fig. 2509. A shrubby plant, becoming 6 ft. high; lvs. oblong-lanceolate, nearly sessile: racemes 8-10 in. or even 3 ft. long from the upper axis, slender, drooping; fls. tubular, red, about 1½ in. long, pendulous. Dec.–March. Calif. This. Flora 7:397. B.M. 1852:169. J. M. 42, p. 482. F.S. 7:532. F. W. BARCLAY.

Thyrsacanthus Schomburgkiâus is a fine old greenhouse-favorite which has of recent years fallen into undeserved neglect. It deserves a place in every good general collection. It is chiefly admired for its umbrellalike habit and pendulous grace of its long sprays of tender, red tubular flowers. In many other aspects, it becomes leggy and weedy in old plants, even if cut back severely. Hence, plants are rarely kept after the second season. The culture of Thyrsacanthus is easy. It is an ideal plant for a general collection, as it requires no special treatment. Some English writers advise a stove temperature, but the undersigned has grown it for many years in a coolhouse. Ordinary potting soil such as suits geraniums will do for Thyrsacanthus. It flowers in winter and remains in bloom a long time. Cuttings may be made at any time in early spring and will produce flowering plants 2-2½ ft. high the first season. After flowering, they should be cut back severely. It is not desirable to have more than one plant in a pot, nor should the young plants be pinched the first season, as the umbrella form is preferable to that of a compact, much-branched bush. The pendulous habit of Thyrsacanthus is suggested to some gardeners the use of this plant for hanging baskets and brackets.

ROBERT SHORE.

THYRSOSTACHYS (Greek, thyrse and spike). Gramíneæ. T. Siamensis is a tall Indian bamboo which has been offered in southern California since the article Bamboo was written for this work. As the plant is not indigenous to California, its botanical status is uncertain. Franchesi writes that the plant is rather tender at Santa Barbara. The genus belongs to a subtribe of bamboos of which Democlanthus is the type. This subtribe is distinguished by having 6 sta-
mens, a 2-keeled pala and the pericarp free from the seed. For generic characters of Thyrsoistachys, see the Flora of British India 7:297 (1897).

Thyrsoistachys is a genus of 2 species of arborecent bamboos native to Upper Burma and Siam. The stem-sheaths are long, thin and persistent, with a long, narrow blade. The lvs. are small or moderate-sized. As nearly as may be judged from the only available description, this species could be inserted at the bottom of page 128 of this work, being distinguished from species 12 and 13 by the narrowness of the lvs.

Siaménèsis, Gamble. A tender, deciduous, "giant bamboo," with very graceful tufted stems 25-30 ft. high and 1½-3 in. thick. Stem-sheaths waved and truncate at the top, 9-11 x ½-8 in.; arillets short-triangular; lvs. small, narrow, linear, 3-6 x ½-½ in. Siam.

W. M.

2509. Thyrsacanthus Schomburgkiâus (× ½).

TIARELLA (Latin, a little tiara or turban; in reference to the form of the pistil). Saxiragracae. False Mitrewort. A genus of 6 species of slender perennial herbs, of which 4 are from North America, 1 from Japan and 1 from the Himalayas. Low-growing plants, with most of the leaves radical and long-petioled, simple or serrate, lobed or even 3-foliolate, with white flowers in terminal, simple or compound racemes: calyx-tube but slightly adnate to the base of the ovary; petals 5, entire; stamens 10, long; capsule superior, compressed, with 2 unequal lobes.

A. Lvs. simple.
B. Petals oblong.

cordifolia, Linn. Foam Flower. Fig. 2510. A handsome native perennial, forming a tufted mass, 6-12 in. high, of broadly ovate, lobed and serrate leaves and simple, erect racemes of white flowers borne well above the foliage in May. Fls. about ½ in. across; petals oblong, clawed, somewhat exceeding the white calyx-lobes. In rich, moist woodland, Nova Scotia to Ontario, south to Ga. Fl. 3:25, p. 21; 32, p. 511; 53, p. 436; 55, p. 46; V. 11:55. — An elegant plant well worthy of general cultivation. It is a lover of cool, shaded places and of rich, moist soil. It will, however, do well in ordinary soil and flower freely in a half-shaded place, but the varied leaf-markings of bronze red and other signs of luxuriance are not brought out to their fullest
TIARELLA

extent except with moisture, coolness and a fairly rich soil. The plant forces well and easily in a coolhouse for early spring flowering. It is tenacious of life and generally easy to manage.

2510. Tiarella cordifolia (× 1/4).

unifoliata, Hook. Hardy perennial; lvs. thin, rounded or triangular, 3-5-lobed, the lobes crenate-toothed; stems usually only 1, rarely 2-3; panicle loose; petals small. W. Amer.—The blooming of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

trifoliata, Linn. Resembling T. unifoliata except in having 3-foliolate lvs. Orig. to Alaska. Also northwestern Asia.

F. W. BARCLAY.

TIBOUCHINA (native name in Guiana). Melastomataceae. A genus of about 125 species, native to the warmer parts of North and South America but mainly from Brazil. Shrubs, herbs or climbers, with usually large ovate or oblong, 3-7-nerved lvs. and purple, rose, violet or rarely white fls., either solitary or in terminal panicles. Fls. 5-merous, rarely 4- or 8-merous; calyx ovoid or bell-shaped, the lobes as long as or longer than the tube; petals ovate, entire or retuse; stamens twice the number of the petals, nearly equal or alternately unequal; ovary free; fr. a capsule, 5-4-valved. D.C. Mon. Pl. Amer. vol. 7.

semidecandra, Cogn. (Lasiandra semidecandra, Linden & Seein. Pl. Erénsia macrophylla, Hook.). Fig. 2511. A tender shrub; lvs. ovate or oblong-ovate, 2-6 in. long, round at the base, short-petioled, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved; bracts broadly suborbiculate, somewhat rounded at the apex and shortly apiculate, margin not translucent; fls. reddish purple to violet, often 5 in. across, solitary and terminal or 1 ft. terminal and 2 in the upper axils on the branchlet; stamens purple; style setulose. Brazil, B.M. 5721; 4412 (as P. Kiriühinum). F.S. 23:2430. Gn. 44:221. F. 1868:193. 1.H. 16:594.

Var. floribunda is more suited to pot culture in pots and flowers more freely when small than the type. Lasiandra, or Plérona splendens, Hort., should be compared with this. T. semidecandra is a plant of easy culture that has been highly praised by several connoisseurs. Cuttings struck in April will give bushy plants for fall and winter blooming. Handsome specimens may be had by keeping the same plant two or three years, training it to wires or stakes in a coolhouse where it has plenty of root room. The flowers last but a day or so, but new ones open up every day and the flowering season lasts for several weeks. Plants may also be used for summer bedding. They are seldom out of bloom. The species is much esteemed in Florida, where it makes a showy shrub 8 ft. high. It endures a few degrees of frost with impunity, and even if cut down it sprouts readily.

crassipes, Coult. & Rose. A hardy native, white-flowered swamp herb, growing 2-5 ft. high from clustered tubers. It has pinnate lvs. with 3-9 leaflets. This was offered in 1890-91 by a collector of North Carolina plants, but is probably not in cultivation. For a fuller account, see Coult and Rose’s monograph of the North American Umbelliferae (contrib. U. S. Nat. Herb. vol. 7, No. 1, p. 164), 1900; also Gray’s Manual, and Britton and Brown’s Illustrated Flora.

TICSEED is Coreopsis.

TICK TREFOL. Refer to Desmodium.

TIEDEMANNIA rigida, Coult. & Rose, is a hardy native, white-flowered swamp herb, growing 2-5 ft. high from clustered tubers. It has pinnate lvs. with 3-9 leaflets. This was offered in 1890-91 by a collector of North Carolina plants, but is probably not in cultivation. For a fuller account, see Coult and Rose’s monograph of the North American Umbelliferæ (contrib. U. S. Nat. Herb. vol. 7, No. 1, p. 164), 1900; also Gray’s Manual, and Britton and Brown’s Illustrated Flora.

TIGER FLOWER. Tigrinia.

TIGER LILY. Lilium tigrinum.

TIGER’S JAW. Catalogue name for Mesembryanthemum tigrinum.

TIGRIDA (tiger-like; referring to the peculiarly marked flowers). Iridaceae. Eight or ten species of cormous plants ranging from Mexico to Peru and Chile, and making very showy summer-blooming plants. Bulbs tubercled. Stem erect, unbranched, a few inches to 2½ ft. tall, with a few narrow plicate leaves at the
base and 2 or 3 smaller ones higher up; spathe 4 or 5; perianth 6, each bearing 3 spots. Flowers in shades of yellow, orange or purplish, variously spotted, often very showy; perianth wide-spread, with no tube, the segments 6, in two dissimilar series, convolute into a broad cup at the base; stamens 3, filaments dilated into a linear cylindrical tube, including the style; pistil with 3-loculed ovary, long style with three 2-parted branches. *Tigridia Pavonia*, from the southern Mexico, was in cultivation in Europe in the sixteenth century. L’Hérit described it in 1556. The younger Linnaeus referred to it the genus Ferraria, and some of the Tigridias are yet cultivated under that name. Ferraria, however, is a South African genus, and all the parts of the perianth are nearly equal. *T. Pavonia* is cultivated in many forms, and is the only common species in gardens. The flowers of all Tigridias are fugitive, lasting only for a day. See Baker, *Irideae*, 67 (1892).

Tigridias are tender “bulbs,” requiring the treatment given Gladiolus. Plant in well-prepared soil when settled weather comes, 2 or 3 inches deep and 4 to 8 inches apart. The principal blooming period is July and August. Allow the corms to remain in the ground until danger of frost approaches, then store in a dry place, where dahlias or gladioli will keep. See that the corms are dry before being placed in storage. Prop. by corms and seeds. Best colors are got in warm weather.

*F. Fls. large (often 4 in. or more across): the two rows of perianth-segments very dissimilar; stigmas decurrent. (Tigridia proper.)

*Pavonia*, Ker-Gawl. Tiger flower. Shell-flower. Fig. 2512. Erect, usually unbranched, 1½ to 2½ ft. tall, glabrous, with several sword-shaped, strongly plicate, long-pointed leaves, the spathe-leaves 3–5 in. long: fls., produced in succession through the warm season, very large and showy, in some forms 5 and 6 in. across, oddly marked, with a cup-shaped or saucer-shaped center and wide-spread limb formed by the obovate outer segments which are bright red on the limb, and purple, yellow or red-spotted on the claw; inner segments panduriform (shaped), about half the length of the outer ones, the blade ovate-acute, orange-yellow and copiously spotted. Mex. and Guatemala. B.M. 332 (as *Ferraria Tigridia*). I.H. 38:142. Var. *conchilora*, Hort. (T. *conchilora*, Sweet), has bright yellow flowers. Var. *Watkinsonii*, Hort. (var. *àurea*, Hort. *T. conchilora* Watkinsonii, Pott.). Raised from seeds of var. *conchilora* pollinated by *T. Pavonia*, before 1846, by J. Horsfield, Manchester, England. Horsfield is quoted as follows by Paxton: “In habit and strength this hybrid resembles *T. Pavonia*, the male parent; but in color and the markings of the flower it resembles *T. conchilora*, the female parent; the large outer sepals, however, are of a very different yellow, inclining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, or if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free a bloomer, and as easy to cultivate and increase as *T. Pavonia*, whereas *T. conchilora* is rather delicate, increases slowly, and is easily lost.” Dutch bulb dealers still offer it. P.M. 14:51. Var. *alba*, Hort., has white fls., but has red spots in the throat. Var. *alba immaculata*, Hort., is a spotless white variety, a sport from var. *alba*. Gn. 49, p. 361. Var. *flava*, Hort., has pale yellow fls., with red-spotted center. Gn. 50:1074. Var. *Canariensis*, Hort., is also a pale yellow-fld. form, but named as if an inhabitant of the Canaries. Var. *lutea immaculata*, Hort., has pure yellow spotless flowers. Var. *rosea*, Hort., has rose-colored fls., with yellow variegated center. Var. *lilaca*, Hort., has lilac fls., with spotted center. Gn. 45:955. Var. *speciosa*, Hort., is a partially dwarf form with deeper red color, the interior of the cup being similar in color to the limb. Described in 1843. Var. *grandiflora*, Hort., has flowers much like those of *T. Pavonia* itself except that they are larger and brighter colored. Gn. 45, p. 263. Identical with this, or a subtype of it, are the forms known as *Wheeleri*, see p. 45. Most of the dwarf forms, and some in colors of *Tigridia Pavonia* are recent. In catalogues the above names often appear as if they were species names.

*Pringlei*, Wats. Distinguished by Sereno Watson, the author of the species, as follows: “Very closely related to *T. Pavonia*, and if color alone were to decide, it might be considered a variety of it, though differing markedly even in that respect from the old species. The base of the sepals is blotched (rather than spotted) with crimson, with a border of orange, the reflexed blade being of a bright scarlet-red. The petals have the base blotched and coarsely spotted with crimson, with a well-defined, deeper-colored, brownish mar-
buccifera, Wats. About 1 ft. high, slender, branching, glaucous; lvs. very narrow, strongly plicate; fl. 2 in. across, the cup pale greenish yellow, dotted with purple, the obvolute obtuse blade of the outer segments light purple; inner segments "folded together in such a manner as to form a sunken longitudinal tube down the center, the dilated sides at the outer end of the tube approaching each other in the form of two cheek-like prominences,—these are colored white, purple, and yellow, while the small rounded terminal blade is a deep purple," Mts. of Jolicoe, Mex. G.F. 2:413.—Offered in 1839 by Horsford.

**TIGRIDA** (the classical Latin name). Tiliaceæ. LIME. LINDEN. BASSWOOD. WHITEWOOD. Trees distributed generally throughout the northern temperate zone, with soft, light, white or light-colored wood, tough fibrous inner bark, serrate alternate petiolate, mostly cordate lvs. and deciduous stipules; inflorescence cyathiform, the peduncle attached to, or adnate with, for about half its length, a ligulate membranaceous bract: fls. small, yellowish; sepals 5; petals 5; stamens many, with long filaments nectariferous; fr. globose, nut-like. In some species, small petaloid scales are found among the stamens.

The soft white wood of several species is in great demand for making fruit, honey and other light packages, the facility with which the wood is cut into veneers rendering it admirable for such use. The fibrous inner bark is used as a tying material and in the manufacture of Russian bass or bust mats. Extensively planted as an ornamental tree and for bee pasture. As a source of honey supply perhaps no other plant excels it, as under favorable conditions the nectar sometimes drips from the flowers in a shower.

Nearly all the species are of rapid growth and not very particular as to soil. Propagated by seeds, layers or grafting. In layering, it is usual to twist the branch layered before covering it. The method known as "stooling" is also employed. In order to effect this a tree is cut close to the ground and the "stools" or suckers are banked up with earth and severed from the old stump and planted in the nursery rows. Rare varieties are usually increased by budding or grafting.

Much confusion exists in the trade names, especially in the European varieties. "This is no doubt largely due to the fact that at least three species have been sent to this country under the name of T. Europæa."

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**TILIA.**

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<td>petaloloris, DC.</td>
<td>(T. Europæa, var. pendula, Hort. T. argentea, var. pendula, Hort. T. glauca, var. pendula, Hort. T. pendula, Hort. T. Silver Linden, White.) Trees. A medium-sized species with slender somewhat pendulous branches; lvs. large, 5-8 in. long, orbicular to broadly ovate, cordate or truncate at the base, rather coarse and remotely serrate with spreading teeth; floral bract adnate almost to the base of peduncle; fr. globose, thick-shelled, with 5 furrows and a slight cavity at the insertion of the pedicle. Rare varieties have the lvs. edged with yellow or a lighter green.</td>
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**Mandshurica, Rupr. & Maxim.** Tree, attaining 50 ft., with spreading, often somewhat pendulous branches; lvs. large, 5-8 in. long, orbicular to broadly ovate, cordate or truncate at the base, rather coarse and remotely serrate with spreading teeth; floral bract adnate almost to the base of peduncle; fr. globose, thick-shelled, with 5 furrows and a slight cavity at the insertion of the pedicle. Very variable in time of flowering. Eastern Europe.—This is a very distinct and striking species.

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**heterophylla, Vent.** (T. Europæa, Michx., not Ait.) Trees, attaining 70 ft.; lvs. very large, 5-8 in. long, smooth and shining above, whitish and tomentose beneath; floral bract short-stalked; fr. glohular, not
TILLAGE. The working or stirring of the land, in order to improve it for agricultural purposes, is known by the general name of tillage. There is a tendency to use the word cultivation for these operations. Tillage is a specific technical term, and is to be preferred. In the eager discussions of scientific matters, as applied to agriculture in recent years, there is danger of forgetting that the fundamental practice in all kinds of farming is, after all, the tillage of the land. The knowledge of the importance of tillage has developed late in the world’s history. In fact, it is only within the latter part of the century just closed that the real reasons for

TILLIA

ribbed. July. Alleghanies, S.S. 1:27.—This has been sent out as T. macrophylla, a name that properly belongs to a large-leaved var of T. Americana.


7. T. Americana, Lind. (T. Caroliniana, Hort.), American Linden. Basswood. Fig. 2514. Stately tree with large cordate lvs. shining above, usually smooth except for the tufts of hairs in the axils of veins: floral bract very large, tapering to a more or less pointed base: fr. ovoid, tomentose. July. E. N. Amer. S.S. 1:24. Mn. 6:133.—This is our most common American species and the one most frequently planted. Variable in its habit, size and shape of lvs. and in the color of its bark. As a forest tree it was formerly abundant in the eastern and middle states, but with the general destruction of the forests and the greatly increased demand for its white wood for manufacturing purposes, good specimens are becoming scarce, and the source of supply is constantly moving westward. Vars. in the trade are macrophylla, Hort., a large-lvd. form; Moltkei, Hort., a very strong-growing large-lvd. form which originated in cultivation in Europe. What is sold sometimes as T. Americana, var. pendula, is a form of T. petiolaris.

8. Mongolica, Maxim. A slender tree with very small orbicular or ovate lvs., truncate at the base, usually 3-lobed, coarsely cuspidate, or coarsely serrate with acuminate teeth, glaucous beneath or green on vigorous shoots: cyme rather dense, with the stalk naked at the base. E. Asia.

9. platyphylos, Scop. (T. grandifolia, Ehrh.). This is the broad-leaved Linden of European plantations and probably the largest. It attains 90 ft. Lvs. large, green, pubescent, often on the upper side to some extent, unequally cordate, petioles and veins hairy: fr. 5, rarely 4-angled, tomentose, thick-shelled. This is the species most commonly sold here as T. Europae, and the earliest to flower. June. Eu. G.F. 2:256.—The following varietal names in the American trade seem to belong here: pyramidalis, an upright grower with reddish shoots; rubra, a branchy variety with thinner, more silvery dark red bark on branches; laciniosa and laciniosa rubra, with deeply cut leaves and reddish young bark; sulphurea, probably the same as aurea; vitifolia, the vine-leaved Linden with lobed leaves.

10. daystyla, Stev. CRIMEAN LINDEN. Lvs. tough and leathery, dark glossy green above and pale beneath, with tufts of brown hairs in the axils of the principal veins: bark of young branches bright green: lvs. often obliquely truncate at base. E. Eu., W. Asia.

11. vulgaria, Hayne (T. Eugenia, Hort., in part). This species grows nearly as large as T. platyphylos, has large unequal or oblique cordate lvs., smooth and green on both sides; tufts of hairs in axils of veins which, fr. globose or oval, tomentose, shell thick, June, July. Eu. G.F. 2:256.—This is said to be the celebrated specie of Berlin and is often sold in this country under the name of T. Europae. It is a week or ten days later in blooming than T. platyphylos, and about the same number of days earlier than T. Americana.


JOHN F. COWELL

2514. Basswood or American Linden — Tilia Americana. 

(× 1/3)
not merely a means by which seeds can be put into the land, weeds killed, and the crop taken out.

Tillage improves land in many ways. It divides and pulverizes the soil, gives the roots a wider "pasturage," as Tull puts it, increases the depth of the soil, and improves its physical condition with respect to warmth and dryness.

Tillage also saves moisture by deepening the arable soil so that moisture is held, and also by checking evaporation from the surface by means of a thin blanket or mulch of pulverized earth that is made by surface-working tools. Water is lost from the soil by under-drainage and by evaporation from the surface. The more finely the soil is pulverized, within certain limits, the more water it will hold. Its capillary power is increased. As the water evaporates from the surface, the moisture is drawn up from the under surface so that there is a more or less constant flow into the atmosphere. If any foreign body, as a board or a blanket, is spread on the land, the evaporation is checked. A similar result follows when the soil is covered with a layer of dry ashes or sand or sawdust. Very similar

The ideal tillage of the land is that which is practiced by the gardener when he grows plants in pots. The soil is ordinarily sifted or ridded so that unnecessary parts are removed, and most of it is brought into such condition that the plants can utilize it. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage by placing the boxes on boxes. Often the gardener will produce as much from a handful of soil as a farmer will produce from a bushel.

TILLANDSIA

Elias Tillands was professor of medicine at the University of Abo. See a catalogue of plants of the vicinity of Abo. Bromeliaceae. Tillandsias are mostly epiphytes and all natives of America. They are allied to billbergias, echmeas, guzmania, pineapples, and the like. Many species are described in botanical literature as having been introduced into cultivation, but most of these are known only to amateurs and in collections where species of botanical interest are chiefly grown. In the American trade about 30 names occur, many of which are to be referred to other genera. The generic limits of Tillandsia, as most bromeliaceous genera, are ill defined. By different authors a given species may be placed in several genera. Latey, Tillandsia, Vriesi.a have been merged, but in this book Vriesia is kept distinct, following Mez's monograph. It is useless to attempt a description of all the Tillandsias that by chance may occur in collections. Persons who want to know the species other than those regularly in their trade should consult Baker's "Handbook of the Bromeliacae," 1889, or Mez's "Bromeliaceae" in De Candolle's "Monographia Phanerogamarum," 1896. The latter work, which regards Vriesia as a separate genus, adds many species of Tillandsia. Some of these species extend northward into the United States, growing chiefly in Florida, although one or two reach southern Georgia, and the Spanish moss (which is Tillandsia usneoides) reaches Virginia, and is common throughout the South. The native upright Tillandsias are not in the general trade, but they are offered by one dealer in southern Florida: of such are T. recurvata, T. tenellifolia, T. fastigiatu, T. utriculata.

Tillandsias are usually known as "air-plants" to gardeners. They are perennial herbs, mostly of upright growth (the common T. usneoides being a marked exception), the bases of the narrow entire leaves often dilated and forming cups that hold water, and in which utricularias and other water plants sometimes grow. The flowers are usually borne in spikes or heads, singly beneath bracts; they are perfect, with 3 sepals and 3 petals which are twisted or reflexed in the flower; 3 stamens, a superior ovary with filiform style: fr. a 3-valved capsule, containing hairy or plumose seeds. Vriesia is distinguished by having one or two scales or ligulae at the base of the petals on the inside. In the flowers of Tillandsia are eliquote; however, there are intermediate forms and it is sometimes a matter of individual opinion as to which genus shall receive a given species. Some of the cultivated Tillandsias belong to still other genera. This is the case with T. zebra. which is properly Cryptanthus zonatus (Fig. 2515). This is an odd plant, producing crinkled deflexed saw-edged leaves, which are whitish beneath and brown-barred above, and small clusters of white flowers. See p. 404, where other kinds of Cryptanthus in the American trade are described.

Tillandsias are grown both for foliage and for flowers. The foliage is usually showy and sometim'e attractive. Many of the species are ver showy when in bloom, sending up strong central clusters of blue, violet, red, yellow, or white flowers. In nature, the seeds are carried in the wind by means of the soft hairs, and find lodgment on trees, where the plants grow. Among many species, however, grow on the ground. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept nearly dry, although they need moisture. They need a warm temperature and plenty of light while growing. Give a soil rich in peat. In some cases sphagnum may be added to advantage. Prop. by division or by seeds. Also by seeds. Other bromeliiaceous genera described in this book are Bromelia, Echmea, Karatas, Cryptanthus, Ananas, Pteriois, Fuya, Guzmania.
TILLANDSIA

A. Plant-body slender and hanging: fls. solitary in leaf axils.

usneoides, Lind. Spanish, Florida or Long Moss. Figs. 2516, 2517. Whole plant hoary-gray, hanging from trees; the stems very slender and often several feet long; lvs. scattered, narrow-linear, 1-3 in. long: fls. solitary in the leaf axils, small and not showy, the petals yellow and reflexed at the end. Trop. Amer. and in the U. S. from Texas to Fla. and eastern Virginia; extends southward to southern Brazil. B.M. 6399. Gn. 37. p. 221. Gl. 45. p. 267.—This is one of the most characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cultivated, although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the African Usnea.

2516. Spanish Moss—Tillandsia usneoides. (More reduced.)

b.

TILLANDSIA

b. Stamens longer than the petals.

c. Stem thickened and bulbous at the base.

bulbosa, Hook. Small scurvy plant a few inches high, the stem swollen at the base: lvs. 3-5 in. long, much dilated and clasping at the base and terete above; fls. few, in racemose short spikes, long and narrow, the much exerted but not spreading petals purple; Var. pieta, Hook., has the upper lvs. and bracts scarlet. S. Fla. to Venezuela. B.M. 4288. F.S. 3:221.

2517. The Spanish Moss—Tillandsia usneoides, hanging from the trees. Gulf coast.

c.

TILLANDSIA

cc. Fts. many, distichous.

cv. Fts. linear or filiform from the base or abruptly from a dilated base.

polystachya, Lind. (T. augustifolia, Swartz. T. parvispicie, Baker). Lvs. rostrate, lepidoite or secrufy, curved, equaling or exceeding the stem; inflorescence compound, somewhat paniculate, the lateral spikes shorter than the central ones, the bracts distichous and pointed and little exceeding the calyx; fls. blue, S. Fla. to Brazil.

tenuifolia, Lind. (T. cevipida, Leconte, not Cham. & Schlecht. T. Bibrani, Ell. in part). Plant less than 6 in. tall, reddish, clustered; lvs. awl-shaped and erect, nearly terete, concave at the base, scurfy; fls. few in a simple or somewhat compound spike, the blue petals exceeding the bracts and recurving at the apex. Fl. to Brazil.

dd. Lvs. gradually narrowed from a broad base.

fasciculata, Swartz. (T. bracteata, Chapm. T. glucophylla, Baker. T. trixiu glucophylla, Hook.). Tall, strong species with stem 2 ft. tall; lvs. 1-1 1/2 ft. long, concave or channeled above, erect or ascending, scurfy and bluish; stem longer than the lvs. and branched, the branches or spikes bearing distichous keeled acute mostly greenish and red-tined bracts; fls. narrow, exserted, blue. S. Fla., West Indies and Central Amer. B.M. 4415. F.S. 5:432.—Very variable.

utriculata, Lind. Plant 2-3 ft. high; lvs. glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base and forming pockets that hold water; inflorescence branched, the fls. far apart on the branches; fls. pale blue (pale colored forms), narrow, the petals twice longer than the sepals. S. Fla. to S. Amer. B.R. 9:719 (as T. lucens, var. pallida).—For full description of this species, together with plate, see Trelease, 5th Rept. Mo. Bot. Gard. (1894).

T. bicirrata, Linden, is Cryptanthus bivittatus. See p. 464.—T. farinosa, Hort., is Billbergia pyramidalis. See p. 463.—T. La Saliana: "A new species from South America, with most brilliant flowers. It is of free growth and easily cultivated, thriving best in a moderate temperature and in a light, porous soil mixed with sphagnum." (Siebrecht).—T. muscosa, Linden, is properly Guzmania muscosa, Mez. It is monoculose; lvs. 25 or less in a rosette, round and obtuse but with a cusp, with transverse lines on both surfaces; fls. in a rounded head on the end of a red-bracted scape, the corolla white. Colombia, B.M. 8673. H. 24:268 (as Caragagna muscos). It is an excellent plant, with broad lvs. 2 ft. long. In the American trade, this plant is sometimes known as Massangua (see p. 962).
TILLANDSIA

T. usneoides, Hort., is Plicaria usneoides, P. usneoides, Hook. & G. D. Don. and Plicaria Bevendieni. The name T. usneoides has occurred in the trade, but the plant is unknown to the writer.

—T. Watson, Was., has been introduced sparingly to cultivation, as it does not appear to be in the trade. It was discovered in Hernando county, Fla., in 1887 by Dr. W. F. Wilson, of the University of Pennsylvania. The plant is very handsome, probably larger fls. splendens, paniculate, including several species of the genus, Mes. Tafted, broad from the base, glabrous throughout; lvs. 1 ft. long, about 1 in. broad, crimson striped and yellow; inflorescence paniculate, subtended by several large, bright yellow, Costa Rica, Mex. 1889, as Curatagusta Zahnii. In the trade.

The following names are accounted for under Vicia: violata, fenestrata, gutata, kopenig,

Spathiphyllum, belladonna, splendens, tessellata, zebrina (in part).

L. H. B.

TOMMYTHY. Phileum pratense.

TINANTIA fugax, Sched., is sometimes seen in old gardens but is not in the trade. It is a tradescantia-like herb from tropical America, with blue, green or yellow, numerous alternate leaves, and yellow or purplish flowers, in loose, terminal panicles. Here begins the plant recently introduced to southern Calif., as Mockernut Tipup, which Fresenbachi says yields one of the rose-woods of southern Brazil.

TIPUANA (name apparently Latinized from a Brazilian name). Leguminosae. A genus of 3 species of large trees from tropical America, with blue, green or yellow, numerous alternate leaves, and yellow or purplish flowers, in loose, terminal, paniculate panicles. Here begins the plant recently introduced to southern Calif., as Mockernut Tipup, which Fresenbachi says yields one of the rose-woods of southern Brazil.

TIPULICA (Latin, Tupila, a genus of insects, alluding to the form of the flower). Orchidaceae. Includes 2 species of small terrestrial orchids in N. America and the Himalaya region. Herbs with solid bulb, having several generations connected by offsets; leaf solitary, basal, appearing in autumn after the flowers, sepalin in long, loose, terminal raceme, green, noding; sepals and petals similar, spreading; labellum 3-lobed, produced into a long spur; column erect, wingless or narrowly winged.


TOAD FLAX. Linaria vulgaris.

TOADSTOOL. Consult Mushroom and Fungi.

TOBACCO is considered to be an agricultural rather than a horticultural crop and hence is not treated at length in this work. See Nicotiana for an account of the cultivated species of the genus to which Tobacco belongs.

TOCOCO (Toxoco, the native name of T. Guianensis). Malassezaceae. A genus of 12 species of horticultural shrubs native to the northern Americas including several handsome foliage plants for hot-houses. Their beauty is similar to that of the well-known Cyaneophyllum, for which see Miconia. The lvs. are usually simple, petiolate, membranous, rarely leathery, entire or dentilcate, usually 3-nerved; fls. rather large, borne in terminal or sometimes axillary panicles, white, red or rosy, 5-merous, rarely 6-merous; stamens 10: ovary 3-lobed, rarely 5-lobed.

phyllostachis, Benth. (Spathiphyllum latiloba, Naud.). Short-stemmed plant with succulent, somewhat torus- ced lvs. broadly ovate, minutely dentilcate-elliptic, 7-nerved; fls. rosy or red; ovary 5-loculed. Colombia, Venezuela, Costa Rica. —Cogniaux puts this species in a section characterized by having the lvs. desti- tute of vesicles and the calyx notinged. In this section it is unique by reason of its herbaceous branches with showy green or pinkish brown bracts. Although the species of the section have showy and glabrous branches, a very beautiful plant, but considered to be difficult to grow.

W. M.

Tococa requires a warmhouse temperature, with shady and fairly moist place. Use leaf-mold mixed with florists' loam, and potting compost as the medium. It is best propagated from what are called split joints, or eyes with the leaf rolled up, and inserted in thumb-pots in fine sand with chopped moss; then insert pot in sand or cocoa fiber, with bottom heat of 75-80°. Cover with bell- glasses or other inclosure to exclude air and to keep a fairly moist (but not wet) condition. In about two months the cuttings will have rooted. The wood for propagating should be well ripened.

TODDALLA (Kabu Todalli, Malabar name of T. acu- lata). Bayclise. About 8 species of trees, shrubs and climbers native to the Old World tropics and the Cape. Lvs. alternate; lfts. in 3's, shining, leathery, full of fine veins, glandular-dotted, with a wavy vein inside the margins; fls. small, white, 10-12 in clusters. Petals 4-5, minute; petals 4-5, valvate or imbricate; stamens many, as wide as many, as petals; ovary 4-5- loculed, stigma peltate; fr. hard, coriaceous, globose, permanently syncarpous. In Toddalia proper the petals are deciduous, the ovary 1-2-celled, with a single ovule, and the stamens as many as the petals; in the subgenus Vepris (name altered from vepris, bramble) the petals are imbricate and the stamens twice as many as the petals.

laceolata, Lam. (Vepris laceolata, A. Juss.). Small trees or large shrub, erect, without prickles, entirely glabrous; petioles 0-1 in. long; lfts. oblong-lanceolate, 2-3 in. long, acute, entire, spreading; leaf usually 3-lobed, produced into a long spur; column erect, wingless or narrowly winged.

TODEA (Tode, a German botanist). Osmundaceae. Gape Fern. A genus of ferns related to Osmunda but with the sporangia borne on the upper surface of the leaf. The last three species, although frequently united with Todea, more properly form a distinct genus Lep- tospermum, differing widely in habit from the original Todea; they form delicate foliage plants resembling the filmy ferns in habit.

For culture, see Ferns.

A. Texture leathery: lvs. bipinnate.

hbarbara, Moore (T. Africana, Willd.). Lvs. in a crown rising from a short caudex, 3-4 ft. long, 9-12 in. wide; pinnae erect spreading, sometimes 2 in. wide; sori closely placed, often covering the whole under sur- face at maturity. South Africa to New Zealand.

AA. Texture thin: lvs. with linear divisions.

B. Lvs. tripinnatifid.

hymenophylloides, Rich. & Less (T. pellucida, Hook.). Lvs. 1-2 ft. long, 8-12 in. wide, lowest pinnae about as long as the others; rachis mostly naked. New Zea- land.

superta. Col. Lvs. 2-4 ft. long from a woody caudex, pinnae often crisped, the lower on the caudex gradually reduced; rachis densely tomentose. New Zealand.

BB. Lvs. bipinnate.

Fraseri, Hook. & Grev. Lvs. 1-2 ft. long, from an erect woody caudex, 3-4 ft. high, lowest pinnae nearly as large as the others: rachis narrowly winged, naked. Australia.

L. M. Underwood.

TOLMIEA (Dr. Tolmie, surgeon of Hudson Bay Co., at Puget Sound). Saxifragaceae. A genus of one species, a western relative of the Bishop’s Cap or Mitella,
and with the same style of beauty. It is a perennial herb 1-2 ft. high, with loose racemes of small greenish or purplish flowers. The species seems to have been brought, and twenty years ago it was offered in the eastern U. S. for western collectors. It is probably hardy and doubtless requires some shade.

Generic characters: calyx funnelform, gibbous at base, 5-lobed, the tube in age longitudinally splitting down one side, inserted in the sinuses of the calyx, recurved, persistent; stamens 8; ovary 1-loculed, with 3-parietal placentae. This plant has been described under Tiarella and Heuchera, which it resembles in foliage and inflorescence. It seems to be the only plant of the Saxifrage tribe that has 3 stamens.

Menziesii, Torr. & Gray. Perennial herb, 1-2 ft. high, with slender creeping rootstocks and some summer runners: 1vs. round-ovulate, more or less lobed and crenately toothed, slender-stalked, all alternate, those of the stem 2-4 in number: raceme ¾-1½ ft. long: fls. and capsule nearly ½ in. long, greenish or tinged purple. Forests of Mendocino Co., Calif., to Puget Sound.

Propagated naturally by adventitious buds, produced at the apex of the petioles of the radical 1vs. and rooting when these fall to the ground.

W. M.

**TOMATO** (Plate XLII). The Tomato is *Lycopersicum esculentum* (which see), one of the solanum or nightshade family and closely allied to the potato. In fact, the potato and Tomato can be grafted on each other with ease, although they will not cross. The graft produces no practical results, but works (see Bull. of Cornell Exp. Sta.). The Tomato is grown more extensively in North America than elsewhere in the world, and the varieties have here reached a higher degree of perfection. The American standard or ideal is a Tomato that is nearly globular, solid and "smooth" (that is, not wrinkled). Figs. 2518-20. This flat and wrinkled Tomatoes (Fig. 2526; 1334, Vol. II) are now little grown in this country. These forms are little adapted to canning, to which use enormous quantities of Tomatoes are put, and they do not satisfy the popular ideal or desire. The old-time pear, cherry, and plum forms (Figs. 2521, 2522) of Tomatoes are still grown for curiosity and also for the making of pickles and preserves, but their field culture is relatively not important. The currant Tomato, grown for ornament and curiosity, is *Lycopersicum pimpinellifolium* (Fig. 2523). It sometimes hybridizes with the common species (Fig. 1338, Vol. II).

The Tomato requires a warm soil and climate, a sunny open position, and a long season. The plants are usually started in hotbeds or glass houses, being transplanted to the open as soon as weather permits. The plants are usually set from 4-5 feet apart each way and are allowed to grow as they will, finally covering the ground. For home use, however, the plants are often trained, in order to forward their ripening and to secure larger and better colored fruits. The best method is to train to a single stem, as recommended for forcing below. The stem is supported by a stake or perpendicular wire or cord (Fig. 2524); or sometimes it is tied to the horizontal strands of a trellis. This single-stem training requires close attention, and if the time cannot be spared for it, the vines may be allowed to form a broad trellis or topiary keeps the plants from the ground and thereby allows the individual fruits to develop perfectly and also checks the spread of the fruit-rot; but it usually does not give such perfect fruits as the single-stem training, since the number of fruits is limited in the latter. The most serious general difficulty in Tomato growing is the rot of the fruit. This usually causes most damage, following close, wet weather when the fruit is ripening. It is also more destructive than other diseases, the fruit thickly with foliage and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop beyond a few pickings; and if the plants are brought into bearing early and are kept in a favorable condition for subsequent bearing, the percentage of total injury is greatly reduced. The Tomato is tender to frost. The green fruit remaining when frost kills the plants may be ripened in tight drawers or cupboards, if it is nearly or quite full grown. The Tomato is probably a short-lived perennial; but in cold climates it is grown as an annual from seeds.

L. H. B.

**General Advice on Tomato Culture.** — The Tomato comes from tropical America and in its natural habitat the conditions of temperature and moisture during the entire growing season are constantly favorable for its rapid development. The plant is adapted to such conditions, and if we are to have the best possible results with it under cultivation we must provide them and see that it has a steady and uncheched growth from the germination of the seed to the ripening of the fruit. It is true that the plant will live through considerable degrees of cold, wet, drought and other unfavorable conditions, and often seemingly recover from their ill effects and make a vigorous growth. But we believe it is true that any check in the growth of a Tomato plant, particularly if it occurs when the plant is young, will surely lessen the quantity and lower the quality of the fruit produced. This is a strong statement, but we are convinced of its truth by scores of experiences like the following: Two adjacent fields of similar character were set with plants from the same coldframes. Those in one field were carelessly set out just before a cold, dry wind-storm and received a check in transplanting, the effect of which was evident for at least ten days; but the plants ultimately became as large as those in the second field, which had been kept in the coldframe during the storm and were set out rather more carefully than the first lot, but six days later. They suffered scarcely perceptibly from the transplanting, and actually commenced a new growth sooner than those set six days earlier. The subsequent treatment of the two fields was as nearly identical as possible; but the second field yielded over 100 bushels per acre more fruit than the first and it was so superior in quality that, sold by the same man in the same market, it brought an average of nine cents per package more money. We were familiar with the fields and their treatment, and know of no reason for the difference in results except the check that one lot received at transplanting. All our experience with Tomatoes convinces us that the first and great essential to the best results is a steady constant growth from start to finish, but more especially when the plant is young. This
leads to a method of culture which differs somewhat from that usually recommended. We plant the seed in flats placed in a greenhouse or hothed, some forty to fifty days before we think the plant can be set in the field without danger of frost, or what is quite as bad, a cold, dry wind-storm. As soon as the plants can be handled (which ought to be ten or twelve days from the sowing of the seed), we transplant into other flats or into coldframes, setting them 2 to 4 inches apart according to the space available and the desired size of the plants when set in the field. We have never failed to get better results from plants which had been transplanted but once (and that when very small) and had been kept in constant growth, than from those which were started earlier and kept of a practical size for setting in the field by repeated transplanting and pruning.

We aim to give the young plants light, heat, water, and above all air, in such proportions as to secure a constant and steady growth, forming stocky, vigorous deep working until, at the time the plants are set, it is a bed of mellow, friable soil. We are able to make the day after the plants are set, running the cultivator as deep as possible, and go through again every two or three days, as long as the plants will permit; but we aim to make each cultivation shallower than the preceding one until it becomes a mere stirring of the surface soil.

When quantity and quality are of little importance compared with earliness, the best results are obtained by the method already described. The seed is sown very early, that, though growth is kept in check by crowding and scarcity of water, the plants set the first cluster of fruit, which is sometimes nearly full grown by the time freezing is past, and the plants are then set in the field much earlier than recommended for general crop. In setting, furrows are opened running east and west and the plants set in slanting to the south, so that the fruit is just above the surface, with a bank of earth on the north side, and the roots are no more than normal depth. So treated, the plant will ripen the fruit already set very early, but the subsequent crop is of very little value.

When quality is of first importance, staking and pruning is essential, as in this way much better fruit can be grown than can be produced on unpruned vines allowed to trail on the ground, particularly if they be at all cold. When the plants are to be staked and pruned they may be set as close as 30-40 inches apart. We have obtained the best results from the use of a single stake, some 2 inches square and 5 or 6 feet long, to each plant. As soon as the plant shows its first cluster of flowers it divides, and the two branches are allowed to grow, being tied to the stake as necessary; all branches starting below the division are cut or pulled off, and any above are cut off just beyond the first leaf or cluster of blossoms. Most of the fruit produced in the Gulf states for shipment north is grown in this way.

For market or for canning and pickling, quantity and quality of crop and cheap production are of prime importance, and the best results are secured by following the general cultural directions as just given. As the gathering of the crop is one great element of its cost, we have found it profitable to set 15 to 20 rows and then omit one to form a driveway, at the same time omitting every sixth or eighth plant in the row to form a crosswalk. This facilitates the distribution of the empty and the collection of the full crates, and enables one to gather the fruit with less injury to the vines; consequently one secures nearly as much marketable fruit, particularly if it is gathered green for picking, as if the entire space was covered.

Although the Tomato has been in cultivation a much shorter time than most of our garden vegetables, there have been developed a great many varieties, differing materially in habit of vine, size, form and color of fruit as well as other qualities; and these differences are so divergent, and individual taste and the demands of different markets so varied, that it is difficult to classify the varieties or arrange them in order of merit.

The extra-early sorts are of two types, one represented by Early Minnesota, with a vigorous vine producing in abundance large clusters of small, round, smooth fruits which ripen early but are too small for market; the other represented by the Atlantic Prize, in which the vine is short-lived, lacking in vigor, and produces very early-ripening fruit, too rough to be salable after the smoother sorts reach the market.

Of varieties for a general crop there are quite a number, varying greatly in type and quality, from the Optimum of medium size, perfect form, fine flavor and brilliant vermilion-red color, through the larger Favorite and Matchless, to the perfect-shaped, large-sized, late-ripening Stone; or if one prefers the purple-red, from the Avenue through the Beauty to the later Buckeye State.

If one prefers the dwarf-growing plants, we have the purple-fruitcd Dwarf Champion or the fine-flavored and beautiful red Quarter Century. For special purposes and to meet individual tastes we have the immense and solid Ponderosa and the Honor Bright, which can be

2519. A prolific Tomato, the result of training to a single stem.

plants able to stand erect when set in the field, even if they are a little wilted. A plant which has once bowed its head suffers from it forever.

For Tomatoes we prefer a field that has been made rich by fertilization in previous years, but if manure is used we aim to have it thoroughly worked into the soil. There is no crop in which this is of greater importance than with Tomatoes. If we have to depend upon commercial fertilizers we select those comparatively rich in nitrogen and potash, and work in two-thirds of it just before setting the plants and the balance some four or five weeks later. We prepare the field by plowing as early as it can be worked, and repeated reseeding or
Tomato Under General Field Conditions. — Tomatoes should be started in hotbeds. To make the beds, select a sheltered place on the south side of a barn or erect some shelter on the north side from where the hotbed is to be made. Dig a hole about a foot deep, 8 feet wide and as long as needed; 18 feet long will give room enough to grow plants for twelve acres of tomatoes. Use fresh stable manure; cart it out in a pile and let it lay three or four days, then work it over until it gets good and hot, then put it into the hole prepared for it, 5 x 18 feet, about 18 inches thick. Then place the frame, 6 x 16 feet, on the manure; that will leave one foot manure outside of the frame; by this means the heat will be as great at the edge of the bed as it is in the middle. Then place 4 or 5 inches of dirt on the manure and let it lie for a couple of days to allow the dirt to get warm. The sash is put on as soon as the dirt is placed. When the dirt is warm, rake it over to get it nice and fine, then sow the seed in drills which are made about 2 inches apart by a marker. Sow the seed by hand; the sash is then put on close to the dirt; at the lower end of the bed the frame is made 3 inches higher at the end next to the bank so the water will run off; the bed is banked up all around so no cold can get in. In this way the bed will be kept warm and the seed will soon come up. After the plants are up nicely, they will need some air that they may become hardened and grow stocky. Ventilating can be done by raising the bottom of the sash and putting a block under them while the sun is hot; but do not neglect to lower them at night. When the plants are four or five weeks old, and about 2 inches high, transplant the first into a bed that has a little warm manure in the bottom and about 4½ inches of dirt on top. Use sash over this first bed, as the weather is quite cold at night. Do this in order to get the early plants in the field. Transplant the remainder into coldframes and use coverings or shutters made of boards. Transplant all in rows 6 inches apart and 2 inches in the row. Keep them in these beds until planted in the open fields. When there is a frost in the morning and plants are large, take off the covering early in the morning that the frosty air may harden the plants while they are in the bed. Sometimes the plants are in blossom before they can be set in the fields. Never pinch a plant back. A good-sized plant is from 4-6 inches high and stocky; the stronger the plant the earlier will be the crop. The main point is to get the plant strong before it is set in the field, then it will not stop growing, while a slender, weak plant will not start to grow as soon. Transplanting the plants from the sowing bed into the cold beds helps the plants, and they will produce earlier fruit than those set in the fields from the hotbeds. Take them up with a trowel that all of the dirt possible may go with them from the bed into the field. In case the ground is dry, take a large box with clay in it and make a regular mush, dip the plant into it, then put the plant in the box. One can leave the there for a day or two before setting them in the field.

Prepare the ground about the same way that farmers prepare corn ground. Have it well harrowed, then make it 4 x 6 or 5 x 6, and when the ground is very rich 6 x 6 feet, and set the plant in the cross. Use the hands to fill the dirt around the plant. Set the plants that are transplanted under sash first, as they are the oldest and strongest. These can be risked in the field first; then fill that bed with plants again, as plants may be needed for replanting in case cutworms or other causes destroy some of the first setting.

Never put manure under the plants set in the field. The best way to manure the ground is a year before, for some other crop, such as cabbage, potatoes or pickles; then you can grow Tomatoes several years after. Never put Tomatoes in ground prepared with fresh manure, for the manure burns the roots and causes trouble, and the flavor of the Tomatoes is not so good. As soon as a field of Tomatoes is planted, go over the area with hoes and dig a little soil to the plant, and fill in around the plant with earth so it will not get dry into the roots. After the plants begin to take root, go through the field both ways with the cultivator, and keep this up during the season. One cannot cultivate them too much. Some farmers think that because there are no weeds growing around the plants they need very little cultivating, but this is a mistake. When the season is dry they need more cultivation in order to keep up the moisture.

Half-bushel baskets are very useful in picking Tomatoes. Our own practice is to take about six rows in a piece and throw the vines of a row around so that we can drive a team through the field. If the rows are 6 feet apart a team can go through without destroying many Tomatoes. In that way one can pick more Tomatoes in a short time because he does not have to carry them so far. Have boxes alongside where the team will go and the Tomatoes are carried to these bushel boxes, and when the team is done leading them to the factory. Picking is done mostly by children. A man is with them who keeps account of what they pick and gives them instructions in picking. H. J. Heinz Co.

Tomato Culture in the South. — The Tomato is one of the most capricious of market-garden vegetables. It is of greater relative importance in the South than in the North. Essentials of habit and cultivation do not materially differ in either section. While by no means a
gross feeder, the plant demands a fairly good soil, light, porous and well drained, and is generously responsive to judicious fertilizing, though acutely sensitive to the slightest variations of soil and climate. Underfertilized it is unprolific; too liberally manured, especially if combined with insufficient irrigation, may cause an excess of fruit and is subject to excessive invasions by bacterial and fungous diseases. Similar results follow from wet seasons or too heavy soil, while drought or insufficient irrigation cut out a middle course between these extremes is difficult. It is, on the whole, safer to underfertilize than to overfeed—to select a moderately dry, sandy loam, well manured the last season, and with but a light application of fertilizer in one at all as the present crop—to risk underproduction rather than invite overgrowth of vine, fungous maladies, loss of foliage and decay of fruit.

The normal fertilizer formula approximates that for the potato, though a smaller percentage of nitrogen will suffice—say 3 per cent nitrogen, 9 per cent phosphoric acid and 7 per cent potash. This would be met by a compound of: Nitrate of soda, 400 lbs.; high grade (14 per cent) superphosphate, 1,320 lbs.; muriate (or sulfate) of potash, 280 lbs.; total, 2,000 lbs. This may be used to the amount of 1,000 lbs. per acre with safety on a well selected soil if applied sufficiently early in the season. Such a combination will produce a yield of 300 bushels per acre in a normal season with any of the better standard varieties.

Varieties.—All things considered, the following short list presents the South the best, or at least a century's effort in development: Crimson Cushion, Stone, Ponderosa, Freedom, Acme, Trophy, Paragon and Perfection. The medium-sized, smooth, round, red, uniform, and fruit represented by Stone and Acme, and of which Crimson Cushion is perhaps the choicest and most conspicuous example, presents an almost perfect type, of which one can ask little more than that its present standard be permanently maintained. Yet local experience must ever differ with this as with all other soil products.

For slicing, Golden Queen or Yellow Acme is incomparable, but it is useless for cooking by reason of the muddy tint developed thereby. Fruit of the Ponderosa type is too large, gross and frequently too asymmetrical for successful shipping; it finds a ready sale in local markets. Extra earliness in maturity seems to be more or less a chimera, little real difference appearing (on the average) between most varieties. Early ripening is rather a matter of soil, manipulation and local environment than a fixed habit.

Color is apparently a secondary consideration, tastes in the prevailing climate. Some markets prefer the crimson shade of the Acme type, while others demand the purple tinge of the Mikado.

Vigor of growth, productivity and shipping quality seem the three most important requisites—size, even, yielding to them in importance. Oversized fruit, indeed, is almost as serious a defect as undersized. The following would probably represent the best scale for an ideal Tomato at the South, though differing somewhat from that generally recognized:

| Per cent | Vigor (covering freedom from disease) | 20 |
|———|———|———|
|     | Productiveness | 16 |
|     | Shipping quality | 14 |
|     | Shape | 12 |
|     | Uniformity | 11 |
|     | Earliness | 10 |
|     | Color | 24 |
|     | Flavor | 5 |
|     | Cooking quality | 4 |
|     |-----------------| 100 |

Cultivation.—Whether grown on a large or small scale, the young plants are started under glass from January to April, according to the local climate, and to 30 days from the seed are ready for "pricking out"—to open ground in the lower latitudes, farther north into boxes or "Neposet" pots. The latter are the preferable, admitting of handling without rupturing the root system when permanently transplanted some 30 days later.

The land, when the business is conducted on a large scale, may be prepared as for cotton by "laying off" after breaking and fining, and then bedding on the fertilizer drilled in continuous rows—though compost is usually distributed "in the hill." For garden cultivation the latter plan is preferable to vineyard culture; in which case, manure or compost is preferable for limited areas. A showy or of well-rotted stable manure to each hill, reinforced by a top-dressing of superphosphate in early spring, is an excellent practice in the harvest.

Distance naturally varies with character of soil—sometimes with variety of Tomato—and depends, also, on the mode of training. Where no supports are used 6 x 4 ft. is not too great. When trellised with 3 ft. of wire inserted at intervals of 15 inches, 6 x 4 or 6 x 3 will do, and when trained to 5 ft. single stakes, 5 x 3 ft.

The crop should be readily worked through the season with either cultivators or "22-inch [heal srarapes"—at first in both directions, and afterwards, as the vines spread, following the wide row only. Of course with trellises cross-plowing is impossible.

Under either system pinching back weak or inconsequent laterals is necessary. All lower laterals when stake-training is employed must be pruned until a main stem is established, which is trained spirally around the stake and secured with raffia, after which laterals are cut short to about 3 inches. This is an ideal, and also a practical system, and though necessarily the most expensive, will generally justify its use by the results. With the trellis system, the vines are allowed to grow as to one end of the framework, the plant is sometimes restricted to one stem for "fancy" results. When no support is used only the more stocky and fungus-resisting varieties should be planted and severely pruned while young, to form, as far as possible, an upright, rigid growth. This is the most common method and probably the most profitable also, when land is cheap and the grower is not readily discouraged by damp and decay and is vigorous and determined in the use of the sprout pump. It is certainly the most economical form of cultivation everywhere, at least to outward appearance.

Without his spray-cart and fungicide the tomato-grower is lost—and knows it! The sprayer has hence become an invariable and indispensable adjunct to the truck farm, by means of which most of the fungous and bacteroid affections of the plant may be, if not altogether prevented, at least held in hand and damage reduced to a minimum. Proper application is not only difficult, but, when once started, must be continuous from the first—the earlier sprayings to consist of an admixture of 4 ounces Paris green to each barrel of Bordeaux mixture to hold in check insect dep-
peaches, and forwarded by "ventilated fast freight." This meets the early spring demand, but the fruit ripens unevenly and is frequently unsaleable at the expected fancy figures on account of its appearance.

A growing tendency has been lately manifested to ship as the fruit is coloring, after careful and systematic grading, in "four-basket carriers" by refrigerator cars. Despite the extra cost of icing and the later shipment, quality and prices are thereby more satisfactorily maintained and the northern public will soon insist altogether on this more rational method being put into practice universally. The sorting and grading cannot be carried too far, since the culls and second-class fruits are equally as good for the canny as first grades and hence the standard of excellence may always be maintained without material loss.

**Fungal Diseases.**—Of the fungous affections of the Tomato, damping-off in the seed-bed is the first to be noted, and is familiar to all. Provoked by excess of moisture, warmth and confined air, it may be controlled by withholding water from the young plants except at midday, stirring the soil to break up and destroy the mycelium of the fungus, and otherwise thoroughly ventilating.

Mildew, Cladosporium fulvum, is a common malady in the South during wet seasons, and may be easily recognized by the continuous and successive death of the foliage from below upward along the main stem, and the great effort of the plant to set new leaves and branches above, thereby maintaining its life at the expense of production. Steady spraying with Bordeaux mixture is the remedy.

Florida blight, an undetermined species of Sclerotium, is less common, though sometimes quite serious. It produces a wilted appearance in the plant somewhat resembling that caused by the "bacterial blight," and like it generally causes death. The peculiarity of this fungus consists in the fact that the greater portion of its life is passed under ground and it is hence unaffected by fungicides applied to the foliage. Even when applied to the surface of the ground beneath the plant Bordeaux mixture is of little value, since the precipitate formed by the copper salt in suspension is more or less arrested or strained out by the soil as the liquid filters through. The ammoniacal solution of copper carbonate, and copper sulfate, are not liable to this objection, and may be used as remedies with fairly satisfactory results.

Leaf curl, edema, is also well known and while it seldom, if ever, completely destroys the plant, yet it greatly reduces its productiveness and is all the more insidious from the fact that it frequently escapes notice until it reaches an advanced stage. It is a form of vegetable dropsy due to too much soil moisture, unbalanced food formulas or excessive pruning—one or all. Caution of pruning followed by deep cultivation will arrest the malady, to a great extent, as the plants will thus be given an opportunity to set foliage, thereby affording breathing surface sufficient to transpire or pass off the surplus moisture. The feeding power of the roots should be reduced and evaporation stimulated from the soil. Possibly a light application of superphosphate at time of cultivation would also prove beneficial.

Black rot, or blossom end rot, a widespread affection causing great loss of fruit, and quite familiar to all, seems to have long been erroneously ascribed solely to one of the forms of Macrophomina— the familiar early blight of the potato—and Bordeaux mixture is consequently suggested as a remedy. Recent investigations by Earle seem to indicate that the real cause of the malady is no fungus but a bacillus, incapable, unaided, of penetrating the outside tissues of the fruit, but rapidly developing on abraded surfaces or in insect wounds of any kind.

The boil worm appears to be an active agent in its distribution, while thrips and other wandering insects largely assist in spreading or disseminating the bacilli. Hence fungicides would prove of little avail in controlling the bacterial agencies, which seem to work in conjunction with the fungus heretofore regarded as alone responsible for this malady. We must therefore look for its complete subjugation only to those preventive measures which have been found efficacious in other forms of bacterial disease in plants. These are detailed in the next paragraph, which covers the worst malady known to the trucker.

Bacterial blight, Bacillus solanacearum, is by far the most difficult to control of all the affections of the Tomato. When this peculiar form of wilt puts in an appearance the grower is always thrown into more or less of a panic. The malady progresses rapidly. The foliage soon yellows and shrivels, the stems parch and contract, and death follows swiftly. As with most bacterial diseases, an effective remedy is yet to be found. At best, preventive measures only can be adopted. Since it has been found that certain insects—among them the Colorado beetle—assist in disseminating the bacilli causing the trouble it is evident that all leaf-devouring insect
pests should, as a primary procedure, be eradicated, as far as possible, from the Tomato plant. This also suggests the importance of crop rotation as a second step, and thereafter, in sequence, the destruction of affected vines and contiguous vegetable matter, the selection of areas not recently planted with analogous crops, and finally the importation of seed (for all solanaceous plants as well as Tomatoes) from districts known to be exempt from the blight.

**Insect Pests.**—While these are relatively numerous, their ravages are much less extensive than those of the fungous or the bacterial maladies. Only the more important are herein stated.

First, the boll worm, *Heliothis armigera*. As the problem of the damage done by this insect is of almost equal interest to the cotton planter and the Tomato grower, the corngrower, too, being largely concerned, it might well not need any further comment from our standpoint.

Hand-picking of the great, green, sluggish tobacco worms, *Phlegethonius Carolinus*, usually proves effective, in combination with the process of poisoning followed by tobacco growers by soaking the tobacco leaves in salt and sugar deposits each afternoon, at dusk, in the corolla of the Jimson weed, *Datura Stramonium*, which the tobacco moth frequents.

The flea beetle, *Phyllotreta vitata*, pinholing the foliage in claymound, cloudy weather and thereby obstructing the inroads of fungi and bacilli, is sometimes repelled though not destroyed by Bordeaux mixture.

Nematode galls, Fig. 2144, p. 1515, caused by the "vinegar eels," *Heterodera radicicola*, which infests the roots of potatoes, corn, and other solanaceous plants, frequently do much damage to the Tomato. They can be avoided only by rotation of area and preventing the cultivation of any of their host plants—particularly cucurbits.

After all, the chief injury wrought by insects upon the Tomato consists not so much in direct depredation as in the incidental transfer of bacterial germs through their agency. Boll worms, thrips, Colorado and fleas, and other forms relatively less obvious to themselves, become, for this reason, a serious menace. Were their complete extirpation possible, the commercial prospects and possibilities of the Tomato plant would be infinitely improved. **Hugh N. Starnes.**

**Tomato Growing Under Glass.**—The Tomato is now one of the most popular vegetable crops for forcing. It is grown to a considerable extent near most of the large eastern cities. Very often it is grown in connection with carnations or other plants. The houses may be used for carnations during the winter season and for Tomatoes in late winter and early spring when the outside temperature becomes warmer. In many cases, however, houses are used almost exclusively for Tomato growing. The forced crop usually comes into market during holidays and runs until May or even June. The winter crop is usually relatively light and the Tomatoes small. The crop that matures when the days are long, from April on, is much heavier and the fruits are considerably larger. Nearly all the heavy tomatoes grown that are reported in the public press are grown in the later crops.

Many Tomato growers aim to have crops from two sets of plants. One set of plants produces a crop in winter or somewhat later, and the other set comes into bearing in April or May. These crops may be raised in different houses, succeeding other plants. If they are grown in boxes, however, they may be handled in the same house, the pots for the second crop being set between those of the first crop before that crop is off. In many instances, however, only one crop is grown; that is to say, the effort is made to secure a more or less continuous picking from one set of plants running over a period of two or three months.

The Tomato requires a uniform and high temperature and is very subject to diseases and difficulties when grown under glass. There are many risks in the business of Tomato growing in winter. It is probable that there is no money made in it when the price falls below thirty cents per pound, and perhaps the limit of profit, taking all things into consideration, is not much below forty cents.

Tomato plants are not usually grown on benches or in solid beds, preferably the former. Sometimes they are grown in boxes 10 or 12 inches square or in 10- or 12-inch pots, but greater care is required to keep them in this way and the expense is greatly increased. Plants may be raised either from cuttings or from seeds. Seedlings are usually preferred in this country. It requires from four to five months to secure ripe Tomatoes after the seeds are sown. The young plants are usually started in flats and are then transplanted to other flats or, preferably, to pots. They should be starchy and well grown and 6 or 8 inches high when they are placed in the beds.

Sometimes the old plants are brought down to the height of one or two feet of the stem covered with earth; the top then renews itself, particularly if cut back, and a new crop of fruit is produced. Plants can be kept in bearing for two seasons. Healthier plants and better results are usually secured, however, when new plants are used for each succeeding crop, although time may be saved by the laying-down process.

As grown in this country winter tomato plants are usually trained to a single stem, being supported by a cord that runs from near the base of the plant to support overhead. In this system of training the plants may stand 2 feet apart each way or even less. The side shoots are pinched out as fast as they appear, the main central shoot being allowed to grow. It is loosely tied to a cord or wire as it ascends. Usually the main stem is stopped when it reaches about 5 feet in height. Some growers prefer to start 5 stems from near the crown of the plant and to train them fan-shape. When this is done the plants should stand from 2 to 3 feet apart.
either way'. This system is seldom used in American commercial Tomato growing, however.

The soil should be much like that which is adapted to the growing of Tomatoes out of doors. It should be well filled with rich and also with some commercial fertilizer which is relatively rich in the mineral elements. Care should be exercised that the soil is not secured from a Tomato field, for in that case diseases likely to be brought into the house. Every effort should be employed to cause the plants to grow continuously. Plants that become root-bound or yellow and pinched cannot be expected to give good results.

Some bottom heat should be applied. If the soil is as shallow as 4 inches, care should be taken that pipes are not too close to the bottom of the bench or that the heat is not too great. From 5 to 6 inches is a better depth for soil on Tomato benches, and the pipes for carrying steam should be several inches beneath the bottom. The temperature of the house at night should not fall below 60°, although a lower temperature than this, providing the house is dry and the plants are not growing very rapidly, may result in no appreciable harm. It is better, however, to maintain a temperature of 65° at night. The day temperature should run from 75 to 80°. The house should have an abundance of light and should be high enough only to allow the plants to have free head-room.

The Tomato plant is very likely to grow too rapidly when it is given too much water and the temperature is too high. This is particularly true in the dull cloudy days of midwinter. The plant then fills with moisture, becomes soft and flabby and is likely to develop the oidea, or dry rot, this disease manifests itself in brown elevations on the stems and in the curling of the leaves. When a plant is once seriously affected it is worthless. The preventive is to keep the houses well ventilated and relatively dry in spells of dark weather. This caution applies particularly to the drier and damper parts of the house.

The Tomato flower needs hand-pollination to enable it to set fruit. The pollen will ordinarily discharge readily if the flower is jarred quickly at midday when the sun is shining and the house is dry. When the flowers are ready for pollination a bright day should be looked for and the house should not be watered that morning. The pollen is jarred into a spoon or a watch-glass, and into this pollen the protruding stigma of the flowers is rubbed. It is necessary to apply an abundance of pollen in order to secure large and well-formed fruits. The pollinating should be done freely and with great thoroughness, as upon this operation depends the chance of securing a full and good crop. One can rarely expect to secure from a whole house an average of more than 3 to 4 pounds of fruit to a single plant for the winter crop when the plants are trained to a single stem. Similar plants fruiting in April or May, however, may produce considerably more than this. The fruit clusters begin to set heavy, they should be supported by cords secured to the main stem (Fig. 2925).

Many varieties of Tomatoes force with ease. There are few which seem to be special forcing varieties. Usually a Tomato of medium rather than of large size and one that is rounded and with few creases or angles is to be preferred. The varieties of Tomatoes that are most in favor for forcing are constantly changing and it is not advisable to give a list here.

The Tomato is beset by several difficulties when grown under glass. One of the most serious is the root-gall, which is due to a nematode worm. In the northern states where the soil is frozen there should be little difficulty with this pest. After the crop is off in early summer all the soil should be removed from the benches and the boards should be thoroughly washed with lye. The new soil should be such as has been thoroughly frozen. The practice of mixing old forcing-house soil with the new soil is very likely to perpetuate any root-gall difficulty that may have been introduced into the house. When once plants are affected with the root-gall they cannot be saved. The Tomato rust, which is characterized by fungous spore-patches on the underside of the leaves, may be held in check by spraying with Bordeaux mixture or other fungicide. There are several forms of blight which are apparently bacterial troubles. These seem to follow unsanitary conditions of the house, as too close temperature, too little light, too much moisture at the root, and the like. They are characterized by various degrees of curling and withering of the foliage and young growth. There is no remedy. Infected plants should be destroyed and, as a safeguard, the soil in which they grow should not be used again in the house. The rot is often serious in Tomato houses. The cause of the trouble is not definitely known. After the rot has proceeded to a certain stage, filamentous fungi develop, and these were formerly considered to be the trouble. The only remedy so far known for rot in houses is to
give attention to the general sanitary conditions of the place and to pick off the injured fruits as fast as the disease develops.

L. H. B.

**TOMATO.** Husk **T.** is *Physalis pubescens*. Strawberry **T.** is *Physalis Alkekengi* and *pubescens*.

**TOMMASINIA** (Tommasini, a magistrate and naturalist of Trieste). *UMBELLIFERAE*. Two species of herbs allied to *Peucedanum* and *Angelica*. Bentham and Hooker attach it to *Peucedanum*. In the breaking up of that genus (see *Peucedanum*), this group would seem to be best treated as a distinct genus, following Koch, Boissier and others. It has the habit of *Angelica*. From *Peucedanum* it differs chiefly in having the petals involute on the margin. Involucr none; involuvel many-leaved; margin of carpels dilated; fls. somewhat polygamous. One species, **T. verticillaris**, Bertol. (*Peucedanum verticillare*, Koch. *Angelica verticillare*, Linn.), is advertised in this country as a lawn plant. It is a hardy perennial, about 1 ft. tall; lvs. with many small yellow-green flowers, 3-pinnate; the leaflets ovate, acute-serrate and the lateral ones often 2-lobed and the terminal one 3-lobed, the petiole much dilated at base, Piedmont region, S. Europe.

L. H. B.

**TOOART TREE.** *Eucalyptus gomphocephala*.

**TOOLS.** The American farmer is known by his tools and machinery. Labor costs much and land costs little. The

No. 1. Figure of an ancient Plough, supposed to be used about the Time of the Romans.

No. 2. Figure of a Spanish Plough, which some suppose preserves somewhat of the Manner of the Roman Plough, only altered to be drawn by one Horse; instead of a Yoke of Oxen. 'Tis said that the Husbandmen in Spain will plough two or three Acres of light Land, in a Day with this Plough.

No. 3. The common Shoulder Plough or best Plough, used in several Parts of England, for cutting or breaking the Surface of Grass Grounds, or Heath Lands; 'tis push'd along by one Man; sometimes cutting the Turf half an Inch thick, sometimes an Inch or two. At A is an Iron turn'd up with a sharp Edge, to cut the Turf from the rest of the green Sward.

No. 4. Is a Figure of the common

Dray Plough, which is good to be used for mery Clays in Winter; but is not so proper to be used in Clayys when they are hard.

"No. 5. The Figure of a singld Wheel'd Plough, used in Sussex.

"No. 6. The Figure of the Hertfordshire Wheel Plough, which is of the easiest Draught; proper for any Grounds, except mery Clays, which are apt to clog the Wheels. The several Parts of this Plough, being understood, will explain to us the Use of the other Ploughs. A is the plough Beam, B the Handle, Tail, Stilts, or Staves, C the Neck, or Share Beam, D the Earth Board, Easle Board, Furrow Board, Shield Board, E the Sheath, F the Share Iron, G the Couler, H the Plough Pin and Collar Links, I the Plough Pillow, K the Wheels."
American is inventive. The result is that there is a tool to expedite and lighten almost every labor. The effort of each man is multiplied. Not only are the American tools numerous and adapted to almost every agricultural labor, but they are trim, light and comely in design.

A tool is properly a hand implement, used to facilitate mere manual labor. A machine is a contrivance, usually more elaborate, that multiplies and transmits power or motion. Yet tools and machines merge so completely that it is impossible to make a definite category of one or the other. The word implement is more generic, and applies to any intermediary device by means of which a man accomplishes a given work. The phrase "agricultural implements," as used by tradesmen, usually refers to both tools and machines. In general discussions the word tool is used somewhat indefinitely, as in this sketch; but even then it does not include complicated machinery.

The tools used by horticulturists can be thrown into four general categories:

1. Tools for tilling the land, as plows, harrows, rollers, cultivators, weeder, hoes, rakes. See Tillage.
2. Tools to facilitate various handwork, as seed-sowers, transplanters, markers, pruning implements, and most greenhouse devices.
3. Tools or machines to facilitate the destruction of insects and fungi, as fumigators, syringes, spraying devices. See Spraying, Insecticide, Fungicide.
4. Tools or vehicles for transporting, as carts, barrows.

In the multiplicity of tools, one is often at a loss what to purchase. The buyer should have a definite idea of the kind of labor that he needs to have performed, and he should then consider how well adapted the tool may be to perform that labor. Once purchased, the tools should be cared for. A tool shed or room is the greatest convenience and often the greatest economy. Labor is expedited and annoyance saved if each tool has its place. Every farm or garden should be provided with a room that can be warmed in cold weather, in which repairs can be made on tools and machinery. No general farm barn is complete without such a room. The care of tools not only contributes to the longevity and usefulness of the implements themselves, but it sets distinct ideals before the farmer and thereby is a means of educating him. The greater the variety and the better the quality of the tools the more alert the user of them is likely to be. One should look up the new ideas in tools each year as he does in markets or crops. The advertising pages of rural papers are suggestive in this direction.

The original tool for opening or tilling the ground appears to have been a forked or crotched stick, one prong of which was used as a handle and the other as a clearing instrument. From this the hoe and the plow appear to have developed. Fig. 2529. The hoe and the plow are still the fundamental or primary tillage tools, one being for hand-work essentially what the other is for team-work. As the philosophy of tillage has come to be better understood, these tools have been greatly modified and varied. It is surprising to know that the plow was not perfected until within a century. It is doubtful if the invention of any of the most important machines of modern times has really meant so much for the welfare of the race as the birth of this humble implement. To many persons is ascribed the credit of the invention of the modern plow; for the implement seems to have originated independently in different countries, and even in America there are various contestants for the honor. Thomas Jefferson, Charles Newbold, David Peacock, and others have received the honor. There is reason for ascribing the modern type of plow to Jethro Wood, of Scipio, Cayuga county, New York. The years 1814 and 1819 are the dates of his most important patents, although the latter is usually regarded as the natal day of the implement. Wood was born in Massachusetts in 1774 and died in 1845 or 1846. (See "Jethro Wood, Inventor of the Modern Plow," by Frank Gilbert, Chicago, 1882.) The study of plows is a curious and profitable undertaking, and one that still needs to be prosecuted. Some of the forms of plows, ancient and modern, are shown in Figs. 2527-30.

The large-area farming of North America and the apprehension of the principles that underlie tillage have resulted in the invention of a large number of surface-working tillage tools. These inventions are particularly important in orcharding, as they enable the grower to maintain the necessary surface mulch (see Tillage and Pomology) with a small amount of labor and without training the trees too high. There are now many cultivators and harrows which cover a wide swath and which are adapted to the light stirring of the surface soil without the turning of furrows and the ridging of the land.

Fig. 2531. One who is contemplating a serious study of tillage tools should familiarize himself with the inventions of Jethro Wood before the middle of the eighteenth century. Tall devised implements to facilitate the tillage of plants when they were growing in the field.

In hand-tillage tools the greatest recent advancement is in the development of the wheel hoe. Fig. 2532. This light and simple tool, usually with adjustable blades, performs the labor of many sets of fingers and does the work more effectively so far as tillage is concerned. It also enforces better initial preparation of the land in order that it may do its work more perfectly; and this remark will also apply to the modern seed-sowers. Fig. 2533.

Unfortunately, there is no recent American book that discusses the principles underlying the application of farm tools and machinery. Practically, our only sus-
tained effort in that direction is Thomas’ "Farm Implements and Machinery," 1839 and 1860. Useful handbooks illustrating various farm devices are "Farm Conveniences" and Martin’s "Farm Appliances," both published by the Orange Judd Company.

L. H. B.

**TOOLS**

2531. Two types of tools for preparing the surface soil.

The spike-tooth and spring-tooth harrows.

**TOOTHACHE TREE.** See *Xanthorygium*.

**TOOTHWORT.** English-made name for *Dentaria*.

**TORCH LILY.** *Kniphofia*

**TORENYA** (after Olaf Toren, clergyman; traveled in China 1750-52 and discovered *T. Asiatica*). *Spergularia*-like. About 20 species of annual or perennial herbs, mostly low, branching and somewhat decumbent, with simple, opposite, serrate or crenate leaves and tubular, somewhat 2-lipped flowers in terminal or axillary, few-fl. racemes. The species are mainly from tropical Asia and Africa. Calyx tubular, plicate or 3-5-winged, obliquely 3-5-dentate or 2-lipped at the top; corolla-tube cylindrical, usually wider above; posterior lip erect, broad, concave, round or more deeply cut; lower lip large, spreading, with 3 nearly equal lobes; stamens 4; perfect; capsule oblong; seeds numerous, small.

Torenyas are of easy cultivation and are very useful for window-boxes, low borders or even for large masses. The flowers are not large but the plants are floriferous and keep in good leaf and flowers from spring to frost. *T. Fournieri* has the best habit for a bedding plant, but it may be bordered with *T. Harris*. The plants are easily raised from seed, but may also be grown from cuttings, which root quickly.

**TORREYA** (after Dr. John Torrey, one of the most distinguished of the earlier American botanists: 1796-1873). *Syn.: Taminium, Carpotaxus. Contifere*. Ornamental evergreen trees, with spreading, usually whorled branches, clothed with yew-like, two-ranked, dark green foliage; the fruits are drupe-like and about 1 in. long. The Torreyas are but little known in cultivation and rarely seen in a flourishing condition. The southern

**flava**, Buech.-Ham. (*T. Balfourii*, Godefr.). Usually decumbent and creeping: lvs. 1-2 in. long, ovate to oblong, coarsely crenate; petiole half as long as the blade or less; fls. axillary and solitary or scattered at the ends of the branches in pairs on an erect rachis; corolla-tube red-purple above, yellow beneath; corolla limb bright golden yellow with a purple eye. India and E. Asia. B.M. 67000. F. 1883:55.

AA. Fls. mainly blue or white.

**Asiatica**, Linn. Annual, erect or diffuse: stem quadrangular: lvs. ovate or ovate-lanceolate, long-acuminate, serrate, obtuse, not cordate at the base, rough to the touch; peduncles axillary, single-fl.: corolla large; tube dark purple; limb 4 lobed, of a delicate pale purplish-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4249.

**Fournieri**, Lindl. (*T. edentula*, Hort., not Bentham.), Fig. 2534. Low, bushy, usually annual, becoming nearly 1 ft. high: stem 4-angled: lvs. petioloed, cordate-lanceolate, 1-1½ in. long, crenate-serrate; petiole ½ in. long; corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lip not cut; pale blue, the anterior 3 lobed: lobes round obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. 1.H. 23:249. R.H. 1876, p. 465. B.M. 6747.—Var. alba, Hort. (var. White Wings) has pure white flowers. A.F. 57401. G.M. 36:87. Var. grandiflora has somewhat larger fls. and is more free-flowering. In the neighborhood of Philadelphia, self-sown seed sometimes germinates in the spring; also seeds of *T. Harris*.

F. W. BARCLAY.

**Torenia Fournieri** in Florida is an excellent substitute for the pansy, which is cultivated only with difficulty so far south. Young plants come up by the hundreds around the old plants from self-sown seed during the rainy season. The species can also be propagated with great ease by cuttings. The Torenia shows its full beauty when planted in beds or borders or in masses in front of small evergreen shrubs. It flowers abundantly throughout the summer, and even late in fall isolated flowers may be found. The best results are obtained by treating it as an annual. Any good and rich light soil seems to meet its requirements. It succeeds almost everywhere but prefers shade and moisture. It even grows luxuriantly in wet places along ditches and water-courses where forget-me-nots grow in the North. If such localities, however, are very shady, the flowers, though much larger, are neither produced as abundantly nor are they colored so brightly as in sunny situations. On the other hand, it is sometimes found in such dry positions, where only cacti and yuccas manage to live, that one can scarcely understand how it is able to succeed. In good soil the Torenia attains a height of from 8 to 10 inches, and when planted about 8 inches apart soon cover the ground entirely. There is already a great variety in colors, but the typical plant has beautiful light blue and royal purple flowers, with a bright yellow throat, in texture rivaling the most exquisite velvet.

H. NEHRING

**TORNILLO.** See *Prosopis pubescens*.

**TORREYA** (after Dr. John Torrey, one of the most distinguished of the earlier American botanists: 1796-1873). *Syn.: Taminium, Carpotaxus. Contifere*. Ornamental evergreen trees, with spreading, usually whorled branches, clothed with yew-like, two-ranked, dark green foliage; the fruits are drupe-like and about 1 in. long. The Torreyas are but little known in cultivation and rarely seen in a flourishing condition. The southern
T. taxifolia survives the winters in very sheltered positions in the vicinity of Boston, but T. Californica is not hardy north. The Japanese T. nucifera is probably the hardiest and most desirable species, but seems not yet to be widely planted. Torreyas will probably grow best in shaded and sheltered positions and somewhat moist loamy soil. Prop. by seeds; also by cuttings and by grafting on Cephalotaxus. Plants raised from cuttings grow very slowly and usually remain bushy. For choice, terminal shoots should be selected.

There are 4 species in N. America and E. Asia. Trees, rarely shrubs: lvs. 2-ranged, linear or linear-lanceolate, with 2 narrow and linear or linear-lanceolate lines beneath, becoming fulvous with age; when bruised the foliage emits a disagreeable odor: fts. diocious, rarely monoecious; staminate fts. ovoid or oblong, composed of 6–8 whorls of stamens, surrounded at the base by bud-scales; pistillate fts. consisting of a solitary ovule surrounded at the base by a fleshy aril and several scales: fr. drupe-like, consisting of a rather large seed, with thick woody shell entirely covered by a thin fleshy aril. The hard, strong and close-grained wood is much valued in Japan for cabinet-making and building. It is very durable in soil. In this country it has been used for fence posts. Rafinesque's Torreyon has recently been taken up as the proper name for this genus, since the name Torreyon was used for other genera before being applied to this; but there are good reasons why none of these older Torreyas can stand, and no useful purpose can be served by replacing the present name.

A. Lvs. linear, about ¼ in. broad or less.
B. Length of lvs. ¾–1¼ in.

T. taxifolia, Arnott (T. Minion taxifolium, Greene). Fig. 2535. Tree, attaining 40 ft., with spreading, slightly pendulous branches, forming a rather open pyramidal head; bark brown, tinged orange, lvs. linear, acuminate, dark or dark yellowish green above, with narrow white lines beneath, ¾–1½ in. long: fr. obovate, dark purple, 1–¼ in. long. Fls. S.S. 10:312.

Bn. Length of lvs. 1–3¼ in.


ALFRED REDEKE

TORREYAN PLANTS. Testudinaria Elephantipes.

TOUCH-ME-NOT. Impatiens aurica and biflora.

TOURNÉEFFORTIA (Jos. Pitton de Tournefort, 1656–1708; one of the earliest systematic botanists). Borraginaceae. A large genus comprising possibly 100 species widely scattered, about the warmer portions of the world. Mostly trees and shrubs, rarely subshrubs, with alternate simple leaves and small flowers in terminal cymes.

Heliotropiodes, Hook. Properly Heliotropium ancho- safolium, Poir. A hairy, shrubby perennial, with aspect of garden heliotrope but not sweet-scented: lvs. elliptical, obtuse, wavy-margined: peduncles terminal, 2–3 times branched, bearing a 1-sided, 2-ranked raceme of many fts.: calyx 3-lobed, hairy; corolla-tube yellow, the limb 5-lobed, lilac. Bucanan Ayres. B.M. 3066.—Self-sows and comes up in the garden spontaneously. Not popular North, but a good shrubby plant in the South.

F. W. BARCLAY.

TOWNSÉNDIA (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). Composite. About 17 species of low, many-stemmed herbs, nearly all of which are natives of the Rocky Mts., with linear or spatulate, entire lvs. and rather large heads resembling those of Aster; the numerous rays from violet to rose-purple or white; flowering from early spring to summer. The annual or biennial species have larger heads than most of the perennials. Judging from the literature, the largest fl. of the perennials are T. condenaata, Wilczowia and Rothrockii, three species which seem not to be in cultivation as yet. The species mentioned below are presumably among the most desirable of the genus. They are offered by collectors of Colorado wild flowers.

As a genus Townsendia is distinguished mainly by its akene, which is commonly beset with a few simple hairs, having a forked or glabous-calyculate apex. Townsendia is practically unknown to floriculture. For fuller account see Gray's Synoptical Flora of North America.


sericea, Hook. Nearly stemless perennial with sessile heads surrounded and surpassed by the linear lvs.: heads in cross; axes: rays white or purplish tinged. April, May. Dry hills, plains or mountains, Saskatchewan to Rockies, south to New Mex. and Ariz. —Known as "Easter Daisy" in Colorado.

TOXICOPHLEIA. See Acokanthera

TOXYLON (Bow-wood, from the Greek). Urticaceae. Osage Orange. One species, a thorny North American small tree, much used for hedges. Formerly known by Nutall's name Maclura (named for Wm. Maclure, American geologist), but Rafinesque's Toxylon has a year's priority. The orange-like, inedible fruit is familiar to children. See Fig. 2536. The tree thrives in moist and rich or in ordinary or dry soils. Its roots

TOXYLON

1823
TOXYLON

are voracious feeders and rapidly deplete the soil. Hardy as far north as Massachusetts. A tree with deciduous, simple, alternate, opposite, entire, oval, and milky sap; branches, particularly the lower, beset with numerous straight, axillary spines 2–3 in. long; fls. minute, dicoccous, apetalous, axillary, appearing in May to June, the staminate borne on the short spurs like branches of the prunus laevigata, pendulous; calyx 4-parted, with its segments valvate; stamens 4, the pistillate borne on branches of the current year, sessile, capitate; peduncle short, the 4-cleft calyx sessile or nearly so; the simple ovary, long and exserted; ovary superior, one-loculed; ovule solitary; fr. a dense aggregation of enlarged, fleshly alices into a globular syncarp with a mammillate surface, light green or yellowish in color; syncarp 4–5 in. in diameter, falling as soon as ripe in the autumn.

TRACHELOSPERMUM

made, and towards spring this should be cut back, leaving about six inches of the young growth. The season following more care must be given to forming a hedge. When in full growth, say in July, shear off the tops of the plants. This will cause the side shoots to develop; and it is these side shoots which will form the base of the hedge. Another light trimming should be given when growth is over for the season, to bring the plants into a hedge shape. Much the same work will be required every year—a trimming when growth is in full swing to make the hedge bushy, and another later on to shape it.

The proper shape for a hedge is the conical form, though it may be flat-sided or in any shape desired, provided the upper branches never overlap the lower.

One or two years after planting Osage Orange plants differing from the one described has been followed by some. Strong two-year-old plants are procured and are planted in a slanting position. As the new growth is made it rises in an upright position. This is a case where not only are the shoots well shaped and sturdy stems, but the wood is good as well. The plant produces a dough-like appearance of the branches, and a very strong hedge. It is certainly stronger than a common hedge, and yet a common one properly looked after forms a defensive fence, meeting all requirements, and costs not nearly as much as the other. — S. H.

JOSEPH MEEHAN.

TRACHELIEUM (Greek, trachelos, neck; from its supposed efficency in diseases of the throat). Campanulae. Throatwort. A genus of 4 or 5 species of perennial herbs or low shrubs, with simple, entire, pinnatifid, and terminal pedicels of small blue flowers. The species are native to the Mediterranean region of Europe. Calyx adnate; lobes 5, narrow; corolla narrowly tubular; stamens free from the corolla; capsules small, globoid, or oblong.

C. Linn. A half-hardy biennial or perennial, 1–3 ft. high; lvs. ovate, acuminate, unequally serrate; fls. blue or white, in dense, terminal cymes, in late summer. Shaded places in S. Europe. B.R. 1:72. Glaume 51, p. 84. It is a species of short growth, flowering perennial suited to culture as an annual. According to Glaume, 28, p. 181, the species is fairly hardy in England, but young plants are more floriferous than old ones. Seed may be sown in the open ground. The plant is easily propagated by cuttings. According to Glaume, 27, p. 303, plants from cuttings are dwarfer than seedlings.

F. W. BARCLAY.

TRACHELOSPERMUM (Greek, referring to the fact that the seed has a neck). Apocynaceae. Trachelospermum is a genus of 6 species of climbing shrubs native to S. Asia and Mexico. The species are dioecious, and white or purplish fls. in lax cymes. Generic characters: calyx 5-parted, glandular or scaly within; corolla salver-shaped; stamens constricted; lobes oblique, overlapping to the right; styles 2, inserted above the middle of the tube; anders connivent over and adhering to the stigma; tubes spurred at the base; disk annular or of oblong glands; carpels 2, discil, many-ovul.

T. jasminoides, the Star Jasmine, is a tender, evergreen, shrubby climber from China, with fragrant, white, 5-lobe flowers. It is a favorite in the South, where it grows out of doors and known as the "Confederate Jasmine." In northern conservatories it is generally known under its synonym, Rhychnospermum. Handsome specimens may be grown in large tubs, making dense bushes 3 or 4 ft. high and as much in diameter. In May such specimens, having shoots covered with flowers and fill a greenhouse with their delightful fragrance. The blossoms are about an inch across, 5 or 6 in a cluster, pendulous, and of a very spirited appearance, which is largely due to the manner in which the 5 many-ovul petals (or rather corolla-lobes) are rolled back. See Fig. 2537.

"Rhychnospermum" is a most satisfactory greenhouse shrub for a general collection. It requires no special treatment, except that the plants should be kept on the dry side during the winter.

It requires several years to work up a good-sized specimen. Young plants should be given a warm, well-ventilated place, and encouraged to grow. Large, well-established specimens thrive in a greenhouse. During sum-

2536. Osage Orange—Toxylon pinniferum (X 1:5).


EMIL MISCHE.

Before the advent of wire fences the Osage Orange was an extremely popular hedge plant, meeting general requirements better than any other plant suitable to our climate. It is used considerably, and where properly attended to from the start makes a hedge in a short time of a fairly defensive nature. Most dealers in tree seeds keep seeds of the Osage Orange, and those who grow the plants procure the seed in spring, drilling it in rows. The Osage Orange grows readily from seed, even when the latter is a year old. The sowing in rows gives the seedlings a chance to become stocky by fall and plants two feet high the first year are not uncommon. These one-year-old plants are quite good enough for hedging. Nurserymen who grow them for sale usually dig the plants in the fall, storing them away in a cool cellar, the roots buried in sand. They are then sorted into two grades, which compose first and second-class plants. At the time of grading, the plants are chopped off somewhat, leaving about six inches of length only. This fits them for planting without more cutting.

The place where a hedge is desired should be well cleared of all weeds. If cultivated for a year in advance, so much the better, as it will make the keeping down of weeds a much easier task.

There are two ways of planting a hedge; viz., single row or double. The single row is made by setting the plants nine inches apart each way, the plants in the second row coming between those in the first row, forming a zigzag line. The single row, however, isgood enough, and is much easier to cultivate and keep clear of weeds. In single rows set the plants six inches apart.

The soil need not be rich for the Osage Orange. The plant is a strong grower naturally, and soil in fair condition will give a grow double to trable for to form a good hedge than a rank growth from rich soil.

When dug the Osage plants have very long roots, and the ends of these may be chopped off without disadvantaged. The shoots are held in bundles and the roots chopped to an even length the setting will be an easy task. The tops will have been already cut off if treated in the way above suggested.

Beyond cultivation of the plants, nothing is required the first year. By fall a good growth should have been
TRACHELOSPERNUM

TRACHYCARPUS 1825

TRACHYCARPUS (Greek, rough or harsh fruit). Palms. FORTUNE'S PALM, known under many technical names, is of unique interest to the horticulturist, as it is the hardiest of all palms. It is a spineless fan-palm which grows 30 ft. high. It is slightly harder than Chamaerops, the only trunk-producing palm which grows outdoors the year round in the southern

and western parts of England. In some sheltered spots in these favored regions it has flowered regularly year after year. It is also called the Chusan Palm.

Hilar practical purpose the plants do favor is best considered a genus of four species, two of which are natives of the Himalayan region and two native respectively to China and Japan. The Himalayan species have their trunks clothed with the old leaf sheaths, while the far-eastern species have beautiful, smooth, polished trunks. In each group one species has the tips of the leaf-segments pendulous and the other has them straight. These are the most obvious and important differences to the horticulturist, except that T. Fortunei is the hardiest of the whole genus. The differences above cited mark extreme types only. Intermediates occur. Much study has been given to this genus of palms and many characters to separate four species have been prepared at various times and subsequently abandoned. The latest botanical conception of the group (Becardi and Hooker in the Flora of British India, 6:434 [1894]) unites the Himalayan species into one and the far-eastern forms into another. In support of this view may be urged the important facts that smooth-trunked forms have lately been discovered as far west as Upper Burma, and also that the straight-tipped Japanese form may be more cultivated or run wild in Japan. Its origin and nativity are not yet certain. Both points of view are given on the next page, each being correct for its own point of view. The horticultural account is based upon Hooker's notes in B.M. 7:28, and the botanical is taken from the Flora of British India. Some botanists prefer the masculine case endings, others the feminine.

fortune's Palm is grown indoors and outdoors in America wherever palms are grown, but it is not one of the most popular species with northern florists. It seems to reach perfection in California, where it is one of the most popular of all palms. Ernest Braunton writes that it is hardy throughout the southern part of the state, where it is commonly known by the appropriate name of Chinese Windmill Palm. It attains a height of 30 ft. Braunton adds that it is harder than the native Washingtonia and will stand more abuse. It grows well near San Francisco. A new palm has recently come into California under the name of Chamaerops or Trachycarpus Phadoniora, a name unknown to botany. All the specific names cited in the synonymy below have also been combined with Chamaerops.

Generic characters: spadices many, interfoliar, stout, branched: spathes embracing the peduncle and branches of spadix, coriaceous, compressed, tomentose: bracts and bracteoles minute; fls. small, polygamo-monocious; sepals 3, ovate; petals 3, broadly ovate, valvate; stamens 6; carpels 3; stigmas 3, recurved; ovules basilar; drupes 1-3, globose or obovate; seed erect, ventrally grooved; albumen equable.

2538. Fortune's Palm—Trachycarpus excelsus (for T. Fortunei). The leaves finally become 4-5 feet across.
TRACHYCARPUS

Horticultural View of Trachycarpus.

A. Trunk clothed with old leaf-sheaths.
Himalayan species.

B. Tips of lvs. drooping; lvs. very glutinous beneath

Martianus

Bb. Tips of lvs. straight; lvs. hardly glutinous beneath

Khasyanus

AA. Trunk not clothed with old leaf-sheaths.
Chinese and Japanese species.

Bb. Tips of lvs. pendulous

Fortunica

Following is the Latest Botanical View of Trachycarpus.


W. M. TRACHYCARPUS Fortunei is not a popular florist's palm for three reasons: First, it is not as beautiful as Livistona Chihensis; second, it is a slower grower, and this is an unpardonable fault to the average florist; third, there is a greater demand, generally speaking, for pinnate-leaved palms than for fan-leaved palms. The undersigned has not seen a plant of it for several years, but it was cult. in America more than 20 years ago. It is dwarf in habit, rather slow-growing, the foliage dark green and somewhat stiff, and in texture decidedly tough. In a young state it bears much resemblance to Livistona australis, though the latter is more spiny and has longer footstalks.

W. H. TAPLIN.

TRACHYMÉNE (Greek, rough membranace; alluding to the fruit). Umbellifera. A genus of 14 species, 12 of which are Australian annual, biennial or perennial herbs, usually hisurate, with terately divided leaves and blue or white flowers in terminal umbels. Calyx-teeth minute; petals entire, obtuse, imbricated; fr. compressed. Flora Australiensia, Vol. 3.

cerules, R. Grah. (Didiscus cerules, DC.). An erect annual about 2 ft. high, somewhat hairy; lvs. 1-2-

TRADESCANTIA

tripartited, with linear, acute, 3-celled lobes; peduncules long, bearing an umbel 2-3 in. across of very numerous blue lvs.; calyx-teeth obsolete; petals unequal, the external being longer. July-Oct. Australia. B.M. 2675. B.R. 15:1225.

F. W. BARCLAY.

TRADESCANTIA (John Tradescant, gardener to Charles I., died about 1638). Compositae. Thirty-six species are admitted by C. B. Clarke, the latest monographer, 1881 (DC. Monogr. Phaner. 3). This enumeration does not include T. Regina and other recent species. They are all American perennial herbs, ranging from Mexico to Argentina. In habit they are various, varying from erect bushy species to trailing plants rooting at the nodes. The plants are more or less soft and succulent in texture, although usually not losing. The leaves are alternate, sheathing, varying from ovate to long-linear-lanceolate. The flowers vary from red to blue and white, sometimes solitary but usually in simple cymes or umbels; sepal and petals each 3, free, the sepal sometimes colored; stamens 6, in some species the alternate ones shorter, the filaments usually more or less bearded at the base or above; ovary 3-loculed, with 2 ovules in each locule, the style single; fr. a 3-loculed dehiscent capsule. The genus Zebrina, usually confounded with this by gardeners, differs, among other things, in having a tubular perianth.

To horticulturists, Tradescantias are known as hardy herbs, coolhouse plants and greenhouse plants. T. Virginita is the best known of the hardy species, withstanding the climate of the northern states. The Wandering Jew of greenhouses and hanging baskets, usually known as T. tricolor, is partly T. fluminensis and partly Zebrina pendula. T. Regina is perhaps the best known greenhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The greenhouse species are essentially foliage plants. Several species have handsomely striped leaves. All Tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

A. Plant prostrate, rooting at the joints.

fluminensis, Vell. (T. mandula and T. albiflora, Kunth. T. ripes, ripes vittata, vireis, vireis vittata, prostrata, procumbens, striata, Hort. T. tricolor, Hort., in part). Wandering Jew in part. Figs. 2539-41. Glabrous, with shining stems and leaves, the nodes conspicuous, trailing, or the ends of the shoots ascending: lvs. ovate-acute, without distinct petiole, ciliate at the very base, the sheaths ½-⅓ in. long; lvs. white, hairy inside, the 6 stamens all alike, borne several together in a sessile cluster on the bushy 2 un- eupatous lvs. or bracts, the pedicels not all of same age. Central Brazil to Argentina. One of the commonest of greenhouse and basket plants. In greenhouses, usually grown under the benches. When the plants grow very vigorously and have little light, they are usually green, and this is the form commonly known as Vireis. There are forms with lvs. striped yellow and white, but the colors usually do not hold unless there is abundance of sunlight. In light places, the lvs. become red-purple beneath. Very easily propagated by cuttings or offset shoots at any time of the year. The plant needs plenty of moisture in order to grow vigorously. Three plants are known as Wandering Jew, and although they belong to three genera, it is not easy to tell them apart when not in flower (Fig. 2539). These Tradescantia fluminensis, sheaths hairy or ciliate only at the top, lvs. white; Zebrina pendula, sheaths hairy throughout or at least at base and top, lvs. redder beneath and always colored above, lvs. rose-red; Commelina nudiflora, sheaths glabrous, lvs. blue. The two first are tender to frost; the
TRADESCANTIA
last is hardy in the open ground in central New York. All of them are suited for baskets and vases. The first are best known and are the plants commonly known as Wandering Jew. All of them may have stripped foliage. See Commelina and Zebrina.

AA. Plant erect, or ascending from a decumbent base.

B. Species grown primarily for the colored foliage: greenhouse kinds.

c. Stem none, or scarcely rising above the ground.

Iscocata, Lodd. (properly Pyrrhinea Loddigesi, Hassk.). Stemless, brown-tomentose or hairy: fls. oblong-ovate, entire, about 7-nerved, short-petioled: fls. blue or blue-purple, 1 in. or more across, borne in the midst of the lvs. on very short pedicels, stamens 6. S. Amer. L.B.C. 4:374. B. M. 6:482. B. M. 2390.—Lvs. 6-8 in. long. Now referred to Pyrrhinea, being the only species.

cc. Stem evident, usually branching.

d. Lvs. distichous (in 2 rows).


DD. Lvs. not 2-ranked.

e. Stems all equal and similar.

Warscewicziiana, Kunth & Bouéé (Dichorisandra Warscewicziana, Planch.). Fig. 2542. Dichorisandra-like, having a stout caudex or trunk, marked by leaf-scars and finnally branching: lvs. green, stiffish, 1 ft. or less long, clustered at the top of the stem, recurving, lanceolate-acuminate: fls. blue-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B. M. 5188. R. H. 1800, p. 136.

ee. Stems unequal,—3 long and 3 short.

elongata, Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1-2 ft.: lvs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath: peduncles 1-5, terminal: fls. rose-colored, the scapals green. Tropical Amer.

2541. Wandering Jew—Tradescantia iluminarias.

Natural size.

BB. Species grown as border plants for their flowers: native kinds.

c. Umbels sessile.

Virginiana, Lin. Common Spiderwort. Erect, branching, 1-3 ft., glabrous or nearly so; lvs. conduplicate, very long-linear-lanceolate (6-15 in. long), clasping: umbels several fls., terminal, the pedicel recurving when not in bloom: fls. violet-blue, in various shades, 1-2 in. across, produced freely all summer. N. Y. to S. Dakota, Va. and Ark. B. M. 105; 3546 (as T. caro-tolica). L. B. C. 16:1513 (as T. elata).—An exceedingly variable plant. Var. occidentalis, Brit., is in the trade. It has much narrower lvs. and smaller fls. and is usually dwarf. There are several horticultural forms: T. Virginiana has dark red fls. T. cocinea has bright red fls. T. carinata has bright blue fls. Some of the forms would better be regarded as species. See Rose, Contr. Nat. Herb. 5:264.

breviculialis, Raf. Villous, 1 ft. or less high, sometimes nearly aseculent: lvs. mostly from near the ground, linear-lanceolate, more or less ciliate: fls. about 1 in. across, blue or rose-purple. Ky. to Mo.

cc. Umbels peduncled.

rosea, Vent. Slender and nearly or quite simple, glabrous, 12 in. or less tall: lvs. very narrow-linear: bracts short and scale-like: fls. 1/4-3/4 in. across, rose-colored. Md. to Mo. and south. Mn. 2, p. 36.

T. crassifolia, Cav. Something like T. Virginiana, but lvs. short and broad (oblong-ovate, ciliate, as also the stem: fls. 1/4 in. across, blue-purple, in terminal and axillary sessile umbels, the stamens all equal. Mex. B. M. 1398.—T. Crassula, Lind. & Otto. Somewhat succulent, ascending: lvs. thick, oblong and nearly or quite obtuse, glabrous except on the edges: fls. about 1/4-1/2 in. across, white, in terminal and lateral often stalked umbels, the calyx and pedicels hairy. Brazil. B. M. 2935. L. B. C. 16:1560. T. decora, Buhl. Foliage plant: lvs. lanceolate, dark olive-green with a central gray bar. Brazil.—T. discolor is Rheo discolor, which see (p. 126).—T. dracocephalum. *A noble and rapid-growing plant, with luxuriously handsome foliage. The leaves in many respects resemble a dracaena and are a deep green, marked with chocolate or black. . . . When fully grown the plant will send out long runners, bearing out tufts of leaves at the end." John Lewis Childs, Catalogue 1900.—T. multicolor, Hort. See Zebrina.—T. nasicardia, Orf. Much like T. Virginiana; stoloniferous; stem much branched; lvs. ovate-acute, sessile, boat-shaped; umbel terminal, many-fl., with 3 foliaceous bracts: fls. rose-colored, the stamens all equal. Peru. Mentioned in European literature as a warmhouse subject.—T. quadrilocularis, Hort. See Zebrina.—T. superba, Lind. & Rod. Lvs. oval-oblong-acuminate, sessile, purple beneath, dark metallic green with a white band on either side of midrib. Peru. I. H. 39:135; 40:172 (6). Oat. 46, p. 163. Perhaps not a Tradescantia.—T. zebrina, Hort., is Zebrina pendula.

L. H. B.

TRAPOPOGON (Greek for goat’s beard). Composita. Goat’s Beard. Between 30 and 40 species of erect biennial or perennial herbs with narrow grass-like leaves and heads of yellow or purple flowers, belonging to the ligulate section of the composite family (tribe Cichoriaceae). Florets perfect, with slender style-branches and sagittate anthers; pappus composed of bristles in a single series and mostly raised on a bead; involucre cylindric or nearly so, with approximately equal bracts in a single row. The Tragopogons are mostly weedy plants with a tap-root. They are native to southern Europe, northern Africa, central and southern Asia. One of them is cultivated for its edible tap-root (salsify) and another is now a frequent weed in this country. The flowers of these open only in the morning.
porrifolius, Linn. SALSIFY. VEGETABLE OYSTER. OYSTER PLANT. Figs. 2283, 2545. Tall strict biennial, sometimes 4 ft. high when in bloom, glabrous: fls. showy, closing at noon or before; the outer rays exceeded by the involucral scales: peduncle thickened and hollow beneath the heads. S. Eu. Naturalized in many parts of the country, often becoming a persistent weed. See Salsify.

pratensis, Linn. GOAT’S BEARD. More or less branched, 3 ft. or less tall: outer rays exceeding the involucral scales; peduncle scarcely swollen. A weed from Europe.

TRAILERS. See Vines.

TRAILING ARBUTUS. Epigaea repens.

TRAILING BEGONIA. Cissus discolor.

TRAINING. See Pruning.

TRANSPIRATION is the process by which water is given off in the form of vapor from leaves and stems. Instead of a circulation of the sap in plants similar to the movements of the blood of animals, water containing mineral salts is taken in at the roots in liquid form and carried upward to the leaves through the woody tissue, and then evaporated, leaving the mineral or ash behind in the leaf, where it serves in making food. The chief purpose of transpiration is, therefore, to carry a stream of mineral food from the soil to the green parts of the plant, although it also serves to aid in the exchange of gases with the air, and preserves more equable temperatures of the body of the plant.

Minerals may be absorbed by the plant only in very dilute solutions. Hence it is necessary for the plant to lift several thousand pounds of water to the leaves in order to obtain one pound of minerals. After the mineral-laden water reaches the green organs it is of no further use and must be evaporated. It is estimated that 98 per cent of the energy received from sunlight by the plant is used in this important work. That an enormous amount of work is performed by the plant in transpiration may be seen when it is known that a single sunflower plant will evaporate a pint of water from its leaves in a single day, and about seventy times this much in the course of its development. A birch tree with 200,000 leaves will transpire from 700 to 1,000 pounds of water daily in the summer. A single oak tree will throw 120 or 130 tons of water into the air during the course of a season, and an aer of beech trees containing 400-600 specimens will transpire about 2,000,000 pounds in a single summer.

To determine the exact amount of water transpired by a plant, a specimen not more than a yard in height growing in a pot may be used. Set the pot on a small plate of oil-cloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring glass, and balance. Allow the plant to remain in the warm sunshine for eight hours, then pour water into the measuring glass until the scale shows original position or reading. The water in the glass will represent the amount of transpiration.

To demonstrate that water vapor does actually come from the leaf, cut off a small leafy shoot of any convenient plant and thrust the base of the stem through a piece of cardboard into a tumbler of water; now cover the exposed part of the shoot with another tumbler and set in a warm, light place. Moisture, which could have come only from the leaves, will soon gather on the glass.

Some transpiration occurs over the entire surface of the plant, although only about one-thirtieth as much is given off by a stem as from the same amount of leaf surface. The leaves are specially adapted to carry on this function. The interior of the leaf is made up of a great number of loosely arranged cells through which water can enter the air between them. The air in the leaf communicates with the atmosphere through openings called stomata, which are generally placed on the lower sides of the leaf. Consequently the watery vapor fuses out through the stomatal opening. The stomata are controlled by guard-cells which may completely close them up, and the action of the guard-cells is under the control of the plant. When the plant is losing too much water the stomata close; and they are variously affected by winds and sunshine.

Species growing in very dry localities adapt themselves to the conditions by building only limited surfaces from which transpiration may take place and by reducing the number of stomata. The cactus is an example of this type, and this plant transpires only about one three-hundredth as much water as a leafy plant of the same volume. As might be expected, the character and amount of the mineral salts in the soil also affect the amount of transpiration.

D. T. MACDOUGAL.

TRANSPLANTING is a general term used to designate the removal of living plants whereby they may become established in new quarters. Transplanting may be performed when the plant is in a dormant condition, as in winter, or when it is still actively growing. Small herbaceous plants are usually the only ones that are transplanted when in a growing condition, and this only when the plants are living under special garden conditions where they may have the best of attention to watering and shading. Considered from the standpoint of the plant, transplanting is always a violent operation, for it destroys a considerable part of the root system, loosens the plant’s attachment to the soil and arrests for the time being a large part of its progressive vital activities. In order to overcome these dangers the earth into which the plant is set should be well prepared and moist, so that the plant may quickly reestablish itself; part of the top usually should be removed in order to lessen transpiration, and with success and growing plants some shade should be provided for a time. The deeper and finer the soil, and the greater the quantity of moisture it holds, the more successful the transplanting operation will be, other things being equal. The operation is also more successful in humid regions, as in the Atlantic states, than it is in dry regions, as on the plains and westward. In the more arid parts of the country transplanting is performed as little as possible, for there great quantities of annual and other garden plants are transferred from seed-beds to the open ground.

The successful transplanting of any plant depends in part on the condition of the plant itself. The younger the plant, as a rule, the better it withstands the opera-
Plate XLIII. Various stages in the transplanting of a large tree. See Transplanting.
tion. Herbaceous or growing plants that are relatively short and stocky and compact in growth transplant better than those that are long, "leggy," and weak. The stocky plants are better able to withstand the vicissitudes of inclement weather when they are transferred from a protected place to the open air, and they probably also have more recuperative power to make new roots and to attach themselves to the soil. Many plants may be "hardened off" or gradually inured to sun and cold before they are transplanted. The more frequently a given plant is transplanted the more readily it endures transplanting. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent removal, providing a long interval does not take place between the operations.

The success of transplanting also depends to some extent on the weather at the time the removal is performed. If cool, cloudy and damp weather follows the transplanting, the plants are much more likely to live. Plants usually establish themselves more quickly in freshly turned soil, because it contains a relatively large amount of moisture. In order to bring the earth into contact with the roots, it should be formed closely about the plants. This packing of the soil tends to bring the subterranean moisture upwards where it may supply the roots; it also tends to increase evaporation from the surface of the soil and thereby to waste the water, although much of the moisture is utilized by the plant as it passes upwards. In order to prevent the escape of moisture from the surface of the soil, it is customary to cover the ground with a mulch, from one to three inches in depth, of litter, sawdust, leaves or coarse manure. When practicable the water may be saved by covering the surface well tilled, thereby providing a mulch of earth.

In dry weather it may be advisable to water newly set plants, particularly if they are green and growing fast, as tomatoes, cabbages and other annuals. The watering may best be done at nightfall. The water should be applied in a hole or depression about the plant or at one side of it, rather than on the surface; and the following morning the loose, fresh earth should be drawn over the roots in order to provide a surface mulch and to prevent the soil from packing.

All kinds of plants can be transplanted, but some of them require with great difficulty. In these cases the special skill which is born of experience with these particular plants must be invoked for success. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and some hickories. In these instances the plant may be prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust underneath the earth. In other cases the difficulty is the inability of the plant to make new feeding roots quickly, as in some of the asilias or pears. Such plants often may be treated like the tap-rooted plants; that is, the long, cord-like roots may be severed at some distance from the crown a year or two before the plants are to be removed. In other cases the inability to transplant is probably due to the excessive rate of transpiration from the foliage. In these instances cutting back the top rather severely and providing shade may contribute to success. In some cases the difficulties are so great as practically to prohibit transplanting.

So-called transplanting machines have been perfected within the last few years for setting small herbaceous stuff, as cabbages, tobacco and tomatoes. These are really vehicles, drawn by horses, that open a furrow and drop a small quantity of water when the plant is inserted in the furrow by the hands of an operator who rides on the machine. The plants, already prepared for setting, are placed in a tray or hopper, and the operator places these between guards which automatically measure the distance. These machines are particularly valuable in large areas where great quantities of plants are to be set, and also in hard and dry land where it is difficult to make the proper openings with the hand and also otherwise to supply the plant with sufficient water. For most small plants that are to be reset in small quantity, the dibber is a most useful implement to expedite the operation. Fig. 2544. Plants grown in pots and small shallow boxes transplant more readily than those grown in the open soil. Particularly is this true of pot-grown plants, for the heavel or slope of the pot allows the ball of earth to be "knocked out" readily. See Potting. Special transplanting boxes are on the market, to be used instead of pots, for purposes of economy. These boxes are usually made of thin basket stuff and are thrown away when the plants are taken from them for transplanting. Fig. 2415. The seeds are sown directly in these boxes. Melons, cucumbers and other plants that are difficult to transplant are often grown on pieces of inverted turf, taken from old pastures.

In the case of large trees and shrubs, success often may be attained by transplanting in the winter, when a ball of frozen earth may be removed. Fig. 2546. It is usually better to give the transplanting of large trees into the hands of an expert, than to attempt to perform it with unskilled help and inefficient appliances. Only a small proportion of the efforts in transplanting very large trees are really successful. The trees may live for several years and yet never fully recover nor make satisfactory subjects. The surest and best results are usually secured only when the trees are nursery-grown and have been transplanted two or three times within a few years of their final removal. There are some species that remove from the wild with relative ease when they are of large size, among which are elms, maples, pine oak, hickories; but the large number of species do not readily recuperate from the operation.

It is sometimes said that a plant cannot recover from the transplanting operation, that the severing of the roots inflicts injuries that are not outgrown, and that a new type of root-system develops. These fears appear to be unfounded. In many cases the plant does not regain itself, but these instances are probably due to lack of skill in the operation rather than to any inherent difficulty in the transplanting process itself. But even if the transplanting process were to be found to be theoretically injurious, nevertheless it must be employed in the practice of modern horticulture.

L. H. B.
Transplanting Large Trees (Plate XLIII).—The principles of transplanting large or small trees are the same, excepting as regards the mechanics of transportation. Types of machinery for moving deciduous trees may be classified as follows:

The most primitive device is a two-wheeled cart with a pole. The tree is dug, and the cart is secured to it with the trunk resting in a notch in the axle or bolster, and the pole lashed up among the branches. The tree is pulled over and dragged root foremost.

In a modification of the above, a platform under the ball connects the rear axle, bearing the tree, with the front axle. Of this type are the Hall, Estes, Santimer, Rutherford and other patents. In one form the tree is loaded top foremost, and by means of a turn-table above the rear axle, swung around to position. These machines usually carry a ball of earth and roots, 7 to 9 ft. in diameter, cut shorter on the side next to the platform.

For moving trees in an upright position, there are low platform trucks, and trucks with two high perches. In the latter, one perch or a section of the axle is removed to permit the trunk between the perches. This form is used in England; also a similar one in which the tree is swung vertically beside the axle of a two-wheeled cart drawn by one horse. When carried vertically, the top interferes with electric wires and the tops of other trees, and the roots are injured by the platform or other support. It is not practicable to carry a spread of 30 or 40 ft. of roots between the wheels.

House-mover's rigging is adapted to moving trees for short distances, but is so slow that the fine feeding roots outside the central ball of earth are likely to dry out, and get broken by the work.

Trees are carried horizontally with the trunk resting on two benches on a low truck. The tree may be tipped over on the benches by tackle, or loaded and unloaded by derrick. The derrick legs usually interfere with the full circle of roots, and as the derrick has to be set up twice for each tree moved, the operation is slow, and, with the tree swinging in midair, somewhat dangerous. For moving trees a few feet, a derrick may be used, with or without small wheels in the base of the derrick legs. Many kinds of machines may be used, but in order to make this discussion concrete, the following account has reference to the device shown in Plate XLIII. Other successful moving operations are shown in Figs. 2547, 2548.

For operating the mover shown in Plate XLIII, the tree, of say 14-26 in. diameter of trunk, is dug by starting a circular trench with a diameter of 30-40 ft. An under cut is made beneath the roots with a light prospecting pick, and the soil picked out and coved down with a spading fork or picking rod, the points of which are rounded to avoid cutting off the roots. The loose dirt is shoveled out of the bottom of the trench. The roots, as uncovered, are tied in bundles with burlap yarn and bent up, out of the way of the diggers. See Fig. 2549. If the roots are to be out of the ground over one day in dry weather the bundles may be wrapped in clay mud, damp moss and straw, or burlap. When the digging has progressed 10 ft. to 3 ft. of the center, the tree is slightly tipped over to loosen the central ball, which cleaves from the subsoil near the extremities of the downward roots. On sand or hard-pan subsoil this is at a depth of 6 to 8 ft. In deep soil it may be necessary to cut some downward roots. A ball of earth is left in the center from 5 to 12 ft. in diameter, or as heavy as can be drawn by four to eight horses. This ball is not essential with deciduous trees, but it is easier to leave it than to remove and replace the soil.

With fine-rooted trees like the red maple, it is difficult to pick out the soil, while with coarse-rooted trees, like the beech, in gravelly soil, the ball drops to pieces.

For loading, the cradle which is pivoted above or back of the axle is swung over to the tree, the trunk having first been wrapped with cushions and slats. The trunk is clamped to the cradle by chains and screws without injuring the bark. By means of a screw 9 ft. long operated by a ratchet lever or hand-brake wheel, the cradle lifts the tree from the hole and swings it over in a horizontal position. Pulling in the same direction, by tackle fastened in the top of the tree, aids the work of the screw.

After the tree is loaded, the roots on the under side of the axle are tied up to the perches. The front wheels are on pivots, therefore the roots are not broken by the swinging of the axle. The roots are drawn aside to put in the pole and driver's seat. Planks are placed under the wheels, and the mover is pulled out of the hole by tackle.

The hole to receive the tree is prepared with a layer of soft mud in the bottom, which partly fills the crevices as the tree is lowered into it. The weight of the tree is not allowed to rest upon and crush the downward roots, but is supported by the mover until fine earth is packed in. Soil is worked down between the roots in the form of mud by means of a stream of water and packing sticks. One man shoveling, two or three with packing sticks, and one with hose is the right operation until the center is made solid. The packing sticks are 2 in. in diameter, 6 ft. long, and pointed at one end and round at the other. The side roots are next unwrapped and covered at their natural depth.

While the tree is horizontal, it may be most conveniently pruned. Th outside should be cut back 1 to 3 ft., cutting to a crotch or bud, and the remaining twigs thinned out about one-third. Hardwood trees and trees with few roots need the most severe pruning.
TRANSPLANTING

The soil should be friable loam, not baking clay nor sterile sand, and it should be made fertile. The surface should be covered with a soil or straw mulch 3 inches deep and the earth kept moist by watering once a week or less frequently, as required. The roots may be dam-

aged by too thick mulch, deep planting, excess of water or lack of drainage, all of which exclude the air. Decaying manure and caustic fertilizers in direct contact with the roots are injurious.

The tree may be secured by guy wires. Anchor posts are set slanting, 4½ ft. in the ground, with a cross-piece just below the surface. Two to six strands of No. 11 galvanized steel wire are used. The wire is run from the post, through a piece of hose around the tree, and back to the post. It is twisted tight, with two sticks turning in the same direction and moving toward each other. To prevent the sun from drying out the bark on the south side of the tree, the trunk should be wrapped with straw, especially thin-barked trees, like beech and silver maple.

The best trees for moving are those with abundant small roots. These have fibers branching from them which take in the water and plant-food. The large roots in the center of the root-system are conduits for the sap, and braces for the tree. Trees which transplant successfully are the maple, horsechestnut, elm, catalpa, ash, linden, willow, poplar and pin oak. Trees with few fine roots and hard wood, as the hickory and white oak, are difficult to transplant with good results, as well as the tender-rooted trees like magnolia and tulip. Trees grown in the open are much better for moving than those in the woods. The roots are more numerous, and not mixed with the roots of other trees, the bark is thicker and does not dry out so quickly, the branches and twigs are closer and better developed to stand exposure, and may be thinned out without destroying the beauty of the tree, and more plant-food is stored for the new growth of leaves and roots. A young tree of large size is better to move than an old tree. In friable loam the roots are straighter and tougher and less liable to injury in digging, than in hard or rocky soil.

The popular prejudice that moving large trees is an ultimate failure, or that small trees quickly overtake them, arises from moving trees 1 to 2 inches in diameter with 6 to 8 feet diameter of roots. As this mass of roots is mainly the large roots, and from 70-90 per cent of the feeding roots are lost, the tree, after sending out the leaves with its stored plant-food, fails to support the foliage and bark. In successive seasons its branches die, or the growth is short and yellow and the bark dies on the south side. For moving large coniferous evergreens, it is usually considered necessary to keep a ball of earth intact. The foliage is coating the roots, and if the roots become dry, the sap does not flow again. As it is not generally feasible to move balls of over 12 feet diameter and 3 feet in depth, the size of evergreens which it is practicable to transplant is smaller than of deciduous trees.

The digging is started as in Fig. 2550. The flexible roots are wrapped against the ball by twisting them with a cord, and the large, stiff roots are cut off. The ball may be held by frost, or by upright staves, iron bands, or irons in the form of a pot split in halves and held by bolts or clamps. The best method is the use of a canvas band, wider than the depth of the ball, cut to fit. It has draw ropes operated by levers which firmly compress the earth, without damaging the small roots wrapped against the ball. A hammock, consisting of several ropes to distribute the pressure, is attached to a windlass. A platform is placed with a chisel edge in the under cut. By means of the windlass, the ball is cut off from the subsoil and the platform, with the tree, loaded upon a truck.

In planting, the hammock is reversed and holds the ball, while the platform is pulled out by the windlass, leaving the tree in the hole. By this method, trees 20-40 feet high and 6-12 inches in diameter may be moved.

Trees grown in fertile clay loam are best for transplanting, but with care the canvas will hold balls of sand or gravel. Root-pruning, one or more years pre-

2549. Diagram to illustrate the operations in the removal of a large tree for transplanting.
vious to moving, all or part way around the tree at a diameter less than the size of the ball to be moved, is beneficial. With very large balls, freezing aids in keeping the soil solid, although it destroys the fine roots outside the ball.

Evergreens may be moved any month in the year. In June and July, the new growth is likely to wilt more than in August, after it has hardened. It is well to protect from deep freezing and drying winds in winter.

Henry Hicks.

Another View of Transplanting Large Trees.—The modern demand for immediate effect in landscape work has been met by the successful transplanting of large trees. The method employed at Chicago was somewhat from that in vogue in the east. This is due to a considerable degree to the condition of the soil in which the trees are found.

Select a shapely tree with well-balanced crown and which has stood in the open so that all its branches are equally thrifty. A bushy top is preferred that the necessary amount of trimming can be done by thinning out whole branches and not disturbing the terminal shoots, thus preserving the original outline of the tree. Crowded forest trees are too tall and it is difficult to get the sap to carry to the top. A light sandy soil often produces fibrous roots spreading over a large area, but this generally slips off in transplanting and, if frozen, cracks badly when the ball is rolled. When resetting a tree, care must be taken to sift in new soil between the fine hair-roots and get it in direct contact with each rootlet, because if crowded together the roots are likely to rot. When practicable, it is undoubtedly best to move the roots in their native soil. A hard ball can be rolled at will and easily supports the weight of the trunk, which otherwise would crush the roots when rolled or handled. The prevailing soil about Chicago is two feet of rich black loam and a subsoil of clay. This is ideal for giving plenty of fibrous roots near the trunk, and a body to the ball of earth encasing the roots, without waiting for the ground to freeze. This allows a longer planting season and makes it easy to have loose soil to tamper around the tree.

After the tree has been dug loose, rock back and forth, filling under it each time with soil, until the whole ball is standing flush with the surface. It depends upon the weight of the load what style of a wagon is to be used. A hardwood tree of thirty inches in diameter weighs, with proper ball, about fifteen tons. This is the limit of practical construction for a low-hung stone truck. Simply pull the tree over and rest it on the high support over the rear axle and with block and tackle roll the ball on the wagon. When at the desired location roll off again, letting the ball rest on the ground before dropping into the hole. A countercheck should be maintained to keep the tree always under control. Straighten up and thoroughly tamp so as to anchor it well and the work is complete.

Wm. A. Peterson.

TRAPA (name explained below). Omphaloceros. Trapa natans, the WATER CHESTNUT of WATER CALTROPS, is an interesting plant for the aquarium. It has two kinds of leaves. The submerged ones are root-like, long, slender and feathery. The floating lvs. form a loose rosette. The leaf-stalks are swollen and spongy near the apex. The fruit is about 3/4 in. across and has 4 spine-like projections, like the fruit of the Water Caltrops.

TRAVELER'S JOY.


bispínosa, Roxb. SINGHARA NUT. Petiole of floating lvs. 4-6 in. long, woolly; blade 2 x 3 in., slightly crenate in the upper half, very villous beneath; fr. 3/4 in. thick, with 2 of the spines sometimes absent. India, Ceylon.

W. M.

Trapa natans is one of the daintiest aquatics in cultivation. It is perfectly hardy and very desirable for aquarium, pools, ponds or tub culture. Its beautifully mottled or variegated foliage is very attractive. The flowers are white, small and inconspicuous. The fruits are very large in comparison with the flowers and leaves, and they are hidden beneath the foliage until they ripen, when they drop off. They are good to eat raw, like chestnuts, and are sweeter and more palatable before the shell becomes hard. The nut is not likely to become of commercial importance in America. The seeds drop from the plant and remain in the pond all winter.

Wm. Thicker.

TRAUVETTERIA (Trauvetter, a Russian botanist). Rumexcuticus. A genus of but two species of North America and eastern Asia. Tall, erect, perennial herbs: lvs. broad, palmately lobed: lvs. white, small, corymbose-paniculate; sepal 3 to 5, caducous; petals none; carpels many, forming 1-seeded achenes. Very hardy, thriving in ordinary or rich soil. Propagated by division of roots. Offered by dealers in native plants.

Carolinensis, Vaiil. (Hydráctis Carolinénsis, Walt. T. patmáta, Fisch. & Mey.). Stems 2-3 feet high; lvs. alternate, reticulated, radical ones very large, with lobes much toothed and cut. July, Pa., south and west. B.M. 1630 (as Cimicifuga patmáta).

grándis, Nutt. (Actéia patmáta, Hook. A. grándis, Dietr.). Much like the above species. Lvs. membraneous, more deeply lobed, often to the base, thin, sparsely hairy beneath along the ribs; reticulations less distinct; styles longer and somewhat curled. Wash., Idaho, Brit. Col.

K. C. Davis.

TRAVELER'S JOY. Clematis vitalba.
TRAVELER’S TREE. See Ravenala.

TREASURE VINE. Name proposed by J. L. Childs for Hidalgos Wercklei or Childsia Wercklei.

TREE. Candelabrum, or Chandelier T., Pandanus Candelabrum.

TREE OF HEAVEN. See Ailanthus.

TREES. Plate XLIV. Figs. 2551-2566. What is a tree? is a question to which it is not easy to give a short and well-defined answer. The same species may assume a tree-like habit or remain shrubby, according to the climatic conditions, soil and other circumstances. Usually a tree is defined as a woody plant rising from the ground under normal conditions with a single stem and attaining a certain height, fixed by some at 20, by others at 15 feet, or even less. A more exact definition has been given by B. E. Fernow: “Trees are woody plants the seed of which has the inherent capacity of producing naturally within their native limits one main erect axis continuing to grow for a number of years more vigorously than the lateral axes and the lower branches dying off in time.”

Trees are the most prominent feature of the vegetable world and surpass all other organic beings in height, magnitude and longevity. The greatest height known has been reached by Eucalyptus amygdalina of Australia, of which trees have been observed that were 470 feet high. In length, but not in body and longevity, even this tree is surpassed by some giant floating alga said to attain the length of 900 feet, and by some climbing palms of Java attaining, sometimes, 600 feet. Following Eucalyptus amygdalina is probably Sequoia sempervirens, which attains 325 feet and occasionally 35 feet, in Taxodium distichum 90 feet, and somewhat less in Adansonia digitata.

The age attributed to many of the tallest trees is based more or less on speculation, and opinions often differ widely. Dracaena Draca is believed to reach 6000 years of age, Adansonia digitata 5,000, Taxodium mucronatum and Platanus 3,000, Cupressus sempervirens and Taxus baccata 3,000, Castanea sativa, Quercus pedunculata, Sequoia gigantea and Cedrus libani more than 2,000 years.

Although the trees are the most conspicuous features of the vegetable kingdom, they represent only a small percentage of it as regards the number of species. In the United States, where about 550 trees occur, they represent only about 3½ per cent of the whole phanerogamic flora, in Europe even less. As a rule, towards the tropics the number of tree-like species increases, towards the arctic regions it decreases. Remarkably rich in trees is the flora of Japan, where the proportion of trees to the whole phanerogamic flora is more than 10.
per cent, which percentage surpasses by far that of any other country in the temperate regions.

Trees belong to many different natural orders, but of the orders of monocotyledonous plants only a few contain trees and none of them is hardly north. None of the larger orders contains trees only, but there are some which consist exclusively of woody plants and include a large proportion of trees, as Coniferae, Cupuliferae, Salicaceae, Juglandaceae, Magnoliaceae, Sapindaceae, Elmagnaceae, Ulmaceae, Hamamelidaceae, Lauraceae, Anacardiaceae, Ebenaceae, Styraceae and others.

The uses of trees are manifold, and a country from which the forests have been destroyed becomes almost uninhabitable and worthless to mankind. The forests furnish wood and timber, exercise beneficial influences on the climate, act as regulators of the water flow, prevent erosion and also the removal of soil by the wind. Besides furnishing wood and timber, many trees yield other products of great economic importance, especially the numerous kinds bearing fruits. The aesthetic value also of the tree must not be underrated, though it cannot be counted in money.

The science of trees and shrubs is dendrology. The art of growing trees is arboriculture, of which silviculture is a branch and deals with the rearing and maintaining of forests and the producing of wood crops. Orchard culture is a branch of arboriculture or of horticulture and deals with the cultivation of fruit trees; it is usually included under pomology, which comprises both the science and practice of fruit-growing. As ornamental subjects, trees are more permanent, easier of cultivation and cheaper in the long run than herbs. It is curious to note how little attention the average gardener who has the care of a park or garden gives to the most prominent feature of his domain. He usually knows fairly well the greenhouse plants and his herbaceous perennials, which cost most in time and money, but the trees and shrubs he often hardly deigns to look at. This is apparently due to the fact that after being once planted, and often not by himself, the trees and shrubs do not need his perpetual care and usually grow without his aid and interference.

To the landscape gardener a thorough knowledge of trees is absolutely essential. He ought to know the ornamental properties of the trees, their rate and mode of growth, their peculiarities in regard to soil, situation and climate. As the trees are, after the surface of the ground, the most permanent element of the landscape, they ought to be planted with careful deliberation as to the intended artistic effect and their fitness to the soil and climatic conditions, for mistakes in planting of trees are afterwards not easily corrected and rarely without injury to the original artistic design. The available number of trees from which selection may be made is large. There are in American and European nurseries and gardens more than 600 species in cultiva-
and to furnish shade and shelter. The enjoyment of the trees give by beautiful flowers, various foliage, splendid autumnal tints, and ornamental fruit is more incidental, though of great value and worthy of careful consideration. The trees should be selected for planting in accordance with the natural and adapted character of the scenery and not be taken indiscriminately because they happen to be handy and easy to procure.

It is essential that the trees should be well adapted to the climate and soil, and in this respect a careful observation of the natural tree growth of the locality will give many good hints. Other considerations are the height the trees attain, the character of growth, color and effect of foliage, flowers and fruits, autumnal tints and winter effects. Concerning the general rules which govern the selection of trees for planting and which are principally the same as in herbs and shrubs, much other information may also be found in the articles on Landscape Gardening, Park, Shrubbery and Herbs.

Selections of Trees for Special Purposes.—The following lists include trees of proved hardiness and are not intended to be complete but merely suggestive, and chiefly for the northeastern states.

1. Trees with Showy Flowers.

A. Blooming in early spring before or with the leaves.

- **Acer ruhrum** (fls. blood-red).
- **Amelanchier Canadensis** (fls. white).
- **Cercis Canadensis** (fls. rose pink).
- **Cornus florida** (fls. white, also pink).
- **Cornus Mas** (fls. yellow).
- **Magnolia Yulan** (fls. white).
- **Magnolia Soulangeana** (fls. white to purple).
- **Prunus Avium** and other cherries (fls. white).
- **Prunus Americana** and other plums (fls. white).
- **Prunus Davidiana** (fls. pink, also white, the earliest of all Prunus).
- **Prunus pendula** (fls. pinkish, branches pendulous).
- **Prunus Pseudo-cerasus** (fls. white to pink).
- **Fyrrhus bacata** and other species (fls. white to pink).
- **Salix** (staminate plants with yellow catkins).

AA. Blooming late in spring after the leaves.

- Esculus Hippocastanum and other species (fls. white or red).
- **Catalpa speciosa** (fls. white).
- **Cladraestis tintoria** (fls. white).
- **Cornus Kousa** (fls. white).
- **Crataegus** (fls. white).
- **Fraxinus Ornus** (fls. white).
- **Laburnum** (fls. yellow).
- **Magnolia hypoleuca** (fls. white).
- **Pierocorys** (fls. white).
- **Robinia** (fls. white or light pink).
- **Syringa vulgaris** (fls. white to purple).
- **Tamarix parviflora** (pink).

AAA. Blooming in summer and autumn.

- **Aralia Chinensis** and spinosa (fls. Aug. and Sept.).
- **Castanea Americana** (fls. white; July).
- **Gordonia lutea** (fls. white; Sept., Oct.).
- **Koelreuteria paniculata** (fls. yellow; July, Aug.).
- **Oxydendrum arboreum** (fls. white; July, Aug.).
- **Rhus succedana** (fls. white; Aug., Sept.).
- **Robinia Neomexicana** (fls. light pink; Aug.).
- **Sophora Japonica** (fls. Aug.).
- **Syringa Japonica** (fls. white; July).
- **Tamarix Gallica** (fls. pink; Aug., Sept., if severely cut back).

2. Trees with Showy Fruits.

- **Acer rubrum** (fr. bright red in May and June).
- **Allanthus gigantea** var. erythrocappar (fr. red).
- **Cornus florida** (fr. scarlet).
- **Crataegus coccinea and others** (fr. scarlet or red).
- **Hippophae rhamnoides** (fr. yellow).
- **Ilex opaca** (fr. red).
- **Magnolia hypoleuca** (fr. scarlet).
- **Magnolia tripetala** (fr. pink).
- **Fyrrhus bacata** and allied species (fr. yellow or scarlet).
- **Rhus Cotinus** (ample feather panicles)."

Acer Negundo (branches light green).
Acer Pennsylvanicum (striped bark).
Betula nigra (flaky reddish brown bark).
Betula papyracea (smooth, silvery white bark).
Crataegus viridis (redfruit).
Crataegus laevigata (keeps its dead leaves).
Gleditschia (large, flat pods).
Hipppophae rhamnoides (yellow berries).
Liquidambarr (corky branches).
Pyrus prunifolia (scarlet or yellow fruit).
Quercus alba, pendunculata and tineoria (keep their leaves).
Quercus macrocarpa (corky branches).
Rhus typhina (scarlet fruit).
Salix vitellina (yellow branches).
Sorbus Americana and Aucuparia (scarlet fruit).

7. Very Tall Trees.

Gleditschia triacanthos.
Juglans nigra.
Liriodendron Tulipifera.
Picea excelsa.
Pinus Strobus.
Platanus occidentalis.
Populus balsamifera.
Populus deltoides.
Quercus macrocarpa.
Quercus palustris.
Quercus rubra.
Quercus velutina.
Taxodium distichum.
Ulmus Americana.

8. Columnar or Narrow Pyramidal Trees.

Abies (most species).
Acer negrum var. monumentale.
Betula alba, var. fastigiata.
Carpinus Betulus var. fastigiata.
Chamecyparis Lawsoniana.
Chamecyparis Nutkaensis.
Juniperus communis var. Svea.
Juniperus Virginiana (especially var. pyramidalis).
Liriodendron Tulipifera var. pyramidalis.
Picea (most species).
Populus alba var. Bolleana.
Populus nigra var. Itulica.
Quercus pedunculata var. pyramidalis.
Taxodium distichum (especially var. imbricarium).
Taxus baccata var. fastigiata.
Thuja.
Ulmus campestris var. monumentalis.
Ulmus scabra var. fastigiata.


Acer saccharinum var. Wieri.
Betula alba var. pendula.
Fagus sylvatica var. pendula.
Fraxinus excelsior var. pendula.
Fraxinus parvifolia var. pendula.
Prunus pendula.
Prunus serotina var. pendula.
Quercus pedunculata var. Donvessel.
Salix vitellina var. pendula.
Salix Babylonica.
Salix blanda.
Sorbus Aucuparia var. pendula.
Tilia petiolaris.
Ulmus scabra var. pendula.

10. City Trees (See also No. 11).

Allanthus glandulosa (pistillate tree).
Carpinus.
Crataegus Oxyacantha.
Fraxinus Americana.
Fraxinus excelsior.
Ginko biloba.
Gleditschia triacanthos.
Platanus orientalis.
Populus deltoides.
Populus nigra var. Itulica.
Prunus serotina.
Robinia Pseudacacia (often attacked by borers).
Sophora Japonica.
Ulmus Americana.
Ulmus campestris.
Tilia ulmifolia.

11. Shade and Avenue Trees.

Besides the trees enumerated under city trees, No. 10 (which are to be recommended as street trees in the cities), the following are good avenue subjects:

Acer platanoides.
Acer rubrum.
Acer saccharinum.
Acer saccharum.
Aesculus carnea.
Aesculus Hippocastanum.
Catalpa speciosa.
Celtis occidentalis.
Fagus ferruginea and F. Sylvatica.
Liquidambar styraciflua.
Liriodendron Tulipifera.
Quercus alba.
Quercus coccinea.
Quercus imbricaria.
Quercus palustris.
Quercus Phellos.
Quercus rubra.
Tilia Americana.
Tilia dasyphylla.
Tilia ulmifolia.

12. Trees for Seaside Planting.

Allanthus glandulosa.
Crataegus Oxyacantha.
Elaegnus angustifolia.
Hipppophae rhamnoides.
Juniperus Virginiana.
Picea alba.
Pinus Laricio.
Pinus rigida.
Pinus sylvestris.
Populus deltoides var. Carolinensis.
Populus tremuloides.
Quercus rubra.
Salix alba.
Salix Caprea.
Sassafras officinale.
Tamarix.

13. Trees for Dry Situations and Dry Climates.

Acer campestre.
Acer Ginnala.
Alnus rugosa.
Betula alba.
Cornus Mas.
Elaegnus angustifolia.
Fraxinus pubescens.
Phellodendron Amurense.
Pinus Divaricata.
Pinus rigida.
Pinus sylvestris.
Quercus cocinea.
Quercus rubra.
Quercus Primus.
Quercus veluthina.
Ulmus effusa.


Acer rubrum.
Acer saccharinum.
Alnus glutinosa.
Alnus maritima.
Betula alba.
Betula nigra.
Chamecyparis Sphaeroidea.
Hicoria Faciniosa.
Nyssa sylvatica.
Picea alba.
Picea nigra.
Pinus rigida.
Populus (most species).
Quercus alba.
Quercus bicolor.
Quercus palustris.
Quercus Phellos.
Salix (most species).
Taxodium distichum.

Ornamental Trees for the Middle Southern States.

1. Deciduous Trees. Acer saccharinum (A. dasyphylla) and A. Negundo, the latter extensively used for street planting.—Broussonetia Papyrifera, formerly planted along streets, but objectionable because of the many suckers which they produce, as is also B. Kazinoki.—Cercis Canadensis. Valuable as an early spring flowering tree.—Ceiba Bungeana. One of the most distinct trees: an excellent shade tree.—Catalpa. Seldom planted.
south as an ornamental tree, because of the repeated attacks of caterpillars. The latter are frequently used for fish bait. — *Cladrastis lutea.*—Very desirable as a flowering lawn tree. — *Cornus florida.* The white-flowering species is among the most attractive of our early spring-blooming trees and is largely used in landscape work. The pink- and red-flowering forms are exceedingly beautiful. — *Crataegus.* Taking into account the various shapes, the foliage and the bright colored fruit in fall and winter, the best are: *C. cordata* or Washington Thorn, *C. arborescens,* *C. spathulata* and *C. asplenifolii* or Apple Haw. — *Chelopsis saligna,* known as *C. linearis,* is one of the best for dry soils. The typical species produces lilac-colored flowers, but several forms have lately been produced with flowers ranging from light lilac to lilac-purple with yellow stripes inside. A pure white-flowering form is very striking but is of more dwarf habit. — *Diospyros Virginiana.* Sometimes planted for shade or for its fruit. Adapted itself to nearly all soils. There are many forms varying both in the foliage and size and shape of fruit. — *Fagus terricola* is frequently used for street planting in sandy soils. The red-leaved forms of the European species are of little value south, the purple tint of the foliage fading to a dull green at the approach of warm weather. — *Fraxinus americana* and *F. pennsylvanica.* Both thrive best in rich soils and are very desirable for street planting, being seldom attacked by insects. — *Ginkgo* or *Salisburea* is sometimes used for avenues and street planting where a rigid pyramidal tree is required. The foliage is one of its attractions, being shaped like the Maidenhair fern. — *Gleditschta triacanthos.* The fertile tree is sometimes planted for its large falcate pods, which are relished by many for the saccharine acidulated pulp. The finely pinnate foliage is very ornamental. — *Hibiscus terebinthifolia.* In the middle sections of the South and in rich, dry soils it grows to a small tree, but in the mountain districts in rich soils along the water-courses, trees 40 to 50 feet high are frequently found. Valuable for landscape planting. — *Hicoria* or *Carpa.* The pecan is the best southern nut tree and is very largely planted for its nuts. It is often planted in avenues for its beauty. — *Hicoria nyrsisteforum* is scarce, but its foliage is more attractive than that of any other species. — *Hoveia deltis,* the foliage and the flabby red peduncles in autumn make it an excellent shade and ornamental tree. — *Idesia polycarpa.* A handsome tree when grown in partial shade; the bark blisters in full sun. — *Juglans.* *J. nigra* is one of the most valuable ornamental period during February. *J. Sieboldiana* is a very ornamental tree and very productive at an early age. *J. cinerea* is suited only to the mountain regions of the South. — *Katreuteria paniculata.* Very desirable for its pinnae foliage and panicles of yellow flowers, which are succeeded by bladder-like fruits. — *Lagerstræmnia Indica.* The Crape Myrtle is one of the most characteristic features of southern homes. It has become almost naturalized south. If transplanted to a single stem it will form a tree 25 to 30 feet high; otherwise it affects the bush form. It is conspicuous for its shining brown bark and the profusion of its beautifully crimped and fringed flowers, which are produced from April until August. The colors vary from a pale to a dark pink, purplish red, pure white and glowing crimson. No other flowering tree can surpass it in beauty, and by a judicious selection of the various colored flowers a grand effect is produced in landscape work. — *Liriodendron Tulipifera.* One of the most valuable and rapid-growing shade and ornamental trees; thrives best in rich soil. Trees taken from woods transplant badly. They should be grown in nursery and occasionally transplanted until sufficiently large for using in street planting. — *Liquidambar.* A most symmetrical shaped tree; adapts itself to all soil; valuable for street planting. Some trees assume a deep purple or crimson tint in the foliage during autumn, others a golden yellow. — *Magnolia.* Of the native deciduous species, *M. acuminata* is the most desirable for street and avenue planting. All the species are voracious feeders and thrive best in rich soils. — *M. macrophylla,* or *Umbrella Magnolia,* seldom grows beyond 25 feet, but is conspicuous for the length and size of its leaves. This tree is called Umbrella Tree south, whereas this name applies to *M. tripetala* at the North. — *M. Fraserti,* Ear-leaved Magnolia or Wahoo of the western North Carolina mountaineers, is also a very ornamental tree. *M. tripetala* is objectionable in gardens owing to the unpleasant odor of its flowers. Few Chinese species, with the exception of *M. hypoleuca,* attain the size of a tree. *M. Yulan* and *M. Soutangeana* can be trained to a single stem and made to attain a height of 15 feet. All the other varieties may be classed as shrubs. The flowers are often injured by late spring frosts. — *Melia Azedarach* (Pride of India, Chinaberry). Almost naturalized south. It is of very rapid growth and begins to flower at an early stage. The flowers are delightfully fragrant with the perfume
of the lilac. Extensively planted for shade trees. The umbrella form, known as Texas Umbrella, assumes a dense, spreading head with drooping foliage. It is of unique appearance and can be used with great effect in landscape work.—*Morus*. *M. rubra* is frequently planted for shade; it is valuable for its wood, which is of great durability for posts. *M. alba* is naturalized in many sections. A form of *M. rubra* discovered in middle Georgia some years ago and called Stubbs from the discoverer, produces enormous crops of large, rich vinous fruit. Thus and the Hicks and Multieulis (latter of Chinese type) are often planted for feeding poultry and hogs. They should not be planted near dwellings, owing to the dropping of the fruit.—*Nyssa sylvatica*. —Papavera imperialis. Rapid-growing. Almost naturalized in some sections of the South. The foliage in young trees is very large. Flowers pale violet, very fragrant, in long panicles; they open before the leaves appear. —*Prunus*. There are many ornamental varieties which are exceedingly handsome while in bloom, especially the double-flowering crimson, white and pink; others are desirable for their peculiar growth, as *Pyramidalis*, which is as erect as a Lombardy poplar. Weeping, willow-leaved and golden-leaved varieties are interesting.—*Prunus*. Hortulana or Chieasaw plums are sometimes planted for ornament, though commonly for fruit. *P. Virginiana* is abundant everywhere but not valued owing to being usually infested with tent caterpillars. *Prunus Pissardi* is the best purple-leaved tree for the South, as it retains its color during summer. —*Punica granatum*. This very ornamental small tree is seldom seen under cultivation, as it grows naturally in wet and boggy soils.—*Pyrus coronaria*. The crab apple, a small tree with very fragrant flowers in spring, is excellent for shrubbery.—*Platanus occidentalis*. One of the most desirable trees for street planting.—*Populus*. The variety which is of greatest value for street planting is *P. deltoides* or *monolitata*, commonly known south as cottonwood. It is of rapid growth and grows in nearly all soils that are not too arid. All southern nurserymen catalogue the Carolina Poplar, but the stock is not always true to name.—*Pterocarya racemiflora*, or Caucasian Wing-fruited Walnut, is a very rapid-growing tree, with spreading branches and pinnate foliage. Very ornamental when covered with pendulous racemes of small winged nuts, which, however, are of no economic value.—*Quercus*. Nearly with the species of the same states are found more or less abundant in the middle belt, but the most valuable purely southern species are as follows: *Q. Phellos*, or Willow Oak, with lanceolate leaves; *Q. aquatica*, or Water Oak, with leaves almost perpendicular, oblong or lanceolate, and flowers for streets and shade, as they grow very rapidly and in almost any soil. *Q. ilicata*, *Q. laurifolia*, *Q. Phellos* and *Q. Mahalnberg* are desirable. *Q. Virginiana*, or Live Oak, is a very large tree, seldom exceeding 50 feet in height but covering a large circumference. It is native along the seacoast and adapts itself to inland sections, where it does not attain the great size of the coast region. There is no southern tree except *Magnolia grandiflora*, that is more admired, especially in large trees planted in avenues.—*Sapindus marginatus*. The globe yellow berries are retained during winter. Berries when boiled produce a saponaceous fluid.—*Stillingia saxifraga* or the coast小学生, Naturalized on the coast of Georgia and Carolina. The acuminate rhomboidal leaves give the tree a unique appearance. Requires rich soil and is valuable in landscape work.—*Symphyla tuctoria*. Not common. Could be suitable for forest. *Ptelea pubescens*. A large tree occasionally found in rich soils along the seacoast. Differs little in general from *T. Americana*, but seems to be better suited to the middle South. Very desirable for street planting or shade.—*Toxylon*, or *Macleaya*, is naturalized in many sections of the middle South. Grows to a height of 30 feet and the fertile trees are very ornamental when laden with their large, globular fruit. The wood is very lasting when used for posts and takes a beautiful polish. *T. Americana* is perhaps more largely planted for streets and avenues than any other deciduous tree.—*Tiburon prunifolium* (Black Haw or Possum Haw). In very rich soils sometimes attains a height of 15 to 20 feet. The dark blue berries are retained during winter. Desirable for shrubbery.

II. Broad-Leaved Evergreen Trees. *Camellia japonica*. Although these magnificent plants are usually seen in bush form, they can be trained to single stems and attain a height of 20 or more feet in the South, where they have found a congenial soil and climate. The typical single red variety, a tree of which is growing at Charleston, S. C., and planted in 1868, being the first introduced, is now upwards of 20 feet high. The double-flowering sorts, while usually of vigorous growth, do not attain the size of the single red.—*Cinnamomum camphora*. In southern Louisiana and middle Florida trees grow to a height of 50 feet; in the middle South they affect the bush form or when trained to single stems seldom exceed 15 to 20 feet. For the extreme South it is recommended for street planting.—*Cyrilla racemiflora*. Specimens are occasionally found on shady banks of streams where the soil is very rich, that will grow 20 feet high, but the tree form must be secured by pruning. The foliage assumes a bright red or bronze tint in winter.—*Eriobotrya japonica*. Flowers produced in January, and its branches followed by a golden yellow plum-like fruit of good flavor. Reaches a height of 20 or more feet in the coast belt.—*Gordonia lasianthus*. A stately tree found only in shallow swamps or furry soils. There are spires almost to the surface of the ground, which makes it difficult to transplant trees taken from the woods. Trees grown from seed in pots are best for planting, but a rich moist soil is necessary to their growth. —*Ilex.* Of the very large number of species the most valuable evergreen trees, the former being the best where a large tree is desired. Specimens taken from the woods should not exceed one foot in height, as larger sizes almost always fail, in transplanting.—*Ligustrum*. *L. japonicum* often forms a tree 25 feet high. Berries blue-black, retained during winter.
Magnolia. *M. grandiflora* is justly considered the glory of southern broad-leaved evergreen trees. There are many forms, based on the size and shape of the leaves and the flowers. The superb white flowers, which are fragrant, begin on May 15th, and occasionally upon some trees as late as October, vary from 4 to 12 inches in diameter. Thrives as far north as Washington, D. C. *M. glauca* has white flowers 2 to 3 inches in diameter and is fragrant. *Optomus trugus*, var. *rubra* and *O. Aquitatum*, var. *ilicifolius*, can be trained to single stem. The flowers of the first are delicately fragrant and produce twice a year. — *Pomex Carolinae* is adapted for shade in rich soils in the coast belt. — *Photinia serrulata*, or Chinese Evergreen Thunberg, has white flowers and dark red autumn foliage. — *Praucus Carolinae*. Known south as Carolina Cherry, Carolina Laurel, Mock Orange, etc. One of the most ornamental southern trees. — Quercus Suber. Acorns were distributed by the U. S. Patent Office in 1850 and many large trees are now found in several sections of the South, where they have fruited. Some small plantations are made for the purpose of producing cork. It grows well in comparatively poor and stony soils. — *Sabat Palmetto* is now freely used for street and avenue planting on the coast. It is conspicuous for its tropical appearance. It is not successful further than 40 miles from the seashore.

III. CONIFERS OR NARROW-LEAVED EVERGREENS.

— Abies. Of this section few specimens are found below the Piedmont region. Occasionally, the Norway spruce grows to a moderate size. — *Cedrus Deodara*. A admirable tree and of rapid growth, 40 to 50 feet. *C. Latifolia*. 25 to 30 feet. — *Cunninghamia Sinensis*. Foliage resembles an Araucaria. — *Cupressus*. *C. sempervirens* has many forms, from the compact, spiral or shaft-like shape to more spreading habit. *C. Lasian scavus* or Cypress of Goa, has numerous forms with foliage of an ash green and pendulous branches, to others of a more dark tint and rigid form. Of *Chamaecyparis Lawontana* there are endless forms, from a compact, erect habit and vivid green foliage to those of open or pendulous shape and with glaucous or golden foliage. *C. Unbursis* has in its seedlings. — *Juniperus*. The Irish Juniper is of fine pyramidal form, and reaches a height of 15 feet. *J. excelsa*, *Chinenisis* and *Thurifera* differ in the tint of their foliage and are all of tall growth. — *Libocedrus decurrens*. The California arbor-vitae, with its graceful feathery foliage and conical shape, is one of the most ornamental of conifers. — *Pinus*. Few of the exotic species are suitable to the South. *Pinus excelsa*, or Bhutan Pine, is undoubtedly the best adapted to the Middle South of all kinds. — *Cephalotaxus* is a valuable group of Japanese Cypress, but with the exception of *K. Obtusa*, *Fulteria*, *plumosa* and *squamosa Velchtli*, all are of dwarf habit. — *Thuja*. The Asiatic species so admirably adapted to the middle South than the American species. Of the former the best forms are known to nurseries as *Biota pyramidalis* and var. *vern, reaching a height of 15 to 18 feet. *B. Japanica*, var. *filiformis* (Thuja orientalis) is a remarkable va-
It eventually merges into the great body of forest trees lying on the easterly side of the Mississippi valley. The principal trees which have come upon the Plains by this route are the common red cedar, papaw, half a dozen willows, one cottonwood, basswood, two or three cherries, hackberry, mulberry, three ashes, wild apple, four species of hawthorns, Junecberry, wild cherry, choke cherry, wild plum, coffee bean, honey locust, redbud, sycamore, two species of buckthorns, buckeye, one maple, longleaf, sumach, two species of walnuts, five or six hickories, nine or ten oaks, ironwood, blue beech, and one birch. But ten species of trees have come from the Rocky Mountain forests, and these have made much less impression upon the forests of the Plains than those which came from the eastern forests. In this list are the bull-pine, the western red cedar, four species of cottonwoods, the buffalo berry, a maple, and two birches.

Although the present forest area of the Plains is not relatively great, it is large enough to be seriously considered in regard to its preservation. There is danger that with the habits acquired by our people in the thickly wooded portions of the United States of cutting down forest trees wherever found, much of this small forest area will be destroyed. It is much easier to preserve an area of forest land than to create it anew. First, all forest fires must be kept down. Where a mass of woodland adjoins the open prairie, fire guards should be made so that the fires will not sweep into the forest growth. The greatest destroyer of the forests of the Plains in the past has been fire, as it swept over the prairies into woodland. Second, it is absolutely necessary to keep out certain kinds of stock. Swine, if herded in large numbers, will inevitably destroy the trees. They prevent the growth of small trees, and eventually destroy those of larger growth.

Cattle, in large numbers, are equally destructive. In fact, when the attempt is made to preserve uninjured the trees in a forest it is necessary to keep out stock of all kinds, excepting possibly during limited portions of the year. Third, it is necessary to cut out the trees for use with very great care. A forest should be a permanent crop, and the cuttings should be so made that the forest as a whole is not injured. Trees should be cut here and there in such a way that the young trees which are left keep an opportunity for growing into usable timber.

Care should be taken to encourage the tendency to spreading which is so strong in nearly all parts of the Plains. With a little care every present living forest area may be made to extend itself spontaneously, or nearly so. If forest should be effectively inclosed by a fence placed at some distance from its outer border, leaving a belt of unoccupied land between the trees and the fence. This will grow up with weeds, and mingled with these will be the seedling trees springing from the seeds blown or carried from the forest area. In this way the border of the forest will be gradually extended. This can be helped by plowing up these inclosed belts of land, giving better opportunity for the starting of seedling trees. With the weeds and little trees will spring up low shrubs of various kinds. These need give no trouble, for this is merely nature's way of taking possession of the soil. Little if any cultivation need be given to such a nursery belt, as the winds, so long as they are blowing, will serve the useful purpose of sheltering the little trees, and eventually the trees will rise above, and choke them out. Grass, however, forming a tough soil, is harmful to the little trees, far more so than the ordinary weeds.

There are many places where actual planting must be resorted to. In looking about for a site for the new forest plantation, we must remember that the best conditions for tree growth are usually to be found in the natural forests. Where there are natural forests the planting should be around their borders, so as to extend them in much the same way as indicated in the preceding paragraph in regard to natural spreading. Where there are no natural forests at all it is necessary to select the more favorable places for planting. Since the natural forests on the Plains occupy the depressions rather than the hill-tops or the slopes, this should give us a hint as to what we should do. Wherever the land slopes into a depression one may find favorable conditions for growing trees. These depressions, generally called "draws," may be filled with trees, and when once a growth of a few acres is secured it will not be difficult to extend the forest far up the hillside slopes. On the other hand positions of the Plains similar positions should be taken under the irrigation. In the selection of trees for the formation of forest areas we should also take a hint from nature. The rule, which is a very excellent one for the plainsman to follow, is to plant on his farm the kinds which he finds in the nearest forest, and to give his planted trees as nearly as possible the same conditions as those under which they grew in the native forest. On the eastern third of the Plains, the walnut, white oak, shell bark hickory, white elm, red elm, hackberry, white ash, wild cherry, catalpa and honey locust are recommended for planting. On the extreme eastern portions bordering the Missouri river, many more kinds can be planted, but as we pass westward toward the borders of the Sand Hill region the list grows smaller. On the central Plains the list is reduced, and as we go farther west it is changed in species. The two elms may be planted, as also the hackberry, the green ash in place of the white ash, wild cherry, honey locust, and in many places the bull-pine. On the western Plains, especially the portion lying west of the main body of the Sand Hills, and having an elevation above the sea of from 3,000 to 4,000 feet, the list is still smaller. The white elm is still included also the hackberry, the bull-pine, and in many places the red cedar.

The trees mentioned are of the more durable and profitable kinds. But on all parts of the Plains people

2557. Avenue of live oaks in Audubon Park, New Orleans.
must often have quick-growing trees which soon produce fuel, but which have little, if any, value for other purposes. In the eastern part of the Plains the black willow, alder willow, common cottonwood, silver maple, and box elder are useful trees for this purpose. We should not condemn the use of these easily grown soft-wooded trees. A forest is a crop, and there is no reason why a farmer may not plant a more quickly growing crop if he wishes, but he should at the same time plant the more enduring kinds given in the preceding lists. On the central Plains the quick-grown trees may include the same willows and cottonwood and also the box elder. The silver maple will not do well in the greater part of this central region. On the western Plains the list is essentially the same as for the central portion: namely, the willows, cottonwood, and the box elder, to which may be added, here and there, one or more of the western species of cottonwood.

Now for the horticultural point of view. About the country homes the first trees are usually cottonwood, silver maple and box elder, followed later by green ash and white elm. Very commonly the red cedar is planted with the first mentioned species, and often Scotch and Austrian pines are soon added. It must be remembered that the settler’s house on the Plains stands in the open instead of being hemmed in by forest trees, as in the eastern portions of the American continent. The settler’s problem is to surround his house with trees, not to clear the trees away. In towns and cities, because of its easy propagation, rapid growth and extreme hardiness, is the favorite tree for this purpose. Where landscape gardening is attempted, the Scotch and

white elm (which here attains to a singular beauty of form and foliage), to which are occasionally added bur oak, black walnut and Russian olive (Elaeagnus), and in proper situations, the white willow. The coniferous trees of greatest value for ornamental purposes on the Plains are the Austrian pine, Scotch pine and red cedar. With proper care these may be grown on all parts of the Plains where water enough to maintain life may be obtained. On the extreme eastern border the Norway spruce and even the balsam fir have proved valuable. Among deciduous trees the white elm holds the first place, followed by the hackberry (which is not as much planted as it deserves) and the green ash.

C. E. BESSEY.

Trees Grown for Shade and Ornament in California. — The mild and equable climate of California allows a wide range of available species from which to select trees for shade, ornament and shelter. On account of the long rainy season, the low humidity of the atmosphere, and the relatively high mean, and freedom from low winter minima in temperatures, the trees which thrive best in middle California are those indigenous to the arid and semi-arid warm-temperate regions of the globe, e.g., southern Australia, the Mediterranean region, South Africa, northern Mexico and Chile. Many trees of the temperate humid regions also thrive in this state, particularly in the relatively humid climate of the coast, and are offered by our nurseriesmen. Several of the species mentioned in this list are not described in this Cyclopedian, as they did not appear to be in the general trade when the pages were written.

I. THE SPECIES MOST EXTENSIVELY PLANTED. — The three following are the trees most frequently met with as shade and ornamental trees in middle California:

1. Eucalyptus Globulus.
2. Cupressus macrocarpa.
3. Ficus radiata.

The relative abundance of the succeeding species is only approximately indicated by their sequence.

4. Robinia Pseudacacia, probably more widely distributed and occurring in more remote and out-of-the-way places than any other species (except, perhaps, Eucalyptus Globulus). The seeds may have been brought across the Plains by the earliest settlers at the mines.

5. Melia Azedarach var. umbraculiformis.
7. Schinus Molle.
8. Aesculcus melanoxylon.
10. Magnolia Grandiflora.
12. Washingtonia robusta.
13. Cordyline Australis and other species.
15. Araucaria excelsa.
17. Juglans Californica and spp.
18. Ulmus racemosa and spp.
19. Acor Negundo and var. Californicum.
20. Salix Babylonica.

2558. A tree group dominated by a leaning oak, which is a remnant of the forest.

Austrian pines, Norway spruce and red cedar are generally used, and to these are often added one or more species of the Rocky Mountains pines. The most generally used deciduous tree for this purpose is the
21. Eucalyptus robusta.
22. Eucalyptus viminalis.
23. Eucalyptus rostrata.
25. Pittosporum spp.
27. Betula alba.
28. Cedrus deodara.

II. Trees Being Most Extensively Planted at the Present Time.—The following list, arranged in sequence according to the actual number of sales made during the planting season of 1900-1901, is compiled from data furnished by John Rock, of the California Nursery Company, at Niles. The percentages refer only to the seventeen species here enumerated, and not to the total number of trees sold by the nursery, which has a large and varied assortment of species many of which are more suitable and more effective than those for which there is, at present, the greatest demand.

Per cent.

1. Eucalyptus Globulus .......................... 35.24
2. Cupressus macrocarpa ....................... 26.43
3. Eucalyptus viminalis ....................... 15.00
4. Pinus radiata .................. .................. 4.67
5. Melia Azedarach, var. unbrachcaliforniensis ........ 2.75
6. Phoenix Canariensis (Fig. 2365) .......... 2.71
7. Acacia melanoxylon ......................... 2.20
8. Acacia mollissima .......................... 1.76
9. Robinia Pseudacacia ...................... 1.65
10. Magnolia grandiflora ...................... 1.65
11. Acer saccharinum ......................... 1.43
12. Juglans Californica ..................... 1.43
13. Acer Negundo, var. Californicum ......... 0.89
14. Populus deltoides Carolinensis .......... 0.81
15. Ulmus Americana ...................... 0.81
16. Betula alba ...................... .................. 0.81
17. Washingtonia filifera ................. 0.85

100.00

III. Selections for Special Purposes.—The diversity of choice, rendered possible by the extent of desirable material that is available, makes it somewhat difficult to readily select the most suitable species for various specific purposes. The following classified lists are intended as suggestions to aid in making a suitable selection; they are almost entirely restricted to species offered in the Californian trade, and are intended to be suggestive only, and not by any means complete. New species and varieties are constantly being added to the nursery stocks, some of which will be found particularly well adapted to certain conditions of climate and soil, and will doubtless replace others now in use.

2560. Picturesque field pine, remnant of a forest.

1. For Subtropical Effect.—That there is in California a strong appreciation of subtropical effects in gardening is shown by the great demand for dracenas and such large-leaved plants as palms, magnolias, bananas and rubber-trees. That the effect produced by the planting of such trees so often fails to be satisfactory is largely due to one or both of two causes,—either unsuitable location of the specimens or choice and association of unsuitable species. To prevent a repetition of the first-named error, the prospective tree-planter is recommended to consult the article on Landscape Gardening in Volume II; and to avoid the second, a selection from the following list is suggested, with the addition of such large-leaved herbaceous plants as cannas, colocasia, cymaras, funkas, Guinera scabra, pampas grass, veratums, agaves, yuccas, aloes, Woodwardia radicans and Rodgersia podophylla, together with such shrubby plants as bamboo, giant reed, the choicer varieties of castor-bean, Seneio grandifolius, Polygoumum Schachtiense and P. Sieboldi.

AA. Small Trees or Tall Shrubs.

Acanthopanax reinierzoum, Erythrea arnata,
Aralia Chinensis, Fatsia japonica,
Aralia Chinensis, var. Fatsia paprifea,
Mandshurica, Musa Ensete,
Aralia spinosa, Prunus Laurocerasus,
Arundinaria falkata, Ricasodium Cambodgenis,
Campanopus humulis, Ricasium macrophyllum,
Dioskoria antaretica, Ricasium sanguineus,
Eriobotrya Japonica, Ricasium Zanazarbensis,

BB. Larger Trees.

Catalpa bigmoneoides, Jubaes spectabilis,
Catalpa ovata, Livistona australis,
Catalpa speciosa, Magnolia grandiflora,
Cordyline australis, Paulownia imperialis,
Cordyline Banksii, Phoenix Canariensis,
Cordyline indivis, Phoenix dasyfera,
Cordyline strieta, Phoenix reclinata,
Coromacarpus leviga, Phoenix sylvestris,
Eucalyptus calophylla, Phytolacca dioica,
Eucalyptus ficifolia, Trachycarpus excelsus,
Ficus Carica, Tristania conferta,
Ficus macrophylla, Washingtonia filifera,
Gymnochlaena Canadensis, Washingtonia robusta.

Eucalyptus Globulus can also be used effectively if cut down periodically when the folate leaves begin to appear; it will continue to shoot up vigorously from the same root for several years. Eucalyptus robusta is useful for screen purposes if cut out before it becomes straggling.

2561. Leaning tree in a clearing, showing its effort to regain itself by producing upright branches.
2. Trees with Ornamental Flowers.—In making the following grouping, arranged according to relative hardiness, it has been impossible to give precise information as to the exact degree of frost-tolerance of the several species, as we can find but meager published data on the subject.

A. Susceptible to light frost.

The following would probably succumb at a temperature of 28° Fahr.:

- Eucalyptus calophylla
- Eucalyptus sieboldiana
- Fagraea excelsa

B. Susceptible to frost (20° Fahr, and perhaps less).

- Acer Баileyana
- Acer leadhata
- Acer glaucous
- Acer salicinum
- Bryophyllum armatum
- Eucalyptus globulus (potted to produce suckers)

B. Hardy.

- Cercidiphyllum japonicum var. griseum
- Picra pungens var. griseum

A. Purple or bronze.

- Cercis Canadensis
- Cercis spectabilis
- Cercis occidentalis

B. Susceptible to 25° Fahr.

- Ribes campestre
- Ribes laevigatum
- Ribes semprevirens

A. Glaucescent.

- Magnolia soulangeana
- Magnolia stellata
- Paulownia imperialis
- Prunus Armeniaca (double-flowered)
- Prunus cerasifera, var. atropurpurea
- Prunus persica, var. atropurpurea

B. Hardy.

- Cercis laevigata
- Cercis oliviformis
- Cercis pendula

A. Evergreen.

B. Growth rapid; trees susceptible to 25° Fahr.

- Acacia mollissima

B. Growth somewhat slow; trees hardy.

- Arbutus Menziesii
- Ficus carica
- Olea europaea

AA. Outline conical or spiral, usually pointed. B. Conifer, with mostly narrow leaves.

- Abies balsamea
- Abies cephalonica
- Abies concolor
- Abies nobilis

B. Hardy.

- Abies Nordmanniana
- Abies pingolinea
- Abies fortunei
- Abies grandis

B. Susceptible to severe frost (probably about 20° Fahr.).

- Abies engelmannii
- Abies latifolia
- Abies koreana
- Abies sachalinensis

B. Susceptible to frost (20° Fahr, and perhaps less).

- Acer ginnala
- Acer negundo
- Acer pseudoplatanus

B. Hardy.

- Abies balsamea
- Abies cephalonica
- Abies concolor
- Abies nobilis

B. Susceptible to 25° Fahr.

- Ribes campestre
- Ribes laevigatum
- Ribes semprevirens

A. Purple or bronze.

- Cercis Canadensis
- Cercis spectabilis
- Cercis occidentalis

B. Susceptible to 25° Fahr.

- Ribes campestre
- Ribes laevigatum
- Ribes semprevirens

A. Glaucescent.

- Magnolia soulangeana
- Magnolia stellata
- Paulownia imperialis
- Prunus Armeniaca (double-flowered)
- Prunus cerasifera, var. atropurpurea
- Prunus persica, var. atropurpurea

B. Hardy.

- Cercis laevigata
- Cercis oliviformis
- Cercis pendula

A. Evergreen.

B. Growth rapid; trees susceptible to 25° Fahr.

- Acacia mollissima

B. Growth somewhat slow; trees hardy.

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B. Hardy.

- Abies balsamea
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- Abies concolor
- Abies nobilis

B. Susceptible to 25° Fahr.

- Ribes campestre
- Ribes laevigatum
- Ribes semprevirens

A. Purple or bronze.

- Cercis Canadensis
- Cercis spectabilis
- Cercis occidentalis

B. Susceptible to 25° Fahr.

- Ribes campestre
- Ribes laevigatum
- Ribes semprevirens

A. Glaucescent.

- Magnolia soulangeana
- Magnolia stellata
- Paulownia imperialis
- Prunus Armeniaca (double-flowered)
- Prunus cerasifera, var. atropurpurea
- Prunus persica, var. atropurpurea

B. Hardy.

- Cercis laevigata
- Cercis oliviformis
- Cercis pendula

A. Evergreen.

B. Growth rapid; trees susceptible to 25° Fahr.

- Acacia mollissima
TREES

D. Susceptible to severe frost (probably 20° Fahr. and even less).

Cinnamomum Camphora, Cryptocarya laevigata, Cryptocarya kiersii.

Eucalyptus cyanophylla, Eucalyptus maculata var. citriodora.

Phytolacca dioica.

A. Evergreen.

Acer saccharum, var. Wier laciniatum.

Betula alba, var. pendula elegans.

B. Deciduous.

Acer pseudoplatanus, var. Wier laciniatum.

Betula alba, var. pendula laciniatum.

Youngi.

Crataegus monogyna, var. pendula.

Fagus sylvatica, var. pendula.

Fraxinus excelsior, var. aurea pendula.

Fraxinus excelsior, var. pendula.

Juglans regia, var. pendula.

Laburnum vulgare, var. pendula.

Cupressus funebris.

2562. Weeping elm, type of a grotesque horticultural variety.

Ulms scabra var. horizontalis.

A. Evergreen.

B. Deciduous.

6. Trees for Streets, Avenues and Roadsides. — The number of tree species suitable for street planting is limited by the necessarily heavy restrictions, as to height, spread, severe penetration and sidewalk-raising, imposed by municipal street departments. In European cities the first-named objections are overcome by means of frequent and systematic pruning to a uniform standard; where this necessity can be obviated by the selection of trees which naturally keep within the desired bounds, the labor of maintaining them in a slightly condition is minimized and the result much more pleasing.

For town streets not more than 60 feet in width, it is important to have trees that will not give too much shade and prevent the rapid drying of the roadway after showers, nor be so tall nor wide-spread as to obstruct the view and shut out sunshine, rendering the adjacent houses dark, cold and damp. On this account trees with narrow or pyramidal outline are in many cases preferable to those with wide-spread habit, and, generally speaking, deciduous trees are more suitable than evergreen, although at the time of losing their leaves they make more litter. Exception may be made in favor of such evergreen species as certain palms and cordylines, some acacias and a few other species mentioned below.

It is not wise to use trees of very rapid growth on town streets; they soon become too large and require frequent trimming, which is usually equivalent to mutilation, and are likely to interfere with sewers.

It cannot be said that street planting in California towns has, in most cases, been satisfactory. In spite of the much larger variety of suitable material than is available in most of the states, there are few examples of good street-planting to be met with. In most of our towns the eye is greeted with a few struggling trees, of which perhaps not more than two are of one kind, recalling Professor Waugh's apt simile of "nine monotonously different buttons in a row down the front of a Prince Albert coat." There are many pleasing exceptions, however, although few are entirely satisfactory. The repeated attempts to improve the appearance of a town by planting trees along the streets should be encouraged on every occasion, and the object of this article is to render
assistance by pointing out how some of the mistakes may be avoided. The unsatisfactory results of street-planting, so often met with, can generally be traced to one or all of three causes:

1. Selection of unsuitable species.
2. The mixing of several species on the same block and even in front of the same lot.
3. Crowding the trees.

This last-mentioned source of trouble is perhaps the cause of more failure than the first. When trees are once growing, few persons have the heart to thin out the specimens to the proper distance apart; finally a newcomer, without personal feeling in the matter and noting only that there is too much shade and too little light, cuts down the whole row and a gap is left in what may have been a fairly uniform block. Spreading avenue trees of large size should not stand closer than 50 ft. apart; smaller trees, on narrower streets should have 40 or at the very least 30 ft., unless they are slender species such as cordylines or washingtonias, when

2554. Abies venusta, one of the California firs.
20 ft. may be sufficient. As a rule, three small trees to a 50-foot lot will be found ample, and the center one of these three should be taken out when they begin to meet at the sides; if the whole street is planted uniformly with the same species, and at this same distance, the result will be much more pleasing than if four or five trees are planted in front of every house.

A. For city and town streets.
B. Small trees suitable for streets 60 ft. wide or less.
C. Deciduous.
D. Growth rapid or moderate.

Betula alba, Betula lutea, Betula papyrifera, Betula populifolia, Catalpa bignoniodes, Catalpa ovata, Catalpa speciosa, Koelemantra paniculata, Melia Azedarach, var. umbelliformis, Paulownia imperialis, Rhus typhina, Sorsus Aesuparia.

DD. Growth slow.

Crataegus mollis, Crataegus monogyna, Ginkgo bilaoba.

E. Palms and arborescent Liliaceae.

Coryline australis, (Fig. 2563), Livistona australis, Trachycarpus excelsus, Washingtonia filifera, Washingtonia robusta, Rhedelida.

EE. Evergreen trees other than palms and arborescent Liliaceae.

Aecia Baileyana, Aecia cyanophylla, Aecia falcata, Aecia lineata, Aecia longifolia, Aesia merifolia, Myoporus latum, Pittosporum eugenioides, Pittosporum tenuifolium, Sterculia diversifolia.

DD. Growth slow.

Alectryon excelsum, Bursera spinosa, Cinnamomum Camphora, Eucalyptus fraxinifolia, Eucalyptus globulus, Eucalyptus nitens, Eucalyptus urophylla, Eucalyptus leucoxylon, Pseudacacia excelsa, Pseudacacia siliquastrum, Pseudacacia stellata, Pseudacacia pubescens, Leucoxylon angustifolia, Tilia Americana, Ulmus campestris, Ulmus racemosa.

BB. Larger trees for streets, avenues and boulevards 80 to 100 ft. wide.

C. Deciduous.

D. Growth rapid or moderate.

Acer saccharinum, Fraxinus Americana, Fraxinus velutina, Gymnocladus Canadensis, Heicia Pecan, Platanus orientalis, Querus pedunculata, Robinia Pseudacacia, Ulmus campestris, Ulmus rubra, Washingtonia filifera, Washingtonia robusta.

DD. Growth slow.

Gleditschia trisacantha, Liriodendron Tulipifera, Sophora Japonica, Tilia Americana, Tilia Europa.

BBB. For avenues and boulevards without sidewalks or with wide spaces between sidewalk and driveway.

C. Palms and bananas.

Erythrina edulis, Livistona australis, Musa Ensete, Trachycarpus excelsus, Washingtonia filifera, Washingtonia robusta.

DD. Evergreen trees other than palms and bananas.

Aecia clata, Acaecia melanoxylon, Acaecia pyriformis, Angophora intermedia, Angophora subvelutina, Eucalyptus amygdalina, var. angustifolia, Eucalyptus calophylla, Eucalyptus corimbosa, Eucalyptus sieberi, Eucalyptus sideroxylon, var. pallens, Ficus macrophylla, Synechiarina laurifolia, Tristania conferta, Umbellularia Californica.

BBB. As for avenues and boulevards without sidewalks or with wide spaces between sidewalk and driveway.

For this purpose almost any of the larger and more ornamental species enumerated in the other lists may be selected. Spreading coniferous trees, with broad bases (such as Sequoia gigantea, etc.) can often be used to advantage, as well as the wide-spreading feather-palms (Phoenix and Juba).

AA. For country roads.

B. Deciduous.

Acer campestrum, Acer negundo, Acer negundo, var. Californicum, Acer platanoides, Acer saccharinum, Acacia carnea, Acacia baileyana, Acacia Hipocastanum, Ginkgo biloba, H迅速ia Pecan, Juglans Californica, Juglans nigra, Juglans sieboldiana.

BB. Evergreen.

Acacia melanoxylon, Acacia mollissima, Arbutus Menziesii, Cinnamomum Camphora, Cryptomeria Japanica, Eucalyptus botryoides, Eucalyptus calophylla, Eucalyptus capitata, Eucalyptus cornuta, Eucalyptus diversicolor, Eucalyptus leucoxylon, Eucalyptus rostrata (Fig. 2461).

Trees which have been tried but have proved unsatisfactory. — There are many species which have failed to give satisfaction in some localities because of local peculiarities of climate or soil; there are some, also, which have proven unsatisfactory on account of habit, etc.; from among these may be mentioned: Eucalyptus robusta, a species which is exceedingly handsome as a young tree and has been extensively planted along roadsides and streets in the warmer parts of the state; when mature it becomes straggling and exceedingly brittle, breaking up in an unsightly manner.

7. Trees...
**TREES**

*Melia Azedarach*, var. *umbraeculiformis*, is found unsatisfactory in the immediate vicinity of the coast; as a sidewalk tree it is exceedingly untidy when losing its leaves, and is also much subject to scale insects.

*Aceria melanoxyylon* is generally debarred from the Citrus belt, as a breeder of scale; when mature it is said to suffer quickly from the effects of drought. In the moister climate of the immediate vicinity of the coast, near San Francisco, however, it proves entirely satisfactory.

*Populus alba*, Robinia *Pseudacacia* and *Ulmus racemosa* are exceedingly troublesome when used as sidewalk trees on narrow streets; their surface roots often break the cement or asphalt sidewalks, and the suckers come up in the midst of lawns several yards away from the parent tree.

*Ficus macrophylla* is another tree injurious to sidewalks.

*Eucalyptus Globulus*, and in fact almost all species of the genus, are frequently debarred by town ordinance from growth within 60 or even 70 feet of a sewer, on account of the remarkable length and penetrating power of their roots.

Pathus imperialis is sometimes objected to on account of the somewhat untidy appearance of the persistent seed-pods, which require no little labor if all are to be removed after flowering.

*Rhus robus* has brittle wood and is usually much broken in heavy winds, but can be used with satisfaction if kept well cut back.

The species of *Phoenix* and *Jubaea* should be avoided on account of their spreading habit, except for avenues and boulevards where there is no sidewalk or where there is from 20 to 30 feet space between sidewalk and driveway.

*Albizia julibrissin* has a bad reputation on account of its disagreeable odor, but as this is only found in the stump-nut trees, it can be avoided by planting the pistillate (fruit-bearing) trees only.

8. **Trees for Alkali Soils.**—There are many places in those parts of the state that enjoy a high temperature and low rainfall, where the percentage of alkali salts in the soil is too great for the cultivation of most of our ornamental trees, and where it is very important that some shade-producing species be grown.

AA. **Tolerant of medium alkali (chiefly “white” salts).**

- *Aceria melanoxyylon*
- *Albizia julibrissin*
- *Casuarina equisetifolia*
- *Eucalyptus amygdalina*
- *Eucalyptus angustifolia* (apparently the least sensitive of the Eucalyptus).

AAA. **Only fairly tolerant.**

- *Acer macrophyllum*
- *Acer Negundo*, var. *Californicum*,
- *Eucalyptus rostrata* (Fig. 2366).
- *Eucalyptus sideroxylon*, var. *rosea*
- *Phoenix dactylifera*
- *Platanus orientalis*
- *Populus Fremontii*
- *Quercus lobata*, *Robinia Pseudacacia.*

AAAA. **Tested and found unsuitable.**

Most of those trees of the humid regions, e.g., the eastern states and N. Europe, which have been tried on alkali soils, have been found to suffer and to remain dwarf and stunted. This is particularly true of *Liriodendron tulipifera*, *Quercus pedunculata* and species of *Tilia*.

Since writing the above, the following additional information on the alkali tolerance of ornamental trees has been brought to light through the investigations of Dr. R. H. Longridge of the Agricultural Experiment Station at Berkeley, and has courteously been placed at my disposal.

Total amount of salts actually found in the upper four feet of soil in which the following trees were growing, expressed in tons per acre:

- *Tamarix ramosissima* .......... 0.2
- *Phoenix dactylifera* 21/2
- *Eucalyptus amygdalina* 0
- *Eucalyptus angustifolia* 20

Washington (species not stated) 2/3

**IV. TREES FOR SOUTHERN CALIFORNIA.**—**Street Trees.**

- *Sterculia diversifolia*, Australian Bottle Tree; *Aceria Melanoxyylon*, Blackwood *Aceria*; *Cinnamomum Camphora*, Camphor Tree; *Sterculia aeroclitofia*, Australian Flame Tree; *Eucalyptus robusta*, Swamp Mahogany Gum; *Grevillea robusta*, Silk Oak; *Arceis dealbata*, Black Wattle; *Avocado ovalifolia*, *Eucalyptus japonicum*, Japan Privet; *Pinnus radiata*, Monterey Pine.

The above are the best ten trees for street purposes, but among these might be placed *Cordylines australis* and *C. indivisa*, and several kinds of palms. The *Eucalyptus* is much used—*Melia Azedarach*, var. *umbraeculiformis*, the Umbrella Tree. Though less known or used, *Eucalyptus calophylla* is by far a better street or sidewalk tree than *E. robusta*. These and species other than those noted do well in this climate. Any extension of the above list must be made almost entirely
through palms, eucalypt and acacias, among which these are a natural preference.

**Low and Shade Trees:** *Arceaeae erecta,* Norfolk Island Pine; *Arceaeae Bideiltii,* The Bunya-Bunya; *Jacaerana ovatiftolia,* Common Camphor, Camphor Tree; *Ficus macrophylla,* Rubber Tree; *Tetrakathoniaceae* (which are hardy), Rubber Tree; *Stereclia australis,* Australian Flame Tree; *Magnolia fatidita,* Bull Bay; *Sequia gigantea,* California Big Tree; *Cedrus Deodara,* Deodar.

There the list contains ten of the best ornamental trees. It might be extended indefinitely if all our good trees were included. The ornamental eucalypt and acacias would at least treble this list, and the palms alone would easily double it. 

**Ernest BRaCToN.**

**TREE TOMATO.** See Cyphomandra.

**TREFOIL.** See Clover, Trifolium.

**TREVESIA** (after the family Trevesi de Bonfigli of Padua, patron of botany). *Articulare.* About 9 species of small trees or shrubs, in tropical Asia and the islands in that region, with large lvs. either palmately cut and simple or digitately or pinnate compound, and flowers which are rather large for the family and borne in panicles, either petals, or the stamens, valvate, somewhat thicket; stamens 8-12; ovary 8-12-loculed; fruit large, ovoid. Greenhouse subject.

**palmata.** Vis. (Gastrodia palmata, Roxb.,) A small tree, with the ends of the branches sparingly prickly and the lvs. crowded at the ends of the branches, 1½ ft. across, palmately 5-9 lobed to below the middle; pedioles 1½ ft. long: panicles long-peduncled: umbels 6 in. through, long-peduncled: 7 ft. in. across, greenish white. Himalayas. B.M. 7008.

**F.W. BARCLAY.**


**TRIARTEA.** Error in a nursery catalogue. See Triartea.

**TRICALYSIA** (Greek, triple calyx; true of some species). Rubiaceae. Here belong the two shrubs from Natal which are cult. in S. Fla., under the name of Kraussia. When Kraussia was written for this Cyclopedia the undersigned treated it in the manner suggested by Bentham and Hooker, Index Kewensis and Flora Capensis. Since then the writer has had access to the Flora of Tropical Africa, which throws a new light on the relationship of these plants.

In Vol. 3 of that work Kraussia is made a section of Tricalysia characterized by having the calyx-limb 4-6 lobed; the other species have a truncate calyx-limb which is entire or nearly so. Tricalysia is a genus of erect or climbing shrubs, with small axillary flowers. It contains a few species from Natal and Madagascar in addition to 21 from tropical Africa. The two species mentioned below have funnel-shaped fls. which are about a quarter of an inch long. Their color is not stated; it is probably white. The fls. are borne in clusters, which are much shorter than the leaves. It is not clear why these plants should be cultivated at all. They bloom in S. Calif., but have not bloomed in S. Fla.

Generic characters of Tricalysia: calyx-tube in many species girt at the base with a single or double epi-calyx of involucral bracts; corolla funnel-shaped, or shortly salver-shaped, throat bearded or glabrous; lobes 4-8; stamens 4-8, inserted at the mouth of the corolla; ovary 2-loculed, rarely 3-loculed. *Kraussia lanceolata* is here removed to Tricalysia and Hiern is cited as the author of the combination *Tricalysia lanceolata,* though the combination has probably never been formally made previous to this occasion.

A. Lvs. lanceolate, acuminate.

**lanceolata.** Hiern (Kraussia lanceolata, Sond.). Shrub: lvs. lanceolate, acuminate; cymes many-flld.; calyx 5-7-lobed; throat of corolla densely bearded; stigma deeply 2-lobed, lobes revolute; fr. globose, the size of a pea. Natal.

**TRICHOLENA AA. Lvs. elliptic, obtuse.**

**Sonderiana,** Hier. (Kraussia cordiiform, Sond.). Shrubs: lvs. elliptical, obtuse or minutely pubescent, wedge-shaped at the base, coriaceous, 1½-3½ in. long; cymes about 4-flld.; fls. pendulous; pedicels ½-¾ in. long; throat densely bearded; stigmas deeply 2-lobed, lobes revolute. Natal. W. M.

**TRICHARIS.** A section of Dipedia.

**TRICHINUM** (Greek, hairy; alluding either to the plant in general or to the fls. heads). *Amaranthaceae.* A genus of 47 species of Australian herbs or shrubs, often hairy, with alternate narrow or rarely obovate leaves and pink or straw-colored flowers in terminal simple spikes or heads, with shining scariosus branch-tubes short; segments 5, equal, linear, rigid, usually flumose; stamens 5, but usually 1-3 of them small and antherless; fr. an indusiate utricule.

**exallataeum.** Benth. (Plitobus exallatae, Nees). A tender perennial, 2-3 ft. high, erect, usually branching above: lower lvs. 2-5 in. long, oblong-lanceolate rather thick, contracted into a long petiole; upper lvs. smaller: spikes erect, long-peduncled, at first ovoid-conical, becoming longer, 3 in. or perhaps less long, yellowish, with dull red tips. B.K. 25:28 (as *T. alopecuroides*). Lately introduced in this country as a greenhouse subject.


**F. W. BARCLAY.**

**TRICHILORSIS** (Greek for three and green). *Garamides.* Under the name of *Chloropusis, or Chloridopsis, Blanchardiana, secaloides,* many hardy, ornamental grass, growing 2½-3 ft. high and useful for edgings. Its proper name is *Trichilosis Blanchardiana,* Hack. It comes from Argentina. There are four or five species of Trichilosis from Chile and some are good for edgings. *T. Blanchardiana* is a useful grass, its umbel-like clusters of soft, awned silvery spikes being very pleasing. It is readily grown from seeds.

**L. H. B.**

**TRICHOCENTRUM** (Greek, hair and slender; alluding to the long, slender spur). Orchidaceae. A small genus allied to Rodriguezia (Burlingtonia). The plants have in dense matted tufts. Pseudobulbs very small, each bearing a broad, fresh green leaf. They have a short, long-flld. raceme on which usually only one flower opens at a time: sepal and petals free, spreading; labellum larger, spurred, with 2 lateral lobes and a 2-parted middle lobe; column short: pollinia 2, on a wedge-shaped stipe. Sixteen species. Epiphytes of dwarf stature, growing best on blocks; free-flowering; they suffer from too much water at the root; give them a warm-house temperature. Prop. by division.

**âbo-purpurascens.** Reichh. f. Lvs. oblong lanceolate, 1 in. long, tufted; fls. on short peduncles, 2 in. across; sepal and petals obvate-lanceolate, inside maroon-brown, with greenish tips, outside greenish; labellum subquadrate, white, with a large purple spot on each of the lateral lobes. Brazil. B.M. 5688. A.F. 6:660.

**tigrinum.** Lindl. and Reichh. f. Similar in habit to the preceding; lvs. oblong, obtuse, speckled with red; fls. pendulous, nearly 3 in. across; sepal and petals broadly linear, yellow, speckled with red; labellum ovate-ovate, emarginate, with a large purple spot on the disk. May. Cent. Amer. B.M. 7380. I.H. 24:282.

**HEINRICH HASSELBRING.**

**TRICHOLeNA** (Greek, trichos, hair, chitána, or in Latin, lana, a mantle; referring to the covering of silky hairs on the spikelets). *Gramineae.* A genus of 10 African species, one of which is cultivated for the ornamental inflorescence, which is used in making dry bouquets. Spikelets in loose panicles, very silky hairy,
to which the cultivated species owes its ornamental appearance. Allied to Paeonia, from which it differs in having the second glume empty (which, on account of the first glume being small or wanting, is apparently the first) provided at the base with a conical callus, and this the third glume more or less awned between the cleft apex.

**rósea**, Nees (T. violacea, Hort. Paeonia Tenerifera, R. Br.). First glume wanting; spikelets (second and third glumes) clothed with violet silky hairs; awns short or wanting; culms 2-3 ft. South Africa. A. S. Hitchcock.

**TRICÓMANES** (Greek, soft hair). Hymenophyllum déceor. A genus of flimsy ferns distinguished by its tubular, cup-like indusium and filiform elongate receptacle. Fig. 2567. Very delicate in texture and capable of being grown successfully only under shaded glass. Over 100 species are known. Various species may be found in the collections of fanciers, but the following appear to be the only ones regularly in the American trade. For culture, see Ferns.

**radicans**, Swz. Lvs. 2-5 in. long, 1-1½ in. wide, bipinnatifid; pinnae ovate, obtuse; indusium terminal, on short lobes. Tropical regions, extending into our southern states as far as Kentucky.

**Priesneri**, Kunze (T. ducps, Hook.). Lvs. 12-18 in. long, 6-12 in. wide, tri-quadrupinnatifid; pinnae ovate-lanceolate; sort 2-12 to a pinule, small, axillary; indusium with a much dilated lip. Tropical America.

**TRICHONÉA**. See *Bromelia*.

**TRICHÓNÉA** (Greek, hair and cap; the anther is concealed under a cap surmounted by three tufts of hair). *Oreochiænum*. About 20 species ranging from Mexico to South America. Pseudobulbs crowded on the short rhizome, flattened, and often elongate, 1-lvd., surrounded with dry scales at the base; lvs. large, solitary, erect, fleshy, keeled; fls. abundantly produced, short, nodding or decumbent scapes; sepals and petals narrow, spreading, often twisted; labellum large, forming the most conspicuous part of the flower, united with the column below; lateral lobes convolute, middle lobe spreading; anther bent over; pollinia on a triangular caudicle; elindandum finitirly winged. The flowers keep fresh a long time, both on the plant and when cut. Handsome orchids, usually grown in pots, although epiphytal. They need an intermediate or greenhouse temperature. If grown too warm, they suffer. Prop. by division.


**frágrans**, Reichenb. f. (Pitánuma frágrans, Lindl.). Pseudobulbs clustered, flattened, 2-5 in. long, 1-lvd.; lvs. oblong-lanceolate, acute, 9-8 in. long; scape pend, 1 ft. long, about 6-fl.; fls. on pedicels 3 in. long; sepals and petals spreading, linear-lanceolate, 2½-3 in. long, waxy and twisted, greenish white; labellum folded over the column, spreading in front, and somewhat lobed, with a yellow stripe in the throat. White. Columbia. B.M. 5043. Fls. almond-scented.

**nobilis**, Reichenb. f. (Pitánuma nobilis, Reichenb. f. T. candida, Linden). Pseudobulbs large; lvs. broadly oblong-acute; fls. white; sepals and petals linear-oblong, acute, 2 in. long, scarcely twisted; labellum large, white with a yellow spot in the throat. Venezuela. I.H. 19:94 (as T. frágans, var. nobilis). F.M. 1872:21 (as T. frágans).—This has larger, stouter pseudobulbs and shorter broader lvs. than T. frágans. The labellum is larger and the petals shorter compared with the size of the flower.

**tortils**, Lindl. Pseudobulbs oblong, compressed, somewhat curved, 2-4 in. long; lvs. solitary, oblong, acute, 6 in. long; fls. solitary, on decumbent stalks shorter than the lvs.; sepals and petals linear-lanceolate, 2 in. long, spirally twisted, brown with yellowish margins; labellum forming a tube around the column, upper portion expanded, 4-lobed, white with crimson spots, becoming entirely crimson within. Fls. profusely in summer and sometimes again in winter. Mexico. B.M. 3739. B.R. 22:1863. F.C. 3:101. B. 3:122.

—Var. alba is advertised.

**suavis**, Lindl. Fig. 2568. Pseudobulbs thin, compressed, 2 in. long; lvs. broadly oblong, 8 in. long; scape pendent, about 3-fl.; fls. on long, curved stalks, large; sepals and petals lanceolate-acuminate, wavy, nearly straight, 2 in. long, white or cream-colored; labellum large, projecting forward, white or cream-colored, spotted with pale purple, yellow in the throat; limb large-lobed, wavy and crenate. May, June. Cent. America. B.M. 4654. F.S. 6:761. R.H. 1859, pp. 220, 221; 1887, p. 454. Gn. 4, p. 511; 31, p. 452; 38, p. 185; 48, p. 79; 51, p. 371. R.B. 23:256. G.M. 58:281.—Var. alba, Warner. Fls. white with a yellow spot in the throat of the labellum.


**crispa**, Lindl. This plant was described by Lindley in Linden's catalogue. It is closely related to T. margaríata,
TRICHOPILIA, /. (•-petals margin W.).

peduncle what plants.

monthly

The 1850 Kirilowii, cordata, fxr.clhm'ly fls.

and B. Bastard Pennyroyal. Low, viscid annual: lvs. oblong or lanceolate-oblong, obtuse, short-petioled; corolla blue or pink, sometimes white. Sandy fields, Mass. to Ky., Fla. and Texas.

F. W. BARCLAY.

TRICYRTIS (Greek, three conveories; referring to the nectar-bearing sacs at the base of the three outer perianth-segments), Lilacée. "ToAD-LIILIES," as the Japanese call them, are autumn-blooming perennial herbs with 6-petalled fls. which are generally more across, and of whitish color, spotted with purple. They are very distinct members of the Lily family by reason of their season of bloom, quaintly spotted flowers, and the peculiar nectar-segments mentioned above.

They are not bulbous plants, but have a short rootstock emitting tufts of branched fibers. All the species are desirable, but if only one can be afforded the amateur should select T. kirta, var. nigra. T. kirta is perfectly hardy and has more fls. and larger flowers than the other species, and with good management it blooms in September. Sometimes, however, it blooms so late that its flowers are prematurely destroyed by frost. For this reason some gardeners prefer to grow the plant in pots, which may be brought indoors when the fls. are at their best. The variety nigra, which differs in having darker colored spots, is said to bloom two or three weeks earlier than the type. It can therefore be cultivated to lovers of choice hardy plants, but with one reservation: it should not be placed in the ordinary mixed border where it will have to struggle against stronger-growing plants. It should be established in a bed where the plants need not be disturbed for years. Half a dozen plants in a circular bed could be made by division to spread into a solid mass in the course of a few seasons. Such a mass is much more desirable than one plant of each of all the kinds. The bed should be made in a slightly shaded position. For soil, try a light fibrous loam mixed with leaf-mold and sand. An English expert, W. Goldring, has suggested as a companion to the ToAD Lilies, either Lantana-flippers (Calliopsis x ke- tobe) or Wood Lilies (Trichium grandiflorum); this happy idea is worth a trial, as the species named bloom at different seasons and would probably not compete with one another. In this country, the leaves of Tri- cyrtis often do not remain in good condition throughout the season.

Tri- cyrtis is a genus of 6 species native to Japan, China and the Himalayas. The plants average 2 or 3 ft. in height and bloom in June. Both show and with many parallel nerves. Fls. bell-shaped, then spreading; perianth-segments lancolate,acute: ovary sessile, 3-celled; ovules crowded, superposed: capsule leathery, 3-valved; seeds minute. Tri- cyrtis is one of the aberrant types of the Lily family. It is placed by Bentham and Hooker in the Uvularia tribe.

heic May, June. Costa Rica.

H. H. HASSELKERN.

TRICHOSANTHES (Greek, hair and flower; alluding to the fringed edge of the petals). Cucurbitaceae. 

Nake Gourd. About 40 species of climbing herbs, annual or perennial by tunnel-like roots, natives of southeastern Asia and Australia. They are tender plants with small, smooth or roundish, leafless leaves and axillary flowers. The male fls. are usually in racemes, while the female are nearly always solitary. The fruit is often ornamental and highly colored. In T. Angustia it is exceedingly long, having been noted over 6 ft. in length. Calyx long, tubular, 5-toothed; petals 5, united at the base, ovate to lanceolate, longly foliariate: stamens 3 (in the male flower).

D. C. Mon. Phaner. 3:35-1. The plants flower in July from seed sown in March. They may be treated as tender annuals.

A. Broats small or none on the racemes of male fls.

b. Fruit ovate

cucumeraoides, M. Root and tuber, tuberous: stem slender, 12-15 ft.: lvs. ovate in outline, 4-6 in. long, more or less palmately 3-5-lobed, margin crenulate; peduncle bearing the male fls., 1-4 in. long and 3-15-ft.; petals about ½ in. long, oblong, acute, longly fringed; fr. oblong, shortly united, nearly 3 in. long, vermilion-colored. Japan. Offered by importers of Japanese plants.

b. Fruit oblong.

Angula, Linn. (T. columbi, Jacq.). Serpent or Snake Gourd. Stem slender, tall-growing: lvs. nearly circular in outline, 5-7 in. round; margin undulate or wavy: peduncle bearing the male fls., 4-10 in. long, 8-15-ft.; body of petals oblong, less than ⅓ in. long, fringes ⅝ in. long; fr. slender; corolla, often exceeding 3 ft. in length. India. B. M. 722. B. K. 32:18 (as T. coloumbia). R. H. 1859, p. 595.

AA. Broats large on the male raceme.

c. Lvs. lobed.

Kirilowii, Maxim. (Erythropiti plantana, Naud.). Perennial root tuber-like: stem annual, high climbing, 20-30 ft.: lvs. nearly circular in outline, 3-8 in. across, deeply 3-7-lobed, the lobes oblong, acute, coarsely serrate: racemes bearing the male fls., 4-8 in. long, 3-4 in. foot of the column; labelum 3-lobed, the lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges; stem slender; peduncle 2-1v.: inflorescence racemose. Resolved Coelogyne.

suavis, Lindl. Lvs. lanceolate, undulate, 3-nerved: fls. few in a terminal raceme, white, yellowish or purplish, fragrant; sepals ovate-lanceolate; petals oblong; labelum ovate-oblong, streaked with purple; disk yellow; upper lobe with several crenate ridges. Himalaya. B. K. 28:21.

T. albo-margiinate of the trade is unidentified.

H. H. HASSELKERN.

TRICHOSTEMA (Greek, hair and stamen; referring to the filaments). Labiate. Blue Curlews. A genus of 4 species of American perennial herbs, mostly known from annual herbs with entire leaves and blue flowers. Can oblique and 2-lipped; corolla-tube shorter than the limb. Offered by some dealers in native plants. For fuller account, see Gray's Syn. Flora of North America.

a. Calyx bell-shaped, regular, almost equally 6-ovate.

lanatum, Benth. A perennial shrubby plant with rose-leafy leaves and cymes of fls. in a naked terminal thyrse: lvs. narrow linear, 1-nerved, sessile, margins revolute; calyx and corolla covered with dense violet or purple wool; corolla ⅔ in. long. S. Calif. A very handsome shrub. Known as "Ramero." AA. Calyx oblique, 2-lipped.

dichotomum, Lindn. BASTARD PENNYROYAL. Low, viscid annual: lvs. oblong or lanceolate-oblong, obtuse, short-petioled; corolla blue or pink, sometimes white. Sandy fields, Mass. to Ky., Fla. and Texas.

F. W. BARCLAY.

TRICHÖSMA (Greek, hair and ornament), Orchidaceae. Sepals and petals similar, erect-scaping, the lateral pair forming a distinct mentum with the projecting foot of the column; labelum 3-lobed, the lobes erect, convolute over the column, middle lobe with
TRICYRTIS

In which it is the only genus with a septicidal capsule. Monographed in Latin by J. G. Baker in Journ. Linn. Soc. 17:463 (1888). In this account the lvs. of T. macropoda are said not to be stem-clasping, but in B.M. 5553 they are described and figured as stem-clasping.

All the names given below are American trade names, except T. flavo, Formosana and latifolia. The writer has been tempted to include these, partly because there has been no account in English of all the species, but chiefly because they are desirable plants likely to come into cultivation.

A. Base of lvs. not stem-clasping... 1. Formosana
   AA. Base of lvs. clasping the stem.
   B. Stem pilose, with spreading hairs. 2. hirta
   BB. Stem not prominently hairy, puberulous or very slightly pilose.
   C. Fls. yellow, unspotted......... 3. flavo
   CC. Fls. spotted, not yellow.
   D. Spots rather large............. 4. pilosa
   DD. Spots minute.
   E. Style as long as the stigmas. 5. latifolia
   EE. Style half as long as stigmas. 6. macropoda

Formosana, Baker. Stem flexuous, 1 ft. high; lvs. sessile, oblongate, wedge-shaped at the base; fls. few in a lax corymb, whitish purple, scarcely spotted. Formosa. —Uniquely by reason of its lvs. not being stem-clasping.

hirta, Hook. (T. Japonica, Miq.). Fig. 2569. Stem 1-3 ft. high, everywhere ciliolate with soft, whitish, spreading hairs: fls. 6-15, racemose or subcorymbose, whitish, the outer segments covered with rather large purple spots. Wide-spread in the woods of Japan. B.M. 5555. Gn. 30, p. 431; 19:1062. V. 12:204.—Var. nigra, Hort. (T. nigra, Hort.). has black instead of purple spots. Gn. 49:782. A form with variegated lvs. was once offered by Pitcher & Manda.

TRIFOLIUM

1851

latifolia, Maxim. Stem glabrous, flexuous, 2-5 ft. high: lvs. broadly oblong or the uppermost ovate; fls. few in a terminal corymb, whitish, with minute purple spots: style as long as the stigmas. Japan.

macropoda, Miguel. Stem 2-3 ft. high, puberulous above; lvs. oblong; fls. in a loose corymb, whitish purple, with minute purple spots: style half as long as the stigmas. Blooms in June and July, according to J. B. Keller. Japan, China. B.M. 6744 (segments broadly ovate, decidely yellow, spotted red and veined red near tips).—In F.S. 18:340 is figured a plant with sessile lvs. striated with white, and no fls., which he refers to T. macropoda. This was sent out by Van Houtte as T. hirta, but it is a glabrous plant and probably lost to cultivation.

T. grandiflora, Hort., should be compared with T. hirta, var. nigra. It is a name scarcely known to botany. Edgewar & Barry say it has orbiculate, fragrant fls. in Oct. and Nov. (Baker says the genus has no fragrant fls.) Kreigle says that T. grandiflora has white fls. mottled with black. W. M.

TRIENTALIS (Latin for the third of a foot; referring to the height of the plant). Primulaceae. STAR FLOWER. CHICKWEED-WINTERGREEN. A genus of two species of low, glabrous, hard perennial herbs, racemose, with small scales on leaves below and a whorl-like cluster of larger, nearly sessile leaves at the summit, from the axis of which in spring the star-like white or pink flowers are borne singly on slender peduncles. In writings given as borders.

AA. Lvs. acuminate at both ends.


European, Linn. Stem either naked or with a few scattered lvs. below the cluster of obovate or lanceolate, oblong, obtuse or abruptly somewhat pointed lvs.; divisions of the white or pink corolla abruptly acuminate or mucronate. Alaska, Eu. and Asia.—Var. arctica, Ledeb. Dwarf: lvs. 1 in. long, decreasing below: corolla white. Var. latifolia, Forst. Stem naked below the cluster of 4-7 oblong-ovate, or oval, mostly acute lvs.; corolla white to rose-red. Woods, western California to Vancouver’s Island.

P. W. BARCLAY.

TRIFOLIUM (name refers to the three leaves). Leguminosae. CLOVER. Trifolium is a large genus, comprising about 200 and 300 species, most abundant in the north temperate zone. They are low herbs, with digitately 3-foliolate (rarely 5-7-foliolate) lvs.; stipules adnate to the base of the petiole, and small papilionaceous flowers mostly in dense terminal heads or spikes. The calyx is 5-toothed, the 5 upper teeth sometimes connate; petals 5, mostly withering rather than falling, more or less adnate to the base of the stamen-tube; stamens 9 and 1; ovary small, ripening into a little few-seeded, mostly indesincent pod. The flowers are usually in shades of red and running into white, rarely yellow.

The Campions are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops and green manures. See Clover, p. 227. For the role of Campions as nitrogen-fixers, see Legumes, p. 93. The species described below are offered mostly as forage plants. Many Campions are perennial, although some are of relatively short life, so that repeated sowing is necessary if plants are to be kept in robust condition. Some of the species are annual, and these tend to become weeds. All are propagated readily by means of seeds; but as the seeds are small and oily, they may terminate well in dry, not soil. Three-blobbed, yellow-flowered species are weeds in some parts, particularly in the East, where they have been introduced from Europe: T. pratense, Linn., Yellow or Hop Clover, with oblong-ovate sessile lfts.; T. pratense, Linn., Low Hop Clover, more spreading, lfts. obvate and the terminal one stalked; T. dubium, Sibth., with lfts. truncate or emarginate at apex and the terminal one stalked. A silky-pubescent annual white-flowered species from Europe, T. arvense, Linn., is the Rabbit-foot

flava, Maxim. Stem dwarf: lvs. oblong-lanceolate: fls. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

pilosa, Wall. Stem 2-4 ft. high, very slightly pilose: lvs. oblong: fls. numerous, loosely corymbose, whitish, with large purple spots: style half as long as the stigmas. Himalayas, 5,000-6,000 ft. B.M. 4953 (petiole segments narrow, oblong). F.S. 12:1219.

2569. Trigertis hirta (X 1/4).

flava, Maxim. Stem dwarf: lvs. oblong-lanceolate: fls. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

pilosa, Wall. Stem 2-4 ft. high, very slightly pilose: lvs. oblong: fls. numerous, loosely corymbose, whitish, with large purple spots: style half as long as the stigmas. Himalayas, 5,000-6,000 ft. B.M. 4953 (petiole segments narrow, oblong). F.S. 12:1219.
Clover of fields and waste places. The *T. odoratum* of some seedsmen is evidently *Mellilotus*. Allied genera are *Lespedeza*, *Medicago* and *Mellilotus*.

A. *Flowers in a long spike.*

*incarnatum*, Linn. CRIMSON or SCARLET CLOVER. Fig. 699, Vol. I. Annual, erect, 1-3 ft. high, soft-hairy; lfts. long-stalked, the lfts. broadly obovate and dentilicate and sessile or nearly so by a cuneate base, the stipules large and thin and veiny and somewhat toothed; heads becoming 2-3 in. long, very dense; lfts. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. Now much used as a cover-crop in orchards. See Clover. Crops. It is very showy when in bloom. If clover seed are sown at midsummer or later, the plants may be expected to survive the winter and bloom early in spring.

*rubens*, Linn. Perennial, 20 in. or less tall, in clumps, the stems erect; lvs. short-stalked, the lfts. oblong-lanceolate and strongly dentilicate, the stipules long-lanceolate; heads usually in pairs, becoming 3-4 in. long; lfts. purplish red, showy. — Eu. Attractive ornamental species. The heads become silky after flowering. There is a white-fl. form.

AA. *Flowers in globular or oval heads.*

b. *Corolla yellow.*

*filiforme*, Linn. YELLOW Sucking CLOVER. Annual, of diffuse growth; lfts. obovate or obcordate, somewhat dentilicate, the terminal one stalked, the stipules broadly ovate: peduncles long and filiform, bearing sessile yellow lfts. in much-belled heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing.

BB. *Corolla white or ochroleucus (yellowish white).*

*Alexandrinum*, Linn. EGYPTIAN CLOVER. Annual, with few sessile hairs, the stems tall, erect or ascending and branching; lvs. numerous, the lfts. oblong or lanceolate and somewhat denticulate, the stipules lanceolate-subulate and partly free from the petiole: head stalked or sessile, ovate, becoming oblong-conic in fr.: lfts. ochroleucus. Egypt, Syria, etc.

*Pannonicum*, Jacq. HUNGARIAN CLOVER. Perennial, very hairy, the stems usually simple, 2 ft.: lfts. lance-oblong and subacute to retuse, ciliate and entire, the stipules narrow and longer than the short petioles: heads obovate-oblong stalked: lfts. pale yellowish white or creamy yellow. Eu., Asia.—Handsome plant for the border; also recommended for forage.

*repens*, Linn. WHITE CLOVER. Fig. 2570. Low creeping glabrous perennial; lfts. long-stalked, the lfts. obovate and obscurely toothed, the stipules small and scale-like: heads long-peduncled from the ground, small and loose: lfts. white, fragrant. Eu. and thought to be native in the northern part of the U. S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some parts prized for pasture. There are forms with red and purplish foliage. This is thought by most authorities to be the shamrock of Ireland. A form of it is offered by Blanc, as *T. minus*, "the genuine Irish shamrock." See Shamrock.

BBBB. Corolla rose-tinted or red.

c. *Individual lfts. pedicelled.*

*hybridum*, Linn. ALSIKE or SWEDISH CLOVER. Ascending or nearly erect, 1-3 ft. high, branching glabrous: lfts. long-stalked, the lfts. obovate and sessulate, stipules ovate-lanceolate and thin: heads small and loose, nearly globular, long-stalked: lfts. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very hardy. Perennial.

c. *Individual lfts. sessile.*

d. *Plant perennial.*

*pratense*, Linn. (T. pratense perennis, Hort.). COMMON RED CLOVER. PEA-VINE CLOVER. Cow-GRASS. Fig. 2571. Ascending and somewhat hairy, 1-1½ ft.: lfts. long-stalked, the lfts. oval or obovate and sometimes notched at the end and the blade marked with a large spot, the stipules broad but with a bristle point; heads globular-ovate, sessile; lfts. red-purple. Eu., but everywhere introduced, and much grown for pasture hay, and green manuring.

*médium*, Linn. MAMMOTH or ZIETZ CLOVER. Stouter and less erect: lfts. oblong and entire and without spots: heads usually stalked, and lfts. rather deeper colored. Eu. and introduced, and much grown by farmers.

DD. *Plant annual.*

*resupinatum*, Linn. (T. sesulurus, Wildl.). Annual, diffuse or trailing glabrous plant: lfts. obovate and sessulate and as long as the petiole, the stipules lanceolate-acuminate: heads globose, with rudimentary involucres: lfts. purple. Greece, Egypt to Persia.—tiroyo; for ornament.

L. H. B.

**TRIGONELLA** (Latin, a little triangle; probably referring to the shape of the lfts.). *Leguminosae.* Includes *Fenugreek*, which see. *Trigonella* is a polymorphous genus of about 50 species widely scattered in the eastern hemisphere. The genus belongs to the Trifolium tribe of the legume family, being distinguished from the clovers and allied plants mainly by the fact that the lfts. are pinately trifoliate and by the obtuse keel of the flower. The inflorescence and pod are too various to be described here. Bentham and Hooker divide the genus into 6 sections, of which *Fenugreek* and other species form a section characterized by having whitish, subsessile lfts. and a thick, oblong or linear pod which has a long beak and obliquely longitudinal veins.

*Femum-græcum*, Linn. *Fenugreek*, which see. White-fl. annual, 1-2 ft. high, blooming in June and August. Distinguished from other species in its section by the erect, unbranched stem and obovate lfts., which are obscurely dentate. Stipules lanceolate-falcate, entire; calyx plicate: pods falcate, twice as long as the head. Eu., Oriental.

W. M.

2571. Day and night positions of red clover leaf; unfolding young leaf at the right.

**TRILISA** (anagram of Liatris). *Compositae.* Here belongs a native perennial herb known as the Vanilla Plant, from the odor which the leaves emit when bruised. It is not, however, the vanilla plant of commerce (see *Vanilla*). *Trilisa* is a genus of two species
TRILISA

TRILLUM

INDEX.

a. Ovary 6-angled, not winged.

1. **nivale**, Ridd. A dwarf species, 5 in. or less high, early: lvs. narrow and obtuse, 1-2 in. long: fls. white, on a short erect or declined pedicle, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B. M. 6449.

2. **undulatum**, Wildld. (T. erythrocormum, Michx. T. petiolum, Pursh.). Of medium to large size, 1 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. a rather large, white, on a short but slender erect or inclined pedicel, the petals ob lanceolate and wavv, about 1 in. long and usually purplish at the base. Woods, Nova Scotia to Missouri and Georgia. B. M. 3002. L. B. C. 13:1232.

a. Ovary 6-angled, often winged.

b. Flowers sessile (and mostly colored).

c. Leaves sessile.


Var. **angustipetalum**, Torr. Similar to **Var. giganteum**, but the lvs. somewhat petiolate and the petals narrower. Calif., Ore. Apparently not in the trade. This and var. **giganteum** appear to be the only Trilliums native to California, except **T. ovatum**.

Var. **rubrum**, Hort. A form of **Var. giganteum** with fls. deep red-purple.


**Nuttallii**, Wats. (T. viridescens, Nutt.). Lvs. pubescent beneath, as also the upper part of the stem: petals linear-lanceolate, purplish green with brown base. Ark.

4. **lanceolatum**, Boykin (T. recurvatum, var. lanceolatum, Wats.). Plant often more than 1 ft. tall: lvs. lanceolate, sessile: fls. dull or brown-purple, an inch or more long, narrow-lanceolate or linear, the sepals ascending or somewhat reflexed, the filaments usually exceeding ½ in. in length. Ga., Ala. — Little known in cult.

c. Leaves stalked.

5. **recurvatum**, Beck. Strong-growing, usually 1 ft. or more high: lvs. ovate or ovate-oblong, tapering to both ends, on short but slender pedicels: fls. brown-purple or dull-purple, about 1 in. or more long, the

TRILLUM (Latin, triplum; triple: leaves and floral parts in threes). "Liliceae." WAKE-ROBIN. BIRTHROOT. WHITE WOOL LILY. GROUND LILY. Twelve species of tuberous-rooted spring-flowering herbs in North America, and about half as many more in Asia from Himalaya to Japan. All the American species and none of the others are found in Canada. The stem here is simple and erect, 3-leaved near the summit and bearing one flower with 3 green sepalis, 3 white or colored distinct petals, 6 short stamens, and a 3-loculed ovary which ripens into a red or purple berry-like fruit. For a botanical account of the American species, see S. Watson, Proc. Acad. Nat. Sc. 14 (1879).

Trilliums are amongst the characteristic flowers of American woods. The best known species is **T. grandiflorum**, which ranges from Canada to the mountains of North Carolina and extends westward beyond the Great Lakes. All Trilliums delight in moist, rich soil. They thrive in woods or meadows. The root is a deep-seated perpendicul ar tuber or rhizome (fig. 2572). It is customary to transplant Trilliums from the woods where they bloom. This is because the plants can be found readily at that time and because the desire to grow them is strongest when the plants are in bloom. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous growing season. After flowering, the plant stores energy for the succeeding year. By midsummer this work is accomplished and the tops die; then the plants are at rest and they are in proper condition to be moved. However, good results are sometimes obtained by moving them in spring. These remarks will apply to most early spring blooming small herbs. Give Trilliums a rich, deep, rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums force well. See **Forey**. Plants may be propagated by seeds sown as soon as ripe. Blooming plants may be expected in two or three years. Trilliums are among the choicest of all early spring plants, and they should be more commonly grown. They can be made to thrive well in borders about city yards. They may also be colonized in grass where the lawn mower is not used. Best results are usually attained, however, when they are planted alone in masses. Trilliums are amongst the relatively few plants that are very showy and yet not coarse.
Trillium grandiflorum, the commonest Wake Robin. Nearly full size.

petals narrow and erect, the sepals narrow and reflexed. Woods, Ga. to Minn., Miss. and Ark.

6. petiolatum, Pursh. Stem scarcely arising above the ground; lvs. ovate-elliptic to reniform, with stalks as long as the blade or even longer (blade 3-5 in long); fls. purple, the petals 1-2 in. long and narrow-oblanceolate, the sepals erect. Idaho, Ore., and Wash. Little known in cult.
TRILLIUM

BB. Flowers stalked.

c. Pedicel longer than the flower: Ivs. nearly or quite sessile.


TRIPHASIA

DD. Flower erect.

12. pusillum, Michx. Small, usually not 1 ft. high: Ivs. lanceolate or oblong, obtuse, sessile: fls. pale flesh color, less than 1 in. long, on a short erect pedicel, the petals lanceolate and exceeding the obsect sepals.

L. H. B.

TRIÖSTEUM (name shortened by Linnaeus from Triosteospermum, which is from Greek for three bony seeds). Caprifoliaceae. Feverworts. Horse Gentian, A genus of 3 species of coarse perennial herbs, of which 2 Australian and 1 Himalayan. Ivs. rather large, pinnately veined, entire or subulate: fls. dull-colored, sessile, solitary or in small clusters in the leaf-axils, followed by orange or reddish fruits.


F. W. BARCLAY.

TRIPHASIA (triple; alluding to the make-up of the flowers); Rutaceae. A small spiny shrub grown for hedges and for ornament, and sometimes for its small berries, which are used for preserves: Ivs. alternate, sessile, dark, evergreen, trifoliate, with small ovate lateral leaflets and much larger obovate central leaflet: thorns slender, about ½ in. long, one or two in the axil of each leaf: fls. white, about ⅛ in. long, solitary, or in 3-fld. cymes, axillary; calyx cupulate, 3-4-lobed; petals 3-4, linear-oblong, free, imbricate; stamens 6, free, inserted around a fleshy disk: ovary ovoid, 3-loculed: fr. a small 1-seeded berry: seeds, exalbuminous, immersed in mucilage; testa coriaceous, embryo often with unequal plano-convex cotingels. Only one species.

aurantiola, Lour. (T. trilobiata, DC.). Bergamot Lime or Lime Berry. Fig. 2577. A glabrous spiny shrub with straggling evergreen branches and leaves. Hindostan.—Cultivated in many tropical countries and

2575. Trillium erectum (X ¼).

Sporting forms are not uncommon. Sometimes forms occur with petiolate Ivs. A.G. 1892:206. T. grandiflorum is the best and handsomest species for cultivation.

8. ovatum, Parsh. Much like T. grandiflorum, but the petals narrow-lanceolate or narrow ovate, the sepals usually nearly as long as the petals; plants 1 ft. or less high: Ivs. ovate to nearly orbicular, often somewhat rhombic. Calif. to B. C.—The Pacific coast representative of T. grandiflorum


Var. viridiflorum, Hook. Fls. greenish. B.M. 3250. Not known to be in the trade.

cc. Pedicel generally not exceeding and usually shorter than the flower.

d. Fl. deccinate under the Ivs.

10. cernum, Linn. Plant 1 ft. or more high: Ivs. very broadly rhombic-ovate, nearly or quite sessile: fls. white, the petals 1 in. or less long, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 954. Mn. 10:49.

11. stylösum, Nutt. (T. nervosum and T. Citroneri, Ell.). Slender, 12-18 in. high: Ivs. ovate-lanceolate, narrow at each end, short-stalked: fls. rose-color, the petals oblong, obtuse or acute, curved, undulate, sometimes 2 in. long. N. C. to Fla.
in greenhouses. Produces an abundance of elliptical or nearly globose, gland-dotted red berries about 3/4-1 in. across. They are sweet and agreeable and are said to be delicious when preserved. In trade catalogues the

TRIPHASIA

spikelets A. fls. fls. scape linear long, narrow, salver-shaped, nearly naked, from stalks 4-7 ft. high. Upper trade. Raised single, staminate or fertile; or cuttings used for propagation. Stamens 5, spreading numerously, united in bundles opposite the petals; capsule 3-loculed, many-seeded, partly exserted or enclosed; seeds numerous, wingless, usually linear-cuneate. Cultivated as greenhouse shrubs in N. Europe; hardy in Calif. north to San Francisco, also in Fla. Propagated by half-ripened cuttings in sand under glass, or by seeds.

TRIPHASIA (in honor of Jules M. C. Tristam, 1776-1861, a French botanist). Myrtaceae. A small genus of subtropical evergreen Australasian trees or small shrubs. Lvs. alternate or rarely opposite, somewhat whorled: fls. axillary, pedunculate, cymose, often fragrant; bracts ovate or caducous; calyx tube turbinate-campanulate, lobes short, petals 5, spreading numerously, united in bundles opposite the petals: capsule 3-loculed, many-seeded, partly exserted or enclosed; seeds numerous, wingless, usually linear-cuneate. Cultivated as greenhouse shrubs in N. Europe; hardy in Calif. north to San Francisco, also in Fla. Propagated by half-ripened cuttings in sand under glass, or by seeds.

TRIPHASIA aurantiola (× ½).

names Triphasia aurantiola and T. trilobata are sometimes erroneously applied to the hardy trifoliate orange (Citrus trifoliata). In the U. S., little known except in S. Fla. It withstands some frost.

H. J. WEBBER.

TRIPSACUM (Greek, tribo, to rub or thresh; probably alluding to the ease with which the fertile spike can be broken up). Gramineae. Species 2 or 3, of the warmer parts of North America, one extending north to central U. S. and many places furnishing considerable native fodder. Fls. monocious, in the same spike, the staminates above; spikes terminal and axillary; staminate spikelets 2-fl., in pairs at each joint; pistillate single, 1-fl., imbedded in each joint of the rachis, so that the smooth cartilaginous axis and the outer glumes form a nearly cylindrical mass. At maturity the pistillate spikes separate into the joints.

dactyloides, Linn. (T. eulobes and T. Dectylis of the trade). Gramineae. Sesame Grass. Culms in bunches, 4-7 ft.: spikelets 2-3 at summit and often single from the upper axils. Moist soil, Comm., III., Kau., and southward. A wild fodder grass, sometimes cultivated for the same purpose and also in gardens as a curiosity. Raised from seed, or more certainly from cuttings of the rootstocks.

A. S. HITCHCOCK.

TRISTAGMA (Greek, three drops; alluding to the three nectar glands of the ovary). Including Stephanothrix. Liliaceae. A genus of 5 species of bulbous plants from Chile. Radical lvs. few, narrowly linear; scape naked, bearing rather numerous salver-shaped pedicellate fls. in an umbel; perianth-tube cylindrical, sometimes with a crown in the throat; lobes 6, spreading, nearly equal; stamens 6; ovary sessile, 3-loculed, ovoid. Fall-blooming bulbs.

nivalis, Poep. (Milla nivalis, Baker). Lvs. 6-9 in. long, about 2 lines wide; scape slender, about 1 ft. long: fls. 1 in. long, 2-8 in an umbel, the segments linear and greenish; crown none.—Offered by Dutch bulb growers.

T. narcissoides, Benth. & Hook., does not appear to be in the

Amer. trade. It is 1 ft. or more high, with short narrow-linear lvs., and white fls. bearing a bright orange narcissus-like crown of 3-6 broad unequal more or less connate scales.

F. W. BARCLAY.

TRISTANIA (in honor of Jules M. C. Tristam, 1776-1861, a French botanist). Myrtaceae. A small genus of subtropical evergreen Australasian trees or small shrubs. Lvs. alternate or rarely opposite, somewhat whorled: fls. axillary, pedunculate, cymose, often fragrant; bracts ovate or caducous; calyx tube turbinate-campanulate, lobes short, petals 5, spreading numerously, united in bundles opposite the petals: capsule 3-loculed, many-seeded, partly exserted or enclosed; seeds numerous, wingless, usually linear-cuneate. Cultivated as greenhouse shrubs in N. Europe; hardy in Calif. north to San Francisco, also in Fla. Propagated by half-ripened cuttings in sand under glass, or by seeds.

TRISTANIA conferta, R. Br. (Lophostemon arboriscens, Schott.), Brisbane Box. Fig. 2578. An unbranched tree attaining 150 ft.: young shoots and calyx hoary-pubescent: lvs. 3-6 in. long, ovate-lanceolate, glabrous, usually crowded at the ends of the branches and apparently verticillate: fls. mostly on the branches well below the lvs.; petals about ½ in. long, white and spotted, fringed. Queensland. B.R. 22:1839 (as T. macrophylla).—A handsome evergreen shade tree, valuable for avenues in hot, dry regions, as it withstands great drought; it also produces timber valued for strength and durability. Much grown in New South Wales as a boulevard tree. Hardy in Middle California, withstanding an exceptional temperature of 26° Fahr. at Berkeley.

JOSEPH BURTT DAVY.

TRISTELEIA (three complete; referring to the 3-merous fls.). Liliaceae. Tristeleia has been referred to Milla and Brodiera; but when the group is restricted to the South American species, it seems to be advisable to keep it distinct. In Brodiera proper the pedicels are articulated at the apex; in Milla and Tristeleia they are not articulated. In Milla the stamens are inserted in one series in the throat of the perianth; in Tristeleia they are distinctly in two series in the tube of the perianth. See Brodiera and Milla.

About 16 Tristeleias are known (see Baker, G.C. III. 20, p. 459). These are of two series,—those with perianth-tube usually as long as the segments, and those with tube shorter than segments. To the former section belongs the common T. uniflora, the only species in general cultivation. The species are native to the Andes and Argentina as far east as Buenos Ayres. They are all low grass-leaved bulbous plants, hardy or

TRISTANIA

conferta (× ½).

about hardy, useful for planting in the border or for spring blooming in pots. Sometimes the odor is unpleasant.

uniflora, Lindl. (Milla uniflora, Grub. Brodiera uniflora, Baker). Spring Star-flower. Fig. 2579. Lvs.

2577. Triphasia aurantiola (× ½).

2578. Tristania conferta (× ½).
TRITELEIA

narrow-linear, 1 ft. or less long; scapes 8 in. or less tall, bearing a bract-like spathe towards the top; fl. 1 (rarely 3) per spadix, yellow or pale blue, with pointed segments violet-streaked through the center. Argentina. B. R. 23:1921. B. M. 3327. R. H. 1859, pp. 350, 351. Gng. 2:39.—Hardy in most of the northern states, but it does not persist long. Grown chiefly as a pot-plant for spring bloom. Vari. caerulea, Hort., has porcelain-blue flowers. There are other horticultural forms. T. violacea, with "delicate violet flowers," is probably a form of this species rather than the T. violacea, Kunth, a Chilean species.

L. H. B.

TRITRHINAX (apparently triple Trinax; application not obvious). Palaeeae. Four species of South American fan palms, one of which was offered for cult. in Fla. in 1859 and is now advertised in southern California. The genus belongs to the Corypha tribe and is distinguished from allied genera chiefly by the following characters: fls. hermaphrodite; petals imbricate; filaments connate into a tube; carpels distinct; style long, distinct, terminal in fruit. T. Brasiliensis is a little-known palm. It seems to have been confused in the trade with Trinax Chloe, also referred to this work by Acaudantfihzcd. The leaf-segments of the former are bifid; of the latter apparently not. André says the species described below is unique by reason of its sheaths at the base of the leaf being parted, and only the "area composed of fibres which are at first parallel and longitudinal, then obliquely intercrossed and finally placed at right angles like the masts of a pandanus in which the coffee of the Antilles and Bourbon is exported. At the summit these stripes unite and form a series of very long, robust, recurved spines which are evidently designed to protect the fls. and fruits against climbing animals."

Brasiliensis, Mart. Trunk slender, 6-10 ft. high, 2-3 in. thick; leaf-segments 22-27, linear, free for two-thirds their whole length, blue. Brazil. B. H. 22:262.

W. M.

TRITICUM (old Latin name for wheat). Gramineae. The genus as now limited comprises two sections, Egipllophs, with 12 species of southern Europe and Asia, one of which is thought by some to be the original of our cultivated wheats; and Triticum proper, which includes our cultivated wheats and speltas, that are referred by Hackel to 3 species. Annual grasses with flowers in a terminal spike. Spikelets 2-3-fl., placed flat-wise, singly on opposite sides of a zigzag rachis. Emarginate glumes curved, these and the fl. glumes more or less awned: grain free. The three species of our cultivated wheats are:

monococcorum, Linn. ONE-GRAINED WHEAT. Spikes compact, the joints readily separating at maturity; spikelets with one awn and usually maturing but one fruit.—The wild form occurs in southern Europe. Cultivated from prehistoric times but now only to a limited extent, and mostly for mush and "cracked wheat," and for fodder.

Polonicum, Linn. POLISH WHEAT. Spikes very large, compressed, mostly blue-green. —Original form unknown. It is thought to be a true species because it rarely produces fertile crosses with T. sativum, as is also the case with T. monococcorum, while the races of T. sativum among themselves produce fertile crosses. Cultivated in Spain, but not extensively elsewhere.

sativum, Lam. WHEAT and SPELT. Hackel divides the numerous varieties into 3 races: (a) SPELTS (T. spelta, Linn.). Spikes loose, 4-sided; rachis articulate at maturity. (This race and the next are easily distinguished by the fact that the grain does not fall out when threshed.) One of the oldest of the cultivated grains, the culture of which has decreased till now it is grown only to a limited extent in a few countries in southern Europe. (b) EMEMRS (T. dicoccorum, Schrak). Spike very dense, laterally compressed, rachis articulate at maturity. This species has a history similar to SPILETS and is commonly cultivated in the middle countries of S. Europe, where it is used chiefly for mush and in making starch. Both of these races are being tested in this country by the Department of Agriculture, and they may prove valuable in the drier regions. (c) WHEATS. Rachis not articulate at maturity. Grain easily falling out when threshed. There are 4 more or less well-marked sub-races. (1) ENGLISH WHEAT (T. turgidum, Linn.). Empty glumes sharply keeled at base; grain broadly truncate above; leaves usually velvety; flour poor in gluten. To this belong the MIRACLE or EGYPTIAN WHEATS (T. compdsittum, Linn.), having branched spikes, which originated as a sport. (2) HARD or FLINT WHEATS, MACARONI WHEATS (T. dberum, Desl.). Empty glumes sharply keeled at base; grain narrow and tapering, very hard; awns long and bristly like barley, in some varieties black. Cultivated in Mediterranean countries, especially for making macaroni and similar products, and in Russia, where it is used for making bread, when it is mixed with 10-25 per cent of soft red wheat. (3) DWARF and HEDGEHOG WHEATS. Empty glumes keeled only in upper half. Spikes short and dense, only 3-4 times longer than broad; culms rigid. Grown in mountainous regions of Europe, Chile and Abyssinia. The awned kinds are called Hedgehog wheat. (4) COMMON WHEAT (T. vulg&re, Vill.). Glumes as in preceding, but spikes longer and looser. There are many varieties grown in this country,—some naked or awnless ("smooth"), others awned or bearded, some with glumes smooth, others with glumes pubescent ("velvet chaff"). Spring wheats are planted in the spring and winter wheats in the fall, the former group of varieties being grown in the more northerly regions.

A. S. Hitchcock.

TRITOMA. See Kniphofia.

TRITOMA (name explained as follows by Ker-Gawler, its author: "Name derived from Triton, in the signification of a vane or weathercock; in allusion to the variable direction in the stamens of the different species"). Including Montbretia. IRIDACEAE. BLAZING STAR. A genus of South African bulbs (plants really cormous), allied to Crocosmia, Acidanthera, Sparaxis and Gladiolus. Baker admits 31 species (Handbook of the Irideae, 1892). Few of them are in general cultivation, although many of the species have been introduced at one time or another. Those of the Montbretia class are showy, hardy summer-flowering bulbs, to be handled like Gladioli; or they may be left in the ground perma

TRITONA 1857

2579. Tritelia uniflora (X 34).
2580. Tritonia Pottsii (× 3/4).

2581. Tritonia crocosmiflora (× 3/4).

**TROLLIUS** (old German *trol*, something round; in allusion to the shape of the flowers.) *Ranunculaceae.* *Globe Flower.* A group of neat, hardy, herbaceous, perennials of about 10 species, mostly found in marshy places, of the north temperate zone. Roots fibrous, thickened; lvs. palmately divided or lobed; fls. large, solitary, yellowish or purplish; petals 5 to many, small, angular, with a nectariferous pit at the base of the blade; stamens many; carpels 5 to many, sessile, many-ovuled; follicles in a head. Plants of this genus grow freely in a mixture of sandy loam and peat, and in rather damp situations. They may be increased either by seeds, or by dividing the old plants; but the young plants grow slowly at first, and will not flower before the second season from seed.

**A.** True petals shorter than the stamens.

**B.** Plant with true stem, 3/2 to 2 ft. high.

**CAUSALIS.**

**B.** Plant with scapes or scape-like stems seldom over 3 or 4 in. high.

**AA.** True petals longer than the stamens.

**B.** Lvs. only 3-parted; lfts. somewhat lobed, cleft and toothed; sepals hardly spreading.

**BB.** Lvs. smaller, bronze-green; lfts. more finely lobed, cleft and toothed; sepals spreading.

**CC.** Lvs. serrate, or notched; lfts. long-petioled.

**D.** Plant with short stem, 2 to 4 in. across.

**ASALETUS.**

**E.** Plant with long stem, 4 to 12 ft. high.

**F.** Plant with long stem, 1/2 to 2 ft. long.

**G.** Plant with long stem, 2 to 4 ft. high.

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**TRITONIA**

nently if given protection of mulch in cold climates. As far north as New York and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best known kinds are *T. crocosmiflora* and *T. Pottsii*. Most of the Latin names in catalogues belong to these, as *sulphurea*, *Tigridia pyramidalis*, *grandiflora*, *elegans*, *floribunda*.

To gardeners, Tritonias are usually known as Montbretias. Garden Tritonias grow 1 ft. or more tall, producing several to many showy flowers of a yellow, orange or red color, and bearing several stiffish linear or sword-shaped leaves. Corms small, covered with strongly reticulated sheaths or tunics. The perianth is tubular, with a spreading limb of obovate or oblong, nearly equal segments. The stamens are 3, inserted in the perianth-tube, with mostly verticillate anthers and filiform filaments. The pistil has a 3-lobe ovary, filiform 3-branched style, ripening into a 3-valved capsule.

**AA.** Perianth-segments oblong.

**B.** Rosea, Klatt. Tall and branched, with short linear lvs. and loose 6-15-fl. racemes; fl. bright red, with oblong segments (the three lower ones yellow blotched at the base) as long as the tube and anthers just protruding from the tube. Cape Colony. B.M. 7280. — Can be left in the open as far north as Mass., if well protected, but are usually safer if taken up.

**Pottii**, Benth. (Montbretia Pottii, Baker). Fig. 2580. Strong, branching plant 2-4 ft. tall, with several lax ra-
TROLLIUS

TROPEOLUM (from Greek word for trophy: the leaves are shield-shaped and the flowers helmet-shaped). Geraniaceae. NASTURTIUM. About 40 species of soft-growing herbs, mostly climbing, of South America, chiefly of the cooler parts of Peru and Chile. They are grown for their showy odd flowers. The common species, T. minus and T. majus, are also grown for their young pods and seeds, which are made into pickles. The pepper-tasting leaves are sometimes used like cress, in salads, whence the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly T. tuberosum, produce edible subterranean tubers. The flowers of Tropaeolum are very irregular: sepals 5, connate at the base, the posterior one produced into a long slender spur: petals 5 (sometimes fewer by abortion), usually narrowed into distinct claws, the upper ones smaller or otherwise dissimilar and inserted in the mouth of the spur; stamens 8, unequal, with declined usually curving filaments; pistil with one style and a 3-lobed ovary, which ripens into 3 1-seeded indischisent carpels (the carpels constitute the "seed" of commerce). The flowers yellow or orange, rarely blue or purple are alternate and usually though often deeply lobed or even usually petalate; stipes none or very species climb by means of the coil of petioles. For references to recent botanical literature on Tropaeolum, see F. Buchenau in Engler’s Bot. Jahrb. 26, p. 580.

Tropaeolums thrive in any warm, sunny, fairly moist place. The tops are tender to frost. For early effects, seeds may be started indoors in pots or boxes. The common climbing species are T. majus and T. Lobianum, both of which are very useful for window boxes, balconies, for covering banks and walls, and for growing amongst shrubbery. The common dwarf species, T. minus, is earlier and usually more floriferous, and is very useful for the front row in the border. T. peregrinum, the Canary-bird Flower, is grown either indoors or in the open. Probably most species are perennial. Many of them are tuberous and withstand some frost at the root; but the half-hardy species are little known in this country.

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Tropaeolum. 1. Lobianum, 11. speciosum, 5.
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T. minus, 13. minus, 15. tricolorum, 2.
T. fimbritum, 11. pentaphyllum, 6. tuberosum, 10.

Flowers blue.

1. azurum, Miers. Very slender glasshouse climber: leaves, petolate, 5-parted nearly or quite to the base, into narrow-obovate or oblanceolate divisions; flower-like, short spur green, the wide-spread corolla azure-blue, the petals 2-lobed or emarginate. Chil.
2. Tropaeolum majus, the common Climbing Nasturtium. (X ½.)

6. Pentaphyllum, Lam. Slender climber, the glabrous colored stems arising from a tuberous root; lvs. divided to the base into 5 oblong or obovate segments or leaflets; fls. small (about ½ in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B.M. 3190, B.H. 22:73.—A half-hardy species, showy because of the great number of bright small flowers.

7. Polyphyllum, Cav. Perennial, half-hardy; stem succulent, prostrate or climbing; lvs. peltate, orbicular, cut beyond the center into 7-9 narrow divisions; fls. much like T. majus in shape, but smaller; spur slender but rather short, the calyx-lobes triangular; petals unguiculate, yellow, wavy or emarginate, the 2 upper ones streaked with red. Chile. B.M. 4042. P.M. 10:175. F.S. 20:2066. G.C. II. 29:241. Gn. 45, p. 158.—It is a tuberous-rooted species, the stem naturally prostrate.

8. Leichtlini, Hort. Hybrid of T. polyphyllum and T. edule (see suppl. list), raised by Max Leichtlin, Baden-Baden. Much like T. polyphyllum, but the fls. of brighter color, and the lvs. larger.

9. Peregrinum, Linn. (T. Canariense, Hort.). Canary-bird Flower. Fig. 2584. Annual, tall-climbing; glabrous; lvs. peltate near the margin, cordate-orbicular, divided to about the middle into 5 lobes, which are mostly apiculate: fls. canary-yellow, odd and very irregular; spur green, hooked; 2 upper petals erect and large, obovate-clawed, much fringed; 3 lower petals small and narrow and ciliate. Colombia. B.M. 1351. B.R. 9:718.—An excellent quick-growing vine, although the fls. can scarcely be called showy.
TROPÆOLUM

EE. Petals entire.

10. tuberosum, Ruiz & Pav. Root producing a pyriform irregular tuber 2-3 in. long; stem climbing, glabrous; lvs. peltate near the base, cordate-ovariliac. 5-lobed nearly or quite to the middle; fls. rather small, the calyx and long spur red, the petals yellow, small and nearly erect and little exceeding the calyx. Peru. B.M. 3714. F.S. 5:495. P.M. 5:49. R.H. 1856:341 (tubers). J.H. III. 39:385.—Plant stands some frost. In Peru, the tubers are eaten, and the plant is sometimes cultivated in Europe for the tubers. It appears in the American catalogues of European dealers. The tubers are usually boiled.

DD. Lvs. entire or only undulate.

E. Plant pilose.

11. Lobbiaanum, Veitch. Annual, climbing, hairy all over except the under parts of the lvs. and the petals: lvs. very long-stalked, peltate, nearly orbicular, undulate and with points on the margin; fls. large, long-spurred, orange-red, the two upper petals large, broad and entire, the three lower ones small and clawed and coarsely toothed and also fringed on the claws. Colombia. B.M. 4087. F.S. 2:67. P.M. 11:271. Var. limbrifolium, Hort., has all the petals toothed or fringed. R.H. 1856:101.—Seldom seen in its pure state.

EE. Plant glabrous.

12. majus, Linn. Figs. 2585, 2586. Strong growing somewhat succulent climbing annual; lvs. peltate, nearly orbicular and undulate-angled; fls. large, mostly in shades of yellow or orange, with straight spur, the 2 upper petals entire or undulate (not apiculate), the 3 lower ones narrower and fringes on the claws. Peru. B.M. 23:3375 (var. atrosanguineum). F.S. 12:1286 (var. atropurpureum major). P.M. 11:176 (var. atrosanguineum). There are double-flowered forms. G.C. II. 11:365. These appear to have been introduced into this country about 1885 or 6. There are also dwarf forms.—This species has been in cult. in Europe since 1684. It is the foundation of the common climbing nasturtium. Some of these garden forms are probably the offspring of hybridization with T. Lobbiaanum

TROPICAL FRUITS

B.M. 98.—Very likely blended with T. majus by hybridization, in garden form.

T. digitatum, Karst. Climber, with root fibrous; lvs. peltate, 5-7-lobed: fls. yellow, 1 in. diam., the spur long and red, the petals fringed. Venezuela.—T. edule, F. Mart. Climber, lvs. orbicular with 5 or 7 narrowed: fls. in shape like those of T. majus, but smaller, yellow. Produced tubers edible roots. Chile. P.M. 12:127.—"T. hederifolia" is offered by A. Blume in 1841.—T. cordatum, Wall. Beauti ful climber with large, peltate, undulate-lobed lvs. that are purplish beneath and beautifully veined with white above: fls. on long pedicels, the long tube red and the calyx lobes green. Colombia. I.H. 41:567. L. H. B.

TROPICAL FRUITS. Travellers hailing from the temperate zone are generally surprised and delighted, at first, with the fruits they find in tropical markets. This is due to the fact that such things are for the most part new to them. They taste everything they see and not infrequently publish their experiences in language where praise is not stinted. Some, on the other hand, view nearly every tropical fruit with prejudice and disdain and cannot be persuaded to taste, and if eventually persuaded, only to condemn with aversion. Under such circumstances it is not to be wondered at that in some quarters all tropical fruits should be held in high esteem, and in others be considered of doubtful value. That good tropical fruits do really exist cannot be disputed, although on careful examination they are found to be few in number, and some kinds far from common even in the local markets. True tropical fruits may be described as those requiring a temperature from 16° to 32° centigrade or 60° to 90° Fahr.

Among the subtropical fruits there are some which appear to thrive in the tropics as well as in their native place, but whether this is really so may be questioned. Any differences in the conditions of the fruits on reaching the ripening stage will account for difficulties often met with in preparing them for export. Such is the orange, for instance; it thrives well under tropical conditions and g...
The fact is that tropical fruits with but few exceptions, have until very recently been almost exclusively grown from seed, with the natural result that variety in the quality, form, size, and color of the fruit is the universal rule; and although there are seedling strains of well-marked types, buyers know that no reliance can in the main be placed upon securing fruits of uniform quality and flavor. In the case of the orange, the class of fruit raised in some districts is good as a whole, but in others the produce is of a low grade and even in the best districts inferior fruit is allowed to develop which often spoils the better samples. This is being rapidly remedied by the planting of grafted kinds. The same variation obtains with all kinds of fruit without exception. In no fruit is this feature more clearly apparent than in the mango, Mangifera indica. Fig. 2589. Kinds exist which are

fit for the table of a king, but at the same time there are fruits grown which the poorest beggar would refuse. The variety is almost endless, and little dependence can be placed upon quality, except those produced by trees grafted from selected kinds. These are now becoming more common, but as yet there are no large orchards planted with selected kinds, and consequently no regularity can as yet be expected in the quality and character of the fruit available for export. The mango, like the orange, easily yields to grafting; it grows rapidly and there is no reason why large quantities of this excellent fruit should not be placed upon the markets. The botanical departments of the British colonies, and elsewhere, have many selected kinds under cultivation and great effort is being made to induce the people to plant selected kinds, instead of the worthless seedlings. Many trees have been shipped with success from the West Indies, and there would appear to be nothing of importance to prevent their being regularly placed upon the markets of Europe and America. All that is needed is to select fine strains, known both for their keeping qualities and good flavor, and to grow them in quantities that would pay. The mango, as a rule, takes many years to establish if grown from seed; but if grafted plants are cultivated, fruit is obtained in four or five years. The Julie, Divine, No. 11, Martin, Malda, Gordon, Peters, Père Louis, and Mango d'Or are varieties which are worthy of the table; the richest, and would be well suited for extensive cultivation for purposes of export. The people are slow to recognize the value of the art of budding and grafting, but education in this direction is rapidly extending under the auspices of the Department of Agriculture and Education throughout the West Indies.

Many fruits practically unknown in northern latitudes are readily available here in small quantities, but insufficient to maintain a paying export trade. If they were grown in larger quantities in uniform quality, there is no serious obstacle to their being regularly placed upon the northern market. The system of transportation now in use is not thoroughly efficient, but would soon adapt itself to the circumstances of a profitable trade.

The success of the banana as an export fruit has long been a recognized fact; and the trade is yearly increasing. In this case the propagation is carried on by suckers, and there is no variation in the quality of the produce; the market always gets the same quality, hence the success.

Among the best of all tropical fruits is the Mangosteen, Garcinia mangostana, native of the Straits Settlements. This has been introduced in the West Indies, and the fruit has been sent in good order to the English market. It is, however, slow-growing, and as yet only very few trees of it are in existence in the West Indies. It has grown well in Trinidad, and has produced excellent crops of fruit. In this climate, however, and there can be no doubt that many of the islands in the West Indies are quite capable of growing this fruit to perfection; and there is no doubt that it could be carried to market without serious loss in transit.

Writings upon tropical fruits are much scattered and there is as yet no book dealing solely with the subject. The most important tropical fruits are detailed in the order of their local value in the following list (see the various entries in this Cyclopedia):

**Tropical Fruits of the West Indies and Central America:**

2. Cocoa nut, Cocca nueHera. Figs. 566-7, 1457.
5. Mangosteen, Garcinia mangostana. Fig. 893.
6. Sapodilla, Aechmas Sorota. Fig. 2249.
7. Pear (Alligator Pear), Persea gratissima. Fig. 1724.
8. Sugar Apple, Anona squamosa. Fig. 94.
9. Custard Apple, Anona reticulata.
10. Sour-sop, Anona muricata.
12. Akee, Cupavia sapida.
14. Guava, Psidium Guajava. Fig. 2068.
15. Pomme Cythere, Spoulias dulcis.
17. Water Lemon, Passiflora laurifolia.
18. Star Apple, Chrysophyllum Cainito. Fig. 469.
19. Genip, Melicocca bijuga. Fig. 1388.

Of this list probably not more than half the number are cultivated in selected varieties, and some are grown in small quantities, as for the Indian and general use. The banana, coconut and pineapple are largely exported. The mango is capable of being grown to any extent for export to temperate climates. The mangosteen is a fruit the cultivation of which for purposes of export should be largely extended. The sapodilla if grown from the finest selected varieties is one of the choicest of tropical fruits. It is tender when ripe but carries well when "full," a West-Indian term for maturity. The pear (Pears) is a fruit which also carries well when mature. It is what should be called a salad fruit and is eaten with pepper and salt. In the East it is often served with sherry and sugar as fruit at dessert.

The pomegranates, Nos. 8, 9 and 10, are good additions to the dessert when well grown from selected kinds. The last, or sour-sop, is particularly well suited for flavoring jellies, it being considered by many as the best of all the fruit flavors for this purpose. It could be easily
TROPICAL FRUITS

imported in ice. The nectar might be exported if preserved. The part used is the large arillus attached to the fruit. It is said to be a fish with many qualities. The governor’s plum is a fruit the size of a green-gage and makes fine jellies. The cashew is useful when preserved, but is too tender for export. The large seeds, roasted and ground, form one of the best table nuts known. The guava can only be exported in the form of the well-known guava jelly. When a good variety is to hand the Pomme Cythere is an excellent and well-flavored table fruit. The granadilla makes excellent lees, and the water lemon is much used as dessert, having the appearance and flavor of a huge ripe gooseberry, though generally somewhat sweeter. *Melicoccus bijuga,* or the ginip, is a children’s fruit, and is sold in Monthly the table fruit. Like all tropical fruits the granadilla practically has no selection, and a large amount of variation appears. This is very prominent in the granadilla.

Some are very acid, while others are deliciously sweet. This variation, as shown in seedlings, is fully sufficient to account for the diverse opinions as to the qualities of tropical fruits.

The citron tribes are, of course, sub-tropical fruits, but it is possible to grow them to great perfection in the tropics. When grown upon the sour orange stock, the trees are capable of reaching a large size, and will afford regular crops. An excellent start has been made in many West Indian islands in the cultivation of grafted plants of the best kinds.

Trees in the tropics usually have their regular season of fruiting, but many trees, such as the mango and the orange, produce fruit out of season, or in the coolest season of the year. Trees which fruit at such a season are generally the most inferior kinds.

Most visitors to the tropics choose this season for making their tour, and in consequence never have the opportunity of seeing or tasting the best qualities of the fruit produced, and only get inferior kinds, which the regular resident would not have to eat. When a mango is described as “all tomb and turpentine,” the writers were writing truly of the ordinary “out of season” mango, but all-year-round residents know that these kinds are as different from the selected varieties as is the quince from a jargonelle or a pear or a crab apple from a Ribston pippin.

J. H. HART.

Another View of Tropical Fruits. — The fruits most grown for export from the West Indies are bananas, oranges, grape fruit or pomelo, pineapples and coconuts. Others that are prised, but not exported to any extent, are mangoes, grapes, star-fruit, sapodilla, avocado pear, granadilla, cherimoya, sweet sop and mangosteen.

Banana.—There are between 30 and 50 different varieties of banana, and about half as many of the plantain, which is the form of banana used as a vegetable. The enormous export of over 8,000,000 bunches of bananas annually from Jamaica is almost entirely of one particular variety, which goes under various names.—“Jamaican,” “Martinique,” “Gros Michel,” etc. A small quantity of a red-skinned variety is occasionally exported. It is prized rather for its color and effectiveness in a dish of fruit than for its quality. There are others, such as “Lady’s Finger,” which are superior in flavor to the Jamaican, and are destined to obtain in time special prices in the markets. These superior varieties have mostly been collected by the Royal Gardens, Kew, from India, Ceylon, Straits Settlements, etc., and have been sent out from time to time to the Botanic Gardens of the West Indies.

The soil most suitable for banana culture is a deep loam with a large proportion of humus. Good drainage is essential. Bananas grow well under irrigation, but the application of the water must be carefully watched. The only disease that is known is a species of Marasmius, a fungous name that attacks the plant. It has not done much harm, and in fact has not attracted any notice except in Trinidad. Insects do not interfere with plant or fruit. Nematode worms are known in other countries to have caused great destruction, but no cases have appeared anywhere.

Citrus Fruits (more properly sub-tropical).—Until a few years ago no attention was paid to the cultivation of any of the citrus fruits: they simply grew wild,—seeds were dropped by birds, and wherever the soil was suitable trees sprang up. Naturally many hybrids and inferior kinds exist, but the great mass of the trees have come true, and the fruit is of excellent quality. Since Florida has suffered so much in its orange-groves, cultivation in the West Indies has become general, and all the best kinds of Citrus have been imported from Florida, California and England. In Jamaica the naval orange was introduced direct from Bahia many years ago, and there is good evidence that it occurs spontaneously in the island at the most favorable elevation for the orange,—about 2,300 feet. A naturally hybrid between the sweet orange and the tangerine is also known in the same district. The general excellence of the orange in Jamaica is partly due to the large numbers of grafted St. Michaels that were distributed from the Botanic Gar

dens at Castleton. A limestone soil seems to suit the orange best. At low elevations both the orange and the grape fruit are rather sweet, but this fault gradually disappears and the flavor improves the higher the elevation,—the limit in Jamaica being somewhere about 4,000 feet for the orange, and 3,000 feet for the grape fruit. The diseases and insect pests that attack the citrus tribe in other countries are known in the West Indies, and the roots of trees are also attacked by the grub of a beetle, a species of *Frigapodea.* Trees that have grown wild are not subject to disease or insect pests.

Pineapples.—Pineapples are indigenous in tropical America, and although it is scarcely possible to say whether they are truly native in any of the West Indian islands, they are spoken of as being grown not very long after the discovery by Columbus. Joseph Acoeta, in his “Naturali and Morrall Historie of the East and West Indies” (London, 1604), says: “The first Spaniards named many things at the Indies with such Spanish names as they did most resemble, as Pines... although they be very different fruits to those which are so-called in Spain... The best [pines] are those of the Islands of Barlovent [Greater Antilles].” The Botanic Gardens in Jamaica are making experiments in crossing different varieties. The Ripley is the general favorite in Jamaica for its exquisite flavor, but the Smooth Cayenne is being cultivated largely for export, as its finer appearance ensures a higher price in the
markets. Mealy bug attacks the cultivated pine-apple, and blight and tangle-foot occur as in Florida, but in suitable situations it grows wild without any cultivation quite free from disease. *Cocoanuts.*—There is a large export of cocoanuts in the shell from the W. Indies, and in Jamaica there is a factory for making cocoanut oil. The palms are subject in some districts to a disease which attacks the terminal bud. So far as can be judged, it is of a bacterial nature, and probably infection is caused by beetles and other insects. In the W. Indies cocoanuts flourish even in the interior of the islands and at a considerable elevation—2,000 feet. They require an abundance of water at their roots.

Mangoes were introduced into the West Indies towards the end of the eighteenth century, and to-day they are the commonest trees—the reason being that the seeds germinate readily and at once take root in almost any soil. The trees will grow even at elevations of 5,000 feet, but they do not bear fruit above 3,500 feet, nor do they bear at all in wet districts. There are numerous varieties, most of them being somewhat fibrous, even the esteemed "No. 11" containing some thread-like fiber. In the year 1869 several of the best gownted varieties of India were imported from Bombay for the Botanic Gardens of Jamaica; these are of superior excellence and without fiber. The seedlings of these Bombay mangoes do not come true, but the majority of them bear good fruit. Grafted plants are distributed from the various botanic gardens of the West Indies. Experiments in budding are being carried on with a view to hod the numerous inferior kinds. Even the coarse mangoes which are worthless as fruit, if picked before ripe, make excellent tarts, preserves, pickles, etc., and there is a wide field for enterprise in utilizing such fruit in various ways.

The pineapple, cashew, ginep, naseberry or sapodilla, sweet sop, sour sop, custard apple, avocado pear, cherimoya, Spanish plum (Spondias), Barbados cherry, papaw, Fig. 2590, cocoa-plum, star apple, granadilla, mangosteen, carambola, bilimbi, Nilgiri blackberry, tamarind, pomegranate, grape, akee, bread-fruit, and jack-fruit are introduced from other countries.

The akee, bread-fruit, jack-fruit, eho-eho (*Sessilium edule*, Fig. 2281), ochra and avocado pear are fruits used as vegetables.

Great improvements have lately been made in the mode of packing fruits for export. The Government of Jamaica is about to appoint inspectors of fruit for export, who will stamp all packages that pass as well-graded, well-packed, etc., with the Government mark. It will be optional for exporters to take advantage of such inspection.

The Imperial Department of Agriculture in the Lesser Antilles, and the Botanic Gardens of Jamaica, Trinidad, and British Guiana are devoting a considerable amount of attention to fruit with gratifying results.

The inauguration in January, 1901, of a new line of steamers, with a subsidy of $200,000 annually, specially built for the fruit trade, and sailing direct from Jamaica to England, has already had a great effect in increasing the area under cultivation. This is only the first step in a regular and systematic export of fruit from the West Indies to Europe, and the development of the trade to an enormous extent is confidently anticipated.

**Botany of Tropical Fruits.** All the tropical fruits mentioned above are described in this work at their proper places, with the exception of some of the following:

- Barbadoes Cherry is *Malpighia glabra*, which see.
- Nilgiri Blackberry is *Rubus racemosus*.
- Ochra is another spelling for *Olea*.
- Pomme Cythere is *Spondias dutes*, described below.
- Pomme d'Or is *Passiflora aurifolia*.
- Spanish Plum. Consult *Spondias purpurea*, below.
- Sweet Cup is *Passiflora edulis* and *P. maliformis*.

The genus *Spondias* of the family Anacardiaceae takes its name from an old Greek word used by Theophrastus for some kind of plum. It contains about 8 species of tropical trees with alternate odd-pinnate lvs., numerous opposite lfts., minute whitish lvs., and yellow fruits as large as common plums. Botanically the fruit is a fleshy drupe with a 1-5-loculed bony endocarp. The genus is distinguished by the following characters: ovary 3-5-loculed; ovule pendulous; lvs. pinnate; fls. polygamous; stamens 8-10; styles 4-5, free at apex. The following are widely cult. in the tropics.

**A. Locules of the ovary nut distant, connected only by the common base.**


**B. Racemes panicle, often exceeding the lvs.: fls. yellowish white.**


**Bb. Racemes unbranched, few-fl., much shorter than lvs.: fls. purplish.**


**Tróximon** (Greek, edible; which does not apply). *Compósita*. A genus of 15 species of mostly perennial, nearly stemless herbs native of North America except possibly 2 species which are South American. The spec-
TRUMPET CREEPER. _Cercis canadensis._

TRUMPET FLOWER. _Consolida regalis._

TRUMPET HONEYSUCKLE. _Lonicer a sempervirens._

TRUMPET VINE. _Celtis sinensis._

**TSUGA** (its Japanese name), _Tsuga. EMERSONI_ **HEMLOCK.** Ornamental evergreen trees of pyramidal habit, with spreading, irregularly whorled, much ramified branches clothed with small, linear, usually 2-ranked leaves and small cones which are usually freely produced. The cones are about 1 in. long, except in one species, which has cones two or three times as large. _T. Canadensis_ is quite hardy north and the Japanese species and _T. Caroliniana_ have proved hardy as far north as Ontario. _T. Hookeri_ is almost as hardy. _T. Mertensiana_ and _T. Brouniana_ are more tender. There are probably no more beautiful hardy conifers than the Hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff, formal appearance of many of the conifers, but are graceful and stately at the same time. _T. Mertensiana_ is the most vigorous species and is more graceful than the Canadian Hemlock, but tenderer. _T. Hookeri_ is noticeable for its light bluish green foliage and the more narrow pyramidal habit. The Japanese species have very handsome dark green glossy foliage, but none show growth as well as _T. Canadensis_ bears pruning well and is well suited for tall hedges (see also _G. G. F. 2:209._) The other species will probably bear pruning well. The Hemlocks are not very particular as to the soil, provided it contains a sufficient amount of constant moisture. Tsugas are not difficult to transplant. Prop. by seeds sown in spring and by grafting on _T. Canadensis._ The varieties and the Japanese species are also raised from cuttings. See also _Cephalis, Abies and Picea_ for cultivation.

The genus contains 7 species, natives of N. America, E. Asia and the Himalayas. _Tsuga_ is closely allied to _Abies_ and _Picea_ and differs little in the structure of the flower and cones, both being very similar to those of the larch, but the _Tsugas_ are not as much like those of _Abies_ in their outward appearance, are very different in their internal structure from all allied genera, since they have a solitary resin-duct situated in the middle of the leaf below the fibro-vascular bundle. The light, soft, brittle and coarse-grained wood is not durable and not much valued except that of _T. Mertensiana_, which is harder and more durable, and that of _T. Sieboldi_, which is esteemed in Japan for its durability. The bark is rich in tannin and that of _T. Canadensis_ is extensively used for tanning leather.

_Tsuga Canadensis_ should be called "Hemlock Spruce," but in common speech it is usually alluded to as "Hemlock."

**TSUGA**

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A. _Lvs._ with 2 white lines beneath; _cones_ light reddish brown, finely pubescent or almost glabrous: _lvs._ linear, obtuse or emarginate, dark green

2591. A spray of Hemlock Spruce (X2.)

1. _Sieboldi_, Carr. (T. Arengi, Koch.). Tree, attaining 90 ft., with spreading slender branches; branchlets pale yellowish brown, somewhat glossy, with reddish leaf-cushions; _lvs._ linear, usually broadest at the apex, emarginate, grooved and glossy dark green above, with 2 whitish lines beneath, 3-4 in. long; cone ovate, 1-1½ in. long, the peduncle exceeding the bud-scales; braets bifid. Japan. G.F. 10:492. Var. _nana._ Endl. Dwarf bushy form, with short branchlets and very short crowded leaves.

2. _diversifolia_, Mast. (Abies diversifolia, Maxim.). Tree, very similar to the preceding, chiefly distinguished by the reddish brown pubescent branchlets; _lvs._ linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base; cone smaller, 2½-3½ in. long; peduncle not exceeding the bud-scales; braets truncate, crenulate, not or slightly bifid. Japan. G.F. 6:149; 10:493.

3. _Caroliniqna_, Engelm. _CAROLINA HEMLOCK._ Tree, attaining 70 ft., of more compact habit and with darker green foliage than the following; young branchlets light reddish brown, finely pubescent or almost glabrous; _lvs._ linear, obtuse or emarginate, dark green
and glossy above, with 2 whitish lines beneath, ¼–½ in. long; cones oblong, 1¼–1½ in. long, peduncled; scales oblong, Va. to S. C. S.S. 10:684. G.C. II. 26:750. G.F. II. 120:183. New Brunswick and Wis., south to Ala. S.S. 10:693. -The Hemlock Spruce yields the lumber most commonly used in the East for flooring and boarding of buildings. It is milled into boards for finishing lumber. A number of garden forms have been raised; the following are the most important: Var. albo-spica, Nichols. Tips of the young branchlets creased, almost shiny; (var. albo-nana, Beissn.). Dwarf conical pyramid with several short branchlets clothed with small leaves. Var. globose, Beissn. (var. globularis erecta, Kunkler). Dense, globose, much branched form with numerous upright branches nodding at the ends. Var. gracilis, Gord. (var. microphilla, Hort.). Slow-growing form with slender sparingly ramified branchlets, spreading and more or less drooping at the ends; lvs. very small, about ¼ in. long; Var. nana, Beissn. Dwarf, depressed form with spreading branches and short branchlets. Var. parvifolis, Veitch. Lvs. very small, ¼ in. long or shorter; branchlets closely set and numerous. Var. pendula, Par. & Par. & Sarg., Port. & Hamb. & Par. (var. pendula, Kent.). Flat-topped form with spreading branches and drooping branchlets. Gn. 32, p. 363; 39, p. 81. M.D.G. 1900:367, 368, 491. Very distinct and desirable form.


ALFRED REINHED.

TUBEROSE. Consult Polianthes.

TUCKER, LUTHER (Plate XLII), born at Brandon, Vt., May 7, 1802, was the founder of "The Horticulturist" and the proprietor of that valuable and unique weekly periodical during the period of its greatest glory, from July, 1846, until the autumn of 1852. The statement, on page 501 of this Cyclopaedia, that the younger Downing "founded "The Horticulturist,"" is inexact, he having been both the associate editor, while the enterprise was Tucker's alone. To Downing, nevertheless, belongs all the credit for the great and distinguished interest and value of the magazine, as he conducted it according to his own ideas, with which the proprietor never interferred, the latter having indeed enough to do in putting it before the public with enterprise and vigor. It was issued simultaneously in Albany, Boston, New York and Philadelphia, with an allied, including what was then the distant western town of Cleveland, Ohio, as well as Hamilton and Cobourg in "Canada West." Luther Tucker also founded, at Rochester, X, Oct., 1835, the first periodical paper published west of New York, "The Advertiser," which is still, under a slightly extended name, an influential journal; also at Rochester, January 1, 1833, "The Geneee Farmer," a weekly, the first agricultural periodical in the world, written directly from practical experience. It has undergone some changes in name, as its scope extended far beyond the Genesee valley, and has been published in Albany since January, 1841, being now called "The Country Gentleman." This is one of the ten American agricultural periodicals that were started before 1830 and outlived the nineteenth century, the others being these: "Maine (Kennebec) Farmer," 1839; "American (Boston) Cultivator," 1838; "Southern Planter," 1840; "Massachusetts Plowman," 1841; "Prairie Farmer," 1841; "American Agriculturist," 1842; "Southern Cultivator," 1843; "Indiana Farmer," 1845; "Rural World," 1848; "Ohio Farmer," 1848. It is now (1901) published by his son and his son-in-law. Mr. Tucker was the descendent of a long line of landowners. The first of the name of whom anything is known was granted arms, and it is believed estab. by William Tucker, of S. W. England, in the direct line down to the subject of this note were uniformly, both in England and in the American colonies and states, country gentlemen and cultivators of the soil. Strong rural tastes came to Luther Tucker as an inheritance, and his conception of a happy and well-spent life was a life as much as possible in the open air and devoted to the advancement of agriculture and its allied arts and the amelioration and refinement of the condition of all classes of country residents, from the proprietor to the humblest laborer. It was, therefore, natural that he should be deeply interested in the New York State Agricultural Society, which he found at a low ebb on his coming to Albany, and of which, only a year later, he was the chief reorganizer, getting on foot the long series of annual fairs beginning in 1841 and still continued. He served the society without any compensation or even reimbursement for his own expenses, for eleven years. The society then presented him with a handsome table service of silver, and adopted resolutions (afterwards reenacted at the time of his death) to the effect that the great success of the early fairs, paving the way for the later, was chiefly due to his unremitting exertions. He died at Albany, after a short illness, January 26, 1873.

GILBERT M. TUCKER.

TULIPA. See Tulipa.

TULIPA (originally from Persian loliban, turban; which the inverted flower resembles). Lilidaceae. Tulipa. Plate XLIV. Bulb tunicated, the outer tunic often hairy or woolly on the inner face; stem 3–10 in. high, usually 3–4 ft., rarely 2–3 or 4–6 ft.; linear or broad; fls. erect, rarely nodding, showy; perianth deciduous, campanulate or slightly funnel-shaped; segments distinct, often spotted or blotched at base, without pitted nectar glands; stamens 6, by far the longest, with distinct segments; filaments longer or shorter than anthers, attenuate or filiform; anthers dehiscing laterally; ovary sometimes narrowed at collar, rarely into a distinct style. Six stigmas adnate, fleshy. Differ from Fritillaria in the absence of nectariferous pits and usually erect (never pendulous) fls., and from Erythronium in its erect, broader perianth-segments, erect fls., and usually 5–6–stamens. Native of Oriental countries. Silene? Asia and Europe; genus of greatest grandeur in the Mediterranean countries of Europe. The genus now includes 83 species, only about half of which are in cultivation at present. The latest monograph is Baker, "Cardiocrinia and Tuliaceae," 1899. See Burbridge, Gr. Sept. 22, 1900.
Plate XLV. The Modern Garden Tulip
Cultivation. — The production of large, perfect flowers depends entirely upon a large supply of fibrous roots. Size of bulbs is not nearly so important; a large bulb can often offset a deficiency of roots.

For outdoor cultivation the bulbs should be set in September or October in New York. They should be planted before hard freezing weather comes. The soil should be a sandy loam, well worked to a depth of at least 12 inches, enriched with well-rotted cow manure. Fresh manure of any kind should never be used near bulbs of any sort. On heavier soils Tulips can be successfully raised if extra care is given to insure perfect drainage. Drainage is important in all conditions. The bulbs will never prove satisfactory in low, wet situations, and if there is danger from standing water it is best to raise the beds several inches above the surrounding ground.

Plant the bulbs 4 inches deep (to the bottom of the bulbs) and from 4 to 5 inches apart, depending upon the size of the plants. A handful of sand under each bulb is recommended in soils that do not already possess a preponderance of this material. The addition of sand allows the water to drain away rapidly and at the same time insures the presence of an easily penetrable medium for the young roots. Care should be exercised to place all bulbs at the same depth, as otherwise they will not all bloom at the same time. When the ground begins to freeze, cover the bulbs to a depth of several inches with leaves, dry forest litter or other light matter. After frost is past the leaves may be removed, but the beds should be uncovered, and if the work of preparation and planting has been well done the Tulips will require little or no further care. In England many of the beds of choice nest of delicate varieties of Tulips are protected when in flower from heavy rains and frosts, by means of light cloth screens, and are thus kept in good condition for some time.

For pot culture, a mixture of fine garden loam, two parts of well-rotted manure (one manure composted for two years is best), mixed with enough clean sand to make the mass easily friable, is most suitable. If no loam is obtainable and a heavier-garden soil must be used, one part of the latter will be sufficient, in which case the addition of an equal proportion of leaf-mold will be advantageous. From 3 to 5 bulbs, according to size, to a 5-inch pot are effective. Fill the pots lightly and press the bulbs down into the soil, thus bringing the base in close contact with the soil particles. Cover the bulbs with the tip and press the soil firmly all around. Water once freely and cover the pots entirely with soil, leaves or litter, so that they will be out of reach of freezing air. Place in a dark, cool, frost-free or room until the bulbs have become well rooted, which under ordinary conditions will require five or six weeks. When the pots have become well filled with roots, the number of which are readily seen through the glass, it is a simple task to take the bulbs out and place them directly in the garden house. For the first few days at least the temperature should be moderate and even, and the atmosphere not too dry. Water freely but not to excess. Some of the varieties—especially the white thin-petaled ones—are said to resent over-watering very quickly. If raised in living rooms greater care is necessary, as the atmosphere of a living room is drier than that of a greenhouse. On cold nights the plants should be removed from exposed places where they are liable to freeze, and when the flowers appear they should not be allowed to stand in the direct rays of the sun shining through a window. Many of the handsomest flowers are thus easily burned and wilted. Practically all of the early single varieties are adapted to pot culture, especially the Duc van Thols when well rooted; otherwise they are extremely unsatisfactory. For a succession, pot every week or every other week from September to December; or pot early and bring into the house at fortnightly intervals. In potting avoid coating soil beneath the bulbs.

Many of the early single varieties are adapted to wall culture for this purpose. For this purpose ordinary glasshouses are well adapted. If the outer windows are left open, the flowers are sometimes not of the best, but are always early. Secure glass and select only well-formed, solid, perfect bulbs of fair size. Use rain water, and put in a little charcoal to keep it pure. The bulbs must be placed so that they are just in contact with the water but not immersed in it. Place them in the dark for 10 days or a fortnight until the bulbs have become well rooted, then give them plenty of light and air. Avoid gaslight as much as possible, and in cold weather protect them from freezing.

Propagation. — Tulips may be increased by the side offsets, but these are not as constant as new bulbs produced within the outer tunicies by means of cutting the old bulbs. Fig. 2392 shows a section of a bulb with new inner bulb and outer offset in place. The new bulb is completely inclosed in a sac which afterwards becomes the outer dry, membranous tunic. The cubebesence, if any, may be found on the inside of this sac even in the earliest stages of growth. The new bulb is attached to the base of the flower-stem immediately after blooming, from which the former proceeds directly upward. Each new bulb-tunic (including the outer sac) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 2392 shows the separated leafy bulb-scales, and likewise gives the homology of tunics and leaves. Sports among the offsets are at present mainly dependent upon the production of new varieties. These have been found susceptible to the "breaking" process, though perhaps slower to respond than the seedlings. Seed production is now practiced only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is very likely a probability of the near future.

The Original Tulip. — The origin of the garden Tulip seems to be lost beyond recovery. It is often said that our garden Tulips are derived from Tulipa Greuteriana, but this is an explanation which does not explain. It merely means that in 1733, the year which is usually arbitrarily taken as the beginning of systematic botany, Linnaeus grouped all the garden Tulips he knew under the name of Tulipa Greuteriana. But the Tulips of that day had been cultivated for two centuries by Europeans, and previously for an indefinite period by the Turks, from whom, of course, we have no exact records. Fig. 2393. One might study wild Tulips in their native places and compare them with descriptions without being certain of the original form which the Turks brought from the wild, simply because of the lack of records at the beginning. It is certain we have some scientific name for the garden Tulips. The one that dares say is that the garden Tulips are chiefly referable to T. Greuteriana and T. snerceolus, with the distinct understanding that these names do not represent an original wild stock.

Tulipa snerceolus requires explanation. This name, which dates from 1795, stands for a kind of Tulip discovered growing wild in southern Europe long before that date. There is no proof that it was native; the probability is that it had escaped from gardens and ran wild. In 1799, it was distinguished from the other Tulips then known by the fragrance of the flowers, the earliness of bloom, slightly greater size and pubescent scape. From the early records it appears that there were fragrant, early-blooming flowers among the first Tulips received
from Turkey. This is one of the main reasons for believing that \textit{T. suaveolens} is not native to southern Europe. At all events it is clear that \textit{T. suaveolens} has played an important part in the evolution of the garden Tulip, the Duc van Thol class being generally credited to this source. The distinctions between \textit{T. suaveolens} and \textit{T. Gesneriana} given below are those of Baker, but they do not hold at the present day. It is impossible to refer any given variety with satisfaction to either type. Some writers have said that the leaves of \textit{T. suaveolens} are shorter and broader than those of \textit{T. Gesneriana}. This character also fails. All grades of pubescence are present. Some pubescent plants have long leaves and colorless flowers. Others have short, glabrous leaves and fragrant flowers.

For practical purposes it may be said that most of the common garden Tulips, at least the late-flowering ones, are \textit{T. Gesneriana}, while many of the early-flowering kinds, e.g., the Duc van Thol class, are supposed to be derived from \textit{T. suaveolens}. It is impossible to press much nearer the truth, as botany is not an exact science and the prototypes of the old garden favorites cannot be known completely and precisely.

\textit{Early History. — The first Tulip seeds planted by Europeans were sent or brought to Vienna in 1534 by Busbequius, the Austrian ambassador before the Sultan of Turkey. Busbequius reported that he first saw the flowers in a garden near Constantinople, and that he had to pay dearly for them. After the introduction of seed to Vienna the Tulip became rapidly disseminated throughout Europe, both by home-grown seed and by new importations from Turkey. In 1559 Gesner first saw the flower at Augsburg, and it is mainly upon his descriptions and pictures that the species \textit{T. Gesneriana} was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated Tulips on a rather large scale. Fig. 2593. He did not introduce the Tulip into Holland, but the appearance of his specimens in 1591 did much to stimulate the interest in the flower in that country. The best of Clusius' plants were stolen from him, as the admirers of the Tulip were unwilling to pay the high prices demanded. After this theft the propagation of the Tulip proceeded rapidly in Holland and the flower soon became a great favorite. The production of new varieties became a craze throughout the Netherlands, and the center of the bulb-growing industry was shifted to the province of Holland, and production of new varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the Tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected. In the meantime many new plants from America. For a while the Tulip was considered more or less of a poor man's flower, though it has at no time been without many staunch admirers among the upper classes.

With the Turks the narrow acuminate flower-segments were in favor, while western taste preferred the rounded petals. (Fig. 2555). The Turks seem to have been satisfied with a preponderance of the reds and yellows, for in the first sowings of Turkish seeds the majority of the resulting blooms were of those colors. It thus came about that the colored were considered common and undesirable in the European gardens and all effort was directed to the production of the rarer white-grounded varieties with finely and distinctly marked leaves, those with a sharp bright red being the favorites. Indisputable evidence of this is seen in the old Holland "still-life" paintings of that time, where one finds none but the rarer forms represented. (Solms-Laubach). All the early Tulips of direct Turkish origin had acute more or less narrow and reflexed segments. Indeed, among all the old engravings, including those of Pena and Lobel, 1579, Clusius, 1576, Do- docens, 1578, Besler, 1613, no round-petaled forms are found. Besler's work, "Hortus Eystettensis," contains minute diagrams and copper plates, the first in any book on plants. In some copies the plates are beautifully colored by hand. The 53 figures of Tulips in this grand work show how widely diversified was this flower even at that early date. In this and in Parkinson's "Paradisus Terrestris," 1629, many are figured with inner segments rounded and outer acute, but none vice versa (so far as could be seen), though that form is mentioned in the descriptions. The broad, rounded, erect-petaled forms were developed later, apparently first by the Dutch growers previous to and during the tulipomania, and produced wholly by selection. This ideal has prevailed down to the present time, for the narrow-petaled varieties are practically unknown among our florists, so much so that the extreme typical one has been referred to a separate species (\textit{T. acuminata}, Fig. 2602). In the Dutch fields they are now known as "thieves," and are destroyed as soon as they make their appearance. Parrot Tulips became known towards the end of the seventeenth century. They were oftentimes considered
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to be monstrousities, and were pictured as such. According to Solms-Laubach, no traces of them are to be found in the old Dutch books. They were evidently developed by the French, who did not disdain the yellow and red forms, to which these belong, to such an extent as did the Hollanders. At one time they were made a separate species, T. Turcica, and later said to be hybrids, by one author, between T. acuminata and sylvestris (E. S. Rand, Jr.) by another between T. Greuteriana and sylvatica (Mrs. Loudon, 1841). That the Parrot Tulips are hybrids is perhaps true, but to state with certainty the parents seems impossible, for as early as 1613, among the figures in Hortus Eystettensis, there is one which shows laciniation of the petals to a marked degree; sufficiently so, in fact, to be the original form from which this strain could be developed. Besides, many of our garden varieties of to-day exhibit more or less laciniation, so that it is probable that "Parrot" strains might be developed from them by simple selection.

Double Tulips seem to have made their appearance at an early date. In Hortus Eystettensis (1613), there are four forms figured, one of which, at least, seems to have been almost wholly made up of bracts, as it is shown entirely green and is described as being "wholly herbaceous and green." The other three there figured are: one red, one yellow, and the other white with maroon borders. Solms-Laubach places the advent of double Tulips at a much later date, 1665, and gives as the first authentic record the account of "Tulipa hirta caulis filo, a monstre jaune double." Flowers with as many as 200 petals are mentioned. A double form of "T. sylvestris" was known in 1701, and at the beginning of the nineteenth century a double form of T. sylvestris was described.

ARNOLD V. STUBENRAUCH.

TULIP BULB CULTURE IN AMERICA.—From a commercial point of view the Tulip in this country has received but little consideration, which is due to the fact that its cultivation has not been considered of sufficient financial importance to warrant the undertaking, and also to the very general opinion that the industry could not be made profitable excepting in Holland and by the Dutch. There is a common notion that Dutch soil alone is adapted to the perfect development of the bulb, and that there is some secret process possessed by the Dutch farmers that they will not under any circumstances reveal. Nevertheless some of our early horticulturists and florists showed conclusively that the Tulip bulbs could be grown in America even better than in Holland.

The late David Thomas, of Greatfield, near Aurora, Cayuga county, N.Y., grew from seed some of the finest Tulips, both as regards size, colors and markings, even shown in this or any other country at that early date. It was near sixty years ago. The writer remembers well seeing them on exhibition at the Aurora Horticultural Society and the favor with which they were received by as critical and intelligent an audience as ever gathered around an exhibition table.

The late Isaac Buchanan propagated the Tulip very successfully from offsets at his nursery in Astoria, L.I., at about the same period, and exhibited the flowers at the first spring exhibition of the first New York Horticultural Society, carrying off the highest honors. Recent attempts in cultivating the Tulip in various parts of the country, particularly in the West, as an industry, have been quite successful, and the work only needs to be taken up systematically and energetically to insure success. (See Washington.)

The Tulip is not at all particular as regards soil. It will thrive in either sand or clay, but grows profusely grown only on a light sandy soil, as in such the bulbs increase more rapidly and are larger and more attractive in appearance, the skin being of a lovely red dish brown, while those grown in a heavy soil are smaller and of a dirty brown color. Nearly all the soil on the Atlantic coast from Maine to Florida is admirably adapted to Tulip cultivation, as is much of the upland soil from Virginia southward, the light sand being almost identical with that of Holland, where the Tulip is almost exclusively grown.

While the Tulip loves moisture, perfect drainage is requisite to success. The best results are obtained when the soil has been made very rich for a previous crop; it matters but little what,—some root crop being preferable. The best manure is that from the cow-stall, which must be thoroughly rotted and evenly incorporated in the soil. Even though the soil be light and fine, it must be thoroughly worked before the bulbs are planted, which should be by the 15th of September. Plant the bulbs 4 inches below the surface in beds 4 feet in width, the rows 6 inches apart and the larger or stock bulbs 6 inches apart in the rows. For propagation the largest and finest bulbs are always used, and selected by the dealers before filling orders.

The sets can be planted 2 inches apart in the rows, the space to be increased according to the size of the bulb. Upon the approach of winter the beds should be given a light mulch to prevent the ground freezing below the bulb. Not that the Tulip will not endure as much frost as any hardy perennial—for it will—but nearly all bulbs make certain preparations for surviving flowers in winter, and when the soil around them is hard frozen this preparation cannot go on; consequently when growth starts in early spring it will be premature and feeble, and the result will be inferior flowers and a smaller increase.

Upon the approach of spring remove the mulch; this is all the work that will be required, other than to keep the surface of the soil frequently stirred and to take to keep down the weeds and prevent evaporation until the flowers appear. The beginning of bloom is the
all-important and critical period of the season’s work, when the florist’s *arcaeten* must be practiced but not revealed. The great secret in Tulip propagation is now open to the world, though not popularly understood. Propagation is effected by offsets, from the fact that varieties will not reproduce themselves from seed. The seed produces only “selfs” or Mother Tubips, which only break into variegated forms at long and uncertain periods. Consequently the flowers must be cut away as soon as they appear; if not, nearly the whole of the plant’s energies would go to the development of the seed—näture’s method of reproduction—and the bulbs produced would be small and with but few or no offsets. From nature’s standpoint the bulb is of consequence as a means of reproduction or perpetuation of the species only in case of failure of seed production.

By cutting the flower-stems as soon as the flowers are sufficiently developed to show, there is no mistake as to variety, and the plant’s energies are wholly directed to reproduction by offsets which, from large bulbs, are freely produced. There is a great difference in varieties in this respect. The increase is not far from tenfold annually; that is, the parent bulb will produce that number of offsets, which must be grown at least three years before they can be sold as first class.

By the cutting of the flower-stems the plant’s period of development is materially shortened. The bulbs will mature at least four weeks earlier than the seeds would if permitted to mature. On Long Island the bulbs can be safely taken up and dried off within two weeks from the time the stems are cut. When the flowers are cut it will not do to leave them on the bed; they must be carried to some place where bulbs are not to be grown. If left upon the beds they will, as the Dutch say, “make the soil sick,” and sound, healthy bulbs cannot again be produced on it until after a succession of grain and grasses. Tulips must not be returned to the same soil annually, a rotation of at least two other crops being necessary to the production of sound, vigorous bulbs. A hundred thousand salable bulbs can be grown on a single acre. They require three years from the sets. The first year double that number can be grown. The average yield or output will be 66,000 bulbs to the acre.

In this country where land admirably adapted to the cultivation of Tulip bulbs can be had at not more than fifty dollars per acre, in comparison with land in Holland worth $5,000 per acre, the industry could be made a profitable one.

C. L. Allen.
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GROUP II. Outer bulb-tunic with a few appressed hairs inside towards the top.

A. Stem pubescent.
B. Lvs. blotched with linear chestnut-brown spots; filaments not bearded at base. 3. Greigii
BB. Lvs. not blotched; filaments bearded at base. 4. Eichleri
AA. Stem glabrous (T. Kolpakowskiana sometimes obscurely pubescent).
B. Lvs. ovate or broadly lanceolate.
cc. Filaments bearded at base. 5. Kolpakowskiana
6. pulchella
7. violacea
cc. Filaments not bearded. 8. carinata
9. vitellina
BB. Lvs. linear or linear-lanceolate.
cc. Filaments bearded at base. 10. sylvestris
cc. Filaments not bearded. 11. Ostrowskiana
12. Sprengeri

3. Greigii, Regel. Height 2-8 in.; lvs. usually 4, obscurely downy, much undulate toward cartilaginous border; perianth campanulate, 5-3/4 in. long, 3 in. across, spreading abruptly from about the middle, bright crimson with a large dark basal blotch, margined with yellow; segments uniform, obvoid, cuspidate or emarginate; stamens yellow; filaments black, glabrous; ovary narrowed at collar; stigma yellow, twice as broad as neck of ovary, reflexed. Turkestán. B.M. 6177. F.S. 21:2261. P. 1876:217. — Early-blooming.

4. Eichleri, Regel. Height 6 in.; lvs. 12-15 in. long, lanceolate acuminate, margins plane and smooth; perianth broadly campanulate, 2-3/4-3 3/4 in. across, deep scarlet with a broad, cuneate, dark violet-blue basal blotch margined with yellow; segments rounded at top with a mucro; anthers violet-brown of old fashioned Tulips which have been preserved from oblivion in the gardens of the poor. Attempts have been made recently to restore them to popular favor. Well worth attention.

5. Kolpakowskiana, Regel. Height 12 in.; lvs. 3-4, obscurely ciliate on margin; bud nodding; perianth campanulate, 2-2 1/2 in. long, 1 3/4 in. across, faintly scented, varying from bright scarlet to bright yellow, typically red with a faint yellow-black blotch at base; segments oblong, acute, the outer spreading away from the inner as the flower expands; authors dark purple: ovary large, stout: stigma large, crisped. Turkestán and Central Asia. 1877. B.M. 6170. Gn. 69, p. 182. — A near ally of T. Gesneriana, which it bids fair to rival in beauty and variability under cultivation.

6. pulchella, Fenzl. Height 4 in.; lvs. 2-3, crowded and spreading close to the surface of the ground, channelled, obscurely ciliate on edges; perianth funnelform, erect. 1-1 1/2 in. long, 2 1/4 in. across, bright mauve-red above, passing downward into a slaty lilac without any dark-colored blotch, but bright yellow at base; segments all acute, densely pilose at base; filaments linear; ovary clavate; stigmas less than ovary-diameter. Alpine region of Cáucaso Taurus, 1877. B.M. 6094. — A dwarf species near to T. Hageri.

7. violacea, Boies. & Buhe. Less than 12 in. high; lvs. 3-5, crowded; perianth campanulate with a contracted base, 1 1/4 in. long, 2 in. wide, fragrant, typically bright mauve-red or rose crimson flushed with purple, varying to white with a slight flush of red outside, with a large brown or black basal blotch, usually bordered with white; segments uniformly oblong, subacute; stamens black or purple; stigma small. Persia. Int. to cult. 1890. B.N. 7440. G.M. 39:390. — Allied to T. Hageri and pulchella.

8. carinata, Hort. Krelage. Lvs. 3, not crowded, as long as fl.-stalk, slightly undulate, slightly ciliate on edge near base; perianth open-campanulate, 3 in. long, dark scarlet, tinged with green just above and blending into a bright yellow basal blotch; segments acute, cuspidate; stamens yellow; ovary prismatic; stigmas white, not undulated. Habitat unknown. Vars. rubra and violacea, Hort., are offered.

9. vitellina, Hort. Lvs. 4, not crowded, as long as fl.-stalk, not undulated, thinly ciliate on edge: peduncle slightly tinged with red near fl.; perianth campanulate, 2 in. long, sulfur-yellow, no basal blotch; inner segments rounded, outer acute; filaments yellowish white; stigmas not undulated. — Said to be "hybrids between T. satureolens and T. Gesneriana." It is one of the "Cottage Garden" Tulips, a class of old-fashioned Tulips which have been preserved from oblivion in the gardens of the poor. Attempts have been made recently to restore them to popular favor. Well worth attention.

10. sylvestris, Linn. Fig. 2631. Height 9-15 in.; lvs. usually 3, at base of scape, channelled, linear-lorate; peduncle sometimes 2-fl., in cultivation: bud nodding; perianth funnelform-campanulate, 1 1/4-2 in. long, yellow; segments all acute, inner narrower: ovary bladder-form (narrowed at collar); stigmas smaller than ovary-diameter, yellow. Said to be native in England and widely so in Europe. — In cultivation as T. Florentina and T. Florentina, var. odorata.

11. Ostrowskiana, Regel. Height 12 in.; lvs. 3, flat, ciliate on edge; perianth open-campanulate, 2-3 in. across, non-olorous, scarlet with small brown basal spot, margined with yellow at top; segments tapering at base and top; filaments dark wine-red: ovary prismatic, white striped with green, red near top: stigmas equal to ovary-diameter. Introduced from Turkestán in 1885. B.M. 6956. Gn. 45:965. — Allied to T. Occulta-solis.

12. Sprengeri, Baker. Height 10-18 in.; lvs. 4, close together, long, linear-lanceolate, stiff; peduncle wiry, tinged with deep red under fl.; perianth open-campanulate (star-shaped), 2 in. long, bright scarlet with a somewhat dull brown basal blotch margined all around with dull orange-yellow, all blending into one another;
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GROUP III. Outer bulb-tunic with scattering appressed hairs all over inside.
A. Stem pubescent (T. maculata) finely so and sometimes glabrous.
B. Perianth usually bright red with a yellow basal blotch...13. elegans
BB. Perianth orange-scarlet or red, with a dark brown, purpulish or bluish black basal blotch.14. maculata
AA. Stem glabrous.
B. Lower lvs. lorate or linear-lanceolate. ...........15. Kesseleringi
BB. Lower lvs. lanceolate or broadly so
C. Filaments bearded at base...16. saxatilis
CC. Filaments not bearded.
D. The perianth segments all rounded at top ............17. Korolkowi
DD. The perianth segments all acute at top ............18. Kaufmanniana
DDD. The inner perianth segments rounded: outer acute at top ..........19. Billietiana
20. Didieri

13. elegans, Hort. Height 12-18 in.: lvs. 3-4, below middle of stem, lorate lanceolate, finely ciliate upon upper face; perianth campanulate, 3-3½ in. long; segments uniform, narrowed gradually to a very acute point; anthers violet; filaments glabrous; stigmas larger than ovary-diameter, yellowish.—Known in gardens only. Krelage catalogues a variety as "Cottage elegans picta," which has larger lvs. and white flowers edged with rose, and without basal blotch. "I probably a hybrid between T. acuminata and sauvolens."

14. maculata, Hort. Height 12-18 in.: lvs. 3-4, lorate-lanceolate; perianth campanulate, 2-2½ in. long; segments obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small.—"A well-marked garden race" (Baker).

15. Kesseleringi, Regel. Lvs. 4-5, crowded at base of stem, lorate-lanceolate, channelled; peduncle sometimes obscurely puberulent; perianth campanulate, 1½-2 in. long, bright yellow, flushed with red and green outside; inner segments subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diameter. Turkistan, B.M. 6654.

16. saxatilis, Sieber. Height 12 in. or more: stem usually branched low down and bearing 2 lbs.: lvs.

usually 3, sometimes lowest 12 in. long; perianth oblong, funnel-form, 2-2½ in. long, light mauve-purple, at base bright yellow; segments crenate at base, inner obovate, outer oblong; anthers blackish; filaments bright yellow: ovary prismatic: stigmas small. Crete, 1878. B.M. 6257. Gr. 50:1324.

17. Korolkowi, Regel. Height 6 in. in: lvs. 2-3, falcate, margin crisped; perianth campanulate, red, with a distinct black basal blotch; inner segments oblong, outer obovate; filaments lanceolate; stigmas small. Turkestan, 1837.

18. Kaufmanniana, Regel. Less than 12 in. high, lvs. 2-3; perianth subcampanulate, 2-3 in. long, ½-¾ in. across, bright yellow in original form, tinged with red outside, without basal blotch; in cultivation very variable in color and nearly always with a deep yellow basal blotch; anthers bright orange, linear; filaments bright orange, linear, flattened: ovary pyramidal: stigmas small in cultivated form, but described as large. Turkestan, 1877. B.M. 6687.

19. Billietiana, Jord. & Four. Lvs. 3-4, undulate, not ciliate on edge; perianth open-campanulate, 2 in. long, 3½ in. across, inodorous, bright yellow, flushed with scarlet-pink, especially outside, with obscure basal blotch striated with blue-black lines; anthers dark grey or blackish; filaments yellow, with distinct striaions; ovary narrowed at collar: stigmas light yellow, very large and crisped. Savoy, Italy. B.M. 7253. G.M. 38:311.—One of the late Tulips.

20. Didieri, Jord. Height 12-18 in.: lvs. 3-4, undulate, acuminate: perianth campanulate, 2-2½ in. long, 4½ in. across, bright purple, with a yellow basal blotch; stamens same color as basal blotch; ovary narrowed at collar: stigmas larger than collar-diameter, white. Savoy, Italy and Alps. B.M. 6639.—Var. Mauriniana, Jord. Lvs. narrower, slightly undulate; perianth brilliant red, with wide yellow blotch. Var. planifolia, Jord. Stem slender; lvs. narrow, not undulated; perianth deep red, faintly marked with yellowish red or blackish blotch. Var. acutilobiiflora, DC. A cultivated form with peduncle 9 in. long; lvs. oblong-lanceolate. Var. Alba, Krelage. Peduncle stiff, mottled with red: perianth light lemon-yellow, or white tinged green outside, basal blotch limited to a few dark striaions; filaments same color as flower. Var. lutescens, Krelage. Lvs. 3, slightly falcate; perianth light yellowish white streaked with red, with a bluish violet, dark basal blotch; filaments colored like spot.

GROUP IV. Outer bulb-tunic pubescent inside, densely so at apex.
A. Perianth segments very linear, long and acuminate..................21. acuminata
AA. Perianth segments oblong, all uniform and acuminate...........22. retrofitexa
AAA. Perianth segments all narrowly oblong; inner acute, outer rounded at top ..................23. Dammanni

21. acuminata, Vahl. Figs. 2602, 2603. Height 12-18 in.: lvs. 4, lowest lanceolate, all undulated at margins: peduncle shining: perianth very open, light yellow splothened with red lines; segments sometimes ½ in. long, less than ⅓ in. wide, with edges rolled in; stamens yellow; filaments pink, flushed, glabrous: ovary prismatic: stigmas very large, yellow, not undulated. Turkey (1).

22. retrofitexa, Hort. Lvs. long-lanceolate, sometimes linear-lanceolate, slightly ciliolate on edge, otherwise glabrous; peduncle shining; noding; perianth open funneliform-campanulate, yellow, a shade darker at base—a trace of a very obscure basal blotch; segments uniform in width, linear-lanceolate acuminata, twisted with undulated edges; stamens yellow; filaments flattened, glabrous.—A supposed garden hybrid between T. Gesneriana and acuminata.

23. Dammanni, Regel. Height 6 in.: lvs. 4, placed whorl-like at middle of stem, linear-lanceolate, recurved, obscurely bristly, ciliate-margined glabrous; peduncle glabrous; perianth spreading, star-shaped, purplish or reddish with an oblong-lanceolate black
blotch without yellow border; segments narrowly oblong; filaments filiform, glabrous; stigmas broader than ovary-diameter. Mt. Lebanon, 1889. Gt. 38:1300.

—Allied to T. linifolia and Maximowiczii.

GROUP V. Outer bulb-tunic pilose inside.

A. Lower lvs. lanceolate, 21. perianth in stem; stigmas 34. 1873.

B. Lvs. slightly or not at all undulated .......... 23. Armena

BB. Lvs. very much undulated .......... 25. platystigma

AA. Lower lvs. linear .......... 26. Maximowiczii

24 Armena, Boiss. Lvs. 5, crowded at base of stem, falcate, glaucous and glabrous, slightly undulated, long, longer than fl. stalk; peduncle glabrous, finely dotted, perianth open campanulate, slightly sweet-scented, 2 in. long, dark scarlet with black basal blotch margined all around with yellow; inner segments rounded, outer acute; anthers purple; filaments flattened, black, not bearded. —This species is referred by Baker without hesitation to T. Georgii, but the plants in the trade as T. Armena differ as indicated above.

25. platystigma, Jord. Height 18 in.; stem slender, glabrous; lvs. 3-4, very much undulated; peduncle glabrous; perianth campanulate, 2 in. long, violet-scented, magenta-red; segments obvate-oblong; claw blue tinted with a yellow spot in the middle; filaments not bearded; anthers violet-colored; ovary prismatic; stigmas very large and undulated. France.


GROUP VI. Outer bulb-tunic woolly at apex inside.

A. Filaments bearded at base .......... 27. Lownei

AA. Filaments not bearded.

B. Perianth crimson or scarlet, with a distinct basal blotch .......... 28. linifolia

BB. Perianth yellow, without basal blotch. 30. Batalini

27. Lownei, Baker. Height 2-4 in.; stem glabrous, sometimes 2-headed; lvs. 2, lanceolate, acuminate, falcate, glabrous; peduncle slender, glabrous; bud slightly nodding; perianth funnelform, small, while with a bright yellow basal blotch, tinged outside with light purple or purplish pink, inner segments wider; stamens yellow; ovary narrowed at collar; stigmas very small. Mts. of Syria and Palestine, 1874.

28. linifolia, Regel. Stem somewhat shining, sometimes 2-headed; lvs. 7, linear and grass-like, spirally arranged, spreading, glabrous; perianth open-campanulate, small, bright scarlet; basal blotch bluish black; inner segments oblong, outer ovate and slightly wider; anthers plumish; pollen gray; filaments bluish black; ovary pyramidal; stigmas very small, yellowish white. Bokhara.

29. montana, Lindl. Height 4-8 in.; lower lvs. oblong-lanceolate, acuminate, undulated, very glaucous; peduncle glabrous; perianth campanulate, 1½-2½ in. long, 2 in. across, deep crimson, paler outside; segments ovate or oblong, flat, acute, the inner often obovate obtuse; filaments purplish; ovary prismatic; stigmas small. Mts. of Persia. B.R. 13:1106. —Var. Júlia, K. Koch. Dwarf, from Caucasus. Not more than 3-4 in.

tall; fls. bright red, 1 in. or less long; all 6 segments obovate and obtuse.

30. Batalini, Regel. Height 5 in.; stem glabrous; lvs. 5, crowded into a sort of whorl just below middle of stem, linear-lanceolate, glabrous, slightly undulated; perianth campanulate, slightly funnelform; segments oblong-ovate, obtuse, sometimes deeply incised on the edge near the top; filaments linear, terete, yellow; ovary elliptic-oblung, compressed, trigonous; stigmas coroniform. Eastern Bokhara, 1889. Gt. 38:1307. G.C. III. 19:759. —One of the early Tulips.

2661. Tulipa sylvestris, known also as T. Florentina, var. odorata (×14).

2662. One of the acuminate-petaled forms — the old Turkish-garden ideal (×1½). No. 21.

GROUP VII. Outer bulb-tunic everywhere woolly inside.

A. Filaments bearded at base. 31. biflora

B. The filaments flattened. 32. Celsiusiana

AA. Filaments not bearded.

B. Perianth bright yellow, with obscure basal blotch or none. 33. Biebersteiniana

BB. Perianth bright scarlet, with a distinct black or purplish basal blotch margined with yellow. 34. Ouloul-solis

35. praecox

BB. Perianth with outer segments rich, bright purple or purplish red broadly margined with white; inner segments yellowish white. 36. Leichtlini
31. *Tulipa*, Linn. Height 3-6 in.; stem glabrous or slightly pilose, usually 2- or 3-fl., rarely 4- or 5-fl.; lvs. often 2, sometimes 3, linear, long: perianth funnelform-campanulate, 1 in. long; 2 in. across, pale yellow or white inside, tinged with green or red or even purplish outside; segments acute; filaments flattened, ciliated at base; ovary narrowed at collar; stigmas small. Mts. of Central Siberia and the Caucasus. B.R. 7:235. L.M. 451.

32. *Clusiana*, Vent. Height 12-18 in.; stem slender, glabrous; lvs. 4-5, very long and narrow and folded double, linear-acuminate, pendent; pedunele slender, tinged with brown directly under fl.: perianth small, when open 2 in. across, funnelform-campanulate, very fragrant, bright lemon-yellow tinged with green outside, or white flushed with red; segments acute; claw hisurate on edge; stamens yellow; filaments cylindric, dense, bearded at base; ovary pyramidal: stigmas small, tinged with red. Portugal, through Mediterranean region to Greece and Persia. B.M. 1390.

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**2693. Tulipa acuminata** (×3/4).

33. *Biebersteiniana*, Schult. f. Height 6 in.; stem slender, glabrous; lvs. 2-4, crowded together, long, channelled, glabrous, slightly ciliated on edge; bud slightly nodding; perianth open-campanulate, 2 1/2 in. long, bright yellow tinged with scarlet-pink on edges and sometimes green outside; at base a brownish yellow discoloration; inner segments obtuse, outer acute; anthers gray; pollen yellow; filaments yellow; ovary prismatic: stigmas yellow, undulated. Asia Minor.

34. *Oculus-solis*, St. Aman. Height, 12-18 in.; stem slender, glabrous: lvs. 3-4, lorate-lanceolate, acute, glabrous: perianth funnelform-campanulate, 2 1/2-3 in. long, 4 1/2 in. across, scentless, erect; segments very acute, the inner ones often less so; anthers yellow; filaments purple: ovary prismatic. South of France, Italy and Switzerland. B.R. 5:380 (as *T. Gesneriana*).


35. *praecox*, Tenore. Height, 12-18 in.; stem slender, glabrous; lvs. 3-5, lorate-lanceolate, acute, undulated at margin: perianth campanulate, 2-3 in. long; 3 in. across, erect, scentless: basal blotch purplish black, margined with yellow; segments widely imbricated, outer slightly longer, acute, puberulent at apex; inner shorter, obtuse and cuspulate; anthers yellow; filaments long, dark purple, glabrous: ovary prismatic: stigmas pubescent, reddish. Italy and Southern France; also Algeria, Greece, Syria, Palestine and Persia. Very closely allied to last, and figured as such in B.R. 3:264; 14:1145; 17:1419.—One of the oldest known species.


**GROUP VIII.** Outer bulb-tunic always hairy at base inside around root crown, and usually furnished with a few scurfy hairs above, but sometimes without them.

A. Stem and lvs. pubescent...........37. suaveolens

B. Stem and lvs. glabrous.

b. Leafy only at base of stem.

C. Perianth uniformly dark scarlet with a bright yellow basal blotch........38. australis

cc. Perianth linear or lanceolate........39. viridiflora

b. Leafy to middle of stem or above.

C. Perianth uniformly dark scarlet with a bright yellow basal blotch........40. fulgens

cc. Perianth variable, but rarely with a bordered dark red basal blotch........41. macrospella

37. *suaveolens*, Roth. Eearly Garden Tulips. Height 3-6 in.; lvs. 3-4, mostly at base of stem, lowest lorate-lanceolate and broad; perianth campanulate, 1 1/2 in. long, erect, fragrant, bright red or yellow or variegated; segments all acute; filaments glabrous; anthers yellow: ovary prismatie: stigmas very large. Southern Russia and Southern Europe, but possibly only a naturalized form of old introduced Turkish garden varieties. F.S. 12:1223. B.M. 839.


39. *viridiflora*, Hort. (?). Outer bulb tunic glabrous except around root-crown, where there is a dense fringe: stem glabrous and glaucous: lvs. lorate-lanceolate, undulated, glabrous, glaucous, edges slightly ellipwise near base; 1 ft. large, soft globe, with yellow or white. Gn. 32:625.—Garden form. Bears some resemblance to a Parrot Tulip.


41. *macrospella*, Baker. A supposed hybrid of unknown origin: height 10-18 in.; lvs. 3-4, long and narrow, lowest long-lanceolate, flat, pendent: pedunele wiry: perianth campanulate, slightly funnelform, emitting a heavy, sweetish, unpleasant odor, bright crimson to cerise or cherry red, with a distinct, nearly black cuneate basal blotch broadly margined with yellow or yellowish white at top: segments obtuse or outer sometimes acute, outer reflexed, inner erect: filaments dilated, white at base, black, violet or striated above, glabrous: ovary prismatic, creamy white: stigmas same color, large, slightly undulated.

42. *Gesneriâna*, Linn. Common Garden or Late Tulips. Figs. 2294-2300. Height 6-24 in.; stem erect; lvs. 3-4 or more, lower lorate-lanceolate or ovate-lanceolate, often undulated, glaucous, pubescence variable: peduncle erect: perianth campanulate, 1-2 1/2 in. long, in- oderous, bright red or varicolored, when bright red, with only an obscure basal blotch, which is usually yellow, but may be dark or even blackish or mixed, sometimes white; segments all oborate-oblong, obtuse, broadly rounded at apex, often with a small cusp in the
Plate XLVI. Flat Turnips and Rutabagas

The Turnips (Brassica Rapa) are the two tubers showing in front and on the left. The Rutabagas (Brassica campestris) are the three top-shaped tubers, with many roots.
TULIPA

center: filaments glabrous, flattened: ovary prismatic: stigmas large and usually crisped. Origin uncertain. Introduced from the Turkish gardens in 1554. Long since hybridized and cultivated out of all semblance to any wild forms. Supposed original form (Baker) in B.M. 6149 (as T. Schrenkii). Darwin tulips (Fig. 2397) are a recent strain of long-stemmed, late, self-colored tulips.

2604. Tunica Saxifrages. Flower about natural size.

Var. Dracantia, Baker (Fig. 2599). Parrot Tulip. Similar in habit; perianth usually yellow and red striped and splotched; segments deeply cleft and lacinately dentate. F.S. 21: 2211 (as T. Turkica).

Var. spatulata (T. spatulata, Bertol.). This differs from the type in its larger fls. of a brilliant red color, with a large purplish black blotch at the base of each of the segments. Italy. Probably the largest of the wild Tulips. Catalogued by many bulb growers as "T. G. vera."

Var. Strangewaysiana, Rebouli. Very large, brilliant, dark scarlet flowers, with a handsome dark basal blotch. One of the naturalized Tulips found without disposition to vary in fields near Florence, Italy. F. 1850: 65.

Var. albocarnea, Kregae. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a distinct white basal blotch; inner segments obtuse, outer acute; filaments white.

T. flavo, Hort., Kregae, is "often confused with vitellina in gardens, though perfectly distinct. Flava is yellow, very robust, tall, and at least a fortnight later in blooming. Vitellina is almost white when old." Imperfectly known. T. lanata, Regel. Dwarf: fls. large, gullet-shaped, rich vermilion, with a large black spot at the base of each of the segments. Imperfectly known. T. Persica, Wild., is a synonym of T. patens, Agardh, a Siberian species not known to the trade. It has fls. about 3 in. across, greenish outside, whitish inside, with a yellow eye. The outer segments are narrower. It is figured in B.M. 3887 as T. tricolor. T. Persica of the trade has been confused by the Dutch with T. Breytniana. Linn., the proper name of which is Barometra Columellaris, Sallab. Barometra is a monotypic genus native to South Africa. There are no true Tulips in South Africa. The only generic distinction between Barometra and Tulipa lies in the dehiscence of the capsule; that of the former is septedal, of the latter loculedial. Barometra is figured in B.M. 567 as Melanthium uniforme. It is a dwarf plant 4-6 in. high with funnel-shaped fls. about 1 in. across, yellow within, tinged with deep brownish red outside. The segments are oblong and subequal. Although a native of the Cape, the plant is supposed to be hardy.

ARNOLD V. STUBBENRAUCH.


TUNA. Opuntia Tuna.

TUNICA (Latin, a tunica or coat, from the imbricated involucres). Cynoglossum officinale. Small slender herbs with linear opposite leaves, with habit of Gypsophila, but botanically more nearly allied to Dianthus. From Dianthus they differ in smallness, the central flower of the cluster not bracteate, the calyx top-shaped or cylindrical rather than short-tubular and 5- or 15-ribbed, the calyx-teeth obtuse; petals 5 and styles 2. There are about 10 species in Southern Europe and in Asia. T. Saxifraga, Scop. (Fig. 2694), apparently the only species in cultivation in this country, is a tufted spreading hardly species suitable for rockwork and blooming in summer and fall (see bottom p. 537). It is a wiry-stemmed perennial, growing 6-10 in. high; fls. small, with rosy white, lila, or pale purple notched petals. A recent novelty is a double-flowered variety. It is more compact and dwarf than the type, and the fls. last longer. Tunicas are propagated by seeds or division. T. Saxifraga has become adventive in some parts of the east.

L. H. B.

TÓPA. See Lobelia.

TÚPELO. See Nyssa.

TURK'S HEAD. Melocactus communis.

TURNIP (Plate XLVI) is a name somewhat loosely applied to two species of vegetables. In this country, and apparently properly, it is applied to vegetables characterized by thick light-fleshy roots that are usually more or less flattened or at least not greatly elongated, with leaves that are hairy and not glaucous. These vegetables belong to the species Brassica Rapa (see page 178). In the term is sometimes included the Swedish Turnip or Rutabaga, a plant that is characterized by having a more uniformly elongated-oval yellow-fleshy tuber with roots springing from its lower portion, a thick elongated leafy neck, and glaucous-blue leaves that are not hairy. This plant, however, is considered to be Brassica campestris. Whether these two species exist separately in wild nature is not positively known, but they appear to be well defined under cultivation. Both species tend to run wild in old fields and to lose their thickened roots. They are then sometimes, though erroneously, known as charlock. The nativity of these species is unknown, but they are almost certainly

2665. Turnip—Brassica

2695. Rutabaga—Brassica campestris.

European or Asian in origin. Characteristic tubers of these two plants are contrasted in Figs. 2665 and 2696. The former is commonly known here as "flat turnip" and the latter as rutabaga or merely "baga." According to Vilmorin, the plant that we know as Rutabaga is known to the French as chou-nave, and in England as Swedish Turnip and turnip-rooted cabbage.
The culture of Turnips and Rutabagas is very similar, except that the Rutabaga requires a longer season in which to grow. The Rutabaga is nearly always grown as a market crop, whereas the Turnip may be sown very late for winter use or very early for late spring or summer use. Usually the flat Turnip is not grown during the hot weather of summer. In the northern states, it is grown from the middle of July to the middle of August for late crop, or on the first approach of spring in order that tubers may be had for the early vegetable market. The late or winter crop is ordinarily used for feeding purposes and for feeding purposes as the early crop is often sold in bunches in the open market, and later by the basket or bushel.

The Turnips and Rutabagas are hardy; that is, the young plants can withstand some frost. They withstand weather plants and demand loose, moist soil. Usually the seeds are sown in drills which stand from 10 to 20 inches apart. In the drills the plants are thinned until they stand from 6 to 10 inches apart, depending on the variety that is to be grown. For general field operations the rows are sometimes placed as far as 30 inches apart, in order to allow horse tillage. Sometimes the late or winter crop is raised from seed sown broadcast, but this method gives good results only when the soil is well supplied with moisture, very thoroughly tilled beforehand and is free from weeds, since subsequent tillage is impossible. The seeds of Turnips and Rutabagas are of similar size, two or three pounds being required and the same amount of manure. When sown in drills one-half or one-third this amount may be sufficient. The yields will sometimes reach 1,000 bushels to the acre, although the average is much less than this.

The Turnip needs no special care as to cultivation. The greatest difficulties are the root maggot, which is the larva of a small fly, and the flea beetle. The maggots may be killed by injecting bisulphide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, this treatment is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea beetles may be kept in check by spraying the plants with Bordeaux mixture, or perhaps better by sprinkling them with Paris green diluted with landplaster (one part by bulk of Paris green to 50 of plaster).

Rutabagas have firmer and richer flesh than the Turnips. They are usually more prized for consumption in winter, and Turnips are usually more popular in the spring and early fall markets. Rutabagas are more sparingly grown for stock feeding. They yield heavily, are rich and succulent and keep well in any ordinary cellar. Rutabagas started in the middle or last of June in the northern states will reach their full growth by October. They are usually not harvested until heavy frosts have come. The roots of Rutabagas and Turnips sometimes persist through the winter, even though they have been solidly frozen, and send up flower stalks in the spring; but unlike salsify and parsnips the roots should not be left in the ground to freeze if they are to be used. L. H. B

| TURNIP, INDIAN. Arisia triphylla. |
| TURNIP-ROOTED CELERY. See Celeriac. |
| TERPENTINE TREE. Syncarpia latilollia. |

**TURPÍNIA** (Pierre J. F. Turpin, a French botanist and author). *Celastrus*. About 8 species of trees or shrubs from the tropical regions of the world, with opposite abruptly pinnate or rarely simple leaves and small white flowers in spreading terminal or axillary panicles. Fls. hermaphrodite, regular; calyx 3-5-lobed, persistent; petals 5, roundish, sessile; stamens 5; ovary sessile, 3-lobed, 3-loculed: fr. subglobose indehiscent.


F. W. BARCLAY

| TURRÉA (Turra, 1607-1688, botanist of Padua, Italy). *Melidaceae*. About 30 widely scattered species of tropical trees and shrubs with alternate, stalked, entire or lobed lvs. and long white fls. in axillary clusters. Calyx 4-5-toothed or parted; petals 4-5, long and free; staminodal tube 4-5-toothed; disk none: ovary 5-, 10- or 20-loculed; ovules 2 in each locale, superposed. *T. heterophylla*, introduced to S. Florida by Reasoner Bros., is probably not in cultivation. It was said to be a native of Natal. The plant described as *T. heterophylla* in Flora Capensis was probably imperfectly diagnosed and should be known as *T. floribunda*, as explained in the Flora of Tropical Africa.

**heterophylla**, Sm., not Sonder. Lvs. more or less obovate-cuneate, 3-lobed above, varying to subentire: fls. 1-3 in. long. Upper Guineas. B.R. 30:1 (as *T. lobata*).—Not cult.

**floribunda**, Hochst. (heterophylla, Sond.). Shrb.: foliage falls away before flowering season: lvs. ovate, acute or produced into a short obtuse point, undivided or 3-lobed; fls. clustered at ends of branches: petals and calices-silky tomentose. Natal. W. M.

**TURTLE-HEAD. Species of Chelone.**

**TUSSILAGO** (Latin, tussis, cough, and ago: referring to the medicinal use of the lvs.). *Compositae*. Here belongs the COLTSFOOT, the flowers of which look much like the dandelion. It resembles the dandelion in having sepal bearing solitary yellow flower-heads composed of rays, but the sepal are scaly and the heads are smaller, lighter colored and borne in early spring before the "main crop" of dandelions. Also the flowers close up in the hot sunshine toward noon, contrary to the custom of dandelions when the fruit is mature, they hang their heads prettily. The Coltsfoot has a downy head of fruit, but it is not as large, round and attractive as a dandelion's. After the flowers have lost their beauty, the leaves appear. They are heart-shaped and rounded at first, but as they grow they become more and more angled. They are covered with a soft cottony matting which diminishes toward the end of the season. The Coltsfoot is generally considered rather coarse and plebeian, and it is rarely offered for sale except by collectors of wild plants. It spreads too fast to be a denizen of the flower garden, but it is desirable for wild gardening operations. It grows naturally in moist places and thrives on steep raw banks in the stiffer clay. A mass of its soft, cottony foliage is a pleasant and restful sight in early summer. The variegated form is more commonly cultivated than the type. *Tussilago farfara*, the "Winter Heliotrope," is a Petasites, which see. The leaves of the Coltsfoot are said to be used in making cigars which are smoked in cases of asthma.

Tussilago is a genus of one species. It is more closely related to Petasites than to Taraxacum. For generic description, see Gray's Manual and Britton and Brown's Illustrated Flora.

**Fárfa, Linn. COLTSFOOT. Described above. Spreads rapidly by underground stems. Fls. in March. Native to Europe, India and northwestern Asia. Naturalized in America.**

Var. *variegátá*, Hort., has lvs. margined and more or less blotched with white or yellow. **Gn. 37, p. 435. Lowe 56.**

**TUTSAN. Hypericum Androsaemum.**

**TWAYBLADE. Liparis litifolia.**

**TWIN FLOWER. Linnaea borealis.**

**TWIN LEAF. Jeffersonia.**

**TWISTED STALK. Streptopus.**
TYDEA. Now included in Isoloma.

TYPHAN (ancient name). Typhaceae. Cat-tail. Reed Mace. A genus of about 10 species of marsh plants with creeping rootstocks and erect, round stems, with long, linear sheathing leaves and monoeccious flowers in densely crowded, terminal spikes which are subtended by a fugacious bract.

The following are hardy aquatic or bog perennial herbs of easy culture in wet soil or in water. They spread rapidly and are likely to become too plentiful unless care is taken to pull such of them up as are not wished before they become firmly established. Forms intermediate between the following two species sometimes occur.

A. Staminate and pistillate spikes contiguous.

latifolia, Linn. Fig. 2607. Stem stout, 4-8 ft. high; lvs. wider than in the following species, usually 1 in. wide; pistillate spikes becoming about 1 in. in diam. June, July. N. Amer., Eu., Asia. B.B. 1:62. R.B. 20:196. V. 2:197.

AA. Staminate and pistillate spikes separated.

angustifolia, Linn. Stem more slender than T. latifolia, 5-10 ft. high; lvs. usually less than ½ in. wide; spikes usually longer than in T. latifolia and much narrower, being about ½ in. in diam. June, July. N. Amer., especially in the east and also Eu. and Asia. B.B. 1:63. G.M. 32:779.

F. W. BARCLAY.
ULEX (ancient Latin name of this or a similar plant). Leguminosae. Furze. Gorse. Whin. Ornamental, much-branched shrubs with dark green spiny branches, usually almost leafless, and showy yellow, papilionaceous flowers which are axillary and often crowded at the ends of the branches. The Furzes are shrubs of various regions and not hardly north, but under protection they survive the winters in New England. They are valuable for covering dry sandy banks and also well suited for seaside planting. On account of their dark green branches they have the appearance of evergreen plants and they are very showy when covered with their yellow flowers. They are also sometimes used for low hedges. They prefer sandy or gravelly porous soil and a sunny position, and should be sown where they are to stand, as they do not hear transplanting well. Prop. by seeds sown in spring or by greenwood cuttings under glass; vars. and rarer kinds also by grafting in spring in the greenhouse on U. Europaeus. A genus of about 20 species, native of W. and S. Europe and N. Africa, closely allied to Cyttisus and chiefly distinguished by the deeply 2-lipped calyx. Very spiny shrubs: Ivs. mostly reduced to scales, only vigorous shoots near the ground bearing fully developed Ivs.: fls. axillary at the end of the branches; pods small, usually few-seeded. The Furze is sometimes cult. as a winter fodder plant in Europe, the green sprigs of one year’s growth being eaten. The fls. yield a yellow dye.

EUROPEUS, Linn. Furze. Gorse. Fig. 2606. Much-branched, very spiny and rigid shrub, 2–4 ft. high; branchlets striped, villous when young: Ivs. scale-like or narrow lanceolate, pubescent: fls. axillary, 1–3, crowded at the end of the branches and forming racemes; corolla bright yellow, about 3/4 in. long, fragrant; calyx yellow, pubescent; pod oblong, 3/4 in. long, villous, dark brown. April, June and often again in Sept., Oct.; in Calif. almost the whole year. W. and S. Eu. F. S. 5, p. 441 h.—There is a variety with double flowers. None of the other species, which are all more tender, seems to be in the trade in this country.

ALFRED REHBER.

ULMÁRIA (derived from Ulmus; alluding to the resemblance of the foliage of the common European species to that of the elm). Syn., Filipendula. Rosaceae. Meadow Sweet. Hardy herbaceous perennials with rather large pinnate leaves and white, pink or purple flowers in showy terminal corymbs, borne on erect leafy stems rising 1–10 ft. from a rosette of radical leaves. They bloom in early summer or midsummer and are very handsome border plants. Most of them delight in a rather moist and rich soil and are especially decorative if planted on the borders of ponds and brooklets, but U. Filipendula prefers drier situations and likes full sun, while most of the others also thrive well in partly shaded positions. U. purpurea should be mulched during the winter in the North. Prop. by seeds sown in fall in pans or boxes and kept in the cool greenhouse, or sown in spring; also by division of older plants. Nine species in N. Asia and Himalayas, N. America and Europe. Perennials with throns or tuberous rootstock: Ivs. stipulate, interruptedly odd-pinnate, the terminal Ift. often much larger and palmately lobed: fls. in cymose corymbs; calyx lobes and petals usually 5; stamens 20–40, with the filaments narrowed toward the base; carpels distinct, 5–15, 1-seeded, indehiscent. Umlaria has usually been united with Spirea, but is very distinct in its herbaceous habit, pinnate, stipulate Ivs. and indehiscent 1-seeded akenes.

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| venusta, 2      | vextans, s. l.           |

A. Lfts. numerous, almost alike, small, pinnately lobed.

1. Filipendula, Hill. (Spirea Filipendula, Linn. Filipendula hypericata, Gilib.), Meadow Sweet. Dogwort. Fig. 2609. One to 3 ft. high, with tuberous rootstock, glabrous; radical Ivs. 6–20 in. long; Ift. sessile, oblong, pinnately lobed and serrate, 1 in. long; fls. in a loose corymb, white, about 3/4 in. across; usually 6 petals; akenes about half the size of petals, semi-cordate. June, July. Europe, W. Asia and Siberia.—Var. flore pleno has double flowers, and is common.

(1878)
ULMARIA


ULMUS (ancient Latin name of the Elm). Urticaceae, tribe Ulmeae. ELM. Ornamental deciduous, rarely half-evergreen trees, sometimes shrubby, with alternate, short-petioled, serrate lvs. and with inconspicuous, generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy north, but U. crassifolia and atata are tender; U. parrsvilioria and U. serotina are of doubtful hardiness, although they have persisted near Boston. The Elms are mostly tall and long-lived trees and very valuable for park planting and for avenue trees, especially U. Americanus, which is the favorite tree for street planting and as a shade tree for dwelling houses in the northeastern states. It is the most characteristic tree of this region and one of the most beautiful. Its habit is at once majestic and graceful, and the spreading head, borne usually at a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American Elm several other species are used as avenue trees, as Ulmus laevis, racemosa and the European U. campestris and scabra. Of U. campestris, the vars. Clemmeri, Cornubiensis and vegeta are among the best for street planting; of U. scabra, the vars. Belgica, Dorei and Piletiiii in the southern states U. serotina, crassifolia and atata are sometimes used as avenue trees. There are several vars. of striking and peculiar habit, as U. scabra, var. fastigiata and U. campestris, var. monumentalis, with narrower columnar head; U. scabra, var. horizontalis, with horizontal limbs forming widespread tiers; U. scabra, var. pendula, with long, pendulous branches, U. campestris, var. umbrocutatii, with a dense, globose and rather small head, may be used as an avenue tree for formal gardens. Several species and vars. are interesting in winter on account of their branches being

furnished with broad corky wings. The foliage of most species turns pale yellow in fall, but that of the European species remains green much longer. Unfortunately many insects and fungi prey upon the Elm, especially on the American, beech, a few of the most destructive is the elm leaf-beetle, which destroys the foliage. The Canker worm is also serious; to keep it from doing damage, paint the trunks a few feet above

2609. Ulmaria filipendula (plant about 2 feet high). Commonly known as Spiraea filipendula. One of the plants called Meadow Sweet.

2610. Flowers of American Elm — Ulmus Americana (X 2).
ULMUS

alata, laciniata, with and stipules budding one less method. Usually following and requires a method. They bear turning well, but generally do not need much attention of this kind.

Propagated by seeds ripening usually in May or June and sown at once. Most of the seeds will germinate after a few days, but some remain dormant until the following spring. Increased also by layers, which are usually put down in autumn and are fit to be removed in one year. A moist and rather light soil is best for this method. Trees raised from layers and said to bear seed less early and less profusely and are therefore especially recommended for street trees, as the foliage of trees that fruit slightly or not at all is larger and more abundant. Dwarf forms of U. campestris and also U. parvifolia and pumila may be raised from greenwood cuttings under glass, the cuttings growing most readily if taken from forced plants. U. campestris and some of its vars. are also propagated by suckers. In nurseries more of the vars. are propagated by grafting, either by budding in summer or by whip- or splice-grafting in spring outdoors or on potted stock in the greenhouse. U. Americana, campestris and seabra are used for stakes.

About 18 species of Ulmus are known, distributed throughout the colder and temperate regions of the northern hemisphere; in North America south to southern Mexico, but none west of the Rocky Mts., and in Asia south to the Himalayas. Trees with warty juice: IVs. short-petioled, usually unequal at the base, with caducous stipules: its, perfect or rarely polygamous, actinocarpous, in axillary clusters or racemes; calyx campanulate, 4-lobed, with an equal number of stamens (Fig. 210); ovary superior, with a 2-lobed style, usually 1-loculed and with 1 ovule: fr. a slightly compressed dry nutlet, with a broad, rarely narrow membranous wing all around. Figs. 201-16. The wood is heavy, hard and tough and often difficult to split. It is especially useful in the manufacture of wagon-wheels, agricultural implements and for boat-building. The inner mucilaginous bark of the branches of U. fulva is used medicinally and 1. Some species is used as a meal and used for food. The tough inner bark of some species furnishes a kind of bâch which is sometimes woven into a coarse cloth, especially that of U. campestris, var. latiniata, in Japan.

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ULMUS

1. American Elm, L. (U. alba, Rafin.): White Elm. WATER ELM. AMERICAN ELM. Figs. 210, 211, 217, 218. Tall, wide-spreading tree, attaining 120 ft., usually with high, light gray trunk, limbs gradually outward-curving with pendulous branches; branchlets pubescent when young, glabrous in fall: buds acute, glabrous; IVs. obvate-oblong, very unequal at the base, acuminate, doubly serrate, pubescent when young, at length glabrous and rounded, or almost glabrous beneath, 3-4 in. long; frs. in many-fl. clusters, 7-8, exserted; fr. oval or elliptic, veined, deeply notched, incising reaching to the nutlet. Newfoundland to Fla., west to the base of the Rocky Mts. S.S. 7:311. Em. 2:322. G.F. 3:443, 467; 6:175. M. 7, p. 125; 8, p. 71. V. 14:79; 20:10. M.D.G. 1900:329-334. One of the favorite avenue trees in the northeastern states. The Elm varies considerably in habit, and the following forms have been distinguished. The "vase form": the main trunk separates at 15 to 30 ft. into several almost equal branches, which diverge at first slightly and gradually, but at the height of 50-70 ft. sweep holdly outwards and form a broad, flat head, with the branches drooping at the extremities. This is the most beautiful and also the commonest form. Fig. 217. The "plume form" is much like the foregoing, but the trunk is less divided and the limbs form few feathery plumes or rarely one. The "weeping-willow form" usually has a rather short trunk with limbs curving outward more rapidly and with long and very slender pendulous branches, forming usually a broad and round head. The "oak-tree form" is distinguished by its limbs spreading abruptly and in sharp turns and the branches being usually less pendulous. The name "Featherly" or "Fringed" Elm is applied to trees which have the limbs and the main trunk clothed with short, somewhat pendent branchlets thrown out usually in clusters. This may appear in any of the forms named, but is most conspicuous in trees of the plume form. Fig. 2618. There are a few named varieties in nurseries: Var. aurea, Temple, with yellow foliage, found in Vermont by F. L. Temple; var. nana, Hort., a dwarf, compact form, which may perhaps not belong to this species, and var. pendula, Att., with slender pendulous branches.

2. pedunculata, Foug. (U. laevigata, Pall. U. effusa, W. U. ciliata, Ehrh. U. ciliata, Borkin, not Thomas): Tree, reaching 100 ft., with spreading branches, forming a broad open head; branchlets pubescent, usually until the second year; buds glabrous, acute; IVs. ovate or obvate, very unequal at base, acuminate, sharply downy or glabrous, pubescent beneath, 2-4 in. long; frs. slender-pedicelled; calyx with 6-8 exserted stamens; fr. ovate, notched, the
incision not reaching the nutlet. Middle Europe to western Asia. — Rarely cultivated and with less valuable wood. The trunk and the limbs are, as in the American Elm, often clothed with short branchlets.

3. racemosa, Thomas, not Borkh. COHK ELM. Rock ELM. Fig. 2612. Tree, attaining 100 ft., with short spreading branches, forming an oblong round-topped head; branchlets pubescent usually until the second year and mostly irregularly corky winged when older; buds acute, pubescent; lvs. oval to oblong-obovate, unequal at the base, shortly acuminate, sharply and doubly serrate, glabrous or somewhat rough above, pubescent beneath, 2-4 in. long; fls. in slender pendulous racemes; calyx with 5-8 exserted stamens; fr. oval or oblate, with a shallow notch at the apex, pale, pubescent, ½-¾ in. long.

2612. Ulmus racemosa. (× 2.)

Quebec to Tennessee, west to Nebraska. S. S. 7:312.

4. alata, Michx. Wahoo or Winged ELM. Fig. 2613. Tree, attaining 50 ft., with spreading branches forming an oblong, round-topped or rather open head; branches usually with 2 opposite very broad wings; branchlets almost glabrous; buds acute, glabrous; lvs. ovate-oblong to oblong-lanceolate, often false, acute or acuminate, doubly serrate, subcoriaceous, glabrous above, pubescent beneath, 1½-2½ in. long; fls. in short, few-fl. racemes; stamens usually 5-6 erect, elliptic-ovate, with narrow wings and 2 incurved horns at the apex, villous, ½ in. across. Va. to Fla., west to Ill. and Tex. S. S. 7:313. — Handsome round-headed tree, sometimes used as an avenue tree in the southern states; not hardy north.

5. fulva, Michx. (U. ëbræn, Michx.) SLIPPERY ELM. Red ELM. Figs. 2614, 2615. Tree, attaining 70 ft., with spreading branches, forming usually a broad, open, flat-topped head; branchlets pubescent: lvs. pubescent to oblong, very unequal at base, long-acuminate, doubly serrate, of firm texture, very rough above, pubescent beneath, 4-7 in. long; fls. in dense clusters; stamens 5-9: fr. oblong-ovate, little notched at the apex, ½ in. across. Quebec to Fla., west to Dakotas and Tex. S. S. 7:314. Em. 2:331. — The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding. An allied species similar in foliage and fr. is U. elliptica, Koch (U. Hegdery, Spätz. U. Schibire, Hort.), a native of western Siberia, Turkestan and Persia, with longer and larger lvs. and grayish pubescent buds.

branchlets pubescent: buds pubescent, rather obtuse: lvs. very short-petioled and unequal at base, broadly pubescent to oblong-obovate, abruptly acuminate or sometimes 3-lobed at the apex, sharply and doubly serrate, rough above, pubescent beneath, 3-4 in. long; fls. obliterated; stamens 5-6, little exserted: fr. oval or roundish obovate, little notched at the apex, with the seed in the middle, ¼-1 in. long. Europe to Japan. — A variable species of which many forms are cultivated; the following are some of the most important: Var. atropurpurea, Spätz. With dark purple foliage. Var. Béllica, Hort. Of vigorous growth, forming a broad pyramidal head; lvs. dark green. Var. morifolia, Loud. (U. murifolia, Hort.) A rather slow-growing form with narrow oblong curved lvs. incisedly serrate with twisted teeth, giving the margin a fringed appearance. Var. Dampieri, Koch. Similar to var. fastigiata, but with narrower branches, and smaller and lighter foliage. Var. Dampieri Wredei, Hort. Differs from the foregoing by its yellow young leaves. M. D. G. 1898:160. Var. Doovi, Hort. Of vigorous growth and upright pyramidal habit. Var. fastigiata, Loud. (U. pyramidalis, Hort. U. pyramidalis, Hort.) Of columnar habit with strictly upright branches and somewhat twisted, broad dark green leaves. Var. horizontalis, Kirchh. With horizontally spreading limbs and rather less drooping branches. G. N. 17, p. 539. M. D. G. 1901:163. Var. lanciata, Trant. Lvs. broadly obovate, or sometimes 5-lobed at the wide apex, large, light green; branches little pubescent, light-colored. E. Asia. Var. nana, Hort. Dwarf form. Var. pendula, Loud. (U. Camperdowni, Hort.) Camperdown Elm. Fig. 2619. With long pendulous branches, the limbs often spreading horizontally. G. N. 40, p. 158. Var. Piteœris, Hort. Pyramidal tree of vigorous growth with deeply serrate lvs. often purplish when unfolding. Var. purpurea, Koch. Lvs. purple when young, changing to dark green. Var. aurea, Hort. Of vigorous growth, with large and long, dark green leaves. Var. tricuspis, Koch. (U. triscuspis or tridentis, Hort.) Lvs. obovate, 3-lobed at the apex.

6. scabra, Mill. (U. montana, With. U. globosa, Huds.), WYCH ELM. SCOTCH ELM. Fig. 2616. Tree, attaining 100 ft., with spreading branches forming an oblong or broad round-topped head; without suckers:}

2614. Fruit of Slippery Elm—Ulmus fulva (× ½).

6. scabra, Mill. (U. montana, With. U. globosa, Huds.), WYCH ELM. SCOTCH ELM. Fig. 2616. Tree, attaining 100 ft., with spreading branches forming an oblong or broad round-topped head; without suckers:

branchlets pubescent: buds pubescent, rather obtuse: lvs. very short-petioled and unequal at base, broadly pubescent to oblong-obovate, abruptly acuminate or sometimes 3-lobed at the apex, sharply and doubly serrate, rough above, pubescent beneath, 3-4 in. long; fls. obliterated; stamens 5-6, little exserted: fr. oval or roundish obovate, little notched at the apex, with the seed in the middle, ¼-1 in. long. Europe to Japan. — A variable species of which many forms are cultivated; the following are some of the most important: Var. atropurpurea, Spätz. With dark purple foliage. Var. Béllica, Hort. Of vigorous growth, forming a broad pyramidal head; lvs. dark green. Var. morifolia, Loud. (U. murifolia, Hort.) A rather slow-growing form with narrow oblong curved lvs. incisedly serrate with twisted teeth, giving the margin a fringed appearance. Var. Dampieri, Koch. Similar to var. fastigiata, but with narrower branches, and smaller and lighter foliage. Var. Dampieri Wredei, Hort. Differs from the foregoing by its yellow young leaves. M. D. G. 1898:160. Var. Doovi, Hort. Of vigorous growth and upright pyramidal habit. Var. fastigiata, Loud. (U. pyramidalis, Hort. U. pyramidalis, Hort.) Of columnar habit with strictly upright branches and somewhat twisted, broad dark green leaves. Var. horizontalis, Kirchh. With horizontally spreading limbs and rather less drooping branches. G. N. 17, p. 539. M. D. G. 1901:163. Var. lanciata, Trant. Lvs. broadly obovate, or sometimes 5-lobed at the wide apex, large, light green; branches little pubescent, light-colored. E. Asia. Var. nana, Hort. Dwarf form. Var. pendula, Loud. (U. Camperdowni, Hort.) Camperdown Elm. Fig. 2619. With long pendulous branches, the limbs often spreading horizontally. G. N. 40, p. 158. Var. Piteœris, Hort. Pyramidal tree of vigorous growth with deeply serrate lvs. often purplish when unfolding. Var. purpurea, Koch. Lvs. purple when young, changing to dark green. Var. aurea, Hort. Of vigorous growth, with large and long, dark green leaves. Var. tricuspis, Koch. (U. triscuspis or tridentis, Hort.) Lvs. obovate, 3-lobed at the apex.

7. campestris, Smith (U. suberosa, Willd., U. suberosea, Stokes). ENGLISH ELM. Tree, attaining 100 ft., with spreading branches forming an oblong round-topped or sometimes open head, usually producing suckers; branches little pubescent when young or glabrous, sometimes becoming corky; buds acute, pubescent or glabrous; lvs. distinctly petioled, broadly ovate to ovato-oblong, unequal at the base, acuminate, doubly serrate, usually glabrous and smooth above at length, pubescent or glabrous beneath, 1½-5 in. long; fls. short-peduncled; stamens 4-6: fr. obovate, with the nutlet much the middle, reaching the last incision at the apex. Middle Europe and northern Africa to Japan. Em. 2:336. M. D. G. 1800:577. — This tree is often planted as an avenue tree; it succeeds very well and fine old trees may be occasionally seen in the northeastern states. The foliage remains green several weeks longer than that of the American Elm. U. campestris is still more variable than the foregoing species and four varieties, very distinct in their extreme forms and sometimes considered distinct species, can be distinguished.

Var. vulgaris, Planch. (U. suberosa, Ehrh. U. minor, Mill.). Small tree or shrub, with often corky branches: lvs. broadly oval or rhombic obovate, rough
ULMUS

above, pubescent beneath, 1-3 in. long: fls. with 5-6 stamens: fr. oblate to oblong-obovate.


238. A Feathered Elm—Ulmus Americana.

Var. Lewis, Spach (U. nitenus, Münch. U. glabra, Mill., not Huds. U. carpinifolia, Lindl.). Tree without suckers: branches spreading, sometimes pendulous, not cory: lvs. ovate or obovate to obvate-oblong, glabrous and smooth above, pubescent or pubescent only at the veins beneath, 2-4 in. long: fls. distinctly petioled, with 5-6 exerted stamens: fr. obovate.

Var. Japonica, Sarg. in herb. Tree, attaining 80 ft.: branches light yellowish gray, covered with short pubescence when young: petioles densely pubescent, ³/₄ in. long: lvs. oblong-obovate, glabrous above, grayish pubescent beneath, 4-6 in. long: fls. almost sessile. Japan. G.F. 6:327. — This form very much resembles the American Elm in habit, foliage and pubescence, but the fls. and fr. are like those of U. campesiris: it may prove to be a distinct species.

The following are the most important horticultural forms:


ULMUS

Elm. Branches coryck: lvs. rather small and rough above. Var. suberosa alata, Hort., has very broad coryck wings and var. suberosa pendula, Hort., has coryck pendulous branches. M.D.G. 1901:166. Var. umbraclífera, Spith. Shrub or tree, with slender branches forming a dense, round head: lvs. small, obtusely serrate, rather smooth. M.D.G. 1900:573. Similar forms are U. Turkestanica, Hort., and U. Ködymanni, Hort. Var. vegeta, Dipp. (U. montana, var. vegeta, Loud.). Of vigorous growth, with bright green, large, obtuse pubescent lvs., somewhat rough above. Supposed to be a hybrid of U. campesiris, var. triveis and U. scabra, and has more the habit of the latter. Var. viminalis, Loud. (U. scabra, var. viminalis, Koch. U. stricata, Hort.). Small tree, with slender spreading branches: lvs. elliptic to oblong, incisedly serrate, 2-3 in. long. Var. Webbiana, Hort. Lvs. small and broad, somewhat curled, dark green. There are also several variegated vars. of which var. argent Ace-variagata, with the lvs. striped and spotted white, and var. Louis van Houtte, with yellow foliage, sometimes spotted green, are the most cultivated.

8. pamila, Linn. (U. microphylía, Pers. U. Sibírica, Hort.). Small tree or shrub, with slender pubescent, sometimes pendulous branches: lvs. oval-elliptic to elliptic-lanceolate, short-petioled, acute, firm, dark green and smooth above, pubescent when young beneath, 3-4½ in. long: fls. short-pedicelled: stamens 4-5, with violet anthers: fr. obovate, with the nutlet somewhat above the middle, incision at the apex reaching about half way to the nutlet. Turkistan to Siberia and N. China.—A graceful small hardy tree. Var. pendula, Hort. (U. parvifolia pendula, Hort. Phlaera reppea, Hort.), has slender, more pendulous branches. U. pinus-rámosa, Díeck, with the slender branches very regularly pinately branched, is probably only a form of this species.

9. parvifolia, Jacq. (U. Chinensís, Pers.). CHINESE ELM. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obvate-oblong, very short-petioled and little unequal at base, acute or obtuse, subcoriaceous, glabrous and glossy above, pubescent beneath when young, usually glabrous at length, 3½-4½ in. long: fls. short-pedicelled in clusters: stamens 4-5, much exerted: fr. oval to elliptic, notched at the apex, with the seed in the middle, ½-2½ in. long. July—Sept. N. China. Japan.—Has proved hardy near Boston.

10. crassifolia, Nutt. CEDAR ELM. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished when older with 2 opposite coryck wings: lvs. short-petioled, ovate to obvate-oblong, usually very unequal at the base, obtuse or acute, doubly and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath when young: fls. in few florets, at the short racemes; stamens 5-8, little exerted: fr. oval-elliptic, pubescent, notched, ½ in. long. Aug. Miss. to Ark. and Tex. S.S. 7:315. — Tender north.

11. serótina, Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular coryck wings: lvs. oblong to ovate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2-3 in. long: fls.
in \( \frac{3}{4} \)-1 in. long pendulous racemes; calyx 3-5-6-parted to the base; fr. elliptic, deeply notched, densely ciliate, \( \frac{3}{4} \) in. long. Sept. 1883. This tree, sometimes planted in avenues in Ga.; has proved hardy at the Arnold Arboretum, Boston.


UMBELLULARIA (from Latin umbella, a sunshade; having reference to the form of the inflorescence). Lauraceae. California Laurel. A monotypic genus, comprising a single Pacific coast tree, with alternate, simple, exstipulate lvs.; fls. small, greenish, in simple pedunculate umbels, which in the bud are surrounded with an involucre of 6 caducous bracts; petals none; stamens 9; filaments with an orange-colored gland at base; anthers opening by uplifted valves; fr. a subglobose or ovoid drupe with hard endocarp. Propagated by seeds.

2620. California Laurel—Umbellularia California (X \( \frac{1}{2} \)).

Californica, Nutt. (Oreodaphne Californica, Nees). Fig. 2620. Handsome evergreen tree, 20 to 30 or even 80 to 90 ft. high, with erect or suberect slender branches, conical outline and dense foliage. Lvs. containing a highly aromatic and volatile essential oil, and burning vigorously in the camp fire, even while green: fls. fragrant: drupes at first yellowish green, becoming purple when ripe. Dec. to May.—One of the most abundant and characteristic of California trees, common in moist places, particularly along streams in the Coast Range foothills and mountains, and attaining its greatest size in the cool, fog-moistened alluvial valleys of the coast of northern California and southern Oregon; it is but rarely seen in the drier interior valleys of the state. It often crowns the highest points of the coast range hills, up to about 2,500 feet altitude and far from the nearest spring or other visible sign of moisture, but in such cases the rock strata are nearly vertical and easily penetrated by the long roots which are able thus to reach hidden supplies of water. In such places it usually forms dense clumps or thickets of shrubs or small trees which are frequently blown by the cutting ocean winds as though by a gardener's shears, suggesting its adaptability for clipped-hedge and wind-break work. The wood takes a beautiful polish and is considered "the most valuable wood produced in the forests of Pacific North America, for the interior finish of houses and furniture," for which purposes it is extensively used. It is also used in boat-building for jibs, masts, cleats, cross-trees, etc. The branches are occasionally used for poles for chicken-roosts, as the strong odor, pervading wood and bark as well as leaves, is said to keep away lice. The leaves are used for flavoring soups and blanmanges but are too strong to give as agreeable a flavor as those of Laurea nobilis or Prunus Laurocerasus. The tree is sometimes cultivated for ornament in southern European parks and gardens. Professor Sargent describes it as "one of the staldest and most beautiful inhabitants of the North American forests, and no evergreen tree of temperate woods can compare it in the beauty of its dark dense crown of lustrous foliage and in the massiveness of habit which make it one of the most striking features of the California landscape and fit it to stand in any park or garden."

JOSEPH BURT DAVY.

UMBRELLA LEAF. See Diphyileia.

UMBRELLA PINE. Sciadopitys.

UMBRELLA PLANT or UMBRELLA PALM. Cyperus alternifolius.

UNIGRÁDIA (Baron Ungnad, ambassador of Emperor Rudolph II to the Ottoman Porte, who in the year 1576 introduced the common horse chestnut to western Europe by sending seeds to Clusius at Vienna). Nagpindoe. A genus of one species, the Mexican Buckeye, a small tree closely related to the horse chestnut but with foliage like a hickory, the lvs. long alternate and lanceolate, and rose-colored fls. which are borne in small lateral clusters or simple corymbs, appearing with the lvs. in early spring. The fruit is short. It has a sweet taste, but is considered emetic and poisonous. The fruit does not have a prickly husk like the horse chestnut; it is a smooth, leathery capsule and strongly 3-lobed. The fls. are about \( 5 \)% of an inch across, polyzymous, 4-5-petaled, and the staminate ones have 8 stamens. For fuller account, see Sargent's Silva.


W. M.

UNIOLA (an ancient Latin name of some unknown plant, derived from unis, one, and said to have been applied by Linnaeus to this genus on account of the union of the glumes). Gramineae. Perennials with creeping rootstocks. Species 5, all American. Spikelets broad and very flat, in loose panicles, several fl., with some of the lower glumes empty; glumes keeled, nerves pointed, but awnless. Cultivated for the ornamental panicles, which are suitable for dry bouquets.

latifolia, Michx. SPIRE-GRASS. Fig. 2621. Calms 2-4 ft.: lvs. broad and flat, often 1 in. wide: spikelets large and thin, at maturity drooping on slender pedicels, forming a very graceful and ornamental panicle. Pts. to Kan. and southward.—Often grown in hardy borders. One of the best of our hardy native, perennial grasses.

paniculata, Linn. SEA OATS. Culm taller, 4-8 ft.: lvs. narrow and convolute: spikelets narrower, upright on short pedicels, forming an elongated panicle. Sandhills along the seashore of the southern states.

URARIA (Greek oura, tail, referring to bracts). Leguminosae. Eight species of perennial herbs with woody bases, all of which are accounted for in the Flora of British India. They have 1-9 lfts. and very numerous, small, minute flat racemes. Standard broad; wings adhering to the obtuse keel; stamens diadelphous: ovary sessile or short-stalked, few-ovuled: style inflexed: pod of 2-6 small, turgid, 1-seeded, indehiscent joints, often placed face to face.

The following species is the most desirable of the genus. It grows about 5 ft. high and is crowned by a single terminal raceme sometimes 2 ft. long, densely
crowded with 200 or more pea-shaped fls, each ½ in. long. In the Flora of British India this plant is erroneously said to ascend the Himalayas to an altitude of 9,000 ft. A corrected account of this plant is found in B.M. 7377, from which source one infers that the plant is not hardy. The first plants flowered in Europe bloomed in September and the annual stems then died down to the base. Seeds of this plant have been imported by a northern amateur who has a winter home in Florida.

crinita, Desv. Erect, little-branched, subshrubby perennial, 3-6 ft. high, distinguished from other species by having its upper lvs, composed of 3-7 oblong lfts., and pedicels clothed with long bristles. Lfts. 4-6 by 1½-2 in.; racemes dense, 1 ft. long, 1-1½ in. thick; standard ovate, violet-purple within, pale blue outside; wings pinkish. Bengal to Assam, eastward through Burma to China, south to Malacca and the Malay Islands to Timor Laut, but not Australia and not indigenous in Ceylon. B.M. 7377.

W. M.

URCEolina (Latin, pitcher; alluding to the pitchers or urn-shaped flowers). Amaryllidaceae. A genus of 3 species of South American bulbous herbs, with thin oblong to long-lanceolate, petioled leaves and a naked scape bearing an umbel of pendulous red or yellow flowers. Perianth-tube often narrow and often somewhat stem-like at the base, suddenly dilated; stamens inserted at or below the throat of the tube, indistinctly appendiculate at the base.

The species of Urceolina are attractive plants and easily grown, flowering every year, but for some reason they are rather scarce. The bulbs are about 3 in. across and during the growing season have 1 or 2 lvs. The plants flower in December. After flowering the bulbs may be removed from the stove to the intermediate house and placed in a spot where they will be kept dry. Just before growth begins in the spring the bulbs should be taken out of the pots and the exhausted soil removed. The bulbs may then be replaced, one bulb in a 5-in. pot, using clean pots, plenty of drainage material and a rich, light, porous soil. Place the top of the bulb level with the soil. Remove the pots to the stove, and as soon as growth begins water freely. In the fall when the lvs. turn yellow, water sparingly and finally withhold water altogether. The flower scapes appear a few weeks after the lvs. disappear.

a. Fls. red.

URCEÓCHARIS (hybrid name, suggesting that the plant is a hybrid between Urceolina and Eucharis). Amaryllidaceae. The only species, Urceocharis Clirbani (see Fig. 2822), is a tender winter-blooming bulbous plant with broad lvs, a foot long and half as wide and large, white, bell-shaped, 6-lobed flowers, a dozen or so in an umbel, and each 2 in. across. The plant is a hybrid, introduced about 1892, between Urceolina pendula and Eucharis grandiflora, or in gardener’s language Urceolina aurea and Eucharis Amazonica. A flower of the hybrid and each of its parents is shown in Fig. 2922. The hybrid bears the same size flowers as Eucharis, the flowers of Urceolina being yellow. The shape of its flower is so singular a mixture of the two as to be very different in appearance from either. The hybrid lacks the beautiful staminal cup of Eucharis, and has a distinctly bell-shaped perianth. The showy part of Urceolina is the urn-shaped portion of the flower, the spreading tips being very short. The perianth of Eucharis is funnelform, the spreading portion being large and showy. The perianth-tube and ovary of the hybrid are like those of Urceolina, the ovary being deeply 3-lobed instead of globose as in Eucharis. The pedicels are ascending, as in Eucharis, not pendulous as in Urceolina. The appendages at the base of the stamens are more distinctly marked than in either of the parents.

The parents of Urceocharis belong to the Pancratium tribe, characterized by having the stamens appended toward the base and often united into a distinct cup. Twelve of the 17 genera in this tribe are from the Andes and 8 of these, including Eucharis and Urceolina, have broad and petiolated lvs, and the ovules are super-petiolated. Eucharis and Urceolina have a long, slender tube which is suddenly swollen above. The flowers of Eucharis are white and those of Urceolina colored, but the essential difference between the two genera lies in the stamens, which are minutely appended in Urceolina, while in Eucharis they are quadrate and sometimes united to make a cup.

This bigeneric hybrid was introduced to the trade under the name of Eucharis Clirbani, but the changes wrought in the structure of the flower by the cross are so great that Dr. Masters was justified in giving the plant a new genus.


W. M.
Ornithogalum, Herb. (U. aubrea, Lindl.). Bulb about 1½ in. through: lvs. 1-2 to a stem produced after the fls., oblong, acute, 1 ft. long by 4-5 in. broad: scape about 1 ft. long: fls. 4-5, bright yellow tipped with green. Andes of Peru. B.M. 5464. G.C. Ill. 12:211.

F. W. Barclay and Robert Cameron.

Ureca (meaning not obvious). Urticaceae. About 18 species of shrubs and small trees, rarely subshrubs, native to tropical regions, with alternate lvs., entire or variously cut, palmately or pinnately nerved, and numerous small fls. borne in cymes which are often repeatedly forked. DC. Prod. vol. 16, part 1, pp. 88-98 (1869). The following has been offered in America as an ornamental greenhouse shrub.

U. pendula, Lindl. All half size.

U. pendula, Herb. (U. aubrea, Lindl.). Bulb about 1½ in. through: lvs. 1-2 to a stem produced after the fls., oblong, acute, 1 ft. long by 4-5 in. broad: scape about 1 ft. long: fls. 4-5, bright yellow tipped with green. Andes of Peru. B.M. 5464. G.C. Ill. 12:211.

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U. pendula, Herb. (U. aubrea, Lindl.). Bulb about 1½ in. through: lvs. 1-2 to a stem produced after the fls., oblong, acute, 1 ft. long by 4-5 in. broad: scape about 1 ft. long: fls. 4-5, bright yellow tipped with green. Andes of Peru. B.M. 5464. G.C. Ill. 12:211.

F. W. Barclay and Robert Cameron.

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F. W. Barclay and Robert Cameron.
dissected into linear laciniae and yellow or orange fl.
heads 2 in. across; rays about 22, 3-toothed, spotted
purple-brown at base; stem glabrous, branched; lvs.
alternate, linear-lanceolate, about five inches as
long as lvs. involucre 4-rowed; scales increasing in
size from the base, outer rows with a brown scarios
border, inner with a white scarios border. F.C. 2:77.
1845:445.

W. M.

ÜRTICA (Urticaceae) is the genus containing the net-
tles. For C. Caracasana, see Uercia. C. nivea is
Ramie or Silver China Grass, properly Boehmeria nivea,
which see. As Ramie is a fibrous plant, not a horti-
cultural subject, it is not fully treated here, the student
being referred to the publication of the office of Fiber

UTAH HORTICULTURE IN. Fig. 2623. While the
area in Utah devoted to fruit-growing is very small
compared to the area of the whole state, there are few
states in the Union which surpass Utah in the number
of kinds grown. Beginning in the northern part of
the state, in the vicinity of the agricultural college at
Logan, the fruits of the cooler temperate regions flourish.
Most varieties of apples and pears succeeding well,
many sorts of plums and cherries thriving and even the
hardier peaches giving a fair number of crops as com-
pared to the years of failure. The chief difficulties here
are, first, the short season, which does not admit of the
ripening of fruits that require more time for their de-
velopment than the Concord grape, for example, and,
second, the great liability to late spring and early au-
turn frosts.
Throughout the entire state the annual rainfall is
very light, and what little precipitation there is falls for
the most part during the winter season in the form of
snow, so that practically no fruit is grown within the bor-
ders of the state without irrigation, and this is a factor
which determines to a very great extent the sections
and even the particular localities devoted to fruit-
growing. The conditions in the Cache valley illustrate
this point. This region is a mountain valley lying in the
heart of the Wasatch range of the Rocky Mountains in
the northern part of the state, and is some 60 miles
long by 12-18 miles wide. The soil of this entire valley,
with the exception of a few alkali areas and some boggy
districts, is well suited to fruit-growing, but the rivers
which furnish the water for irrigating all enter the val-
ley from the eastern side, and as the land slopes from
both sides to the center of the valley it is impossible
ever to reach the water on to much land that might other-
wise be profitably used for fruit. Artesian wells supply
water to some lands to which the river waters cannot
be brought, but here again the difficulty is that com-
paratively few sections of the state are blessed with the
possibility of having artesian wells.
The earlier Mormon settlers of the state inaugurated
a system of irrigating canals, which, considering the
means at their command, were wonderfully effective.
More recently, the Bear River Canal Company of the
northern part of the state and several other large cor-
porations have expended great sums of money in putting
in dams and digging canals, by means of which large
areas of the land had previously been unsuitable, but
the good quality of sage-brush have been changed into
good farms. In order to increase the sale of these lands
many orchards have been set. These operations have
served as a wonderful stimulus to the fruit-growing
industry.
In all the northern portions of the state where late
frosts are likely to occur and injure the fruit crop, what
are known as the "cannon winds," become very import-
ant factors in the success of fruit plantations. These
winds begin blowing daily about eight o'clock in the
evening and continue all night and until six to nine
o'clock the next morning. They are almost as regular
as a windsock. The cannon winds are wind-like and
blow with such force as to necessitate thick wind-breaks
to protect all orchards within a mile or two of the cafon's
mouth. But gradually they spread out over the lower
lands in a fan-shaped area, their force lessening as the
distance from the cannon increases, though still suffi-
ciently strong to prevent the cold air from settling and
producing frost. So marked is their influence upon the
occurrence of frosts that it is no uncommon thing after
a cold night in the spring or autumn to find that while
the plantations in the districts influenced by the cannon
winds have come through without injury, yet just
around a spur of the mountain out of reach of the wind,
the blossoms have nearly all been injured. Perhaps in
time satisfactory varieties may be developed which will
bloom late enough to avoid this danger, but as yet the
problem of frosts is even more difficult to solve than
that of water.
Another factor which has contributed in the past
toward restricting the areas devoted to fruit is the man-
ner in which the early settlements in the state were
located. The pioneers settled in villages, each man
being allotted a small piece of land on which the home
was built and the garden and small family orchard
established. Then on the outskirts of this village, and
extending sometimes as far as ten miles from it, were
located the farms proper, which were allotted to the
residents of the village, so that even in what may be
called the hardy farming districts of the state the people
lived in villages and drove out to cultivate their
farms. Naturally the fruit plantations which needed the
personal and constant oversight of the owner to in-
sure a crop or at least a harvest, were confined to the
plantation in the village and the farm was given over
to grains and hay crops. It is only in the comparatively
few districts where the village system did not obtain, or
within more recent years when it has been somewhat
abandoned, that the larger available areas of the farms
have encouraged the planting of larger orchards.
So far as most insect pests are concerned, the Utah
fruit-grower is neither more nor less fortunate than his
brothers of other states. It is true there was a time
when the somewhat isolated position of the state seemed
to warrant the belief that it would escape from the in-
roads of many of the pests which troubled growers else-
where, but with the advent of better transportation
facilities and the increase of fruit plantations, the standard insect enemies have one after another entered the borders of the state. But, on the other hand, in the matter of fungous diseases the state is singularly fortunate, there being in most sections comparatively little trouble. Doubtless the dry atmosphere of Utah is responsible for this.

It seems probable that the state will never enjoy a large local market, though the mining industry will insure a fair one, but its mountain climate seems to give a higher quality to the fruit grown and with the more general adoption of better methods there is no reason why fruit-growing in Utah should not take its place as one of the chief branches of the agriculture of the state.

Another View of Utah.—In Cache valley, apples, pears, American plums and sour cherries do exceedingly well. Peaches are grown there in a small way. The temperature in winter is often lower than 20° below zero, and that, together with late frosts, is the reason of the failure of the peach crop. In 1899-1900 the lowest temperature was 10° below zero, and the following winter the lowest temperature was about 2° below zero, and each of these winters was followed by a full crop of peaches.

In the valley next south of Cache valley, peaches and apricots are grown very successfully at Brigham City. At Ogden there are a few of the European grapes, but they are protected during the winter by being buried in hay and covered with earth. Even with this protection the vines are badly damaged by freezing, as is indicated by large, corky swellings often called black knot of the grape. Sweet cherries and native grapes do very well in certain localities in this section. There are a few hardy almond trees near Ogden. Farther south, at Provo, there is at least one vineyard of Vitisfera grapes in which the vines are pruned similar to the Californian system, except that the trunks are only a few inches high. These vines are protected with a covering of earth during the winter. Apples and pears do very well from Cache valley in the north, through the portions mentioned above, to Provo, and for some distance farther south. It is very probable that all hardiest varieties of apples and pears would do well in Beaver, Iron and Sevier counties, but as yet very little has been done with them because of the long and extremely cold winters. In many portions of these counties the elevation is 6,000 feet.

The climate of Washington county, in the southwest of the state, is very mild, but is not so mild as that of most of southern California. The temperature in winter occasionally reaches zero. Vitisfera grapes, figs, pomegranate and almonds grow there successfully without artificial protection. No attempt is made to grow oranges and lemons. Peaches and apricots grow to perfection in this region when any attention is given to the trees. This section was Utah's most noted fruit district from ten to twenty years ago, but so little care has been given to fruit trees that the orchards have gone to ruin. At present the principal occupation there is the growing of alfalfa and stock, but the improved methods of fruit-growing will probably be practiced soon. For further notes on fruit-growing in Utah, see Hedrick, Proc. Amer. Pomological Society, session of 1899, p. 225.

C. P. CLOSE.

**UTRICULARIA** (Latin, a little bag or skin; referring to the bladders). *Leptobulariaceae*. BLADDERWORT. Utricularia is a genus of herbaceous plants possessing little bladders which trap small aquatic animals. The bladders have a valve-like door through which the animals enter when looking for food or when trying to escape from other creatures. The bladders are most numerous and effective in the species which float in standing water. They are few in the marsh-vegetation species. The terrestrial kinds often have minute, deformed and useless bladders. The aquatic species are characterized by much dissected lvs. with thread-like segments, a type of foliage seen in the water crowfoot and other floating plants of watercourses. They are quite devoid of roots. The terrestrial kinds are common in the tropics and are characterized by erect foliage of the ordinary type. These often form little tubers by which they may be propagated. Our native aquatic species propagate themselves by seeds and also by winter-buds. (A winter-bud of another aquatic plant is figured under *Eloidae*, p. 528).

The aquatic species are sometimes cultivated in aquaria, but their flowers are not showy, nor are those of any of the hardy kinds. The showy species are the terrestrial and epiphytic kinds of the tropics. These, for complexity of floral structure, beauty of color and lasting qualities, vie with certain orchids. In fact, they are generally grown by orchid lovers in orchid houses. Perhaps the most desirable of the genus are *U. montana*, *E. longiflora* and *l. lingulata*, each of which represents a different color. Well-grown baskets of these plants have numerous scapes a foot or so high bearing 5-20 fls., each 1 1/2-2 in. across. In general, such plants are grown in warm houses, *U. E. longiflora* requiring a stove temperature, while some of the others may thrive in an intermediate house. As a class they are grown in baskets, near the light, using a compost of fibrous peat and sand. The plants are kept constantly wet during the growing season and until the fts. are gone. During the winter they are rested, being kept in a cooler place and given just enough water to keep the tubers from shriveling.

The epiphytic species deserve a word. Those who are familiar with bromeliaceous plants know how the water gathers in the axis of the leaves. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the leaf-axes of Vriesea and other bromeliads live certain Utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which finds another bromeliad and propagates another Bladderwort.

Utricularias have numerous slender, wiry scapes bearing one or many flowers. Calyx large, 2-parted or 2-lobed; corolla with a spur which is usually long and drooping, yellowish and fragrant. Perianth greenish, or 2-parted or 2-fld; anterior lip often large, broad and showy, spreading or reflexed, entire, crenate or 3-lobed, or the middle lobe various. About 150 species.
Utricularia

vulgáris, Linn. Hardy native aquatic plant, with crowded, 2-3-pinnately divided floating lvs. ⅓ in. long, provided with numerous bladders and yellow fls. ⅔ in. long or more, borne in 3-20-fld. racemes. June-Aug. Brooks and ponds, Eu., Asia, N. Amer. B.B. 3:191. One of the most beautiful cultivated water plants, introduced by American aquatic specialists and collectors of native plants.

montana, Humboldtii. Poir. Tropical American epiphyte, with clusters of tubers ½-2½ in. long, minute, deformed, useless bladders and large white fls. with a yellow palate, the fls. 1-4 on a scape, each 1½ in. across. Lvs. 4-6 in. long, elliptic-lanceolate. Trunks of trees, West Indies and S. Amer. B.M. 5923. F.S. 19:1942. I.H. 18:64. — A lovely species.

bifida, Linn. Terrestrial species from tropical Asia, with minute bladders and small yellow fls. resembling a diminutive Linaria or Butter and Eggs. Lvs. densely matted, erect, thread-like, 1½-3 in. long: fls. yellow, with an orange pale, ½ in. long, 5-8 in a raceme: pedicels dropping in fruit. India, Malaya, China, Japan, Philippines. B.M. 6689. — Once cultivated at Kew.

janthina, Hook. Epiphytic Brazilian species growing in the leaf-axils of a bromeliad (Vrieea), with kidney-shaped lvs. and beautiful pale blue or lilac fls. ⅓ in. across, ornamented by 2 vertical yellow lines on the palate edged with dark violet. Lvs. with stalks 4-6 in. long and blades 2-4 in. across: scape about 6-fld.: upper lip hemispheric, arching: lower lip transversely oblong, entire. B.M. 7466. — Int. by Sander, 1892. "Janthina" is the same as "ianthana," meaning violet-colored.

reniformis, A. St. Hii. Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 2 darker lines on the palate: upper lip truncate, emarginate: lower lip 3-lobed, the lateral lobes broad, the midlobe much shorter and scarcely produced. Brazil. — Once advertised by John Saul, but probably lost to cultivation. Very large for the genus, the lvs. ¾-1 ft. long and scape 1½-2 ft. high.


Endresii, Relib. Epiphytic Costa Rican species, with tubers about ¾ in. long, solitary lvs. and pale lilac fls. ½-2 in. across, with a yellow palate: lvs. 1-3 in. long, narrowly elliptic-lanceolate: scape about 5-fld. B.M. 6656. Var. majus, Hort., was offered by Pitcher & Manda, 1895. — A deciduous species found at an altitude of 2000 feet.

longifolia, Gardn. Fig. 2624. A Brazilian species, the typical form of which is perhaps not in cultivation. U. latifolia, Hort., introduced by Sander, is said by the Kew authorities to be a form of this species and the same as the plant figured in Gn. 52:1132 (adapted in Fig. 2624) under the erroneous title of U. latifolia. It has beautiful violet-purple lvs. nearly 2 in. across, with a yellow palate. Lvs. lanceolate, erect: scapes 12-20-fld. and fls. last well. G.C. III. 13:713. W. M.

Uvularia (Latin, ureula, palate, referring to the hanging flowers). Liliaceae. Bellwort, "Wild Oats" in some parts. A genus of two species of very graceful woodland, perennial herbs native to North America. The plants grow about 15 in. high, with a number of clustered slender stems which are forked and leaf-bearing nearly above. The foliage is of a delicate green, which with the terminal, narrow, bell-shaped, drooping flowers make the plants elegant though not showy. The species are perfectly hardy and easy of cultivation in any light, rich soil and a shady situation. They do well north of a wall in a well-prepared border and in such a position they far exceed the plants of the woods in luxuriance. Strong roots may be slowly forced for spring flowering. For distinction from Oakesia, see that genus, to which some of the plants commonly known as Uvularias are referred.

2625. Bellwort — Uvularia perfoliata (X⅔).

A. Lvs. pubescent beneath.

grandiflora, Sm. Stems 1-⅓ ft. high, with 1 or 2 lvs. below the fork: lvs. oblong, oval or ovate, somewhat acuminate: fls. pale yellow, 1-⅓ in. long; segments usually smooth on both sides: stamens exceeding the styles: capsule oblong-lanceolate, truncate. May, June. Rich woods, Quebec to Minn. south to Ga., Tenn. and Ia. B.B. 1:409.

AA. Lvs. not pubescent beneath.

perfoliata, Linn. Fig. 2625. Stems more slender than in U. grandiflora, with 1-3 lvs. below the fork: lvs. oval, oblong or ovate: fls. pale yellow, about 1 in. long; segments glandular papillose within; stamens shorter than the styles: capsule obtuse 3-angled, truncate. May, June. Rich woods, U. S.

J. R. KELLER and F. W. BARCLAY.
VACCINIUM (classical Latin name of the European Whortleberry; etymology uncertain). Ericaceae. Including Blueberry, Blackberry, Huckleberry, Whortleberry, Cranberry. Branching shrubs, creeping vines or small trees, sometimes epiphytes: lvs. alternate, evergreen or deciduous, coriaceous or membranaceous: lvs. small, white, pinkish or reddish, in lateral racemes or clusters, sessile or on leafy petioles, axils, mostly nodding on slender-bracted pedicels and bearing blue, black or red berry-like fruits, mostly edible; calyx 4–5-toothed, adherent to the ovary, persistent, forming a crown-like appendage to the fruit; corolla various in shape, usually campanulate, cylindraceous or urn-shaped, rarely subglobose, 4–5-toothed or clef; stamens twice as many as the lobes of the corolla, distinct, included within the corolla-tube or exserted; anthers often 2-awned at the back, the cells separate and prolonged upward into tubes at the apex, opening by terminal pores or chinks; pistil single, with a 4–5- or 8–10-loculed ovary, which is glabrous or hisrate. Flowers borne in spring with or before the leaves; berries ripe in summer and autumn, sweetish or sometimes acid, mostly edible. The genus includes about 125 species of wide geographic distribution, extending from the arctic circle to the tropics; widespread in North America and the Himalayas. With very few exceptions (e.g., V. erythrunum in Java and Eniwetone in Madagascar) the genus is unrepresented in the southern hemisphere and in the lower regions of the tropics.

There is much confusion in the popular names applied to these fruits. The terms "Blueberry" and "Whortleberry" are commonly used, and have been mentioned as American berries. Many American writers are seldom or never heard among the common people in this country; while "Huckleberry" is often used indiscriminately for plants of this genus and for the Gaylussacias. In the central states the term "Huckleberry" is usually applied to V. corvymbosum, while "Blueberry" is given to the low-growing species, like V. Canadensis and Pennsylvani-um. In New England, "Huckleberry" is reserved for species of Gaylussacia, while "Blueberry" is applied to the lower growing species as above, and "High-bush Blueberry" to V. corvymbosum. The red-berried species are, in general, referred to as "Cranberries.

At the same time, it is perfectly obvious that the landscape in October and November by reason of their bright foliage, many of the species of Vaccinium may be included,—the brilliant red, crimson and orange colors often persisting much longer than the bright-hued leaves of a majority of other plants. Of the ornamen- tal species none are more strikingly beautiful late in the autumn than the common High-bush Blueberry, V. corvymbosum. When well grown it is a stout, thick, spreading bush 8–10 ft. high. The plant is beautiful when in flower; the fruit is attractive and of the best quality, and the bright scarlet and crimson effects in late autumn, rivaling the sumach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden. V. Pennsylvani-unum also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an under- shrub. The same is true of V. Canadensis, which is in many respects similar. V. stamineum, though early deciduous, is attractive when in bloom and throughout the summer, by reason of its graceful habit. Though usually found on gravelly soil, it will thrive in any good soil and it is one of the finest forest under- shrubs specially suited for densely shaded situations. It has the peculiarity of never forming a true flower-bud, the blossom being open from the first. V. corymbosum consists of a red plant, the flowers straggling to be of value except in masses at the South. V. hirsutum is as beautiful in its autumn coloring as is V. corvymbosum and, like that species, retains its foliage late in the season. V. Vitis-idea and utiginosum, with their shining box-like foliage, are effective as edging for the shrubbery border.

In the wild state the Blueberry was originally wor- thy of notice than was the blackberry or currant, but the natural supply is so abundant that little attention has been given to garden cultivation. At the Maine Agricultural Experiment Station syste- matic work is in progress, and several instances of suc- cessful amateur cultivation are recorded from Massa- chussets. The plants of some species are very suscep- tible of improvement under good cultivation; the best in order of merit being V. corymbosum, vacillans and Canadense. The bushes should be transplanted in the fall and treated much the same as currants. Any good garden soil is suitable.

Of all the American species used for food, the most important are, V. corymbosum, Pennsylvanicum, Cana- dense and vacillans. The first of these, the High-bush Blueberry, or Swamp Blueberry, or "Huckleberry" of the middle west, is of firm texture, good size and ex- cellent flavor. The shrub is easily transplanted, grows rapidly on any good soil, and more than any other spe- cies shows a marked tendency to vary in the size, shape and quality of its fruit. It is the natural starting point in the Blueberry culture in the United States; many of the cultivated varieties are mere, except in the Blueberry crop as seen in the cities or at the canning fac- tories.

In many of the northern and eastern states, particu- larly in New England, New York, New Jersey, Michi- gan and the mountain districts of Pennsylvania and West Virginia—there are many thousand acres of land, worthless for agricultural purposes, which after the pine is removed send up an abundant growth of Blue- berry bushes, elders, poplars, gray birches and spireas. These lands are, for the most part, considered as public property and are recklessly burned over by irresponsi- ble parties to promote the growth of the Blueberries. In New England, particularly in Maine, the manage- ment of such lands has been systematized and Blue- berry canning has become an important industrial operation. In some instances the whole business is un- der the management of the landowners, but in most cases the land is divided into several tracts, each of which is leased to some responsible party who assumes the whole care of burning, keeping off trespassers, har- vesting and marketing the fruit; the owner, in such cases, receiving as rental one-half cent per quart for all fruit gathered. Pickers receive 1½–3 cents per quart. Those who lease the land and haul the fruit to canning fac- tory or station for shipment receive ½–1 cent per quart. These rates are determined in accordance with the market value of the crop.

Every year a certain section of each lease is burned over. This burning must be done very early in the spring, before the soil becomes dry; otherwise the fire goes too deep, the humus is burned from the ground and most of the bushes are killed. Many hundred acres on what should be the best part of the Blueberry plains have thus been burned. The method most commonly used in burning a given area is for the operator to pass around the section to be burned, dragging after him an ordinary torch or mill-lamp. He then retraces his steps and repeats the process over the fire-brushed area, setting new fires on the portions which have escaped and back-firing if there is danger of spreading unstir over areas which it is desired to leave unburned. A device occasionally used is to drive ⅝–⅞-inch-diameter steel rods into the end at an angle of about 60°. The end opposite the bent part is closed with a cap or plug and in the other end, after filling the pipe with kerosene, is placed a plug of cotton waste or tow. This device is by many
considered superior to the lamp or torch, as it is more easily handled. Each section of the lease is usually burned over every third year. In this way the birches and alders are subdued and the Blueberries spring up quickly and near a maximum crop the year following the burning.

The Blueberries have an advantage over other small fruits in that they will stand shipment better and will keep longer than the others, with the exception of currants and gooseberries. By far the largest proportion of the fruit is taken to the factories for canning. Early

in the season, however, before the factories are opened, a considerable amount is shipped to the larger cities for use while fresh. This fruit is usually shipped in quart boxes, as shown in Fig. 2627.

All of the early fruit is picked by hand and only ripe berries are gathered. Later in the season, particularly on "old burns," i.e., on areas which will have to be burned over the next year, the fruit is gathered with a "blueberry rake." This is an implement somewhat similar to the rake in use on Cape Cod, and may be likened to a dust-pan, the bottom of which is composed of stiff parallel wire rods. See Fig. 2628. The fruit may be gathered much more quickly and more cheaply by means of the rake. The bushes are, however, seriously injured by the treatment. In no case should the rake be used in gathering the High-Bush Blueberries. As the berries are gathered they are passed through a fluming mill to eliminate leaves and twigs before being sent to the canning factory. In this way specially choice individuals may be perpetuated. For general purposes, however, seedlings or division may be used. Propagation by seed naturally requires care and skill, but is considered feasible, as was followed at the Arnold Arboretum, and at the Maine Agricultural Experiment Station, where for several years seedling Blueberries have been grown, is essentially as follows: Seed-pans or boxes about 4 in. deep are half filled with pots and covered with a layer of sphagnum, after which a compost consisting of one-third each of Blueberry and well-rotted rod and fine sand, is used; the whole being firmed with the hand or a mallet. The seeds, washed free from the pulp of freshly gathered fruit, is then sown thickly, pressed down lightly and covered with a slight sprinkling of sphagnum. The boxes are placed in a coldframe until January, when they are brought to a house with a temperature of 55°-60° and a range of 10° higher by day. As the young seedlings appear, they are carefully removed and a quantity of compost sifted in among the plants. The young plants are treated like other delicate seedlings, and handled about twice during the first season. After Sept. 1 they are pruned off and later removed to a coldframe for winter, the frames being protected to retain the foliage as late as possible and covered with hay or litter during the winter. The next spring the plants are set about 6 inches apart in a well-prepared bed and shaded until thoroughly established. Clean tillage is given during the season. At the approach of winter, a few inches of loam between the plants to prevent heaving is the only protection required. The following spring or two years from seed, they may be planted out permanently. Seed which is kept until dry and then sown, even if given the best of care, will seldom germinate until the second year. The low Blueberry (V. Pennsylvaninum) will usually fruit in three to four years from seed; but V. corymbosum requires four to six years. See Bull. 76, Maine Exp. Sta.

2626. "Buckboard" used in Maine to carry Blueberries from the fields to the cannery.

2527. A quart box of fancy Blueberries, prepared for market.

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in some cases these are albino forms; in others the color is due to a fungus. Albino forms of V. Myrtillus were recorded as early as 1576 by Dodsons. The other species thus far recorded are: V. pensylvaninum, corymbosum and vaccillanum. It is probable, however, that many other species exhibit this variation. No special reason can be assigned for this difference in color. While albino forms are found growing (usually in colonies) by the side of the normal type, if exposed to full sunlight, the fruit is very likely to have a bluish color, or even to be of a scarlet color. The albino forms must, however, be carefully distinguished from the "white berries" caused by the presence of a fungus (Sclerotinia baccarum).

Propagation.—In the past one chief drawback in the dissemination of the Blueberries has been the difficulty, or impossible difficulty, of propagation. The few serymen who have offered them for sale have usually depended upon the native heaths and pastures for their supply of plants, rather than upon the nursery rows. The results have been most discouraging; and the Blueberries, though among the finest of fruits, are almost unknown in cultivation.

In the case of the cranberries, propagation is effected almost exclusively by cuttings (see Cranberry). With these Blueberries, grafting is the easily practiced and in this way specially choice individuals may be perpetuated. For general purposes, however, seedlings or division may be used. Propagation by seed naturally requires care and skill, but is considered feasible. The method followed at the Arnold Arboretum, and at the Maine Agricultural Experiment Station, where for several years seedling Blueberries have been grown, is essentially as follows: Seed-pans or boxes about 4 in. deep are half filled with pots and covered with a layer of sphagnum, after which a compost consisting of one-third each of Blueberry and well-rotted rod and fine sand, is used; the whole being firmed with the hand or a mallet. The seeds, washed free from the pulp of freshly gathered fruit, is then sown thickly, pressed down lightly and covered with a slight sprinkling of sphagnum. The boxes are placed in a coldframe until January, when they are brought to a house with a temperature of 55°-60° and a range of 10° higher by day. As the young seedlings appear, they are carefully removed and a quantity of compost sifted in among the plants. The young plants are treated like other delicate seedlings, and handled about twice during the first season. After Sept. 1 they are pruned off and later removed to a coldframe for winter, the frames being protected to retain the foliage as late as possible and covered with hay or litter during the winter. The next spring the plants are set about 6 inches apart in a well-prepared bed and shaded until thoroughly established. Clean tillage is given during the season. At the approach of winter, a few inches of loam between the plants to prevent heaving is the only protection required. The following spring or two years from seed, they may be planted out permanently. Seed which is kept until dry and then sown, even if given the best of care, will seldom germinate until the second year. The low Blueberry (V. Pennsylvaninum) will usually fruit in three to four years from seed; but V. corymbosum requires four to six years. See Bull. 76, Maine Exp. Sta.
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Botanical Classification.—In the following scheme the species are separated on the basis of natural characters. When two closely related forms occur over wide range in latitude, however, the assigned differences are liable to fail at some point. The key will be found useful in determining herbarium specimens.

A. Ovary 4-5-loculed (rarely 8-10-loculed in V. Vitis-Idaea).
B. Stamens long-exserted.
C. Filaments villous........ 5. erythrocarpon
CC. Filaments puberulent.
D. Stamens very slender, creeping........ 1. oxyoccus
DD. Stems stout, with ascending branches........ 2. macrocarpon
BB. Stamens included.
C. Filaments glabrous or pubescent.
D. Corolla commonly 4-lobed; stamens 8......21. uliginosum
DD. Corolla commonly 5-lobed; stamens 10.
E. Plants dwarf, a footer less high.
F. Bractlets not angled.10. cespitosum
FF. Branches sharply angled........ 9. Myrtillus
EE. Plants taller, 1-12 ft. high.
F. Margins of leaves sharply serrulate.15. myrtilloides
FF. Margins of leaves entire (except in V. ovatifolium).
G. Length of lvs. 1-2 inches........ 16. ovalifolium
GG. Length of lvs. 1½-3 inches........ 4 parvifolium
CC. Filaments pilose.
D. Twigs red. Here probably betulous........ 22. erythrinum
DD. Twigs not red.
E. Stamens 10; ovary 5-loculed.
F. Branchlets pubescent........ 23. ovatum
FF. Branchlets ciliate.
EE. Stamens 8; ovary 4-loculed........ 3. Vitis-Idaea
AA. Ovary 10-loculed (sometimes imperfectly so).
B. Anthers with 2 awns on the back.
C. Stamens included........ 24. arboresum
CC. Stamens exserted........ 25. stamineum
BB. Anthers awnless.
C. Foliage evergreen, coriaceous.
D. Calyx-teeth roundish and very dense...... 6. nitidum
DD. Calyx-teeth acute...... 7. Myrsinites
CC. Foliage deciduous (sometimes heavily so in southern forms).
D. Corolla cylindraceous........ 17. virgatum
DD. Corolla short and usually broad.
E. Branchlets hisrate........ 14. hirsutum
EE. Branchlets glabrous or glaucous (except in V. Canadense).
F. Lvs. glaucous and pale beneath.
G. Fruit blue...... 8. vacillans
GG. Fruit black........ 12. nigrum
FF. Lvs. strongly pubescent both sides........ 13. Canadense
FFF. Lvs. glabrous, often hairy on midrib beneath.

Horticultural Classification.—The following key to the more commonly known species is based upon horticultural or garden characters:

A. Species cultivated chiefly for fruit.
B. Color of fruit red.
C. Stems slender, trailing:
Lvs. evergreen.
D. Apex of leaves acute...... 1. oxyoccus
DD. Apex of leaves obtuse or subacute..... 2. macrocarpon
CC. Stems stout or somewhat ciliate; branches erect, tufted........ 3. Vitis-Idaea
CCC. Stems erect, much taller, 2-10 ft.
DD. Lvs. small, 3½-4½ in. long. 4. parvifolium
DD. Lvs. larger, 5½-6 in. long........ 5. erythrocarpon
BB. Color of fruit blue or black.
C. Plant low, ½-3 ft. high.
D. Foliage evergreen.
E. Lvs. small, ¾-1½ in. long........ 6. nitidum
EE. Lvs. large, 1½-2 in. long........ 7. Myrsinites
DD. Foliage deciduous.
E. Surface of lvs. glabrous.
F. Lvs. pale beneath, not shining above. (See also No. 12. Here might be sought V. corymbosum, var. patilium, No. 18.)
FF. Lvs. not paler beneath, shining, at least above. (Exceptions: No. 12 always paler beneath; No. 11 rarely paler beneath.)
G. Fls. solitary in axils.
H. Branches sharply angled........ 9. Myrtillus
HH. Branches not angled........ 10. cespitosum
GG. Fls. in fascicles or short racemes.
H. The lvs. not paler beneath. 11. Pennsylvanicum
HH. The lvs. paler beneath........ 12. nigrum
EE. Surface of the lvs. hairy.
F. Ovary and fr. glaucous........ 13. Canadense
FF. Ovary and fr. hisrate........ 14. hirsutum
CC. Plant taller, 3-12 ft spreading.
D. Fls. solitary in axils.
E. Lvs. sharply serrate.15. myrtilloides
EE. Lvs. entire or slightly serrate........ 16. ovalifolium
DD. Fls. in racemes or corymbs.
E. Racemes elongated on naked branches........ 17. virgatum
New England, Minn. and Brit. Col. B.B. 2:586. L.R.C. 7:616 (as var. major); 11:1023 (var. minor).—The fruits, which are rather larger than currants, acid and somewhat bitter when uncooked, are largely used in the more northern regions for tarts, jellies and preserves, or as a substitute for the common cranberry. According to Macoun, the fisherman's families along the Gaspé coast and the north shore of the Gulf of St. Lawrence gather the fruit of this species in large quantities for their own use and for sale, calling it "Low-bush Cranberry." Throughout the whole of northern Canada hunters and trappers, as well as the native Indians, have frequently to depend upon it for food. It is valuable for the shurbbery border, where the strong contrast of the dark green foliage and the bright-colored persistent fruit is very striking.

4. parviflorum, Smith. Shrub, 6-12 ft. high, straggling, with slender, green, sharply angled branches; lvs. oblong or oval, obtuse, entire, dull or pale, 3/4-1 1/2 in. long; fls. solitary in the axils; corolla glabrous, nearly white; calyx 5-lobed; berries light red, rather dry. Northern Calif. to Alaska.—Offered by only one nurseryman. T. J. Howell, of Oregon, characterizes the fruit as "of good flavor, excellent for tarts," while Gray says "rather dry, hardly edible."

5. erythrocarpon, Michx. Shrub, erect, divergently branching, 1-4 ft. high; lvs. oblong-lanceolate, acuminate, serrate, thin, 1 1/2-3 in. long; pedicels solitary, axillary, bractless; corolla flesh-colored; calyx-calyx-calyx, 4-5-flowered; calyx and corolla, 3/4 in. in diam., light red, turning to deep blue-black at full maturity, watery, slightly acid, scarcely edible. July. Higher Alleghenies, Va. to Ga. B.M. 7143.

6. nitidum, Andr. A diffusely much branched shrub, with smooth branchlets; lvs. thick, coriaceous, shining above, obovate or oblong; fls. in fascicles on short racemes, the almost persistent bracts as well as the roundish or obtuse calyx-teeth reddish; corolla short-campanulate, 5-toothed, berry "somewhat pear-shaped, black." Fla. and Ga.—Near or passing into V. Myrsinites.

7. Myrsinites, Lam. Low, evergreen shrub erect or decumbent; lvs. exceedingly variable, 3/4-1 in. long, entire or serrulate, sometimes denticulate, mostly shining above; bracts and calyx-teeth acute or acutish; berries "globose, blue." Sandy pine barrens N.Car. to Fla. and La. B.M. 1550 (as V. nitidum, var. decumbens).—The difference between this species and the preceding is obscure. The chief points of distinction seem to be that V. Myrsinites has puberulent branchlets, prominently veined lvs. and acute calyx-teeth and bracts, while V. nitidum has smooth branchlets, smaller and faintly veined lvs., with obtuse or roundish calyx-teeth and bracts. Growth as a point in coolhouses in England under the name of V. Sprengelii.

8. vaillians, Kalm. Low Blueberry. Blue Huckleberry. Erect, glabrous; lvs. ovate or oval, entire or sparingly serrulate; fls. in rather loose clusters, generally on leafless summits of twigs; corolla campanulate, or cylindraceous, contracted at the mouth: berries large, blue, with much bloom, of excellent flavor, ripening with V. Canadense. Dry, sandy, or rocky places, N. Amer. B.B. 2:576. Em. 1:454.—One of the most common species of the northern and central states, particularly west of the Alleghenies. The lfs. are quite showy, while the fruit is particularly valuable.

9. Myrtillus, Linn. Whortleberry. Bilberry. Low shrubs, glabrous; lvs. ovate or oval, serrate, commonly veined, 3/4-1 1/2 in. long; calyx almost entire; berries black, nodding. Mountainous regions, N. Amer., Eu., Asia.—The most widely distributed species and very generally used as an article of diet and in the making of drinks, particularly in the Old World. It is from this species that the common name Whortleberry is derived. Not of special importance in America.

10. caspitum, Michx. Dwarf Bilberry. A dwarf tufted shrub, 3-12 in. high, nearly glabrous throughout; lvs. ovate, obtuse or acutish, serrulate, shining on both sides; lfs. solitary; corolla obovoid, pink or white, slightly 5-toothed (rarely 4-toothed); berries large, globose, blue with bloom, sweet. N. Amer. B.B. 2:576
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B.M. 3429—It is doubtful if varieties can be distinguished. Var. arbuscula, Gray, passes into the ordinary form; while var. angustifolium, Gray, and cuneifolium, Nutt., are found to be simply forms produced by shade. The last form, particularly, is common in New England, and early in the season the lvs. are of the ordinary ovate type, while later they become elongated. Recommended by Warren H. Manning for the rock garden.

11. Pennsylvanicum, Lam. Low Blueberry. Fig. 2630. A dwarf shrub, 6-15 in. high; lvs. membranaceous, oblong-lanceolate or oblong, distinctly serrulate with bristle-pointed teeth, mostly shining on both sides but often hairy on midrib beneath; fls. on short pedicels; corolla campanulate-cylindrical, short: berries large, globose, bluish black with bloom, sweet, the earliest to ripen north. N. Amer. B.M. 3434. B.B. 2:378. Em. 1893:71. —Var.

12. nigra, Britton. Low Black Blueberry. Low shrub, similar to V. Pennsylvanicum, and often associated with it: lvs. oblong-lanceolate to ovate, finely serrulate, green above, pale and glaucous beneath: fls. few in the clusters, white or cream-colored, appearing earlier than those of V. Pennsylvanicum: berries rather small, black without bloom. Dry rocky soil. N. Amer. B.B. 2:373. Rep. Mo. Exp. Sta. 1895:171. —This species is distinguished from the preceding by the glaucous under surfaces of the leaves and by the characteristic shining black fruit. It is usually found in colonies in the same situations as V. Pennsylvanicum; but occasionally the two species will be found intermingled.

13. Canadense, Richards. Canada Blueberry. Erect shrubs, 1-2 ft. high, the crowded branchlets downy-pubescent: lvs. oblong-lanceolate or elliptical, entire, downy on both sides; corolla broad, open-campanulate, greenish white, often tinged with red: berries globose or oblatae, blue with much bloom, of excellent flavor. Low woods, Hudson Bay to Bear Lake and the northwestern Rocky Mts.; south to Mich. 1840:171. B.B. 2:578.-This species, commonly known as "Velvet Leaf" or "Soup Top" because of the character of its foliage and the somewhat acid fruit, usually grows in rather moist, rocky or swampy localities. The fruit is larger and more acid than the other low forms and matures from one to three weeks later. It is not so popular in the general market as the sweeter kinds, but it is very prolific and its lateness in ripening is a point in its favor.

14. hispidum, Buckley. Hairy Huckleberry. Bear Huckleberry. Low shrub, 1-2 ft. high; stems green, grooved, obscurely 4-angled, those of the current year covered with stout, spreading white hairs: lvs. ovate, entire and, together with the pure white more or less corolla, the calyx and the dark blue globose fruit, hisrute. Very local in N. C., Ga. and Tenn. G.F. 2:365. —This species, discovered about 1840, was last sighted of for half a century until rediscovered by Sargent and transferred to the Arnold Arboretum. It is readily distinguished by the hairy and rough fruit. The fruit is described as fully as large as that of Gaylussacia rhesos, shining black kind of an agreeable flavor. Under cultivation not so densely hairy as in the wild state. Gives promise of being valuable under cultivation as one of the latest of its kind to ripen, at the Arnold Arboretum the best period of fruiting being the middle of August, berries remaining into September.

15. myrtilloides, Hook. An erect, branching shrub, mostly glabrous throughout, the twigs slightly angled: lvs. oval, oblong or ovate, acute, serrate, membranous, green on both sides but not shining, 1-2 in. long: calyx entire; corolla depressed-globose: yellowish or greenish white: berries large, oblate, black, rather acid. Lake Superior westward. B.M. 3447.—The berries are large, 1-2 in. in oblate, with broad calyx, of excellent flavor; much relished by the natives of the northwest.

16. ovalifolium, Smith. A slender, straggling, branched shrub 3-12 ft. high, with slender more or less angled branchlets: lvs. oval, obtuse, glabrous, green above, glaucous beneath: fls. small, solitary, on short, recurved pedicels; corolla globose-ovoid; berry large, 1-2 in. bluish purple, with bloom. Woods, Columbia Mts., Mich., Ore. and Alaska. B.B. 2577.—This species is very abundant in the northwest, forming a large part of the undergrowth along the southern coast of Alaska (Hockey). The berries of the rather larger species, collected in great quantities by the Indians, who use them fresh and dry them for winter. The exceptionally large berries and vigorous habit of this species suggest its value for cultivation and particularly for crossing with the low-growing species, such as V. Pennsylvanicum and Canadense.

17. virgatum, Ait. A shrub 3-12 ft. high, with slender green branches, the young twigs puberulent; lvs. narrowly oval-oblong, acute, often mucronate, entire or minutely serrulate, green and glabrous above, pale or glaucous beneath, ¼-2 in. long; fls. in short racemes on naked twigs, appearing before the lvs.; corolla nearly cylindrical, white or pink; bracts small, deciduous; berry black, with or without bloom. Southern Va. to Ga., Tenn., and Ala. B.B. 2:577. B.M. 3929. B.R. 4:363 (as V. fusca).—The distinction between this species and the next is very slight. It is probable that, possibly excepting var. tenellum, this is only a southern form of V. corymbosum and should be reduced to varietal rank.

Var. tenellum, Gray (V. tenellum, Ait., not Pursh). A low form, mostly less than 2 ft. high, with smaller lvs. and nearly white fls. in short, close clusters. Southern Va. to Ark., Fla. and Ala.—Probably a distinct species.

18. corymbosum, Lindl. High-bush Blueberry. Swamp Huckleberry. Fig. 2631. A tall, straggling shrub, 4-12 ft. high, with yellowish green warty branch-
lets which later turn brownish: Ivs. ovate or oblong to elliptical-lanceolate, usually entire: fls. in short racemes on naked twigs; corolla ovate to urn-shaped, or oblong-cylindrical, white or pinkish: berries blue-black, with much bloom, of excellent flavor. Moist woods or swamps, N. Amer. Em. 2:434. American Agriculturist 1886:364. B.B. 2:577. —Exceedingly variable, and numerous gradations unite the several varieties. *V. coromosum* is one of the most valuable species both for fruit and as an ornamental shrub. It thrives in the garden and is readily susceptible of improvement by cultivation.

Var. *amoenum*. Gray (V. aminum, Ait.). A form with bristly ciliate, serrulate leaves, bright green on both sides, shining above, often pubescent on veins beneath. Mainly in the Middle Atlantic states. B.R. 5:100. B.M. 3:433 (as *V. coromosum*).


Var. *fusatum*. Gray (V. fusatum, Ait. V. atroccum, Gray). Black Blueberry. A branching shrub with shaggy bark, similar to *V. coromosum*. Ivs. oval or oblong, dark green above, densely pubescent beneath, entire, acute, often mucronate; fls. in short racemes, appearing with the Ivs.; berry black, without bloom, sweet. Moist woods and swamps, northeastern N. Amer. B.B. 2:578.

20. *crassifolium*. Ait. Slender, trailing shrub; stems 2-3 ft. long, glabrous: Ivs. small, 1/4-3/8 in. long, oval or narrowly oblong, sparsely serrulate or entire, shining: fls. few, almost sessile, in small, axillary clusters, nearly white or tinged with red: berries black. Sandy logs, N. C. to Ga. B.M. 1132. —Useful for the shrubbery border south.

21. *uliginosum*. Linn. Bog Bilberry. A stiff, much-branched shrub 3/4-2 ft. high; Ivs. thick, ovate or oblong, obtuse or recurved, 1/2-in. in long, nearly serrate: fls. 2-4 together, or sometimes solitary; calyx 4-parted, sometimes 5-parted; corolla urn-shaped, 4- or 5-lobed, pink. Stems 8-10; berries bluish black, with bloom, of N. Amer., Eu., Asia. B.B. 2:576. —The plant is useful for the shrubbery border in cold, wet locations, and its fruit, though of poor quality, is used for food by the natives of the northwest.


23. *ovatum*. Pursh. An erect, rigid, evergreen shrub, 3-6 ft. high, with pubescent branches: Ivs. very numerous, thick, shining, ovate or oblong, acute, serrate; fls. numerous, in short, axillary clusters; Ivs. strap-shaped, frequently purple of agreeable flavor. Vancouver's Island to Monterey, Calif. B.R. 16:1334. —A distinctly western species, and one of California's most beautiful hedge plants, but not well known. *V. ovatum* is very tenacious of life and bears pruning well; propagated from suckers, cuttings and seeds, which last it bears freely.

24. *arboreum*. Marshall. Fakkleberry. Sparkleberry. Spreading shrub or small tree, 6-25 ft. high, with glaucous or pubescent branches: Ivs. thin, shining, coriaceous, smooth and shining above, ovate to oblong, entire or obscurely denticulate: fls. profuse, axillary and leafy racemose; corolla white, 5-lobed: berry small, globose, rather astrigent. Sandy soil along river banks. Fla., La., Ill., N.J., L.B.C. 19:1883. B.M. 1907 (as V. *difussum*). B.B. 2:380. —It forms an irregular shrub too diffuse and struggling to be of value except in masses, for which purpose it is useful at the South.

25. *stamineum*. Lind. Deerberry. Squaw Hacker. A divergingly branched shrub, 2-5 ft high, with pubescent or glabrous twigs; Ivs. oval to oblong-lanceolate, acute, entire, pale, glaucous or sometimes slightly pubescent beneath, 1-1 1/2 in. long; 3/4-1 1/2 wide: fls. very numerous, in large leafy-branched racemes, white or creamy green, 5-cleft: anthers and style exserted: fr. large, globose or pyriform, greenish or yellowish, few-seeded, almost indehiscent. Dry woods and thickets, N. Amer. B.B. 2:380.

26. *melanocarpum*. Mohr. Southern Gooseberry. Shrub, 2-3 ft. high, branched from near the base; Ivs. as in the type: fls. in loosely 4-8-flowered elongated racemes; berries twice the size of the typical form, shining black, with a juicy purplish pulp, sweetish, with slightly tart flavor. S. States. —Probably a distinct species. Will thrive on any good, well-drained soil and is a valuable shade-enduring ornamental shrub.


**Valeriana (meaning obscure).** Anarquillidaeae. A single species, a bulbous autumn-flowering plant from Syria with strap-shaped leaves produced after the flowers, which are quite freely produced in 6-8-flowered umbels on naked scapes about 1 ft. high; perianth-tube short, funnel-shaped at the apex, lanceolate, stamens inserted on throat of tube; filaments quadrate: ovary globose, 3-located, with 2-3 ovules in each locule.

**valviflora.** Herb. Bulb globose, about 1 1/2 in. in diameter, with white, yellow or brownish flowers. Offered by European bulb-growers.

**Valeriana (Latin valo, to be strong, in allusion to medicinal uses).** Valerian. Valerianacea. A large genus (probably more than 150 species) of widespread herbs, mostly of the northern hemisphere. Less than a dozen species are North American. The Valerians are erect-growing, mostly tall perennial, with strong-smelling roots, and bearing many small white, pink or rose-colored flowers in terminal cyme or cymose-paniculate clusters. Corolla tubular or trumpet-shaped, the limb nearly equally 5-toothed or lobed, the tube usually swollen at the base; stamens 3; ovary 1-located (by abortion), bearing an entire or somewhat 2-3-lobed style; fruiting into an achenium; calyx of bristle-like lobes: Ivs. opposite, various.

The Valerians in the American trade are hardly perennials of easiest culture. Only 1, officinalis is well known. This is one of the characteristic plants of old gardens, being prized for the spicy fragrance of its numerous flowers in spring. It spreads rapidly from
The roots are eaten by Indians. The leaves are thickish and strongly veined.

The African or Algerian Valerian is *Falda Cornucopia*, Gaertn. (Valeriana Cornucopiae, Linn. Valerianella Cornucopiae, Linn.). It is an Algerian annual used for salad, after the manner of corn salad. It does not appear to be in the Amer. trade. Glabrous, branching, 1½ ft. or less high: lvs. ovate-oblong, thickish, simple, somewhat toothed, those of the stem clasping: fls. long-tubular, pink, in terminal clusters, Cult. as for corn-salad, although it endures less cold. It thrives well in warm weather when no follow. No. B.K. 2.155.—*V. tripterys*, Linn., of Europe, appears to have been offered in this country, although little known here: about 1½ ft. tall, glabrous, radial lvs. or cordate, dentate: stelvs. with 3 lvs. or lobes, the terminal one large: fls. rose-colored, polygamous.

**L. H. B.**

**VALERIANELLA** (diminutive of Valeriana). *Valerianella inclinata*. Among the Annuals of the Vegetable Garden.

**olitoria**, DC. *Corn Salad*. LAMB'S LETTUCE. *Fetttcus*. Fig. 2633. An "autumnal annual" herb, the seed of which ripens in April or May, soon falls to the ground, and germinates in August. The plant makes its growth in the fall and flowers the following spring. In cultivation the seed is generally sown in early spring or late summer. The plant forms a dense rosette of spoon-shaped lvs. which grow in a decussate fashion, and has an angular, forked stem bearing small white or yellowish white fls. in terminal clusters. Ev., Orient. — The Round-Leafed variety has much shorter lvs. than the common type and they are half-erect instead of spreading, and less prominently veined. This kind is the one grown almost exclusively for the Paris market. The Large-Seeded variety is more robust than the common type and is generally sown in spring or late summer. The plant forms a dense rosette of spoon-shaped lvs. which grow in a decussate fashion, and has an angular, forked stem bearing small white or yellowish white fls. in terminal clusters. Ev., Orient. — The Round-Leaved variety has much shorter lvs. than the

**valeriana**, Linn. *Common Valerian*. GARDEN HELIOTROPE. CAT'S VALERIAN. *St. GEORGE'S HERB*. Fig. 2632. Somewhat pubescent: stem erect, simple below but somewhat branching above, 2-5 ft. lvs. all pinnate, with several to many lanceolate to linear acuminate toothed or notched lvs.: fls. numerous, whitish, pinkish or lavender, very fragrant. Europe, N. Asia. — The medicinal valerian is obtained mostly from the roots of this species.

**phu**, Linn. Glabrous, very unisexual, less tall than the above: root-lvs. simple: stem-lvs. lobed or bearing 5-7 entire leaflets: fls. whitish. Caucasus. Var. aurea, Hort., has young shoots golden yellow.

**diocica**, Linn. *Marsh Valerian*. About 1-2 ft. lvs. ovate or elliptic or spatulate and entire, long-stalked; stem-lvs. mostly pinnate with entire leaflets; or divisions, the terminal leaflet ovate or oblong and the lateral ones smaller and narrower: fls. mostly unisexual, the sterile ones the larger, all pale rose color. Europe, in moist soil.

**stitchmania**, Bong. A foot or less, the rootstocks thick and ascending: root-lvs. ovate or oblong, simple or somewhat lobed; stem-lvs. mostly 3-5-foliate, the divisions or leaflets orbicular to oblong-ovate; fls. white, very fragrant, in contracted cymes, the corolla about ½ in. long. Rocky Mts. to Alaska. G.F. 9:315.—A very early bloomer.

**montana**, Linn. Usually one ft. or less high, glabrous or nearly so: root-lvs. oblong, oval or orbicular-oblong, usually obtuse, somewhat dentate; stem-lvs. lanceolate-acuminate, dentate or nearly entire: fls. bright rose, dioecious. Ev. L.B.C. 4:317.

**aa.** Rootstocks perpendicular, branching below.

**edulis**, Nutt. Two-4 ft., glabrous or nearly so: root-lvs. oblanceolate or spatulate with margined peltate, entire to pinnatifid; stem-lvs. few, sessile, parted into linear or lanceolate divisions: fls. yellowish white, in an elongated panicle, more or less diocious. Ohio to Arizona and British Columbia, in wet or moist lands.

**valeriana officinalis** (X3).
kinds and specially suited to cold weather and long distance shipment. The cabbaging variety differs from the others in forming a heart or head of fine flavor. Unfortunately it is the least productive type, but it bears shipment well.

**ericàceps, Desv.** Italian Corn Salad. Distinguished from the common species by the lighter color of the lvs., which are slightly hairy and somewhat toothed on the edges towards the base. The plant is native to the south of Europe, where it is highly esteemed because it does not run to seed as quickly in a warm climate. It is undesirable for northern climates.

**VALLISNERIA** (Antonio Vallisneri, 1661-1730, Italian naturalist). *Hydrocharideae*. About 4 species, are aquatic plants, including the well-known Eel-grass or Tape-grass. This is found in fresh water all over the world. It is a submerged plant with linear lvs., ½–6 ft. long, depending on the depth of the water. The lvs. originate in a tuft at the bottom of the water, and the plant spreads by runners sent out from these tufts. Eel-grass is usually found in quiet waters. It has no horticultural rank, except as an aquarium plant. Like many other aquarium plants, it has special interest for students of botany. The pinnate lfs. are borne on very long spiral threads and come to the surface as shown in Fig. 2634. The stamine lfs. are borne on very short stalks near the bottom of the water. At the proper time the stamine lfs. break away from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pinnate lfs., and in this haphazard way the blossoms are fertilized and seed is produced. Both kinds of lfs. are very small, and they are borne on separate plants. Eel-grass is readily collected, or can be procured from dealers in aquarium supplies or from collectors of native plants. The plant is sometimes called "wild celery," because it is said to impart a celery-like flavor to wild ducks that feed on it. For generic characters, see Gray's Manual or Britton and Brown's Illustrated Flora.


Wm. Tricker and W. M.

**VALLOTA** (Pierre Vallot, French botanist; wrote an account of the garden of Louis XIII in 1623). *Amaryllidaceae*. The Scarboroueh Lily, *Vallota purpurea*, is a South African representative of the American genus Hippeastrum, popularly known as "Amaryllis." It is a bulbous plant with large, red, funnel-shaped, chalice-like flowers, blooming in September and later. A pair of well-grown specimens in large pots or tubs make a showy ornament for the porch. Plants have been grown with over 50 flower trusses, each truss bearing an umbel of 4–9 lfs., the individual lfs. being 3–4 in. or more across. Vallota is a genus of only one species and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the flower is longer than in the *Hippeastrum*, and at the base of each perianth-segment is a cushion-shaped calixus, somewhat different from the minute scales or distinct neck that is often found at the throat of a Hippeastrum.

Other generic characters: Perianth erect; tube broadly funnel-shaped; segments equal, ascending, broad, connivent; stamens inserted below the throat; ovaries many, superposed; stigma capitulate; seeds black, compressed. It has recently been proposed that Vallota be considered a subgenus of Cyrtanthus. The latter is a group of about 20 species of plants with lfs. of various colors and naked at the throat. Cyrtanthus proper and

2635. Scarboroueh Lily — *Vallota purpurea*. (From a specimen 2 feet high)

The scarboroueh Lily is generally rated as a greenhouse bulb, but it can be grown by the amateur who has no glass, provided the plant can be kept over winter in a well-lighted cellar. Many people have had no success with Vallota. Such failures are generally due to the plants being kept too dry during winter. Although Baker says the leaves die down at the Cape in autumn, the plant acts like an evergreen in cultivation. Unlike the majority of bulbous plants, the Vallota should never be dried off, but kept moderately moist about the roots throughout the year. The Vallota is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health
for three or four years without repotting, simply by applying liquid manure to the roots occasionally during the summer. The culture of Vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A Vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance behind the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when shifting to a larger pot.

Vallota is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is essential that the potting soil be of a strong, permanent nature and rich in plant-food. A good compost consists of turfy loam, fibrous peat and old cow manure in equal parts. Add a little sand and charcoal. Avoid repotting until it is strictly necessary, and do so only when it is necessary to increase the number of plants or when there is danger of the roots breaking the pot. For amateurs the best time to repot the plants is directly after the flowering period. Use the greatest care in handling the roots. Allow the bulbs to project a little beyond the surface.

Some gardeners prefer to repot Vallota in June or July when root action has started, but before the flower stems have pushed up. Vallota likes full sunshine all through the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. Amateurs sometimes raise Vallotas in the window-garden, one bulb in a 6-inch pot with 1 or 2 flower-stalks, but a large specimen is well worth years of care. The Scarborough Lily has been cultivated by rich and poor for over a century. Its popular name is supposed to have been derived in the same way as theGuernsey Lily,—a Dutch back having been wrecked off the coast of England, some bulbs washed ashore and become established as garden plants. Vallota is considerably grown for the London market, and it is said that some growers have two or more plants to blossom their plants twice the same year, in winter and summer. At the Cape, the species is said to be native to peat bogs, which fact would account for the special winter treatment which it needs. In California the plant blooms at various times of the year.

Michael Barker.

VANCOUVERIA (after Capt. George Vancouver, commander of the Discovery in the voyage to our north-west coast in 1790-35). Her-betridaceæ. A genus of 3 species of low, hardy perennial herbs native to our Pacific slope. Shade-loving plants, with slender creeping rootstocks and radical 2-3-ternately compound lvs. somewhat like maidenhair or rue and rather small white or yellow flowers in an open panicle on a naked scape. Sepals 6, in 2 series, obvate, petal-like, reflexed, soon falling; petals 6, linear-spathulate; stamens 6: follicle oblong, membranous, unequally 2-valved; seeds arillate. Vancouverias demand a rich soil in rather shady positions. They are not showy plants, but have foliage of an elegant and refined type.

A. Lvs. thin, membranous; fls. whiteish.

hexandra, Morr. & Decne. About 1 foot high; rootstock woody, slender; lfts. roundish, mostly angulately 3-lobed and cordate; scape naked or 1-lvd.; panicle simple or loose-branched; fls. white or cream-colored. May. June. Coniferous woods, Brit. Col. to N. Calif. near the coast. Gn. 30, p. 263.

dais. Vanda caerulea (× 1/2).

either pots or baskets, but the latter are preferable, as they admit air more freely to the roots, whereby they are not so liable to decay from overheating during severe weather.

The best potting or basketing material consists of chopped live sphagnum moss freely interspersed with large pieces of charcoal. This material should be pressed in rather firmly about the roots, leaving a con-
vex surface when finished. A plentiful supply of water is essential at all seasons with copious syringing over the foliage in bright weather. The compost should never be allowed to remain dry for a long time.

1. *V. tricolor* and species like it grow very well among foliage plants in the greenhouse, where their large aerial roots, which are freely emitted from the sides of the stems, may ramble among the foliage and thereby retain moisture a white film after syringing. A few species, such as 1. *Amesianna*, 1. *Inflata* and 1. *Kimballiana*, with one or two other alpine species, require about ten degrees cooler temperature, but otherwise similar treatment to other species of this genus.

Stock is increased by removing a foot or more of the leading growth with a sharp knife, allowing several roots to remain attached to each growth and basketing them in the usual manner. These new pieces should be frequently syringed overhead until they become established or they are likely to shrivel. The old stems will nearly always send out several new growths.

The principal insect enemies to *Vandas* are several species of scale, which breed fast in a dry atmosphere. They can be kept in check by syringing with strong tobacco water and by sponging the plants with a 20 per cent solution of alcohol. R. M. Grey.

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1. Labellum spurred.
2. Lvs. flat, or channelled and keeled, toothed or lobed at the apex.
4. D. Fls. 1½ in. across.
5. E. Color blue.
6. EE. Color white or pale yellow, but streaked and shaded with brown.
7. Dd. Fls. 2 in. or more across (sometimes less in Nos. 8 and 11).
8. E. Color blue.
9. EEE. Color white or yellowish, but spotted with purple or brown.
10. F. Middle lobe of the labellum dilated, reflexed, and therefrom.
11. BB. Lvs. semi-terete and deeply channelled, pointed.
12. AA. Labellum not spurred.

1. Ceruleana, Griff. Stem 1-2 ft. high: lvs. 5-7 in. long, deeply channelled, truncate and 2-lobed at the apex:

- Stems, nearly similar and always about 18 in. long.
- Lvs. 2½ in. across, pale blue; lateral sepals obvolute; petals broadly ovate, clawed; labellum less than one-third the length of the sepal, dark blue, linear-oblong, side lobes small, rounded, middle lobe with 2 teeth at the apex of the labellum, which is also dark blue, autumn.

2. Denisoniana, Benson & Reichb. f. Stem short:

- Lvs. 6-10 in. long, recurved, deeply notched at the apex: peduncles short, stout, bearing 4-6-fld. racemes; fls. white, 2 in. across; sepal and petals waved and twisted, the lateral sepal broadly ovate, falcate; petals clawed, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe panduriform, with 2 orbicular, diverging, terminal lobes.


3. EEE. Color white or yellowish, but spotted with purple or brown.

- Middle lobe of the labellum dilated, reflexed, and therefrom.

- A. Apex emarginate or 2-lobed.

- B. Apex truncate and ob-12:5 in. across.

- C. Middle lobe shorter than the sepal, labellum, &c.

- D. Lvs. semi-terete and deeply channelled, pointed.

- E. Lvs. terete.

- F. Labellum not spurred.

- G. Apex truncate and obt.-

- H. Middle lobe shorter than the sepal, labellum, &c.

- I. Lvs. semi-terete and deeply channelled, pointed.

- J. Lvs. terete.

- K. Labellum not spurred.

1. Ceruleana, Griff. Stem 1-2 ft. high: lvs. 5-7 in. long, deeply channelled, truncate and 2-lobed at the apex:

- Racemes many, slender and pendulous, each bearing about 12 fls.; fls. 1 in. across; sepal and petals obvolute, subacute, undulate or twisted, pale lilac-blue: labellum shorter than the sepal, middle lobe cuneate-ovate, white, with delicate yellow fls. on grayish filaments, with dark blue ridges, side lobes small, dark blue. Spring. Burma.


- Fls. pale violet or nearly white: disc of the labellum deep violet with white lines on the sides. B.M. 6328.

2. Parviflora, Lindl. Stem 4-6 in. high: lvs. strap-shaped, 4-8 in. long, unequally obtuse 2 lobed; racemes erect, many-fld.: fls. small, yellow; sepal and petals obvolute-spatulate; labellum shorter than the sepal, middle lobe ovate, truncate at the apex, yellow below, white above, spotted and dashed with purple and having thick fleshy ridges.

- Himalayas. B.M. 5359 (as *Aerides Wightianum*).

3. Spathulata, Spreng. Stem 2 ft. high: lvs. 2-4 in. long, obtusely 2-lobed; peduncle about 12-18 in. tall, few-fld.: fls. 2½ in. across, golden yellow: sepal and petals oblong-spataulate, flat; labellum as long as the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-ovate, obscurely 3 flid. Ceylon, 1867.

4. Lamellata, Lindl. Lvs. channelled, leathery, obliquely and acutely bifid at the apex: fls. pale yellow, stained with red: sepal and petals obvolute, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the lip ovate-oblong, rotate, auricual-lobed at the apex, yellow below, white above, spotted and dashed with purple and having thick fleshy ridges.

- Himalayas. B.M. 5358 (as *Aerides Wightianum*).


12. Limbata, Blume. Stem about 3 ft. high: lvs. linear, keeled, 6–8 in. long, unequally bifid at the apex; racemes 10–12-fld., 6–8 in. long on peduncles of equal length: fls. 2 in. across; sepals and petals spatulate, bright cinna mon, tessellated, bordered with golden yellow, white suffused with lilac outside; the lobe of the labellum oblong-pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6173.

13. Parishti, Reichb. f. Stem very short: lvs. few, 8–10 in. long, 2–3 in. wide, obtuse. 2-3 ft., drooping, 6–8-fld., on a short peduncle; fls. 2 in. across, fleshy, greenish yellow, freely spotted with reddish brown; sepals broadly ovate-oblong; petals orbicular; labellum one-half as long as the sepals, white striped with orange at the base; lateral lobes rounded, middle lobes flabelliform. Summer. Moulmein, India. — Var.

2637. Vanda Kimballiana (X34).

2638. Vanda teres (detached flower X15).

Marriottiana, Reichb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum, white at base, with yellow spots and maroon lines.


15. Ameisiara, Reichb. f. Stem very short and stout: lvs. fleshy, rigid, almost terete, with a groove down the center, 6–12 in. long; raceme simple or branched, 1–2 ft. long and bearing 20–30 fls; fls. 1 1/4 in. across, white, with rose-colored ridges on the labellum, sepals and petals ovate-oblong, obtuse; labellum with a broadly cuneate, nodulate middle lobe, having 5 ridges converging into a reflexed callus, side lobes small, rounded. Flowers at various seasons. India. B.M. 7139. J.H. III. 29:491; 33:271. A.F. 6:441.


17. Terec, Lindl. Fig. 2638. Stem long, climbing: lvs. terete, 6–8 in. long; peduncle 6–12 in. long, bearing a 3–6-fld. raceme: fls. 4 in. across; sepals nearly orbicular, white tinged with rose; petals a little larger, deep rose; side lobes of the labellum broad, incurved, yellow spotted with crimson, middle lobe exceeding the sepals, fan-shaped, reflexed, purple or rose-colored. May-
VANDA


18. Hookeriàna, Reichb. f. Stem and lvs. terete, as in V. leves, but the latter only 2-3 in. long, and slender: fls. 1 in. across; dorsal sepal and petals white, dotted with purple; lateral sepal narrow, oblong or somewhat obovate, white; label at as large as the rest of the flower, side lobes incurved, white and purple, middle lobe fan-shaped, with 3 large lobes, white spotted with purple. Sept. Borneo. I.H. 30:484. Gn. 23:570. G.M. 19:6.-In cultivation the racemes are usually 2-fl.

19. Càthéart, Lindl. Stem 1-2 ft.: lvs. linear-oblong, 6-8 in. long, unequally bifiid at the tips; racemes longer than the lvs., 3-6 fl.; fls. 2/4 in. across, orbicular in outline; sepal and petals nearly equal, orbicular-oblong, concave, pale straw-colored, transversely streaked with numerous narrow red-brown lines; label at shorter than the sepal; lateral lobes quadrate, incurved, white with red streaks; middle lobe reniform, margin white, slightly crenate, center thick, yellow with a crenate border. Spring. Himalaya. B. M. 5185. F. S. 12:1251. G. C. 1870:1499. Gn. 19, p. 351; 35, p. 224; 42, p. 576.-Found near waterfalls, where it is always kept damp.


Synonym and imperfectly known species: V. Batemanni, Lindl.—Vandopsis lissichiloideus.—V. Cathartica, Hort., is probably an error for V. Cathartica (No. 19 above).—V. gigantea, Lindl.—Vandopsis gigantea.—V. Lowéi, Lindl.—Rezantherum Lowéi.—V. Niemanni.—V. praemirens. H. H. H. I. M. 0.269.

VANDÓPSIS (like Vanda). Orchidaceae. Includes 2 or 3 species which until recently have been united with Vanda or with Stauropis. They are all of allied genera by the label, which is firmly united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these resemble Vandas, with which they are usually classed for horticultural purposes. Treatment the same as for Vanda.


HEINRICH HASSELBRING.

VANGUERIA (Voa-Vanguer, Madagascar name of V. Madagascariensis). Rubiáceae. The Voa VANGA of Madagascar is a tropical fruit that has been recommended by the American Pomological Society as worthy of cultivation in southern Florida. The fruit is imperfectly described in horticultural writings. It is said to be a delicious berry ¾ in. thick, but in Mauritius it becomes 1½ in. thick. It is a globose drupe, shaped something like an apple and contains 1 large stone or bony pyrenes. The plant is a shrub 10-15 ft. high. The species is widely spread in the tropics of the Old World. It was introduced to American horticulture by A. L. Bidwell, of Orlando, Fla. In 1887 Van De- man reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It has probably never fruit ed in America. It grows readily from imported seeds.

Vangoeria is a genus of 20 species native to the warmer parts of Asia and Africa. Shrubs or trees, sometimes spiny or somewhat climbing in habit: TS opposite or rarely pseudo-verticillate in 4's, oval: fls. small, white or greenish in axillary clusters; calyx 5- or 4-lobed, lobes deciduous or rarely persistent; corolla hairy or not outside, usually furnished inside with a ring of deflexed pilose hairs; lobes spreading or reflexed; stamens 5, rarely 4; disc fleshy or depressed; ovary 3-lobed; stigma capitulate; ovules solitary; fr. drupaceous; pyrenes 3-5 in number or putamen 5-3-lobed.


W. M.

2639. Vanilla plant.—Vanilla planifolia.

The detached flowers were about 4 inches across. Drawn in Jamaica. (The pod X ¾.)
VANILLA (Spanish, little sheath or pod). Orchidaceae.

VANILLA. Climbing orchid whose branched stems ascend to a height of many feet. The nodes bear leaves or scales and aerial roots in alternate arrangement. Fls. in axillary racemes or spikes, without an involucre at the top of the peduncle, and petals spreading, only the lower petal, labellum united with the column, the limb enveloping the upper portion of the latter; column not winged. About 20 species in the tropics.

The most important species is V. planifolia, the Vanilla of commerce. It is a native of Mexico, but is now widely cultivated in the West Indies, Java, Bourbon, Mauritius and other islands of the tropics, its chief requirement being a hot, damp climate. The plants are propagated by cutting varying in length from 2 to about 12 ft., the longer ones being the more satisfactory. These are either planted in the ground or merely tied to a tree so that they are not in direct connection with the earth. They soon send out aerial roots, by which connection with the soil is established. They are usually trained on trees so that the stems are supported by the forked branches, but posts and trellises are also used as supports. In most places where Vanilla culture is carried on pollinating insects are lacking and the flowers must be pollinated by hand. Plants bear their first fruit about three years after setting. They then continue to fruit for 30 or 40 years, bearing up to 50 pods annually. The Vanilla pods are picked before they are ripe, and dried. The vanillin crystallizes on the outside. For a full description of Vanilla culture and methods of curing the pods, see Bull. No. 21, U. S. Dept. of Agriculture, Div. of Botany, by S. Galbraith. Vanillin is also made from other sources by chemical means. The genus was monographed in 1896 by R. A. Rolfe in Journ. Linn. Soc., vol. 32.

planifolia, Andrews (V. aromatica, Willd. in part). Fig. 2639. COMMON V. VANILLA. VANILLA BEAN (from the pods). Tall climbing herbs with stout stems: lvs. thick, oblong-lanceolate, acuminate, with short, stout petioles: fls. yellow, large, in axillary racemes of 20, more blossoms; sepals and petals oblong-collinear; labellum trumpet-shaped, with small, reflexed, crenulate lobes. Winter. A native of Mexico but widely cultivated throughout the tropics and in greenhouses. B. M. 7167.


aromatica, Sw. Stem angular: lvs. broadly ovate, with a blumish point at the base: fls. greenish and white. Jamaica, Colombia, Trinidad.

HEINRICH HASELINGER.

VANILLA PLANT. Trillix odoratissima; see, also, Vanilla, above.

VARIEGATION. This term is usually applied to a class of variations, especially in leaf coloration, in which the leaves become striped, banded, spotted, blotched, etc., with yellow, white, red and variegation colors, in connection with the normal green of other portions of the leaves. In the case of yellow and white variegation, the term albinism is sometimes used, especially when the plants are largely marked with white or yellow, as in Abutilon Sellowianum, Pelargonium zonale, and variegated forms of Eucalyptus Japonicus, Hydrangea hortensia, Hedera Helix, Poaee Victorie and others.

Among the dracaenas, caladiums and codiaeums, besides the white variegation, there are developed beautiful reds, pinks, yellow, etc. As a rule, the term variegation is not used in cases of color variation in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (S. Guineensis and S. Zeylanica), Alocasia cuprea, Cissus discolor, and others. Fig. 2641. In many such plants the markings are due in part to hairs, scales, or air in the cuticle or epidermal cells. As in many other plants, the inner cells of the leaf are green, many varieties of Calathea (as C. ornata, var. albo-linear), etc, the epidermal cells develop decided and definite color variation, though the changes do not usually involve the mesophyll or inner cells of the leaf. In some genera, however, especially Calathea, there are all gradations between purely epidermal variegation and changes involving the deeper layers of the leaf, as in C. Veitchii and C. Makoguna. The same is true of many other genera. Different kinds of variegation are shown in Figs. 2640-1.

True variegations may be distinguished from ordinary colorations, bleaching, chlorosis, etc., by the fact that the colored areas are usually quite sharply defined. They do not gradually blend into each other, but have definite boundaries. Cells in the variegated areas are found, as a rule, to contain the same chlorophyll bodies (chromatophores) as the ordinary green cells of the plant. However, in the variegated parts, the green color is not developed, and the chromatophores are often smaller or are somewhat swollen and vacuolated. In the case of chlorosis, due to the lack of iron, or yellowing due to the lack of light, a leaf will quickly develop its normal color if given the proper conditions. This is not the case, however, in variegated leaves. While the intensity of whatever color the chromatophores may have can be varied by light and food, a variegated cell can never be changed by these means to a normal cell. The chlorophyll granules (chromatophores) appear to have lost entirely, in many cases, the power to make starch and sugar from the carbonic acid gas in the air, and in other cases this power is very greatly reduced. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and they thus store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

White or albinic variegation is of course due to a lack of any coloring in the chromatophores, and sometimes to the entire absence of these bodies. The cells seem to have lost completely the power of making chlorophyll. They do not gradually blend into each other, but have looked upon as the more extreme forms of variegation, and usually arise through a feebly or atrophied condition of the plant. Seedlings raised from parents both of which are variegated in this way are usually very weak. High feeding and favorable conditions of growth, while they will not cause a variegated plant to return to its normal condition, will often stimulate the development of a normal green shoot that takes most of the nourishment and thus causes the starvation and disappearance of the albant parts. In other cases, as in codiaeums, modified chlorophyll is made. Large yellowish oil-like drops occur in the substance of the
VARIEGATION

chromatophores, and the various changes that these undergo, as the leaf becomes older, produce the remarkable and beautiful colorations of this group of plants. The coloration here, as in draceenas and caladiums, is intensified by strong light and nourishing food. The more of the modified chlorophyll there is produced and the more rapid the changes in the modified chlorophyll brought about through the action of light and the acids and oxidizing ferments of the leaves, the more highly developed will be the colors, though here again high feeding is likely to cause the plant to revert to its normal condition.

Variegated plants or parts of plants are usually of slower growth and smaller than green plants of the same variety or the green parts of the same plant.

Causes of Variegation. — Variegation occurs either by bud-variation or by variations in seedlings. In the former, a variegated branch is likely to appear on an otherwise perfectly normal plant. Such variegations are easily reproduced by budding, grafting or cuttings, but generally do not develop again from seeds produced on such branches. On the other hand, when variegation develops in seedlings, the seeds of such plants usually give a number of variegated individuals, even the cotyledons being sometimes affected. In some cases the proportion of variegated plants from seeds is large and can be increased by selection. As a rule, the form of spotting or marking is not constant in seedlings, often being very different from the parent. In certain groups of plants, which have for many years been selected on account of the horticultural value of these markings, the variegated condition has become almost a fixed feature of the plant, as in draceenas, caladiums, codieums, etc. While the plants of these genera are not usually propagated from seeds, still when they are so propagated, a large number of seedlings show more or less variegation.

Darwin and many of the earlier investigators believed that these variations were started in the plant by unfavorable nutritive conditions, and much has been written on the subject as to whether or not variegations should be considered as diseased conditions.

The question as to whether a variegated condition could be transmitted to normal plants by budding and grafting has also been much disputed, but the weight of evidence indicates that in many cases such transmission certainly takes place. This has been thought to indicate the presence of some micro-organism, living either parasitically or symbiotically in the

plant, and causing the changes known as variegation.

Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by microorganisms, but is due to a deformed condition of the nutrition of the cells. Without going into the details of the matter, it may be said that the condition is characterized physiologically by a marked increase in the oxidation processes in the cells, caused by the presence of an abnormal amount, or an abnormal activity, of oxidizing ferments in the protoplasm. This ferment prevents the movement of food substances, especially starches and nitrogenous materials. The decrease of the latter is especially marked, and it is probably on account of the lack of sufficient nitrogenous food that the cells do not develop normally. The young growing buds and dividing cells require highly organized albuminoid foods. They do not make use, to any extent, during the process of growth and cell division, of the ordinary nitrates which are built up into nitrogenous foods by the mature cells. The oxidizing ferments, though normal constituents of all cells, prevent, when they become excessively active, the proper nutrition of the dividing cells, and it is a curious fact that when these ferments are bred from plant tissues and injected into the young buds of healthy tissues, they will, in the case of tobacco at least, cause the buds so treated to develop into variegated shoots. The ferment in question passes readily through the cell walls of the plants and thus becomes evident how such changes could be transmitted by grafting and budding. The parasitic organisms of any kind are connected with the matter.

Another method of producing variegation of tobacco is by cutting the plant back severely during rapid growth. The new shoots have to develop with a small supply of elaborated nitrogenous food, the larger part being removed in the severe cutting back. Shoots thus developed nearly always show variegation. The same thing is true of many other plants, especially the potato, tomato, mulberry, etc. In fact, it appears that a plant is likely to show variegation whenever it is so treated that the growing buds or the forming buds, or the seeds, have to develop under such conditions that the ferment content of the cells is reduced beyond the normal amount, and the reserve foods stored are in small amount.

These changes must, therefore, be considered as pathological in their nature, as the vitality and

Vigour of the plants are reduced as a result. It is further evident that other causes of variegation are quite diverse, some of the most usual being seed of low vitality; unsuitable nourishment, especially a lack of elaborated nitrogen; rapid growth in very moist soil; severe injury to the roots during a period of rapid growth of the upper parts of the plant; severe cutting back, etc.

Though started at first through the influence of environment, variegation, when of value horticulturally, has many cases of variegation persistent. It may therefore still it has become almost a specific character in some groups of plants.

Autumnal Coloration. — A word might be said in this connection regarding autumnal coloration. The production of colors in foliage is due partly to the processes of the cells of the cell-sap upon the chlorophyll, or color-contains the leaves, especially the chlorophyll and anthocyanin, causes many of the brilliant colors of autumn foliage. There is a popular belief that these colors are due to the cold weather, the frost; if they are light, hasten the solution and destruction of the chlorophyll, they cannot be looked upon as more than hastening changes which would occur in time without them. Even in the tropics, some foliage before it matures becomes highly colored, and on the Japanese maples the writer has observed beautiful autumnal colorations in July in the region of Washington.

In practically all deciduous trees, bushes, etc., before the maturing and falling of the leaves, all of the valuable food materials, such as sugars, albuminoids, etc., pass from the leaves through the vascular bundles into the twigs and branches so that they are not lost to the plant. When the leaves finally fall they are therefore nothing but mere skeletons, containing waste materials. In the passage, especially of albuminoid matters, from the leaves to the stems, it is necessary that the materials be protected from the strong action of light, and it is believed that part of the coloration of maturing leaves serves this purpose.

An anthocyanin, or chromogen, known as anthocyanin, is always present in such cases, and develops bright reds when the cell-sap is acid, blue when no acids are present, and violet when there is only slight acidity. In connection with the disorganizing chlorophyll causes, the various mixtures of yellow, brown, violet, red, orange, etc., of autumnal coloration as described above. In very young leaves of many plants, such as Alanthus glandulosus, Juglans regia, Vitis, Clausus, and many other plants, this same anthocyanin is developed as a protection to the albuminoid materials traveling to the young cells. Such protective colorations have to be distinctly separated from variegation, which is a separation in the leaves. Chlorophyll granules are protected by the development of anthocyanin, forming a brownish or reddish tinge in the cell-sap. This is especially prominent in many cases.

While, as stated above, these protective and in some cases transitory colorations should be clearly distinguished from variegation, it is an interesting fact that they develop when the conditions for active nutrition are unfavorable, and may in many cases cause the maturing leaves by starving the plants or permitting them to become sufficiently dry to check growth.

Chlorosis. — This term is usually applied to those cases of yellowing of foliage caused by a lack of some nutrient salt, such as iron, potash, lime, phosphoric acid, etc. The most common cause of chlorosis, or yellowing, is due to the lack of iron. In such cases, the disease is readily cured by either spraying the foliage with a dilute solution of iron sulfite or other iron salt, or watering the roots with the same. Even within a few hours the chromoplasts will begin to turn green, and the plant goes on making starch and sugar from the carbon dioxide of the air in the normal manner. A lack of phosphoric acid sometimes causes a similar trouble, which is cured by the addition of this nutrient substance to the soil. Numerous cases are on record of yellowing of foliage due to excess of soluble lime in the soil. Grapes are especially sensitive to an excessive amount of lime, and turn yellow ready as a result of its action. Soils which contain too much magnesia in proportion to lime also often cause a yellowing of the leaves of plants growing in them. All causes of this kind can be readily distinguished from variegation by the fact that all the young leaves produced under such conditions become yellowish or white and are not motled or marked as in variegated plants. Moreover, the condition is readily corrected by furnishing the proper nutrition, and usually all plants growing in such soils show the same trouble.

Albert F. Woods.

VARNISH TREE. Kalymnus paniculata, Ablan-thus glandulosus, Rhus vernicifera, and other plants.

VASSES. Such vases as are shown in Fig. 2642 are common features of formal gardening. All matters concerning their manufacture or beauty are clearly outside the province of this work, but every gardener who purchases such a vase is interested in certain practical horticultural features of its construction. It is imperative that the vase have a hole at the bottom for drainage, otherwise the soil will become sour. It is desirable that the rim of a vase be rounded, and a sharp edge cuts the vines that trail over it and are swayed by the passing wind. Many of the old-fashioned stone vases 4 or 5 ft. high were made with a bowl too shallow for the good of the plants.

Vases are generally stationed in conspicuous positions near buildings, where they receive daily attention from all, including the gardener. It is necessary to water them every morning during hot weather, and it is therefore desirable that the vases have the water supply near at hand. A watering cart is often used in taking care of vases. Vases are often placed in the sunniest situations, but they can also be used in partially shaded spots. On the north side of a building in a shady place sheltered from the high winds small palm-leaves may be used in vases, together with Rex begonias and Pandanuss ts. In this the plants used in vases should be of a firm texture, and resistant to drought, dust and occasional high winds. Canna, ferns and foliage plants that are likely to be cut or whipped by the winds are necessarily excluded. The first three are especially important to an ornamental use. This should usually be some plant of a rather stiff, formal or architectural nature. Cordyline indivisa and C. australis are excellent for the purpose. They stand well out of the wind, are beautiful plants. Any of the handsome vines are used, especially periwinkles, green and variegated, nasturtiums, and Senecio micranthoides. Another choice plant for this purpose is Helichrysum

2642. Stone flower vase 4 or 3 feet high, used in formal gardening.
petiolatum, known to gardeners as Gnaphium lanatum. This is an "everlasting" plant which is not truly a vine; it does not flower in vases but is valued for its silver, central and prominent leaves, which are the feature of the plant. The central piece and the rim of drooping vases are used to hold such standard plants of medium height as geraniums, dusty millers, and the common bedding material, as Lobelia Erinus, coleus, achyranthes and allah. Calytria and C. gymnophora are also useful plants for vases.

The soil in a vase may vary from 6 to 18 inches in depth. It should be a strong, solid compost, about 3 parts of loam and 2 of manure. The type of plant may be shallow and become filled with roots and a top-dressing of well-rotted manure, or of moss with a little bone meal added. Such a mulch will add plant-food and conserve moisture.

Considerable forethought and taste may be required to keep the vases attractive during early spring, in the interval after the last frost and when the tender bedding material is set out. Pansies have been suggested for this period, and make a good effect when seen from above. A better effect can be produced by using conifers in pots which have been wintered in a frame. These may be added with pansies if the gardener desires to do it and can find a place at this time.

Rustic vases are much less expensive than stone, iron or earthenware ones and in some situations are very suitable. It is an excellent idea to elevate a rustic vase on a cheaply made pedestal of two or three bricks or boards, which will soon be hidden by Ampelopis Veitchii.
There seems to be a growing tendency in this country for vegetable-gardening to become a part of general farming schemes. A generation ago a large part of the vegetable-gardening for purposes conducted in relatively small areas by men who devoted their entire time to the business. At present much of the vegetable-gardening enterprise is merely an adjunct to farming proper. This is in part due to the development of the canning industry, because of which enormous quantities of certain products, as of tomatoes, are desired. It is partly due also to the extension of agriculture into the newer regions whereby lands are discovered that are particularly well adapted to the growing of special commodities; as, for example, the raising of squashes in some of the prairie states and the recent extension of melon-growing into Colorado. Long-distance transportation has revolutionized vegetable-gardening in this country. See Packing. Whilst there has been great progress in the industry, our vegetable-gardening has not developed so widely from the European ideals as our pomology has. Yet tomatoes, sweet corn, watermelons and sweet potatoes are probably grown more extensively here than elsewhere in the world.

Vegetable-gardening is an important business wherever there are large cities, because the markets are close at hand. The second most important factor in determining the location is climate, since earliness of product usually increases the profits. A third influence in the geography of vegetable-gardening is the soil. Usually soils of a light and loose character, or those that are said to be "quick," are preferred, because the plants may be started early in the spring and they also grow and mature rapidly. Because such soils are so frequently employed for vegetable-gardening purposes, gardeners have come to be very free users of stable manure and concentrated fertilizers. In recent years the vegetable-gardening areas of the eastern country have rapidly extended along the Atlantic seaboard as far as the keys of Florida. In these southern localities vegetables can be secured in advance of the northern season and when the best prices are reigning. The development of transportation facilities has made this enterprise possible. The southern Mississippi valley region is also developing a large vegetable-gardening interest since it is tapped by trunk lines of railroad running to the north and east. Well-marked vegetable-gardening areas are those on Long Island, N. Y., and about Norfolk, Va., where special industries and practices have developed. Fig. 2643 shows an onion-growing community in southeastern New York.

The most recent published statistics of vegetable-gardening in the United States are those of the Eleventh Census, 1890. According to a bulletin issued by that census the investment in commercial or purely truck-gardening interests of the country lying beyond the immediate vicinity of large cities amounted to more than $100,000,000. More than half a million acres of land were devoted to the industry and nearly a quarter of a million people were employed. After paying freight and commission, the products of these establishments brought to their owners more than $70,000,000.

Vegetable-gardening may be divided into two great categories, depending on the disposition that is to be made of the products; namely, market-gardening or truck-gardening, of which the purpose is to make money from the industry; and home- or amateur-gardening, in which the purpose is to raise a supply for the family use. Whilst the same principles of selection of soil, tillage and fertilizing apply to both these categories, these kinds of gardening are unlike in the general methods of procedure. The market-garden is ordinarily located where the climate and soil influences are favorable. Every effort is made to secure uniformity and great productiveness of crop, and it is usually desirable that the crop come into the market somewhat quickly and then give place to other crops. In the home-garden the climate and the soil are largely beyond the choice of the gardener, since these matters are determined by the location of the homestead. The general effort is to secure products of high quality and to have a more or less continuous supply throughout the season. In market-gardening emphasis is usually placed on a few crops, whereas in home-gardening it is placed on a great variety of crops.

The old-time home vegetable-garden was generally unsuited to the easy handling of the soil and to the efficient growing of the plants. Ordinarily it was a small confined area in which horse tools could not be used. The rows were short and close together, so that finger work was necessary. The custom of growing crops in small raised beds arose, probably because such beds are earlier in the spring than those that are level with the ground (Fig. 1528). With the evolution of modern tillage tools, however, it is now advised that even in the home-garden finger-work be dispensed with as much as possible. Some of the very earliest crops may be grown in raised beds to advantage, but in general it is better to secure earliness by means of glass covers or by ameliorating the entire soil by underdrainage and the incorporation of humus and by judicious tillage. See Tillage and Tools. For farm purposes particularly it is desirable that the rows be long and far enough apart to allow of tillage with horse tools. If the vegetable-gard-
den were placed between the farm buildings and the
outlying parts of the farm, the cultivator could be run
between the rows when going and coming. In this way
nearly all finger-work could be avoided and a greater
quantity and better quality of vegetables could be
secured. Compare Figs. 1528, 2645.
Vegetable-gardeners are usually large users of stable
manure. Near the large cities the manure is bought in
or forcing-houses. In these structures conditions can
be controlled better than in hotbeds, and they are per-
manent investments. However, hotbeds and coldframes
are still exceedingly important adjuncts to the vege-
table-garden, chiefly because they are not permanent
and thereby can be moved when the person shifts to
other land, and because the space that they occupy can
be utilized for outdoor crops later in the season. Much
vegetable-gardening in large cities is prose-
cuted on rented lands; therefore it may not
be profitable to invest in such permanent
structures as forcing-houses. The first cost
of hotbeds is also less than that of forcing-
houses, and this is often a very important
item. Fig. 2646. For management of glass
structures, see Hotbeds, Greenhouse, Forcing.
There are great numbers of insect and
fungous pests that attack the vegetable gar-
den crops. General remarks under Insects,
Fungi, Insecticide, Fungicide and Spray-
ing will apply to these difficulties. The spray
pump has now come to be a necessary ad-
junct to every efficient vegetable-garden. How-
ever, there are many difficulties that are be-
ond the reach of the spray, particularly those that persist year by year in the soil
or which attack the roots rather than the tops.
For such difficulties, the best treatment is to
give rotation so far as possible and to avoid
carrying diseased vines back on the land the
next year in the manure. Even the club-root of cabbage
can be starved out in a few years if cabbages or related
plants are not grown on the area. Any treatment that
conduces to the general vigor and well-being of the plant
also tends to overcome the injuries by insects and fungi.
In its best development vegetable-gardening is essen-
tially an intensive cultivation of the land. Often it is
conducted on property that is too high-priced for ordi-
nary farming. Land that demands a rent on one thou-
sand dollars an acre is often used for vegetable-gardens
with profit. There is also intense competition near the
large cities. These circumstances force the gardener to
utilize his land to the utmost. Therefore, he must keep
the land under crop every day in the year when it is
possible for plants to live or grow. This results in va-
rious systems of double-cropping and companion-crop-
ing, whereby two or more crops are grown on the land
the same season or even at the same time. Market-
gardening is usually a business that demands enter-
pise, close attention to details and much physical labor.

2644. Companion
cropping.—Lettuce be-
tween young cabbage plants.

2645. A better way of growing vegetables.—In long straight rows.
If, with his knowledge of vegetable-growing, the gardener combines good business and executive ability, and an intimate knowledge of market conditions, he should be able, however, to make it a profitable and attractive business. Although the outlay is likely to be large, the returns will be quick. Fig. 2644.

There is a large literature devoted to vegetable-gardening, although the greater part of it applies chiefly to amateur or home-growing. Leading current books on the subject of vegetable-gardening are those by Greiner, Green, Henderson, Rawson and Landrecht. For professional gardeners one should consult Wicken's "California Vegetables in Garden and Field," and for the Atlantic south, Rolf's "Vegetable-Growing in the South for Northern Markets."

There are many books devoted to special topics, and there are many others which in their time were of great practical value, but which are now chiefly known as recording the history of the epoch in which they were written. Only one American work has been devoted to descriptions of varieties of vegetables, as the works of Downing, Thomas, and others have been devoted to the systematic units. This work is Fearing Burr's "Field and Garden Vegetables of America," Boston, 1863, and the abridgment of it in 1866, called "Garden Vegetables and How to Cultivate Them." A full list of the American vegetable-gardening literature may be found in Bailey's "Principles of Vegetable-Gardening" (1901). Persons who desire a cyclopedic account of vegetables should consult Vilmorin's "Les Plantes Potagères," the first edition of which is published in London as "The Vegetable Garden."

L. H. B.

Vegetable Growing in California. It is an interesting fact that though California's horticultural prominence rests upon fruit products, the first attraction to the new state, after the gold discovery, was the wonderful growth of garden vegetables. The reports of immense size, of acreage product and of prices secured, are almost incredible because so much in advance of ordinary standards, but the statements were so fully authenticated that many were drawn to California by them. These horticultural pioneers, however, soon found that immigrants from Asia and the Mediterranean region could, by their cheap labor and by doing their own work, cut under American growers who had to employ high-priced labor, and so the latter retired from the field, leaving the opportunity to the frugal and thrifty foreigner. Thus vegetable-growing, from an American point of view, came into disrepute and largely retains such disadvantage at present. The result is that the American largely avoids market-gardening, while in South Europe there is a thriving on it. There has been a reflection of the same disfavor upon farm growing of vegetables for home use, and our farming population, including the fruit-growers who should know and do better, is largely dependent upon alien vegetable peddlers or products of canneries instead of fresh home-grown esculents, which would be cheaper and inexpressibly better than canned or transported supplies.

Fortunately there are indications that this state of affairs is about to be changed. The uprising during the last decade of a large industry in growing vegetables for overland shipment and for canning seems to have clothed the plant-cultures involved in this trade with new dignity and imposing importance which is attractive to American growers. Cabbage, cauliflower and celery for eastern shipment, peas and asparagus for canning and for shipment, tomatoes for canning, etc., have all become large special crops, while some other plants, like Lima beans, which are chiefly grown in gardens elsewhere, have become field crops in California covering very large acreage. Such enterprises attract American citizens and are changing the popular conception of the dignity and opportunity of vegetable-growing. A measure of this influence, as well as of the extent of the product, may be had in the statistics of the year 1900. In that year there were shipped out of the state by rail and sea 51,400 tons of green vegetables. The product of canned vegetables in 1899 was: tomatoes, 583,061 cases; peas, 25,966 cases; asparagus, 105,881 cases; beans and other vegetables, 38,523 cases. Nearly all the vegetables included in the above trade are of the higher classes, potatoes and onions only moving in considerable quantities when exceptionally high prices prevail in the East. In addition to the foregoing there is the bean shipment to eastern markets, which reached a total of 73,150,000 pounds in 1895, but has been less each year since then because of partial drought in the chief bean districts.

California conditions affecting vegetable-growing are wide and various. Nowhere else perhaps is it more essential that certain things should be done just at the right time and in the right way. If these requirements are fairly met the product is large and fine; if they are neglected the failure is sharp and complete. This fact has given rise to the impression that California is a hard place to grow vegetables, which is not true unless one lacks local knowledge or the nerve to apply it. One of the chief causes of failure is in following seasons and methods which have yielded success under conditions prevailing in the states east of the Sierra Nevada mountains. If one begins garden-making in the spring the plants do not secure deep rooting, which is necessary to carry them to success in the dry season, and the garden is likely to be a disappointment. If, on the other hand, all the harder vegetables are sown in succession from September until February or March there will be continuous produce through the winter and into the early summer. The chief shipments of vegetables from California are made during the late fall and winter and are taken right from the ground to the cars without protection or storage. Tender vegetables, like corn, beans, tomatoes, etc., can, however, be grown in the winter only in a few frostless places. They must either be pushed to a finish in the fall or sown early in the spring and carried into the dry summer as far as necessary either by natural moist land or by irrigation. There are, however, a few localities where tomatoes will fruit early in the spring from fall plantings, and peppers will live through the winter and bear a second season's crop on the old plants.

The possession of an irrigation supply is the secret of
full satisfaction in California vegetable-growing, but a small amount until the tender vegetables can be grown almost entirely without irrigation from plantings made as late as May and the whole growth of the plant is achieved without a drop of water except that stored in the soil. The same is true of the corn crop; perfect corn can be grown without a drop of rain or irrigation from planting to husking. In such casos, however, the winter rains are retained in the soil by cultivation. If winter growth is made by rainfall, summer growth can be had on the same land by irrigation. In this way irrigation becomes eminently desirable in securing all-the-year growth, which cannot be had by rainfall. With good soil and abundant irrigation it is possible to secure four crops per season—the harvest in the fall and winter months; the tender plants in the spring and summer. Of course the adjustment of all these means to desired ends requires good perception and prompt action, and explains why those who have long become accustomed to plant at a fixed date can do little but cut weeds afterwards may find it hard to get the best results in California. And yet the Californian grower has greater advantages in his deep, rich soil, in freedom from diseases which thrive in a humid atmosphere and in an exceedingly long growing season.

Local adaptations for different vegetables are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to that fact. The earliest vegetables come from a practically frostless valley near Los Angeles; almost all the Lima beans are grown on a coast plain in Ventura and Santa Barbara counties; the celery for eastern shipment is nearly all grown on the peat lands of Orange County; the cabbage comes largely from San Mateo county; asparagus and tomatoes from Alameda county and river islands of Sacramento and San Joaquin Valley. Smaller plantings of others not mentioned are more widely scattered, but everywhere the local soil, exposure and climate are chief considerations.

There is a prospect of great increase in the all the vegetable crops of California. Fresh and dried vegetables enter largely into ocean traffic with distant Pacific ports. Interstate trade is constantly increasing and canned vegetables are contracted in advance to European distributors as well as to dealers in all the Americas.

E. J. WICKSON.

VEGETABLE MARROW. See page 1713.


VEITCHIA (James Veitch, of Chelsea, famous English nurseryman). Pothawew. About 4 species of pinnate palms native to the Fiji Islands and New Hebrides. The genus belongs to that portion of the Areca tribe characterized by a parial ovule which is more or less pubescent and spiral in the hairy scales in the spadix, and is distinguished from Hedyscepe and allied genera by the following characters: sepals of the male fls. chartaceous, connate at base; female fls. much larger, the ovules numerous. The species is now in cultivation. V. joannisii, H. Wend., was cultivated in the early eighties. The leaf segments have a wide and rather shallow notch at the apex or are obliquely truncate. The sheath petiole and rachis are a dark brown color and covered when young with a gray tomentum interspersed with lacinulate, thin, dark red scales. Fr. 2½ x 1¼ in., ovoid-ellipsoid, orange, with a red base. G.G. H. 20:255. R.H. 1882, p. 344. It has been conjectured that Kentia Van Houttei (Illicium) described in 1855 by American dealers may be a species of Veitchia. The genus is imperfectly known, and nothing further can be said at present of Kentia Van Houttei.

VELTHEIMIA (after the Count of Veltheim, 1741-1801, Hanoverian promoter of botany, Liliaceae). Three species of tender autumn-blooming bulbs from South Africa; 2 with 3-celled flowers, terminal, tepals ½½ in. long, resembling those of the Poker Plant (Kniphofia), though not in color. The plants grow about ½½ ft. high and bloom toward the end of October. Two species are offered by Dutch bulb-growers. They are grown in Lima beans and considered easy culture. They are practically unknown in America. Generic characters: perianth withering and persistent; tube long, cylindrical; segments 6, very short, ovate; stamens inserted at the middle of the tube; anthers dehiscence introrsely; ovules 2, collateral, placed near the middle of the locules: capsule large, membranous, top-shaped, acutely 3-coroned, loculelaidely 3-valved. These plants have a large tunicate, thick, 2½–3 in. thick. The genus is monographed in Flora Capensis, vol. 6. For culture, see Bulbs.

a. Lvs. green, 2-3 in. broad.


aa. Lvs. glaucous, 2½ in. broad.

glauca, Jacq. Lvs. oblong-lavate, acute, glau- cous: scape less stout: fls. "yellow or bright red," according to Baker. B.M. 1091 (fls. white, dotted red to- ward the tips): 3450 (fls. reddish purple, dotted yellow above).

W. M.

VELVET BEAN. Mucuna bracunia, var. utilis. See also Bull. 104, Ala. Exp. Sta., by J. F. Duggar.

VELVET PLANT. Gymnura aurantiaca.

VENETIAN OR VENICE SUMACH. Rhus Cotinus.

VENIDUM (name not explained by its author). Composita. The plant listed in one of the largest American seed-sellers' catalogs as "Echendeula- ceum" is so little known in America that the following account of it as a garden plant is adapted from Gn, 21, p. 405. It is a graceful single-flowered composite which flowers under the ordinary treatment accorded half-hardy annuals, including a compact, rounded mass 2 ft. high and 3 ft. wide, and "covered for several months consecutively with black-eyed golden blossoms, resembling those of the pot marigold, though much brighter and more refined." "There is considerable diversity in its seedlings both as regards habit and the size, shape and shading of its blossoms, and careful selection in seed-saving is needful in order to secure the best forms. It is admirably adapted for cutting, as the flowers open and shut as regularly as when on the plant." This species has also been treated as a greenhouse perennial, continuing to bloom until near midwinter. The flower-heads are fully 2 in. across. Venidium is a genus of 18 species of South African herbs, 7 of which are annual, the others perennial. Gen- eric characters: rays female: receptacle homebayed, mostly n. involucral scales in several rows, the outer n. longer and more numerous; fruits scarious: acorn glabrous, dorsally 3-winged or ridged, the lateral ridges infixed, the median straight, narrower: no hairs from the base of the acorn: pappus either none or of 4 very minute, unilateral scales. Monographed in Flora Capensis, vol. 2, 1883-85.

decurrens, Less. Diffuse, canescent perennial, 1-2 ft. long: lvs. mostly lirate, the terminal lobe ovate or roundish, sinuato-lobated or repand, at first cobwebbed, afterwards made and punctate above, white-tomentose beneath; petiole 2-2½ in. long. amply cuneate at base, the ear decurrent along the stem.
VENUS

VENDIUM

Var. calendulaceum, Harvey (V. calendulaceum, Less.), differs in having the pediolo not eared at the base or with only a small ear. R.H. 1857, p. 122. Gn. 21, p. 465. - Opinion differs as to its merits. Some consider it coarse and weedy.

W. M.

VENTILATION. See Greenhouse Management, p. 694.

VENUS’ FLY-TRAP. Dionaea muscipula.

VENUS’ HAIR. Adiantum Capillus-Veneris.

VENUS’ LOOKING-GLASS. Specularia Speculum.

VENUS’ or VENICE SUMACH. Rhus Cotinus.

VÉPRIS. See Todalia.

VERÁTRUM (ancient name of Hellebore). Lilliaceae. False Hellebore. A genus of about 10 species of tall, perennial herbs from the temperate regions of the northern hemisphere with short, thick, poisonous rootstocks and rather stout simple stems bearing many broad, plicate leaves and terminated by a long, branched or simple panicle of numerous black-purple, white or greenish flowers. Perianth-segments 6, persistent, spreading; stamens 6, attached at the base of the segments; capsule ovoid, 3-lobed, 3-seeded; seeds flat, broadly winged. Veratrums are striking foliage plants, of easy culture in moist shady positions. In the open sunlight or in dry ground the foliage is liable to burn and decay prematurely. They may be propagated by division or seeds.

a. Fls. whitish or greenish.

b. Perianth-segments cripid-sepitate.

album, Lind. EUROPEAN WHITE HELLEBORE. A hardy perennial 3-4 ft. high; root short, desicc; Ivs. green, plicate; radical Ivs. 1 ft. long, oblong, 5-6 in. wide, firm in texture; panicle 1-2 ft. long, dense; fls. white; inside, greenish outside; segments oblong-spatulate, cripid-sepitate; pedicels almost none. June, July. Eu., N. Asia.

br. Perianth-segments serrulate or entire.

viride, Lind. AMERICAN WHITE HELLEBORE. Indian Poke. Fig. 2647. A hardy perennial, 2-7 ft. high; rootstock 2-3 in. long; Ivs. plicate, acute, the lower oval, about 1 ft. long, the upper gradually smaller; fls. yellowish green; segments oblong or oblanceolate, elliate, serrulate, pedicels 1-3 in. long, July. North America. B.B. 1:148. B. M. 1066 (Helonias viride).

Californicum, Durand. Stem very stout, 2-7 ft. high: Ivs. ovate-acute, the upper ones lanceolate but rarely acuminate; perianth-segments broader than in V. viride, obtuse, whitish with a greener base. Colo. and Wyo. to N. Calif. and Ore. - Int. 1853 by Pringle and Horsford. The long panicile of whitish, bell-shaped, drooping fls. is followed by ornamental fruits or capsules.

AA. Fls. blackish purple.

nigrum, Lind. A hardy perennial often 2-4 ft. high, somewhat bulbous at the base; lower Ivs. oblong pliate, 1 ft. long, 3-4 in. wide, narrowed at the base; upper leaves lanceolate, panicle narrow: fls. blackish purple; segments oblong, obtuse. June. Eu., Asia. B. M. 963.

J. B. Keller and F. W. Barclay.

VERBÁSCUM (old Latin name of the Mullein used by Pliny). Scrophulariaceae. MULLEIN. A genus of over a hundred species, mostly coarse, woody, weedy yellow-flowered biennials native to the Mediterranean region. Considering the fact that the familiar Mullein (V. Thapsus) is everywhere known and despised in America, the popularity of the genus in English wild gardens is highly surprising. Over 30 kinds are cultivated, and some of them have been pictured many times. A little study of the group shows how much pleasure can be missed by any one who persists in one point of view. The English farmer has no dread of the Mullein. The Mullein is actually a favorite border plant in England, especially for the back row and for shrubberies. One connoisseur after growing many kinds of Verbascums discarded them all except the common species. The plant probably came to America from England, certainly from Europe, but not long ago it was sold in England under the name of "American Velvet Plant." The "Soldierly Mullein" has often been praised by Ameri-
smaller than in *V. phlomoides*. The plant has the disadvantage of being sensitive to wetness, its soft, woolly lvs. damping off in wet situations over winter. *V. phlomoides*, though less popular than the preceding, is probably the best of all the yellow-flowered species. It has the advantage over *V. Olympicum* of being a true biennial of easier culture with larger fls. and a longer season of bloom, 8–10 weeks, and even then if cut half way down it will throw out lateral bloom in late autumn.

Generic description: biennial, rarely perennial or suffrutescent, more or less woolly: racemes or spikes terminal, simple or branched: pedicels clustered or solitary: calyx 5-cut or 5-parted; corolla with almost no tube, rotate, rarely concave, with 5 broad lobes; stamens 5, affixed at base of corolla; style entire: ovules Numerous: capsule globose ovoid or oblong. DC. Prod., vol. 10. Boissier Flora Orientalis, vol. 4. Garden 27, p. 172; 41, p. 551. American trade names are: *V. Chaixii*, nigrum, *Olympicum*, *pammus*, *phlomoides*, *pyramidatum*.

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| O. Teeth of calyx ovate. 10. niveum. |

**Thapsus.** Linn. *Common Mullein*. Fig. 2648. Familiar weed in woods and in uncultivated fields, 2–6 ft. high, densely woolly, with large obovate root-lvs. and long racemes of yellow flowers. Eru., Orient, Himalayas. B.H. 3:143. On. 28, p. 148.—Natural varieties have been observed with pale yellow and white fls. and hybrids with *V. sinatum*, *Lychnitis*, nigrum, etc. Other varieties are: indorsence dense or lax, simple or branched; fls. large or small; wool dense or loose: filaments glabrous or pilose. The following European trade names are said to be referable to this species: *V. canescens*, *Linniari*, *allisium*, *Schraderi*, and *thapsoides*, all nearly synonymous; *V. collinum*, *Lamottei*, *Thapsus-foesaeus* and var. *Gordonii*, *Thapsus-nigrum*.

1. **Thapsus**, Linn. *Common Mullein*. Fig. 2648. Italian species known by its very long root-lvs. and long interrupted racemes which are somewhat branched, the lower clusters of fls. spicate.


4. **longifolium**, Ten. (ex. *pammus*, Vis. & Panc.), Italian species known by its very long root-lvs., long interrupted racemes which are somewhat branched, the lower clusters of fls. spicate.

5. **crassifolium**, Hoffm. & Link. Spanish plant, with long-decurrent lvs., spicate raceme, clustered lvs., flattened corolla and glabrous filaments.—One of the few species that thrives in a light, sandy soil.

6. **densiflorum**, Bertol. Italian mountain species known by its decidedly yellow wool and long dense racemes.


8. **virgatum**, With. (ex. *blattarioides*, Linn.). This and the next are two of the very few Verbasums that are green throughout. *Glabrum*, Wild., and *V. virgatum*, Pers., represents its glabrous and sticky-pilose variations. Cosmopolitan.

9. **Blattaria**, Linn. MOTH MULLEIN. *Blattaria* is from *blatta*, cockroach, which the plant is said to repel. Plant is frequented by moths, whence popular name. Native of Europe and N. Asia; naturalized in America. One of the few green-leaved Verbasums, distinguished from *V. virgatum* by solitary pedicels. Fls. rarely white.

10. **niveum**, Ten. Imperfectly known Italian species with white wool, very dense raceme of solitary, subsessile fls. and a 5-parted woolly calyx having ovate lobes.

12. Phoenicium. Linn. (V. ferrugineum, And.). Purple flowers on square stems of pinnate leaves. A very interesting species. The square stems and pinnate leaves suggest the Phoenicium purple and not by the nativity of the plant. The species grows about 5 ft. high, and is one of the few green species, the lvs. being nearly glossy and pyramidal, sessile, being stalked, solitary, about 1 in. across, which open poorly in sunshine, preferring damp weather. The species should, therefore, be placed where only the morning and evening sun strike the flowers. L.B.C. 7, 1557. G. 22, p. 377; 27, 84:1: 46, p. 519. A. G. 1892: 630.—Var. cuprea. Benth. (V. cimicrium, Sims), is a garden hybrid raised from seeds of V. ovatifolium, showing influence of V. phoenicium in its copper-colored lvs. It has long been a favorite. B. M. 1226.

13. nigra. Linn. A common European species, with stem angled above, lvs. nearly glabrous above, long raceme rarely branched and purple woolly filaments. G. 27, p. 173; 41, p. 351 (var. album, showing the wonderful influence of A. Adanson's culture).—Var. ferrugineum, Wierz. & Kochel, is referred to this species by Index Kewensis.

14. sinuatum. Linn. Mediterranean species 2-3 ft. high, with sinuate-pinnatifid root lvs., divaricate, pyramidal panicles and lax, remote, many-flowered clusters.

15. pyramidalum. Blei. Tall and beautiful species, with doubly crenate lvs. nearly glabrous above, pyramidal, canescent panicle, violet-woolly filaments and a very distinct calyx. Caucasus.

16. rubiginosum. Waldst. & K. Stem glabrous or pubescent above: lvs. green, crenate: racemes lax, branched, rarely solitary, twice or many times as long as calyx.—Var. ferrugineum, Benth. (V. ferrugineum, Mill.), has a long, simple raceme i: lfs. a little larger and longer than in V. phoenicium, and usually in pairs. Either a natural or garden hybrid.

17. Olympicum. Bosss. Tall Grecian species, 3-5 ft., white-woolly: lvs. tomentose on both sides: panicles with a few very long, erect branches: clusters many-flowered: lfs. 1 in. across, filaments white-woolly. The garden merits of this species are discussed above (ing. 1851. 1555, 215; 31, p. 125; 38, pp. 55, 56; 41, p. 555; 47, p. 147.


19. Châlau. Vill. (V. orientale, Blei.). Lvs. green or tomentose beneath, crenate, lower ones cuneate at base, truncate or inrolled: racemes panicked, filaments purplish-white, V. vernale of the trade belongs under V. nigra instead of here, as commonly stated. G. 27, p. 172.—Var. semi-lanatum and Fryniannum, Hort., are hybrids. Often attains 10 feet, and acts like a true perennial on warm soils.

VERBENA (ancient Latin name of the common European vervain, V. officinalis). Verbena. Verbena rank very high among garden "annuals." Their clusters of showy and often fragrant flowers are borne in constant succession. The flowers are blue, violet, deep wine, purple or pink, and according to early plates, are more regular; they are elevated on longer peduncles and the cluster is oval or oblong instead of flat or merely convex. This species and V. chamidyptelea seem to be the principal parents of the various red, scarlet and rose-colored forms in cultivation.

Verbena incisa flowering in England for the first time in 1836. This species is characterized by rose or purple flowers, often double, attaining a height of 9 in. The calyx is rather the scarlet variety of this genus.

Verbena 1911

Place the flats in a coldframe, and keep them moist and shaded until the cuttings are rooted. When rooted, transfer to flats in a cool, light house until after New Year's. Then pot them singly in 2 in. pots at a temperature of 50° F., which will soon give plenty of material for additional cuttings. Verbena increased from cuttings tend to flower early, and those propagated in February or March will require at least one pinching. When planting out, set in beds for summer bloom, bend the plant over nearly to the horizontal, so that the new growth will spread along the surface of the soil. These shoots will quickly take root, thereby covering the ground. The old method was to peg the plants down.

In propagating general stock, sow the seed in February and pot into 2-inch pots as soon as the seedlings are up. A temperature of 45-50° will suit them, but they should have full light. There is no place equal to a mild hotbed for young Verbena. About April 15 plunge the pots in a few inches of soil in a mild hotbed. Lift them now and then and rub off the pots which have gone through a hot period in order to check growth and hasten flowering. Customers want to see them in flower before buying, and most of them wait till the end of May. However, Verbena can be planted out early in May, as a slight frost will not injure them. Verbena is a genus of about 110 species, one Mediterranean, the others American and often weedy. Herbs or subshrubs, decumbent or erect; lvs. opposite, rarely in or alternate: stamens 4, filaments glanded or long and distant-flatt., sometimes corymbose or panicul.-corolla-tube straight or incurved; limb somewhat 2-lipped, lobes 5, oblong or broader, obtuse or retuse; stamens 4, didynamous; ovary 4-lobed. Raised. DC. Prod. 11: 535-556 (1847).

Wu Scott and W. M.

The following account of Verbena is extracted from a thesis by J. H. Cowen, whose untimely death deprived American horticulture of a most promising worker. Mr. Cowen was a graduate of the Colorado Agricultural College and had been a student assistant in the horticultural department there. After two years' work at Cornell University he received the degree of Master of Arts in June, 1890, and was elected to the Master of Arts' Department of Agriculture. A few days later he was notified of his election to the chair of horticulture in the state of Washington and also at Colorado. He accepted the position at his alma mater. The day before his intended departure he was stricken by appendicitis. He died July 12, 1890. The work in Colorado was very much to his heart. He was his native state. He knew the people and the conditions. No man was ever better fitted for the work he expected to undertake.

It was Mr. Cowen's purpose to recast his thesis in cyclopedic form. The following account has been changed as little as possible. The botanical part of the essay is entirely recent, but the readable portion is marked with words, with a few slight verbal changes and some omissions.

In 1836 Louden styled the Verbena "a genus of weedy plants." The lapse of a few years was sufficient to reduce this remark to relative inapplicability. At the time on the plains and prairies of South America grew a number of species of such surpassing beauty as to set at naught all preconceived notions of the inherent ugliness and "weediness" of the genus.

Introduction of Parent Species, 1820-1836.—The first of this noble race to be introduced was Verbena chama-
dryfolia, a dazzling scarlet. This species has had a profound influence upon the "selfs" of V. hybridus, par-
ticularly the scarlet varieties of the predominant parent species of the "compactas."

The second important South American species to be introduced was Verbena phytolirica, in 1834. The flower is inclining to purple rather than red, and, according to early plates, are more regular; they are elevated on longer peduncles and the cluster is oval or oblong instead of flat or merely convex. This species and V. chamidyptelea seem to be the principal parents of the various red, scarlet and rose-colored forms in cultivation. Verbena incisa flowering in England for the first time in 1836. This species is characterized by rose or purple flowers, often double, attaining a height of 9 in. The calyx is rather the scarlet variety of this genus. This spe-
VERBENA

Verbenae teucroides is a species of strikingly different characters from the three preceding and one which has exerted a profound influence upon many races of V. hybrid. Five plants flowered in Ireland in July or August, 1838. This species is easily distinguishable by its spikes of white flowers, which emit a rich jessamine fragrance, its recurved, coarsely crenate, sessile leaves, and its stiff upright habit of growth. The characters of V. teucroides are apparent in many forms of our V. hybrid, notably so in many of the blue "oculatas." Of the four species thus far mentioned, V. teucroides alone is still cultivated in a distinct specific form.

These four species seem to be the only ones which have had a marked and permanent influence upon our present races of Verbena. V. teneca and V. Auffelbia have probably been used occasionally by florists in hybridizing, but they belong to a different section of the genus, some of their hybrids seldom produce seeds and their influence, if any, has been slight and transient.

With the successful introduction of V. teucroides in 1838, Verbena lovers had a most promising start for the development of a splendid group of garden plants. They possessed four species, the great variability of which gave opportunity for limitless selection, and the close affinities of which afforded the most favorable opportunities for profitable hybridizing. V. chamadr favorites provided one of the richest scarlets in nature. V. phlogiflora and V. incisa provided various tints of rose and purple, V. teucroides gave white with a rather clusive suggestion of yellow. V. chamadr favorites was of prostrate habit; V. teucroides was stiff and upright; the other two species were intermediate. V. teucroides was possessed of a rich perfume.

Early Period of Hybridizing and Selection, 1838–1848. — Selection and hybridizing had already begun in 1838 and had been rewarded with the production of "several excellent varieties." The first of these were given trinomial Latin names. The Verbena gained popularity so rapidly and so many efforts were made to improve it that a great number of horticultural varieties soon appeared and English varietal names gradually superseded the unwieldy quasi-botanical ones. All the species, except V. teucroides, seem to have soon lost their specific identity and to have completely merged in V. hybrid. The additions made through the four or five years following 1836 were astonishing, as we find in 1840 upwards of 40 kinds enumerated, while in 1844 a single list contained the names of over 200 varieties.

In 1839 Robert Buist, Sr., of Philadelphia, introduced the leading forms to America. Robert Buist, Jr., states positively that these were obtained from England. It is sometimes erroneously stated that Buist obtained seeds directly from South America. He seems to have been for years the leading Verbena grower and hybridizer in America. It is impossible from the meager American literature, to discern any striking difference between the trend of development in America and in Britain. In his "Directory" of 1845, Buist mentions the fact that some of the better varieties have flowers as "large as a dime, far outvying those cultivated a few years ago." In 1854 he speaks of new varieties of "perfect formation," and "flowers as large as a quarter dollar," and as "good as the titled English varieties." Doubtless the Verbena was developed to a higher degree of perfection as an exhibition flower in Britain than in America.

Period of Greatest Popularity, 1848–1868. — The Verbena was fast winning favor as one of the most popular of bedding plants. Its history as an exhibition plant began about 1850 and reached its zenith in 1868, when the Verbena was at the greatest height of popularity. It was in this year that the Royal Horticultural Society of England awarded premiums to 17 varieties. Its height of popularity as a bedding plant was reached some years before this, possibly as early as 1860, for there seems to have been a growing opinion unfavorable to it as a bedding plant as early as 1861.

Period of Decline and Partial Recovery, 1868–1900. — About 1870 the Verbena took a precipitous decline in public favor. There were many causes that conspired to its downfall, but chief among these were:

1. A number of other plants captured the capricious

2649. The four prototypes of the garden Verbenas, faithfully redrawn from early colored plates.
admirations of flower-lovers. A host of showy-flowered and zonal pelargoniums were offered to the public. However, in 1870 he bred 20,000 pelargoniums and that in 1875 he sold 100,000. In many bedding arrangements the Verbena was wholly superseded by the pelargonium. The tuberous-rooted begonias and Phlox Drummondii, Henderson, the latter of the two largely superseding it as an exhibition plant. In the west of England, however, the Verbena continued to be used to a slight extent as an exhibition plant up to 1899.

(2) About this time (1870) the Verbena was beset with unusually destructive insects and diseases. These troubles were not new, for as early as 1844 it was recognized that there was difficulty in preserving plants over winter on account of attacks of mildew and of greenfly, but the reward was sufficient compensation for the required vigilance. It is probable that the highly artificial conditions and "edulking" to which the Verbena was subjected during the period it was used so extensively as an exhibition plant, contributed to weaken its constitution and thereby to heighten the destructive influence of the mildew and aphid.

The prospects for the Verbena have somewhat improved within recent years. The German varieties maintained their constitutions better than the English ones, and the American climate seems better suited to the Verbena than the European. Owing to the long recognized difficulty of "wintering over," the treatment of the Verbena as an annual has come into practice and its success is most gratifying. With the improvement of the habit of growth by the evolution of a race of "compactas" and by the fixing of the various colors so that they will come true from seed, the Verbena has gained a new lease on present and future popularity.

The form and size of the individual flower and of the flower-cluster have been closely associated and have had a dominant evolution. By observing Fig. 2650 it is apparent that in the prototypes of our present garden forms of Verbena hybrid the individual flowers are irregular, the upper lobes of the corolla being narrow and large vacant spaces occur between the lobes, and the flowers are relatively small. V. chamadryfolia is the most irregular, V. incisa and V. tenecioides are somewhat less irregular, while V. philogiton (if the artist was true to his subject) had nearly symmetrical lobes. In none of these species were the corolla-lobes expanded strictly in a plane at right angles to the tube. The flower-cluster of V. chamadryfolia was likewise very defective, from the florist's standpoint, in that considerable portions of the space were unoccupied, giving to his eye a ragged, unfinished appearance. V. incisa and philogiton were appreciably better in this respect, while in V. tenecioides the flowers were unsatisfactorily scattered along a sparsely flowered spike. The Verbena fancier soon established in his mind an ideal of "pimp" and "truss," toward which he constantly selected. This conception doubtless changed from decade to decade, but the essential features remained fairly constant. This ideal type is admirably exemplified in Fig. 2650, which is a reproduction of an apparently idealized lithograph of 1872. The individual flowers are over an inch in diameter, the lobes are geometrically symmetrical and filled the space perfectly, but do not crowd. The flower-cluster is of graceful, oblate-ovate form, with no unoccupied spaces and yet not overcrowded.

Though the Verbena breeder probably never completely realized the ideal flower and cluster, this ideal has had a most significant influence. The greatest progress in improving the size and form of the individual flower and of the flower-cluster was made during the fifties and sixties, especially during the period in which the Verbena was used as an exhibition plant. This is quite natural, because exhibition plants are seen at close range, and the English gardeners of this period were very fond of their flowers in the flowerbeds, and such a high degree of symmetry is not sought in flowers used for bedding and for borders. They are seen at greater distances. Abundance of bloom and depth of color are extremely important and it is probable that best Verbenas of today hardly would come up to the standard of those grown by the English gardeners of 1868 if judged by formal symmetry.

The Verbena has little tendency to "sport" toward the production of double flowers. However, such forms occasionally occur among seedlings.

Development of the Eye. — The only "eyed" effect observable in the prototypes of V. hybrid was produced by the palisade of white hairs in the throat and the yellowish color of the inside of the tube. At present we have numerous races of "oculatas" with distinct white or yellowish eyes of various sizes. Two different kinds of color markings are spoken of as "eyes;" viz.,

Adapted from an English colored plate of 1872.

2650. An ideal type of Verbena.
Whites, and the Matter of Fragrance.—Of the four prototypes, V. tenerridae alone was white, or white with a shade of pink or an imitation of yellow. Among the evergreen Verbenas there have been, from the first, a few prominent white varieties; but there is no period during which the proportion of whites exceeded about one in eight, or one in ten. Whites are more frequently fragrant than other colors. Good reds are seldom or never fragrant, pinks occasionally so, mauves, purples and blues frequently so. A rich jessamine fragrance was one of the noteworthy characters of V. tenerridae. Whites in many, perhaps a majority of cases, show foliage and pubescence characters of V. tenerridae. This is especially true in plants propagated from seed.

Blues and Purples. — It seems that different shades of purple were occasionally represented in the wild forms of V. incisa and phlomisphora; however, there were no distinctly blue ones, and in the early history of the Verba the there is a dearth of blue varieties. We find in the Florist of 1854, that "Bluebeard" is "really blue" and that "a good blue has long been wanted, most of the so-called blues being of a blue-purple color." Subsequent to the fifteenth the number of blue varieties recorded in lists appreciably increase, but they by no means equal the reds, being little if at all in excess of the number of whites. Our best blues of to-day (for example Blue Boy) are of a deep, royal purple (per Ricewa's color chart) rather than really blue. A great variety of tints and shades of purple are represented. In the blue varieties which the writer has grown, especially the ones from European seed, there has been a striking resemblance to V. tenerridae in foliage, pubescence, habit occasionally, etc. They also resemble this species in having many that are very fragrant.

Yellow. — A good yellow has been the dream of many a Verba lover, but it is doubtful whether the dream will ever be fully realized. Gartenflora of 1896 reports that V. tenerridae lutea, Vilm., was produced from V. tenerridae, that it is "bright yellow," and that it will be "joyfully received by Verba lovers."

The Striped Varieties.—Two classes of so-called striped Verbenas have arisen: one sort having the median portion of each lobe of the corolla of a dark color, usually red or rose, and the rest margin which is another sort having irregular stripes, dots and dashes of red, rose or purple upon a white ground color. See Fig. 2651. The former class seems to have originated with the British florists somewhat previous to the latter. It was the most popular "striped" class with them for many years after the introduction of the second class of striped ones. The true striped or Italian Verbenas were introduced into France and England from Italy about 1882. Cavagnini Brothers, of Brescia, are given the credit of having originated this unique race. It is the general opinion of writers that the Italians are derivatives in part of V. tenerridae. Surely the foliage of the Italian varieties portrayed in Flora des Serres and of striped varieties now grown shows no "pinnatifid laciniate" foliage of V. tenerridae. Neither has the undersigned been able to find any evidence of the anther appendages of V. tenerridae. However, it is impossible to determine with certainty the parentage of hybrids on structural characters alone. The true explanation may be that the V. pulchella which is said to have been used, was not V. tenerridae, Spreng., but some form of V. hybrida, Hort. The striped varieties are unstable and have a strong tendency to revert to "selfs," whether propagated by seed or by cuttings. In the writer's own experience, a seedling with blue and white striped corolla reverted in four generations of cuttings, so that some of the plants produced entirely flowers that were solid blue; others, flowers that were white with a strip of blue. Verbenas afford excellent opportunity for the study of bud-variation.

Production of Leaf-Variation (yellow foliage).—Comparatively little attention has been given to leaf-variation among the Verbenas. However, a number of varieties having leaves variegated with yellow were introduced about 1865, during the period when variegated plants were so popular. At present we have a strain of yellowish-leaved Verbenas which come true to this character from seed.

Development of the Compactas.—Early in the history of the Verbenas their "straggling and uncontrollable" habit of growth was lamented. Considerable pegging was necessary in order to keep the plants in any desired position and repeated efforts were made to secure bedding varieties of closer, more upright habit. Considerable progress was made by British florists during the sixties. Most of the progress, however, has been made subsequent to 1870 and the German Verbenas grown at Erfurt deserve much of the credit for the production of this splendid little race that has done so much to help restore the Verbea to their former prominence. Compactas have been fixed in various colors so that they will come true from seed. In most botanical characters they resemble V. chamadryfolia and phlomisphora, droopy varieties.

Development of Treatment as a Cultivar. — Seed Cultivars.

When the Verbenas were first introduced they were
propagated to a considerable extent by separating the protruding rooting branches and potting them. This method was soon abandoned in favor of propagation by cuttings. Verbena root very readily and they were grown from cuttings almost exclusively up to 1850, except that seed propagation was employed for the production of new varieties. During this period, as a consequence of many fortuitous and intentional hybridizing, and of no effort having been made to fix varieties, seedlings were very variable and untrue to parent varieties. Soon after the decline of the Verbena in 1858-70 seed propagation was more extensively employed. It obviated the very troublesome experience of growing over stock plants, which were so susceptible to attacks of mildew and aphids. Soon efforts were made to fix strains that would come true to color and habit from seed. This has been most successfully accomplished, and the Verbena is gaining much of its popularity through treatment as an annual. Seeds are sown in March. The plants are hardened off in a coldframe and set out in the latter part of May. They flower profusely from June to October. Striped varieties are not easily fixed.

Summary of Present Horticultural Types (V. hybridia).—It is impossible to satisfactorily classify the hybrid garden Verbena according to their botanical derivation. They are conveniently classified according to color of flowers into: (1) Selfs, or one-colored varieties; (2) Clusters, or eyed varieties; and (3) Italians, or striped varieties. As to habit they may be divided into: (1) Standards, those of the ordinary loose, spreading growth; and (2) Compacts, which are much reduced in stature and of more condensed form. Verbena now in cult. are shown in Figs. 2652-4.

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A. Connective of the upper anthers not appendaged.

B. Clusters not panicled. Prototypes of the Garden Verbena (V. hybridia, Hort. Fig. 2653).

C. Fls. scarlet

D. Clusters oval to oblong: lvs. saw-toothed

DD. Clusters flat or convex: lvs. more deeply and sharply cut

CCC. Fls. white

BB. Clusters panicled

AA. Connective of the upper anthers formed with a glandular appendage

B. Fls. violet or rosy purple

C. Bracts half as long as calyx: plant a subshrub:

CC. Bracts about as long as calyx or a little shorter: plant annual

BB. Fls. lilac: plants annual

CC. Lvs. twice pinnatifid

CCC. Lvs. once pinnatifid

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2652. The common garden Verbena—V. hybridia (X1).

rather distinct forms; var. Melindres has oblong to oblong-lanceolate lvs., which are unequally incised-serrate. This form is less hirsute and is more graceful and vigorous. It was the form first introduced to cultivation. Var. melindrooides has shorter, broader lvs. and is more hairy. Different forms occur over southern Brazil, Uruguay, Paraguay, and the whole of the Pampas, B.R. 11:1154. L.B.C. 18:1514. B.M. 2533. P.M. 1:173. B. 3:129.

2. phlogiflora, Cham. (V. Tweedieana, Niven). Fig. 2649. Characterized by rosy or purple fls. in oblong or oval clusters; resembles No. 1, but has more upright habit, softer pubescence and larger, longer-pointed, distinctly petioled lvs. Stems ascending: branches rather erect, much subdivided, angled, retrorsely hirsute: lvs. oblong or lanceolate-triangular, acute, base entire, unequally long-attenuate into the evident petiole, unequally subincised serrate, somewhat venously rugose, strigose above, below hairy or strigillose pubescent: spikes terminal, pedunculate, many-fl., oval to oblong:

3. incisa, Hook. Fig. 2649. Rose-purple fls. species with lvs. more deeply cut than in the two preceding. Whole plant hairy -pubescent; stems ascending; branches erect: lvs. oblong-rectangular, base cuneately truncate or subcordately attenuate into the evident petiole, pinnatilobed or deeply serrated and incised, upper lvs. sublanateolate, sessile, incised pinnatifid; spikes terminal, pedunculate, subtermate, flat or convex: bracts ovate: calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs: corolla-tube glandular-pubescent, thrice as long as calyx; limb large, rose-purple, paler beneath, ovate lobes deeply emarginate. Southern Brazil, Paraguay and northern Argentine Republic. B. M. 3628.

4. teucrioides, Gill. & Hook. Figs. 2649, 2653. Characterized by fragrant white fls. in very long clusters. Stems cespitose, rooting at base, ascending, terete, openly and copiously hirsute: lvs. ovate to oblong-rectangular, base entire, sessile or nearly so, obtusely serrate: margins revolute, velvety-rugose, glandular-pubescent above, submentosely hispidulous on veins below: spikes terminal, solitary, glandular, hairy, lax, 5-9 in. long: bracts subulate-lanceolate, ciliate; calyx nerved, twice as long as bracts; corolla yellowish white or pinkish, long exserted, twisting in age, fragrant. Southern Brazil, Uruguay, Argentine Republic, Chile and Peru. P. M. 5:218. B. M. 3694.

5. venosa, Gill. & Hook. Fig. 2654. Differs from all other cultivated kinds by panicked inflorescence and tubercous roots. Herbaceous perennial, 1 ft. high: stems simple, rhizomatic, creeping at base, ascending, 4angled, hairy: lvs. rigid, oblong to oblong-lanceolate, the sublanate base entire and half-clasping, acute at apex, unequally subacuminate, the teeth entire, nerves prominent, hirsute below: spikes in a close terminal paniculate, subtermate, lateral ones pedunculate, fastigate and finely cylindrical; bracts subulate, ciliate, often pubescent, exceeding the hairy calyx: corolla lilac or bluish purple to nearly sky-blue, very thinly villous without; tube slender, thrice as long as calyx: fr. 1

Verbenas may be kept indoors over winter, or species propagated by seeds sown in greenhouse in January.

6. tenea, Spreng. (V. pulchela, Sw., not Hort.). Herbaceous perennial: stems cespitose, decumbent, rooting; branches slender, 4-angled, ascending, sparsely hairy: lvs. exserted, exserted, 3-parted and again pinnatifid into acute, linear, entire, subrevolute divisions, sprinkled with short hairs: spikes terminal pedunculate, calyx elongated, stringy-pubescent or hairy, sprinkled with angles at short stipitate peltate-form glands, twice as long as bracts; corolla rose-violet; anther appendages barely exerted, clavate, subcurved. Southern Brazil and La Plata region.

7. erinoides, Lam. (V. multifida, Ruiz and Pav. V. pulchella, Hort., in part). Moss Verbenas. Annual or perennial: stem strapose hairy or somewhat hirsute, branching, decumbent, rooting; branches ascending: lvs. ovate in outline, cuneate base decurrent into the petiole, deeply 3-parted and the divisions pinnatifid into narrow linear acute lobes, subrevolute on margins, subrevolute especially on nerves: spikes terminal, solitary, pedunculate, soon elongating and relaxing, lanceolate hairy: bracts lanceolate, acuminate, spreading, one-half as long to as long or shorter than the calyx; corolla rather small, shortl exserted, lilac, bearded within; anther appendages exerted, rather short.—Said by Dr. Gillies to be "one of the commonest plants on the Alps of Childe and Mendoza..." varying extremely in color of flowers, in stature and in degree in which the leaves are cut." In some individuals the fls. are said to be scarlet, in others blue or purple. Forms assignable to this species occur also in the southern states of Brazil. The species is probably a composite one as now recognized. B. R. 21:1766 (as V. multifida, var. contracta). Variable but unique species characterized by distinct, finely cut foliage and rose lilac to deep purple fls., but the clusters and individual fls. are too small to make it popular.

8. bipinnatifida, Nutt. (V. pulchela of some German seedsmen. V. montana, Hort., in part). Perennial, prostrate and rooting at base: stems stout, upright, branched, 6-18 in. high; lvs. rather thick, petioled, in long, seachous above, ovate in outline, bipinnately parted or 3-parted into numerous oblong, rather acute lobes 1-3 lines broad; spikes solitary, dense to rather lax, at first capitate, becoming 2-1 in. long in fr.: corolla 5-8 lines long, purple or lilac, limb 4-5 lines broad, lobes emarginate to obovate; throat of corolla provided with a palisade of short hairs; upper stamens bearing each a small oval to oblong purplish gland. Texas to Neb. and Col. —Flowers become bluish purple in drying.
9. Aubletia, Jacq. (V. Aubletia, var. Drummondii, Lindl.; V. Calyclus, B.R. Aublet). V. Drummondii, Hort. V. Limbertii, Sims. V. montana, Hort., (in part). Fig. 2655. Perennial, pubescent, with rather stiff hairs or glabrate: branches slender and ascending from a slender and creeping rootstock, 0.18 in. high: lvs. ovate or ovate-oblong, 1 to 3 in. long, truncate, broadly cuneate or subcordate at base and the petiole more or less margined, incised lobed and toothed, often deeply 3-5-cleft: spikes peduncled, dense, short and capitulated. A. flavescens, F.Muell. var. flavescens, A. longiflorum; A. subulata, mostly shorter than the calyx—these and the calyx densely glandular pubescent: calyx-teeth unequal, filiform-subulate; corolla 6-10 lines long, from bluish purple or blue to rosy purple or white, commonly approaching blue in dried specimens; limb ½-⅔ in. broad, lobes oblong or oblanceolate, emarginate and more or less revolute near the sinuses, throat provided with pilose of short white hairs; upper anthers bearing each a light brown, oblong gland which is barely exerted. Colo. and Mex. eastward across the continent. B.B. 3:72. B.M. 308:2260. B.R. 4:291; 23:1925.—Reported as producing many garden and spontaneous hybrids. Garden forms are of stock, stamine, or pistillate opposite or at root base; lvs. larger, dark shiny green above, more conspicuously veiny, clusters and individual lvs. larger, and the color variation more striking. Many forms have a rich spicy fragrance quite different from that of the hybrid Verbenas. On account of the robust, healthy nature of V. Aubletia it has been frequently recommended in horticultural literature as desirable for hybridization with the hybrid Verbenas. The cross would probably be too radical for best results. It is to be regretted that this charming species which is thought well of in Europe should be neglected in its native America.

VERBENA, LEMON. Lippia.

VERBENA, SAND. See Abriaia.

VERBESINA (probably a meaningless alteration for Verbenan. Compositae. CROWNBEARD. About 50 species of American herbs, annual or perennial (some tropical species shrubby), with alternate, less than 2 in. long, to often decurrent lvs. and corymbose or solitary heads of yellow or white flowers; rays sometimes wanting, pistillate or neutral; achenes flattened or those of the rays 3-5, pappus wanting, wings wanting; pappus wanting; lvs. oblanceolate to linear, obtained with stiff bristles. About half dozen hardy perennial Verbessnas have slight rank as garden plants, but the competition among species and the demand for flowering grasses is so great that Verbessnas have little chance. The following species is a robust and rather coarse plant, growing 4-8 ft. high, and suitable only for the wild gardens and the back row of the hardy border. It is doubtless of the easiest culture. It blooms from Aug. to Oct., and has numerous yellow lvs. 3½-1 in. across in flat clusters. occidentalis, Wait, (V. Siegsbeckia, Michx.). Herb perennial, 4½-8 ft. high: lvs. ovate (uppermost oblong-lanceolate), acuminate, serrate, the larger ones 8-15 in. long: heads very large, yellowish, stelliferous and usually fertile: awns of pappus not hooked. Dry hillsides, eastern U.S. B.B. 3:430.

VERMONT, HORTICULTURE IN. Fig. 2656. Vermont has no reputation as a horticultural state, either amongst her own citizens or outside her boundaries, yet there is no state more important for fruit culture in the temperate zone, not even excepting apricots and peaches, which cannot be grown to perfection here. With the exception of apricots, peaches and sweet cherries, hardy fruits can be produced to great perfection. The only reason which can account for the non-development of Vermont's horticultural resources is the fact that the possibilities are not appreciated by her land owners. Vermont farmers are extremely conservative and slow to make a change in their method of farming, so to the signal disadvantage of the few who have taken up fruit-growing makes but small impression on the many who are still busy making butter and growing hay, potatoes, and little patches of grain. and home markets. Vermont's climate is generally good. Strawberries rarely sell for less than 12½ cents a quart, and the average price for good fruit is probably nearer 15 cents. Blackberries usually bring 10 cents and raspberries 19-12½ cents. Cherries are hardly ever bought through sales or by it and thrive and cherry pie is popular. The price for cherries is always $3 to $4 a bushel. Good vegetables sell equally well. With such favorable markets, supported by numerous and small markets, there is every reason for the summer boarders, horticultural industries certainly ought to thrive.

The horticultural regions of Vermont are, roughly, three. The first and most important is the Champlain valley district, including several large islands in Lake Champlain. This region reaches off toward Montreal on the north; and the general character of its horticulture is much like that in the St. Lawrence valley between Montreal and Lake Ontario. Winter apples are the most important crop in this section. The second region lies in the southwestern part of the state and belongs to the upper Hudson valley. Apples will grow readily where intended, but are seldom of the large, firm, good quality which success is secured with small fruits, the growing of which is greatly encouraged by the large annual immigration of summer residents. The third district comprises the valley of the Connecticut. It is the least developed of the three, horticulturally. The reason for this fact is not plain. Soil and climate are admirably adapted to all sorts of fruits. Even peaches are successfully grown in orchards. The few men who are growing plums, cherries, strawberries, etc., are growing every year that the tremendous valley in Vermont is naturally as much a fruit region as any other.

The apple crop offers the single semi-exception to the statement that Vermont has no horticultural reputation at home. There are a few commercial apple orchards in the Champlain valley which grow as fine apples and yield as handsome cash profits as any orchards in America. Grand Isle county, made up of land lying in Lake Champlain, has the principal reputation for apples. The best orchards and the best orchardists are found there; but Addison county ships about double the quantity of apples.

The varieties of apples grown for market are principally Greening, Spy, Baldwin and Fameuse. Next to these come McIntosh, King, Ben Davis, Spitzenburgh, Seek no-further and Arctic. A few old orchards contain many of the old-fashioned varieties, blu-vey, Dutch Mignonet, Gilpin, Grimes Golden, and the like. But such collections are few and uncherished. The modern commercial varieties are the only ones in repute. Vermont has had some experience with the Russian apples. In fact, Dr. T. H. Hoskins, of Newport, on the northern boundary of the state, has been one of the most famous experimenters with the Russian importations. Nevertheless the Russian varieties have made small impression on the pomology of the state.

Plums are grown just enough to prove that they will succeed admirably. Lombard, Green Gage, Brashaw, the Damsons and other old-fashioned sorts still retain the preference of conservative Vermonters, though other growers are planting chiefly of the Japanese varieties, especially Burbank and Abundance. In the northern and mountain townships only the American and Nigra types are hardy enough; but even these are seldom grown.

Among cherries Morello, Montmorency and Richmond are the favorites. Rarely are any commercial varieties grown. The important fact is that the temperate zone, not even excepting apricots and peaches, which cannot be grown to perfection here. With the exception of apricots, peaches and sweet cherries, hardy fruits can be produced to great perfection. The only reason which can account for the non-development of Vermont's horticultural resources is the fact that the possibilities are not appreciated by her land owners. Vermont farmers are extremely
VERNONIA

(synonymous with Ironweed)

A genus of nearly 500 species of perennial herbs or rarely shrubs, with alternate, pinnately veined leaves and usually purple or rose flowers borne in the following species in terminal cymes. The genus is widely scattered about the world, but is possibly most plentiful in South America. The following species are native of the United States, and are hardy perennial herbs of attractive appearance, with rather large heads of purple flowers in terminal clusters in late summer or early fall.

Heads not glomerate, several- to many-flowered; involucre of dry or partly herbaceous, much-imbricated bracts; corolla regularly 5-cleft into narrow lobes; akenes mostly 10-costate, with a truncate apex and a cartilaginous, ciliolate base; pappus double (at least in American species). Vernonias are of easy culture in any good, rich border, being easily propagated by division.

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A. Heads 50-70-flowered.
   a. Lvs. distinctly linear.
      b. Plant about 1 ft. high.

Lettnermani, Engel. Stem fastigiate and cymose much branched at the summit; lvs. 2-4 in. long, only 1 line wide, margins not revolute; fls. heads numerous, ½ in. long, 10-14-flowered. July-Sept. Sandy soil, Arkansas.

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VERÓNICA (after St. Veronica). Serpulatrixdices.

The Speedwells are mostly herbs, with a few exotic shrubs, best known by their usually long racemes of small blue flowers. About 200 species, mostly in the northern hemisphere, a few species in the tropics and southern hemisphere. In New Zealand they are a dominant feature of the country. Plants in cultivation are mostly hardy at the North, usually low-growing and occasionally prostrate. Lvs. opposite, rarely verticillate or whorled; fls. in axillary terminal racemes and bracted; calyx 4-5-parted; corolla usually blue, rarely pink or white, wheel-shaped or salver-shaped, the lateral lobes or the lowermost one commonly narrower than the others. Standard 2, rarely 3, attached on each side of the upper lobe of the corolla; style entire, subcapitate; capsule flattened, obtuse or notched at apex, 2-furrowed; seeds few or many.

All are showy, free-flowering plants, used, except the shrubs, as garden perennials or annuals, and are propagated by seeds, the perennials also by division, the shrubs by cuttings in spring or summer. They succeed in any good garden soil in a sunny situation. The lower-growing forms are good rock-plants; the taller are adapted to the herbaceous border. The shrub forms are greenhouse plants or grown only in warmer parts of the country, particularly California, where they are evergreen, and where they do well along the coast even in exposed places by the sea. The shrubby species are mostly natives of New Zealand. They are well reviewed in The Garden 45, p. 506, and 28, p. 292. Some of them have enjoyed considerable popularity in England, where they are generally seen in cool conservatories, but they survive the winters outdoors in the most favored parts of the British Isles. The first hybrid was raised in 1848 by Isaac Anderson-Henry (then Isaac Anderson), a noted hybridizer. This gentleman continued his experiments for several years, using V. speciosa, salicifolia and elliptica. His work was continued by others, and most of the hybrid Veronica of today have the parentage as indicated, with the blood of V. speciosa generally much in evidence. If a collective name for Veronica hybrids is desired, V. speciosa var. hybridis is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but a hardier race will probably be secured by using V. Traversii and its allies, which have been introduced more recently. Some of these are V. Olenoii, Rakaniensis, anomala, monticola and pinelodites— all known to the American trade. A third and still harder group of the New Zealand Speedwells is the truly alpine group known as Whitcord Veronicae. These should be quite hardy in northern rockeries. They are unknown in America now. The best of the group is said to be V. egressoides, var. variabilis, known to English trade as V. salicoides. Others in cultivation are V. Hectoni, Arm-Strong and hygrophiloides.

Veronica was monographed by Bentham in Latin in DC. Prod. 10:458-491 (1846), 156 species being then known. An excellent account of cultivated Veronica is found in Vilimorin’s Blumengarten.

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1. Hulkeana, F. Mueller. Showy lilac-fl. species, readily distinguished by its serrate lvs. and terminal racemes. Slender, erect, sparingly leafy, straggling shrub, 1-3 ft. high, with branching stems; lvs. 1-1½ in. long, in sparse pairs, ovate or oblomg, obtuse or acute, coarsely serrate, smooth, leathery; raceme slender, terminal, branching, spreading, 4-10 in. long; fls. sessile, blue: capsule obtuse, longer than broad, twice exceeding the sepals. Summer. Mts. and rocky places, New Zealand. B.M. 5484.

2. Traversii, Hook. f. White-flowered shrub about 2-3 ft., of special interest as being hardy in Ireland and parts of England. A smooth, much-branched shrub; lvs. linear or linear-lanceolate, entire, smooth, opposite, sessile, thick, ½-1 in. long; numerous: racemes axillary, large; fls. many, small, white or mauve: capsule acute, 3-4 times exceeding the calyx. All summer. New Zealand. B.M. 6390. Gn. 32, p. 217.

4. speciosa, R. Cunn. A half-hardy bushy branching shrub, 3-6 ft. high. Stout and very smooth, the branches angled; lvs. obovate-oblong, subsessile, thick and smooth, 2-3 in. long: racemes axillary, densely fld.: fls. blue to violet, with rose, red or white velvets: capsule exceeding calyx. Banks of streams. New Zealand. B. M. 405. R. H. 1841:60. Andersonii, Lindl. & Paxt. (V. Hendersonii, Hort.), a hybrid of V. salicifolia and speciosa, is a summer bedding plant and also a greenhouse subject. It grows 18 in. high; lvs. oblong, sessile, entire, thickish: racemes axillary: fls. bluish violet. F. S. 1856. Fig. 2658.

Var. imperialis, Boncharlat (V. imperialis, Hort.), has large, dense spikes of "amaranth-red" or crimson-purple flowers. F. S. 22:2317. The excellent "Veronica Purple Queen" is alleged to be a hybrid of V. Traveraii and V. Hendersonii and to have violet-blue fls. with a white center. The handsome plate Gn. 45:966 shows no trace of V. Traveraii nor of white center. The plant is close to V. speciosa. In some catalogues V. Hendersonii and V. subcordata are said to be synonymous, but this is a gross error.

5. salicifolia, Forst. Strong, half-hardy, glabrous shrub with flattened branches, approaching a tree in size and habit: lvs. lanceolate, subsessile, entire, smooth, 2-3 in. long, pointed; racemes axillary, densely fld.: fls. bluish to white, large, pedicelled: capsules large, longer than broad, pointed, exceeding the sepals. New Zealand, where it is a graceful tree 10-15 ft. high. Gn. 26, p. 107; 28, p. 293; 34 p. 349.


2658. Veronica Andersonii (X ½). No. 4.

7. Buxbaumii, Tenore. Prostrate annual, with elongated slender pubescent stems, the lower branching and often rooting: lvs. ovate, subulate, coarsely crenate-serrate, pubescent, shortly petioled, ⅛-⅑ in. long, the lower opposite, the upper alternate and smaller: racemes axillary: fls. small, blue, scattering, on long pedicels, of long duration: capsule broader than long, very widely notched, exceeded by the sepals. April-Sept. Fields, middle and S. Europe, Asia and naturalized in N. Amer. F. 1846, p. 112.

8. Syriaca, Roem. & Schult. Ascending, diffusely branched pubescent herb, 6-12 in. high, with or ovate-lanceolate, incised or dentate, smooth; lower petiole, upper subsessile, ½ in. long; raceme terminal, slender, broader than long, notched two-thirds of its length, exceeding the sepals. June. S. W. Asia. R. H. 1897, p. 311.

9. serpyllifolia, Linn. (V. alpiflora, Hort.). THYMELAINED SPEEDWELL. ST. PAUL'S SPEEDWELL. Slender, ascending, nearly smooth plant, growing irregularly in clumps 2-4 ft. high. Fls. blue: capsule exceeding calyx. lvs. ovate or oblong, crenate, ¾-⅞ in. long, smooth, variable: racemes loose, with conspicuous bracts; fls. pedicelled, whitish or pale blue with deeper stripes; capsule wider than long, obtusely notched, exceeding external to fls. Rak-Small, road-sides and fields, Asia, Eu., N. Afr., N. and S. Amer.


11. alpina, Linn. A slender, delicate plant growing from a creeping stock, branching at the base, becoming ascending or upright, the flowers nodding or nearly sessile, 2-6 in. high: lvs. opposite, occasionally alternate, subsessile, elliptic or oblong, entire or dentate, about ⅛ in. long, of varying size, the lowest small, orbicular: racemes short, spiciform, dense: fls. small, blue or violet: capsule ¾ in. long, oblong, longer than broad, hairy, exceeding the calyx. Mts. of Eu., middle and N. Asia and alpine and arctic regions in America. B. M. 2975. — Adapted to the rock-garden. Blackens when dried.

12. gentianoides, Vahl. GENTIAN-LEAVED SPEEDWELL. Erect, slender, tufted species 6-24 in. high, according to soil and position, from creeping roots and leafy stems below broadening above into a spicate raceme: lvs. obvate or oblong, some lanceolate or linear, thickish entire or serrate, smaller crenate, sometimes 1-⅛ in. long: fls. many or less in rosettes; upper lvs. bract-like, smaller and narrower: raceme elongated, leafy, many-fld., hairy; fls. pale blue, with darker streaks on long pedicels: capsule nearly round, slightly notched, exceeding the sepals. Wet alpine fields.非常喜欢这种植物。这种植物在任何土壤或位置上都能生长，耐阴。最常生长在较早的时期。Var. foliis variegatis is a dwarf form with variegated lvs. used in formal bedding. Another variety has longer flower-stems and larger fls. which are light lavender. Var. albans white flowers.


14. incana, Linn. (V. edulis, Hort.). HOARY SPEEDWELL. Strong, upright or ascending, white-woolly plant 12-18 in. high, with many sterile matted branches and fewer fertile erect branches: lvs. opposite, lower oblong, upper lanceolate, 1-3 in. long, white-to-mosaic: racemes erect, numerous, 3-6 in. long: fls. many, blue, short-pedicled: capsule longer than broad, thick, exceeding the woolly calyx. July-Sept. Fields and mountain regions, N. Asia, and southwestern En. — Resembles V. spicata in habit. Has a good
appearance both in and out of bloom. Useful in the rockery, border or geometrical garden.

15. **pinnata**, Linn. Strong, upright plant 2–3 ft. high, glaucous or pubescent. Lvs. sparse or somewhat clustered, finely cut, the lower pinnate with spreading segments, the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fl., elongated: fls. blue. June, July. Open mountain lands, Russia.

16. **spica**, Linn. (V. pastelate, Linn. 1' amelkhina, Willd.). BASTARD SPEEDWELL. Upright, slender, densely pubescent species 2 ft. high: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrate-crenate toward the apex, entire below, smooth, narrowed at the base, broad, lanceolate, racemes numerous, panicked, long, densely many-fl.; fls. blue, pedicelled: capsule nearly round, thick, exceeding the sepals. May, June. Woods, southeastern Eu, and southern Russian Asia.—Becomes weedy late in the season. **Var. elegans**, Voss. Lvs. pubescent on both sides: habit much branched and more slender than the type. A form with variegated lvs. and flesh-colored fls. is known to the trade as **V. elegans canesca variegata**.

17. **longifolia**, Linn. Strong, leafy, upright, densely growing species 2½ ft. high, with usually a smooth stem: lvs. lanceolate or oblong-acuminate, sharply serrate, lower opposite, upper more or less verticillate, pubescent or glabrous, very acute, 3 in. long, erect, spiciform, dense; fls. bluish, numerous: capsules longer than broad, notched, a little exceeding the linear sepals or sometimes exceeded by them. Becomes black in drying. July–Sept. Wet fields, middle and northern Eu. and northern Asia.—Much cultivated and hybridized. Has several varieties. A fine border plant and the most common species, growing and flowering freely in any good soil. **Var. subsecialis**, Miq. Fig. 2659. More erect, compact, pubescent, slender than the type, 2-3 ft. high, growing in clumps with numerous side branches and of a good habit: lvs. 2–4 in. long, according to the richness of the soil: spikes larger and longer than of the type and of an intense lustreous blue. Aug.–Oct. Japan. B.M. 6467. R.H. 1881: 270. G.C. II. 16:788. A good border plant and considered the best Speedwell. Best in deep, rich soil in an open position.


Var. **villosa** (V. villosa, Schrad. V. arenatilis, Hoffm.). A Siberian form with narrower lvs. than the type and large blue fls. Lvs. serrate or doubly notched or incised.

18. **spicata**, Linn. Ascending or erect, slender stems 2–4 ft. high, growing from a shorty creeping, almost woody rootstock: lvs. lanceolate, lance-oblong or the lower ovate, opposite or verticillate, crenate, dainty, 1½ in. long: fls. blue: racemes long, upright, many-fl.; fls. pedicelled, clear blue or sometimes pale pink; stamina very long, purple: capsule longer than broad, notched, thick, exceeding the broad hairy sepals. June–Aug. Hilary pastures, Eu, and N. Asia.—Thrives in an open soil away from shade. Regarded as one of the better border Speedwells. Var. **alba** has white fls. Hort. Var. **rosa**, Hort., has showy pink fls. in early autumn.

19. **circumoides**, G. Don. Low, trailing perennial, growing in a dense mass: lvs. lanceolate, crenate toward the apex, small, dark green, numerous: racemes many, 6 in. high: fls. small, dark blue. May, June. Switzerland.—Rare. Considered one of the best. Valuable as a ground cover, as a rock plant or at the front of a herbaceous border.

20. **montana**, Linn. MOUNTAIN SPEEDWELL. Slender, trailing, hairy plant, 12–18 in. long, rooting from the stem: lvs. ovate, petioled, coarsely crenate, hairy, sparse: racemes slender, few-fl., on long pedicels: capsule large, broader than long, slightly notched, exceeding the hairy sepals. May, June. Moist woods, temperate Europe.

21. **officinalis**, Linn. COMMON SPEEDWELL. FLUTELLEN. GROUND-HELLE. Prostrate, leafy native with a pubescent stem rooting at the nodes. 6–18 in. long: lvs. elliptic, oblong or broadly oblong, ¾–1 in. long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fl.: fls. pale blue, rarely pink, sessile: capsule broader than long, wedge-shaped, broadly notched, hairy, exceeding the hairy sepals. May–July. Forests and mountains of Eu. and N. Amer.—Grows under trees and in shade where no grass will grow, covering the ground with a permanent sod. Spreads rapidly and is easily grown. Prop. by cuttings.

22. **pectinata**, Linn. SCALLOPED-LEAVED SPEEDWELL. Prostrate, white-pubescent, hairy, spreading plant rooting at the nodes, the ascending branches producing single elongated racemes: lvs. ovate or oblong-linear, sometimes pinnatifid, crenate, narrow at the base, sessile, pubescent, ¾ in. long: racemes elongated, many-fl.: lower bracts like lvs.: fls. deep blue with a white center: capsule large, longer than broad, notched, pubescent, thick, exceeding the sepals. May, June. Dry, shady hills. Asia Minor.—Suitable to dry spots in a rock-garden. Grows in almost any soil and position.

23. **Chamaedrys**, Linn. ANGEL’S EYES. BIRD’S EYES. GERMANDER SPEEDWELL. Slender, compact, pubescent species 12–18 in. high, densely ascending from a creeping base: lvs. broadly ovate, sometimes narrower, sub-sessile, crenate or incised, rounded or cordate at base, hairy, thick, 1½ in. long: racemes 3–6 in. long: fls. large, blue, long-pedicelled: capsule longer than broad, widely notched, exceeded by the sepals. May. June. Woods and roadsides, N. and mid-Europe and Canaries. Adventive in this country.—A good border plant.

24. **Teaterium**, Linn. HUNGARIAN SPEEDWELL. SAW-LEAVED SPEEDWELL. Stems produced from rhizomes, the sterile prostrate, the floral ascending or erect, white-pubescent. 1 ft. high: lvs. lanceolate or oblong, crenate, sometimes somewhat pinnate, sessile: racemes several, elongated: fls. large, blue, numerous: capsule longer than broad, slightly notched, thick, exceeding the sepals. June. Middle and S. Eu, and Middle Asia.—**V. prostrata**, Linn., formerly considered a separate species by reason of its narrow lvs. and prostrate sterile stems, is connected with **V. Teaterium by intermediate forms. V. prostrata is still used in the trade for a plant with light blue fls. B.M. 3693 (V. prostrata, var. sativicoloria).
VERONICA

25. *Austrocosmis* Linn. Strong, upright perennial 18-24 in. high, with woolly stems; lvs. mostly deeply pinnatifid, rarely entire or dentate, 2-3 in. long, linear to ovate, the lobes linear or suboblong, narrow at the base; racemes elongated, loosely many-fl., spreading; fls. large, blue or blue-violet, longer than broad, slightly or not at all notched, exceeded by the calyx. S. E. Eu. and Asia Minor.—A border plant.

The following trade names cannot be accounted for by the writer: *V. marcoforata*—V. repens of the American trade is apparently not V. repens of the botanists. This name was first used by Salisbury in 1796 and is a synonym of *V. fruticosa*, a plant with terminal racemes. *V. repens* of the trade has an axillary inflorescence. It is a low plant with woody horizontal stem and erect flowering branches or 4 in. high with strict racemes of purplish fls. borne in June and a 4-parted calyx. The capsule is oblong. This plant has been offered by Rochester nurserymen ever since 1834 and was cult. at Harvard Botanic Garden as far back as 1856. Lvs. narrowly oblong entire or serrate, ½-1 in. long; calyx segments strongly unequal; pedicel's longer than calyx; stem pubescent; lvs. sparingly ciliate, short-petioled.—*V. scabiosa*, John Saul.—*V. steroidal*, John Saul.—*V. verbenacea*, a name unknown to Kew authorities in 1901, has been offered by Rochester nurserymen since 1856. Lvs. short-petioled, narrowly elliptic in upper half; racemes lateral.

A. PHILIPS WYMAN.

VERSCHAFÉLLITA (Ambrose Verschaffelt, 1825-1886, distinguished Belgian horticulturist; founded L'Illustration Horticole at Ohey in 1854 and introduced many plants, particularly palms and other foliage plants). *Patulacea*. A genus of only 1 species, from the Seychelles, allied to Dipsis but the former is armed and the latter not. The two genera are alike in habit and a rather robust shrub, but their spathes are 0.5-1.5 in. long, and their calyx the ovary is 1-loculed, while in Dipsis it is 3-loculed. Verschaffelita is a tall palm, spineous throughout or at length spineless, the slender rigid trunks arising from epigean roots; lvs. terminal, recurved; blade oblong or cuneate-obovate, bifid, plicate, nerve-dotted, usually incinate nearly to the rachis; segments incised; midrib and nerves strong, sealy; petiole half-cylindrical; sheath long, sealy, deeply split; spadix 2-6 ft long, paniculately branched, long-pediculed, recurved, sealy, its rachis long, and branches and branchlets spreading, slender; spathes 2 or 3, long, sheathing, the lower persistent, the upper deciduous; fls. very small; fr. globose, smooth, 1 in. long.

*spéndida*, H. Wendel. Caudex 80 ft high, 6-12 in. in diam., very spiny when young, with many aërial roots; lvs. 3-8 ft long; petiole 6-12 in. long, pale green; sheath 2-4½/2 in. long, white-granular; blade cuneate-obovate, sealy, 4-7 ft long, deeply incised on the edges. I. H. 12:140; 43:31. F.R. 2:483. R.H. 1869, p. 148.

*V. melanocharis*, H. Wendel. See Roscheria.

W. M.

VERVEIN. *Verbena.*

VESICARIÁ (Latin, *bladdon*; referring to the shape of the pods). *Cruciifera*. About 29 species of widely scattered herbs with racemes of large, rarely small, yellow or purple flowers of various forms. Sepals equal at the base or laterally subulate; siliquae globose or ovoid, many-seeded, and with a slender style; lvs. entire, wavy or pinnately cut. The genus has small horticultural standing, but some of the hardy perennials are said to be well adapted for rockwork and of easy culture. Some are like wall flowers; others resemble slychnums. Both seeds and plants of *V. sinuata* are offered by American dealers, but the plant is imperfectly known. De Candolle says it is an annual or biennial, while Koch says it is perennial or subshrubby. In America it is considered an early flowering yellow annual, about 1 ft high, blooming in May and June.

*sinuata*, Poir. Lvs. softly tomentose, oblong- lanceolate, narrowed toward the base, sinuate-dentate or subentire. Span.—According to De Candolle the petals finally become wider.

W. M.

VETCH. See *Vicia*.

VIBURNUM (the ancient Latin name). *Caprifoliáceae*. Ornamental, deciduous or evergreen shrubs, rarely small trees with opposite, petioled and entire, dentate or lobed lvs. and white fls. in showy clusters, followed by decorative red or blackish berry-like fruits. The Viburnums rank among our most valuable ornamental shrubs. Besides showy flowers and decorative fruits they possess handsome foliage which mostly assumes a bright, fresh green color. The plants are of good compact habit. Most of the deciduous species are hardy north, but *V. macrocephatum*, *var. sterile* and *V. obovatum* are tender; also *V. tomentosum*, *Wrightii*, *phelobium*, *caprifolium*, *rugulatum*, and *dilatatum* are not quite as hardy farther north than New England. Of the evergreen species *V. japonicum* is the hardest and stands some degrees of frost. The Viburnums are well suited for borders of shrubbery or planting along roads, and the more showy ones are handsome as single specimens on the lawn. They are mostly medium-sized shrubs, 5-10 ft high, but *Viburnum Lentago*, *prunifolium* and *radula* sometimes grow into small trees, 30 ft high, while *V. acerifolium* hardly reaches 5 ft. The most decorative in fruit are *V. Opulus, dilatatum* and *Wrightii*, with scarlet or red berries which remain a long time on the branches. Besides the Snowball forms, *V. dilatatum*, *tomentosum*, *Sieboldii*, *prunifolium*, *radula*, *molle* and *dentatum* are very handsome in bloom. Varieties with all the flowers of the cymes sterile and enlarged are known in the case of Opulus, tomentosum and macrocephalum, the common, the Japanese and the Chinese Snowballs. The foliage of most species turns purple or red in fall, that of *V. Opulus* and *acerifolium* being especially brilliant. *V. dilatatum* and *phelobium* assume a dull yellow color. *V. macrocephalum* and *Sieboldii* keep the bright green of their foliage until late in autumn. The Viburnums are not very particular as to soil and position, but most of them prefer a rather moist and sunny situation. Some, as *V. acerifolium*, *Lantana*, *dilatatum*, *Trene*, *pulchra* and *prunifolium*, grow well in drier places, while *V. dilatatum* and *panduratum* require shade and a porous soil of constant moisture. *V. acerifolium* does well under the shade of trees in rocky and rather dry soil. *V. Fraxius* is often grown in pots and is a good lowly and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not intended for forcing, it requires during the winter a temperature only a little above the freezing point and even an occasional slight frost will not hurt it. The Common and the Japanese Snowball are also sometimes forced and require the same treatment in forcing as other hardy shrubs.

Pluto, by seeds sown in fall or stratified; also by greenwood cuttings under glass, especially *V. tomentosum*, *macrophatum*, *molle*, *cassinoides* and the evergreen species; *V. dentatum* and *Opulus* grew readily from hardwood cuttings and all species can be increased by layers (Fig. 2660); grafting is also sometimes practiced and *V. Opulus*, *dentatum* and *Lantana* are used as stock.

About 100 species in N. and C. America and in the Old World from Europe and N. Africa to E. Asia, distributed as far south as Japan. When small trees, with opposite stipulate or estipitate lvs.; fls. small in terminal panicle or mostly umbel-like

2660. A layer of Viburnum Opulus, the Common Snowball.
VIBURNUM

cymes; calyx with 5 minute teeth; corolla rotate or campanulate, rarely tubular; stamens 5; ovary usually 1-loculed: fr. a drupe with a one-seeded, usually compressed stone. In several species the marginal fls. of the cymes are sterile and radiant; such are V. macrocephalum, tomentosum, Opulus, Sargentii and alnifolium, and of the three first named garden forms are known with all fls. sterile and enlarged.

ALFRED REHDER.

VIBURNUM

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aquifolium, 7
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Aorobuckii, 3
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prunifolium, 9, 10
plicatum, 16
prunifolium, 9, 10

A. Les. peninnerved, not lobed.
B. Cymes paniculate, broadly pyramidal or semi-globose.
c. Foliation deciduous.
cc. Foliation evergreen.
d. Corolla with cylindrical tube.

dd. Corolla rotate-campanulate.

bb. Cymes umbell-like, flat (except in the Snowball forms. See Nos. 12, 16, 28.)
c. Secondary veins curving and anastomosing before reaching the margin: margin entire or finely serrate.

D. Foliation persistent, entire.
E. Branches and lvs. glabrous or slightly pubescent.

EE. Branches and lvs. hispate.

DD. Foliation deciduous.
E. Branches and lvs. glabrous or ferrugineously scurfy.
F. Lvs. entire or slightly undulate-dentate.

G. Cymes sessile: lvs. small.

GG. Cymes pedunculate.

FF. Lvs. finely and sharply serrate: cymes sessile, sub-tended by the upper leaves.

G. Petioles mostly with wavy, rather broad margin.

GG. Petioles without or with narrow, not wavy margin.

H. Winter-buds and petioles rusty-pubescent.

HH. Winter-buds and petioles not rusty-pubescent.

EE. Branches and lvs. stipitate pubescent; winter-buds naked.

CC. Secondary veins prominent, ending in the points of the teeth.

D. Winter-buds naked: lvs. with usually numerous small teeth.

2661. Viburnum Sieboldii (×½)

The familiar Snowball of delightful memory seems to be doomed. It is too much trouble to try to keep off the aphids. Fortunately its place can be taken by a Japanese species that is even more satisfactory. Fig. 2661. The berries of the Japanese species, F. tomentosum, are a brilliant scarlet, changing to black. The foliage of this Snowball is also remarkably beautiful. The leaves are olive-green with brownish purple or bronzy margins, and their plicate character makes them very distinct and attractive. The bush is entirely free from insect pests. The single and double forms of the Japanese species differ in the same way that is shown in Figs. 2664 and 2666. Unfortunately they have been confused in many nurseries, and only the trained eye can tell them apart in the nursery row. The double or Snowball type is, of course, the one destined to the greater popularity, though the single form is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as Viburnum plicatum, but its proper name is V. tomentosum, var. plicatum. While it is hardy in New England, it is not a shrub that can be transplanted as easily as many other species. Hence it should be transplanted every second year in the nursery until it is sold. The double form may be propagated by cuttings of half-ripened wood in close frames, or by layers, which in some soils would better remain two years. French nurserymen propagate it by layering. The layers seem to suffer from winter and, to be on the safe side, it is best to cover them well with moss or leaves when the ground is somewhat frozen, so that the frost may be kept in until spring. The clusters are as about as big as oranges and pure white. They are in great demand for Decoration Day in New York.

The single form, unlike the double, is easily transplanted. It is also readily propagated by layers or cuttings. Both kinds are hardy in the North and make compact bushes 6-8 ft. high.

J. W. Adams and W. M.
1. Sieboldi, Miqu. Fig. 2661. Deciduous shrub, attaining 10 ft., with stout branches, pubescent when young: lvs. oval to obovate-oblong, crenate-serrate except toward the base, acute, dark green and shining above, paler and pubescent beneath, 3-6 in. long: lvs. white, rarely campanulate, in panicles 2-5 in. broad; fr. oval, changing from pink to yellowish white. May, June. Japan. G.F. 2:559.—Hardy shrub of vigorous growth with handsome dark green foliage, large for the genus, exalting a disagreeable odor when bruised. The fruits drop soon after ripening. It is known in some nurseries as V. japonicum, V. latifolium or V. japonicum latifolium. Var. reticulatum, Rehd. (V. reticulatum, Hort.). Smaller in every part.

2. Sandankwa, Hassk. (V. angustissimum, Hort.). Evergreen shrub, attaining 6 ft., with slender warty branches: lvs. oval to obovate-oblong, acute or obtuse, usually remotely crenate-serrate toward the apex, shining dark green above, paler beneath, glabrous, 2-4 in. long: lvs. white, tinged pink, in dense semi-globe panicles becoming 1½ in. high; corolla ½ in. long, with cylindrical tube twice as long as limb; fr. red, subglobose. June, July. Loochoo Is. B.M. 6:217.—Tender.


6. obovatum, Walt. (V. levigatum, Ait.). Shrub, attaining 8 ft., with spreading branches: lvs. almost sessile, obovate to oblongate, obtuse or retuse, coriaceous, glossy, entire or obscurely crenate-serrate except toward the apex, ½-1½ in. long: fls. white, in sessile cymes 1-2 in. broad; fr. oval, black. April—June. Va. to Fla. L.B.C. 15:1496.—Tender.

7. nudum, Linn. (V. nudum, var. Clagvoni, Torr. & Gray). Upright shrub, sometimes attaining 15 ft.: lvs. oval to obovate or obovate lanceolate, acute or obtuse, usually somewhat or somewhat oblanceolate or obliquely crenate, thickish, scurfy on both sides when young, glabrous above at length: fls. white or yellowish white: cymes rather long-peduncled, 3-5 in. broad: fr. globose, pink at first, changing to dark blue. June, July. Long Island to Fla., west to Ky. and La. B.M. 2281.—Not quite hardy. Var. nitidum, Zabel (var. angusti- folium, var. Clagvoni, Torr. & Gray. V. nudum, Ait. V. nudum, Hort.). Lvs. smaller and narrower, more shining above and firmer.

8. cassinoides, Linn. (V. nudum var. cassinoides, Torr. & Gray). Upright shrub, 2-6, occasionally 12 ft. high: lvs. oval or ovate to oblong, acute or bluntly acuminate, usually obscurely dentate, almost glabrous, rather thick, dull green above, 1-3 in. long: fls. and fr. almost like those of the preceding species, but peduncle sometimes slightly longer; fr. reaching a little earlier. June, July. Newfoundland to Manitoba and Minn., south to N. C. G.F. 9:365. Em. 2:411 (as V.
9. Lentago, Linn. SHEEP - BERRY. NANNY - BERRY. Fig. 2662. Shrub or small tree, attaining 30 ft., with slender branches: winter-buds long-pointed: petals mostly with acute, acuminate, glabrous or scurfy on the veins beneath, 2-4 in. long: fls. white; cymes sessile, 2-5 in. broad: fr. oval, bluish black, with bloom. May, June. Hudson Bay to Manitoba, south to Ga. and Minn. S.S. 5:222, 224. - Hardy, large, often arborescent shrub, keeping its fruits until spring. Sometimes as V. prunifolium and pyrifolium in gardens. A garden hybrid, originated in Germany, is V. Telleri, Zabel (V. Lentago X nudum), similar in habit to this species but the cymes on short peduncles over ½ in. long.

10. rufidulun, Raf. (V. prunifolium, var. ferrugineum, Torr. & Gray. V. ferrugineum and rufa-tomentosum, Small). Large shrub or small tree, attaining 25 ft. or more with hairy short-stout branches: winter-buds short-pointed, glabrous or rusty-pubescent: fls. rusty-pubescent on the veins beneath, 2-4 in. long: fls. pubescent white; cymes 3-5 in. broad: fr. dark, dull blue, glaucous, ½ in. long. April-June, later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 5:225 (as V. prunifolium, partly). - Handsome arboraceous shrub with dark green shining foliage, showy fls. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.

11. prunifolium, Linn. (V. pyrifolium, Poir.). BLACK HAW. STAG-BUSH. Shrub or small tree, attaining 15 ft., with spreading, rather stout branches: winter-buds short-pointed, glabrous or reedy, pubescent: fls. broad oval to ovate, acute or obtuse, glabrous or nearly so, 1-3 in. long: petals often with narrow margin, rusty tomentose: fls. elliptic to obovate, usually obtuse, glabrous and shining above, rusty-pubescent on the veins beneath, 2-4 in. long: fls. pubescent white; cymes 3-5 in. broad: fr. dark, dull blue, glaucous, ½ in. long. April-June, later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 5:225 (as V. prunifolium, partly). - Handsome arboraceous shrub with dark green shining foliage, showy fls. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.


13. anisophillum, Marsh. (V. lantanaoides, Michx.). HOBBLE-BUSH. AMERICAN WAYFARING TREE. Low shrub, sometimes 10 ft. high, with wide-spreading, often prolabaceous branches, strigulose-pubescent when young: fls. orbicular or broadly oval, coriace at the base, short-acuminate or acute, irregularly serrate, minutely pubescent or almost glabrous above, stellate-pubescent beneath, 2-3 in. across. fls. white: cymes sessile, 3-5 in. across: fr. ovate-oblong, dark purple. May, June. New Brunswick and Mich. to N. C. - Handsome shrub, with very large foliage, assuming a deep claret-red in fall.

14. Lantana, Linn. WAYFARING TREE. Upright shrubs or sometimes small tree, attaining 20 ft. Large, drooping branches scurfy-pubescent: fls. ovate or obovate-oblong, usually coriace at the base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, dentate, 2-4 in. long; fls. white: cymes dense, 2-3 in. across: fr. ovate-oblong, bright red, changing to almost black. May, June. Eu., W. Asia. A.G. 18:453 and F.E. 9:593 (as V. lantanaoides). - Hardy shrub, especially for drier situations and limestone soil. Var. rugosum, Hort. With larger and very wrinkled fls. and larger cymes. There are a number of other vars., including some with variegated leaves.


17. \textit{Japonicum}, Spreng. (\textit{V. macrophyllum}, Blume). Upright shrub, to 6 ft., with glabrous branches: Ivs. broadly or rhombic-obovate to oblong-ovate, acute or shortly acuminate, remotely dentate except at the base, 3-6 in. long; fls. in short-peduncled, glabrous cymes 2-4 in. broad: fr. globose, red. June. Japan.—Handsome large-leaved shrub, but not hardy north. Evergreen.


19. \textit{Wrightii}, Miq. Upright shrub, to 10 ft. high, with the branches almost glabrous: Ivs. almost orbicular or broadly obovate to ovate, abruptly acuminate, coarsely dentate, almost glabrous except on the veins beneath, 3-5 in. long; fls. rather large, white, in usually short-stalked, 2-4 in. broad cymes; corolla glabrous outside; fr. globose, red. May, June. Japan.—Handy shrub, similar to the preceding, but of less dense habit, with larger fruits in nodding cymes.

20. \textit{philobotrichum}, Sieb. & Zucc. Upright shrub, attaining 5 ft., with glabrous branches: Ivs. ovate to oblong, acuminate, dentate except at the base, glabrous above, with long appressed hairs on the veins beneath; 2-3 in. long; fls. white, with purple calyx, mostly slender-pedicled and nodding, in few-fl., long-peduncled cymes; fr. globose. May, June. Japan.—Not quite hardy north.

21. \textit{dentatum}, Linn. Arrow-wood. Upright bushy shrub, attaining 15 ft., with glabrous branches: Ivs. rather long-petioled, orbicular to ovate, acute or shortly acuminate, coarsely dentate, glabrous or pubescent on the veins, Ivs. and under side of Ivs. stellate-pubescent; Ivs. larger, with stouter petioles, dark green, peduncles stouter; teeth of calyx more prominent; fr. large and more pointed; blooms 2-3 weeks later. Mass. to Fla. and Tex. G.F. 4:30.—Handsomier than the preceding on account of its larger darker green foliage and more robust habit. In gardens sometimes confused with \textit{V. pubescens} and sometimes found under the erroneous name of \textit{V. Hanceanum}. See supplementary list.

22. \textit{molle}, Michx. (\textit{V. sequissimum}, Chapm. \textit{V. Nepalense}, Hort.). Similar to the preceding, but branches, cymes and Ivs. in the leaves beneath, Ivs. stellate-pubescent; Ivs. larger, with stouter petioles, dark green, peduncles stouter; teeth of calyx more prominent; fr. large and more pointed; blooms 2-3 weeks later. Mass. to Fla. and Tex. G.F. 4:30.—Handsome than the preceding on account of its larger darker green foliage and more robust habit. In gardens sometimes confused with \textit{V. pubescens} and sometimes found under the erroneous name of \textit{V. Hanceanum}. See supplementary list.

23. \textit{Demetrionis}, Deane & Rob. Shrub, attaining 12 ft.: Ivs. orbicular or broadly ovate, cordate, shortly acuminate, coarsely dentate, pubescent or almost glabrous, 2½-4½ in. long; cymes long-peduncled, puberulent, about 2½ in. broad; fr. oblong, almost ½ in. long. Mo. B.B. 3:231.

24. \textit{pubescens}, Pursh. Bushy shrub, 3-6 ft. high, with slender, upright branches: Ivs. oval to ovate, rounded or cordate at base, acute or acuminate, coarsely dentate, almost glabrous above, pubescent beneath, 1½-2½ in. long; cymes short-peduncled, dense, 1½-2½ in. broad; stamens exceeding the corolla about one-half; fr. oval, almost black, slightly flattened. June. Quebec to Ga., west to Manitoba and Ill. G.F. 3:125. A.F. 12:1101. Gng. 5:311. —Handsome shrub of compact habit.


26. \textit{acerosum}, Thumb. Upright shrub, attaining 5 ft., with slender, upright branches: Ivs. orbicular or ovate, 3-lobed, with acute or acuminate lobes, coarsely dentate-serrate, pubescent at length almost
2664. Viburnum Opulus (X \(\frac{1}{2}\)).

Single form of the common Snowball as it grows in the wild.

VIBURNUM

27. paneolorum, Raf. Straggling shrub, attaining 5 ft.; lvs. orbicular to oval, coarsely dentate, with 3 short lobes above the middle or often without, glabrous or slightly pubescent beneath when young, 2-3½ in. long; cymes few-fld., small, on lateral, short, usually 3-flvd. branchlets; fr. scarlet, subglobose. June. Labrador to Alaska, south to Vt. and Colo. in the mountains. G.F. 3.5.—It does not usually succeed well in cultivation; requires shade and moist porous soil.

28. Opulus, Linn. (V. Americanaum, Mill. V. trifolium, Marsh. V. opuloides, Mühl. V. éclater, Pursh. V. Oxyceens, Pursh.) CRANBERRY-BUSH. HIGH CRANBERRY. Figs. 2664, 2665. Shrub, containing 12 ft., with rather smooth light gray branches and stems: lvs. broadly ovate, 3-lobed, with coarsely dentate-serrate, acuminate lobes, pubescent or almost glabrous beneath, 2-4 in. long; fls. white, in peduncled cymes, 3-4 in. broad; fr. subglobose to oval, scarlet. May, June. New Brunswick to Brit. Col. south to N. J. and Ore.; also in Eu. and AsI. Handsome native shrub, very decorative in fruit, which begins to color by the end of July, remains on the branches and keeps its bright scarlet color until the following spring. The berries are not eaten by birds.

V. nánum, Jacq. A very dwarf, compact, small-leaved form; flowers but very rarely. Var. stérile, DC. (V. viscum, and roséum, Hort.) GUELDER ROSE, SNOW-BALL. Fig. 2666. All fls. sterile, forming large, globose heads. Gnp. 1:9. Gn. 56. p. 83.—This is a very showy var., but it lacks the decorative fruits. There are also variegated forms of the type and of the sterile variety. The American Cranberry-bush is considered by some botanists a distinct species under the name V. Americanaum, Mill., but differs little from the European form, chiefly by the more vigorous growth, by the petioles having a shallow rather broad channel and small glands, and by the shorter peduncles and shorter stamens.

29. Sargentii, Kochne. Similar to the preceding, of more upright, denser habit; bark of stems darker, fissured and somewhat corky, young branchlets with prominent lenticels; lvs. of thicker texture, pubescent or glabrous beneath, the upper lvs. with much elongated and usually entire middle lobe and small, short, spreading lateral lobes; petals with large glands; sterile fls. larger, sometimes to 1¼ in. across; anthers purple; fr. globose, in usually upright cymes. N. China, Japan.—Introduced under the name Viburnum Opulus from Pekin. It does not seem to fruit as profusely as V. Opulus.


ALFRED REIDEN.

2666. Snowball—Viburnum Opulus, var. stérile (X \(\frac{1}{2}\)).

All the fertile flowers are changed to sterile, showy ones.

VICA (classical Latin name). VETCH. TARE. More than 100 species of herbs, mostly climbing, with pinnate foliage, closely allied to Lathyrus, Pisum and Lens, but differing in minute floral characters: wings adhering to the keel; style very slender, with beards or hairs all around the upper part only, achenes many-seeded, 2-valved and dehiscent, the seeds either globular or flatish; stamens diadelphous (9 and 1). Flowers mostly blue or violet, sometimes yellowish or white. The Vicas are widely spread in the northern hemisphere and some of them in South America. About two dozen species occur in North America, some of the species introduced. Most of the Vicas are weedy or insignificant looking plants, but a few are grown for the bright flowers, others of late and autumn, short, spread (see Cover-Crops), and one (V. Faba) is a garden bean. The species are mostly cool-season plants of easy culture. The interest in the Vetches in this country is mostly for their value as soil covers and for foliage.

V. sativa and V. villosa are the important species here at present.
VICTORIA (in honor of Queen Victoria). *Nymphaea regia* ROYAL WATER-LILY. This remarkable aquatic genus may be recognized by its large, round, floating leaves often 6 feet or more in diameter, with the margin turned up at right angles to the water surface to a height of 3-5 inches, making a bashful-like object. The lvs. (12-18 in. across) are nocturnal, opening on two successive days about 4:30 P. M. and remaining open until the middle of the following morning. The first evening the inner floral lvs. remain loosely closed over the stigma; the flower is purest creamy white, and exudes a delicious fragrance somewhat resembling a rich apple; the second evening the floral lvs. spread widely open, and the color changes to pink or even a deep red. The ovary is inferior, densely prickly, and surmounted by a short, broad tube, on the sides and summit of which the floral lvs. are situated. Sepals 4; petals 50-70, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150-200, linear-lanceolate; parcarpels about 25; forming a ring of thick, fleshy bodies between the stamens and normally ending in a very minute point; fls. violet-blue, in long 1-sided axillary racemes. Eu., Asia.—Now considerably used as a cover-crop.

*Vicia,* Linn. A. Plant stiff and erect, usually bearing no tendrils, cultivated for the beans (*Fabæ*). B. *Fabæ*, Linn. (Påca vulgaris, Moench. *F. sativa*, Bernh.). Brown Bean. *Windsor Bean*, English Dwarf Bean. Figs. 130, 191, Vol. I. Strong, erect annual, 2-4 ft., glabrous or nearly so, very leafy; leaflets 2-6, the lower ones not opposite on the rachis, the terminal one wanting or represented by a rudimentary tendril, oval to elliptic and obtuse or mucronate-pointed; fls. in the axis, dull white and with a large blue-black spot; pods large and thick, from 2 or 3 inches even to 6 in. long, the seeds large and often flat. Probably native to northern Africa and S.W. Asia.—Much grown in the Old World, but the hot dry summers prevent its cultivation in most parts of the U. S. It is grown successfully in parts of Canada, particularly in the maritime provinces. The plant is grown mostly for cattle feeding, although the beans may be used, both full grown and immature, for human food. This bean has been cult. from prehistoric times and its nativity is in doubt. The plant is hardy and seeds should be sown early, when the season is cool.

**A.** Plant weak, usually climbing by means of tendrils that represent leaflets.

**B.** Fls. about 2 in the axis, sessile or nearly so.

**sativa**, Linn. Spring Vetch or Tare. Annual or biennial, not surviving the winter in the North, more or less pubescent, 2-3 ft. high: lfts. 7 pairs or less, elliptic, oblong or oblanceolate, mostly truncate and apiculate at the tip, the tendril part of the leaf extended: fls. usually 2 in each axil, about 1 in. long, purplish: pods 2-3 in. long when mature. Eu., and naturalized in some parts of the U. S.—Much cult. abroad as a forage plant; in this country grown for similar purposes and also somewhat as a cover-crop for orchards. Seeds sometimes used for making flour. There is a white-seeded and also a large-seeded variety.

**VICTORIA** (in honor of Queen Victoria). *Nymphaea regia* ROYAL WATER-LILY. This remarkable aquatic genus may be recognized by its large, round, floating leaves often 6 feet or more in diameter, with the margin turned up at right angles to the water surface to a height of 3-5 inches, making a bashful-like object. The lvs. (12-18 in. across) are nocturnal, opening on two successive days about 4:30 P. M. and remaining open until the middle of the following morning. The first evening the inner floral lvs. remain loosely closed over the stigma; the flower is purest creamy white, and exudes a delicious fragrance somewhat resembling a rich apple; the second evening the floral lvs. spread widely open, and the color changes to pink or even a deep red. The ovary is inferior, densely prickly, and surmounted by a short, broad tube, on the sides and summit of which the floral lvs. are situated. Sepals 4; petals 50-70, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150-200, linear-lanceolate; parcarpels about 25; forming a ring of thick, fleshy bodies between the stamens and
the styles; carpels 30-40; stigma forming a broad, basin-like depression, 2-2½ in. wide, in the midst of the flower, with a central conical continuation of the floral axis, the basin filled with fluid on the first evening of opening: carpellar styles broad and fleshy in the lower part, produced upward to a fleshy, subulate, incurved process about ½ in. long. In fruit all of the floral lvs. have decayed away, leaving the basal tube of the torus at the top of a great prickly berry, half the size of one's head. The seeds are greenish or brownish black, about the size of a pea. The genus is represented by 2 well-defined species, inhabiting still waters of South America from British Guiana to Argentina.

In its native haunts Victoria grows in 4-5 ft. of water, spite of the cup-like form of the leaves, water from rain or other sources does not remain on the surface; it doubtless runs down at once through the tiny perforations. This would be an indispensable protection to the leaf against fungous foes and in the function of assimilation.

A single leaf, by its buoyancy, may sustain a weight of 150 or 200 pounds. Not the least remarkable feature of these leaves is their rate of growth. Caspary found the maximum growth in length to be about 1 inch per hour when the leaf is just expanding; the surface increases 4 or 5 sq. ft. in 24 hours, and a plant will produce in 21 to 25 weeks 600 or 700 sq. ft. of leaf-surface. A great development of heat has been observed in the opening flowers of Victoria. About 8 p.m., when the authors are shedding their pollen (in second-day flowers), the stamens may reach and maintain a temperature 10° F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionaries, and certainly of use to savages as food in quite early times, Victoria was first noticed botanically by Haenke in Bolivia about 1801; but he died in the Philippines without recording his discovery. Bonpland, the companion of Humboldt, also saw it, near Corrientes, Argentina, in 1819, but still it was neglected. In 1832 Poeppig found it on the Amazon, and described it as *Euryale Amazonica*. D'Orbigny saw the plant in 1827 at Corrientes, and in 1833 in Bolivia, and several years later published accounts of his find. Robert H. Schomburgk, finding it again in 1836 on the Berbice river in British Guiana, sent home specimens and figures from which Lindley in 1837 (published in 1838) established the genus *Victoria* and described the species *V. regia*. This name has settled upon the northern species, while the one found at Corrientes was named in 1840, by d'Orbigny, *V. Guianensis* in honor of General Santa Cruz, of Bolivia.

The struggle to bring the "Queen of Water-lilies" into captivity began with Schomburgk. He removed living plants from inland lakes and bayous to Demerara,
British Guiana, but they died. In 1849 bridges obtained seed in the Bolivia locality, province of Mozos, and sent them in a jar of wet clay to England. Out of 22 seeds obtained at Kew, three germinated and grew vigorously as small seedlings until October; but in December, in 1848 dry seeds were sent to England from the Essequibo river, along with rhizomes, the latter in Wardian cases; the rhizomes rooted, and the seeds refused to germinate. In 1849 an expedition from Liverpool returned with as many as thirty-five living plants, but these all died. Finally some seeds were sent to Kew from British Guiana in bottles of fresh water by two English physicians, Rodie and Meehan, August 21, 1851.

The next notable importation of seed from South America was sent by Edward S. Rand, Jr., from Para, Brazil, to Mr. Sturtevant, then at Bordentown, N. J. The resulting plants proved to be slightly different from the Pacific Coast specimens, and were called V. regia, var. N. They are doubtless the same form that was described by Planchon as V. Amazonica, and retained with grave doubts by Caspary; subsequent cultivation has shown it must be regarded as V. diastis. In 1852 seed was sent to Kew from Guiana. In 1854, however, Mr. Tricker received seed of quite another species, which was provisionally named V. regia, var. Trickeri; it is much more amenable to out-of-door culture than the older type, and has received a well-deserved popularity. Specimens grown from seeds sent by Mr. Tricker to Kew were regarded simply as garden forms of V. regia, but recent investigation by Mr. Tricker and the writer shows that it is truly the V. Cruziiana of de Candolle, and specimens of which (including the above) had been sent to Paris over 60 years before. Its far southern habitat (27° S.) explains its hardness. The large starchy seeds of this species are used as food in Peru under the name of "Maíz del Agua," "water-corn." For much interesting information on Victoria, see Hooker, B.M. 4275-78; Planchon, in F.S. 6: 193-224, etc.; Caspary in Flora Brasiliensis 4, part 2, p. 143 et seq. In 1854 John Fisk Allen published in Boston a quarto work (pp. 24-27) on Victoria with colored plates, entitled "Victoria regia; or the great water lily of America."

With a brief account of its discovery and introduction into cultivation: with illustrations by William Sharp, from specimens grown at Salem, Massachusetts, U. S. A.*

regia, Lindl. (Including V. regia, var. Randi). Fig. 266a. Lvs. sparingly pubescent beneath, upturned margins reddish, 3-8 in. high; ts, becoming dull crimson the second evening; sepals prickle almost or quite to the tips; prickles of the arvy about two-fifths in. (10-11 mm.) long; seed elliptic-globose, nearly 1/2 in. long, long in diam. (7-8 mm. long, 5/6 mm. diam.); rapha indistinct; operculum elliptic-oblonge, with the microple at its center and hilum at the margin. British Guiana, Amazon and tributaries. B.M. 4275 (poor); 4276-78 (incorrect in some details). F.S. 6:595-602. Kerner, Natural History of Plants, pl. XI. Tricker, Water Garden. L. K. Naegke, p. 21, 55. Caspary, Fl. Brasil. 4, part 2, pl. 38, fig. 15 (seed).

Cruziiana, d Orbigny (known in cultivation as V. regia, var. Trickeri, and V. Trickeri). Lvs. densely villous beneath, upturned margined green, 6-8 in. high; first, showing deep pink the second evening; sepals prickle quite to the tips; prickles of the arvy about two-fifths in. (15-16 mm.) long, crowded; seed subglobose, about 6/8 in. (5/4 mm.) in diam.; rapha stout; operculum elongate-ovate, with hilum and microple equidistant from the hilum. British Guiana and tributaries. Tricker, Water Garden, pl. 1; pp. 51, 55. Caspary, Fl. Brasil. 4, part 2, pl. 38, fig. 16 (seed).—Intro. by Wm. Tricker in 1849.

HENRY S. CONARD.

Victoria regia at first was cultivated at a great expense in conservatories and tanks built especially for the purpose. Then it was grown in artificially heated ponds in the open air. The Victoria is largely grown in private and public gardens throughout the United States at the present time, together with tropical nymph-ponds and indoor ponds with water heated, but this method of culture is uncertain and often unsatisfactory.

For many years but one type of Victoria was known, but in 1880 Mr. E. D. Sturtevant, of Bordentown, N. J., introduced another form that produced a deep crimson seed: these were named back to their source of origin and turned up as Victoria Randii. Having grown this variety and the original for several seasons in the open air, the writer is unable to differentiate any of the two species. They are known to vary and may be grown to drop V. Randii. In 1894 the undersigned received seed of what is now known to the trade as V. Trickerii. This is by far the best kind for out-of-door culture. Moreover, it can be grown where V. regia fails to grow, as it revels in a temperature of only 75°-80°. Victoria regia is now considered of easy culture. Its requirements are heat, light and a rich, mellow loam in abundance. The seed should be sown during February and March. The temperature of the water should range between 85° to 90° F. The seed may be sown in pots or seed-panes and placed in shallow water. A tank 8-12 in. deep, having a metal lining, copper preferred, is very serviceable for seedlings and young plants. Where sufficient heat is not available, the addition can be made by the use of an oil-lamp. It is altogether unnecessary and unnatural to file or chip the seed to assist or hasten germination. The seedlings will grow through the winter, though they may appear in ten days. These should be potted off singly into 2½ in. pots, using fine, loamy soil. The water temperature for the young plants should be the same as directed for the seed pots. As soon as the young plants acquire their first floating leaf they will doubtless be benefited by repotting. From the very beginning, as sprouted seeds, they should be kept steadily growing, repotting at intervals, until they are planted out in their summer quarters. For convenience they will require more space, so that the leaves are not crowded and overlap each other.

To raise plants of V. Trickerii is altogether a different matter. The seed will not germinate in a high temperature; 65° to 70° is sufficient. The seed may be sown in February, but there is a great uncertainty as to how long one must wait for the seedlings to appear, and also as to what percentage of seeds will germinate. As soon as the seedlings appear, they should be planted in the pond in the same way as seedlings of V. regia, except as to temperature, which should be kept as above stated for seedlings and small plants, and as the season advances may be raised to 75° and 80°. After the rationality of the pond or tank is established is borne out by the fact that early in June quantities of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender nymphs, that is, when the pond is not artificially heated. Where it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, earliness or lateness of the season, locality, etc., must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pits carefully constructed to start the Victorias, these pits to be heated by hot water or steam and covered with frames and ashes. By this method plants may be set in their summer quarters early in May and heat applied until the middle of August, or rather earlier if an average of 85° maintained until the advent of summer weather.

Very gratifying results are obtained when the Victoria is grown under glass, as it is thus grown in several places in the London Regent's Park, Pittsburg, and Allegheny Park; also at "Graystone," the estate of Samuel Untermyer, Esq., Yonkers, N. Y.; and at many notable gardens in Europe. Plants grown under glass enjoy a longer season, as they are protected against climatic changes and the elements; besides enjoying more of a tropical atmosphere. There is, however, more than one disadvantage.
Setting aside the costly construction, labor, etc., it is by no means inviting even on a warm day to spend many minutes in such a structure. Compare this with a natural pond and its surroundings and a cool shady walk with the sweet sounds of plants at help of each other.

Whether grown indoors or out, these plants are only annuals, and seedlings are of necessity raised every spring. They form no tubers as do the tender yam, or as do the cultivated potatoes.

Few if any, insects are troublesome on these plants. The worst is the black fly or aphides. The use of insecticides should not be resorted to, as they are most likely to damage the foliage. For the introduction of a poly or two of the well-known "lady bag." They and their larvae will soon clear off all the aphides without any injury to the plant.

W. M. TRICKER.

VIGNA (Dominic Vigni, Paduan commentator on Theophrastus in the sixteenth century) is a leguminous genus of 30 or more species, closely allied to Phaseolus. It is distinguished under Cowpea in Vol. I. The Cowpea is known both as V. Caijung, Walpers, and V. Sinensis, Endlicher. The former name, however, dates from 1838 and the latter from 1848, and the former should be used. The Cowpea is an annual bean-like rambling vine with three rhomboid-ovate stalked leaflets, the lateral ones equal-sided, the petioles long. The flowers are borne like white or pale, borne two or three together on the summit of a long axillary peduncle. The pods are slender, usually curved, a few inches to a foot or more long. Seeds small, kidney-shaped, bean-like, white or black, usually with a different color about the eye. The Cowpea varies much in stature, and particularly in the color of the bean. It is possible that more than one species is concerned in these horticultural forms.

The nomenclature of the cultivated varieties of Cowpeas is almost hopelessly confused. Formerly the name Cowpea was restricted to thebuff-colored or clay pea, but now it is commonly used generically. The word Cowpea is an Americanism. Common generic terms now in use in the South are "black-eye pea" and "cornfield pea."

While the Cowpea is now used mostly for animal food and green-manuring, the pea itself is also a good human food and has been so used for many years. For table use the peas are usually gathered when the pods begin to change color, although the dried peas are also extensively used. As long ago as 1855 an excellent essay on Cowpeas by Edwin Ruffin (Essays on Agriculture, Richmond, 1855),

L. H. B.

VIGUÉIRA (Dr. A. Viguer, botanist of Montpellier, France). Compostia. About 60 species of herbaceous or subshrubby annuals, found in the warmest parts of the world, especially America. The following is a native of Lower Calif., and is offered in S. Calif. It is a tall, bushy plant with silvery foliage and small yellow flowers, like single sunflowers, but borne in ample corymbs. The plant blooms both winter and summer. For generic characters see Gray's Synoptical Flora or Bot. Calif.

tomentosa, Gray. Shrub or branching subshrub: lvs. opposite, subdigitate, serrate, tomentose on both sides, 3-5 in. long: heads corymbose: akmes villous, with 2 long awns and many small scales.

V. M.

VILLAGE IMPROVEMENT AND CIVIC IMPROVEMENT. An improvement association is an organization of persons who band themselves together in order to promote the civic beauty and hygiene of the town wherein they live. Such associations have no legislative power outside their own bodies, yet they may rightfully use their influence to promote laws affecting the general welfare. The secret of their success in the long run is in educating public opinion to demand good officials, and then in cooperating with the officials, not antagonizing them. A few notable associations are composed entirely of women. Those of Homesdale, Pa., and Stockbridge, Mass., having examples of the best type of mixed associations. The Merchants Association of San Francisco, with a membership of more than a thousand, is an excellent example of an effective society composed wholly of men. Experience has taught the older organizations that a juvenile auxiliary is a valuable adjunct. These juvenile branches are worked through the public schools, and their promotion is the most practical way known of teaching civics.

These associations are organized by one or more interested persons calling a meeting and electing officers. The officers are president, vice-president, recording and corresponding secretaries, a treasurer, and an executive committee, all elected annually. The duty of the last is to plan the work, make the contracts and expend the funds. The funds are raised by annual dues of the membership, by contributions and by entertainments.

The usual and most successful mode of work done by these associations is to form as many committees as are desired, and place every member of the association on one of these committees. Each committee has a chairman, who calls its meetings independent of any meetings of the central body. This placing of each member upon a committee assures the working interest of the entire membership.

In large cities it has been found best to have section or ward organizations, which work for the especial needs of their ward or section while delegates from these sections are elected to the central body, which works for the general good of the whole city. Denver, Col., Oakland and San Francisco, Cal., and the famous Woman's Civic Club of St. Paul, Minn., work upon these lines. The standing committees are never quite alike in any two associations. They necessarily vary with the needs of the community.

While the avowed object of these associations is the improvement and ornamentation of public streets and highways, the cleaning and beautifying of premises, school yards, library grounds, railroad stations, and other public buildings, the formation of parks and the preservation of natural beauties, yet in an association of progressive, broad-minded people, much kindred work naturally creeps in. For example, the Montclair, N. J., association has ten standing committees and confers with the ward committees and special committees as need arises. The names of these committees are as follows: street, sanitary, finance, humane, railroad, children's auxiliary, park, preservation of natural beauties, prevention of cruelty to children, prevention of cruelty to animals.

The work of committees may be well set forth by specific examples from the Montclair society. Under the supervision of the street committee, galvanized iron barrels were placed at intervals along the main
thoroughfares for the reception of rubbish, such as paper, and fruit rinds. Shopkeepers are asked to keep their premises in good order. If they do not comply with the request, the Town Improvement Association sends a man with a wheelbarrow (the latter labeled T. I. A. and fitted with a general housecleaning takes place. After two or three visits of the T. I. A. man, the proprietor generally takes the hint and attends to his premises himself. The sanitary committee reports to the health board any nuisance. The milk supply has been carefully looked after, the dairies inspected, and a map showing the locations of all the dairies placed on file in the office of the town clerk, where it may be seen by any householder who cares to examine it. The finance committee looks after the funds. Annual dues are fifty cents a member. The work of the humane committee is to inspect the police station, see that it is kept in sanitary condition, and the prisoners properly treated. The railroad committee keeps a watchful eye upon the stations and sees that they are as neat as possible and the surroundings made attractive. The children’s auxiliary is formed of eleven hundred school children, who have pledged themselves to “work together to make Montclair a happier place in which to live, by doing everything we can to make the town more healthful and beautiful.” The different classes from the school take charge of the flower-beds around the buildings, attend to the planting and keep them in order. All this fosters early the love of attractive surroundings, engenders habits of neatness, and develops local pride and patriotism.

The committee for the preservation of natural beauties has much to keep it busy. Its members watch the fine trees of the town, and if any are splitting, the owners are notified to mend them. Dead trees are cut down, and the owners of unsightly fences are requested to remove them. The burning of hedge-rows is forbidden, as it destroys the wild flowers and leads to forest fires. The duties of the committees for prevention of cruelty to children and animals are self-explanatory. They are auxiliary to the state association, and have full power to act. The park committee takes charge of any waste pieces of ground, generally at the intersection of roads, keeps them in order, and plants shrubbery or makes flower-beds, as the case may be.

Montclair boasts of the most humanely equipped jail in the state, with a separate apartment for women, and a sanitary and padded cell for the insane. The committee for the prevention of cruelty to animals has placed the sign posts, “Please uncheck your horses going up this hill,” at the top and bottom of the mountain road. The paving of the plaza in front of the railway station is due to the efforts of the railway committee, which visited the officials at least once a month for three years before the work was undertaken.

Newton Center and Stockbridge, Mass., contend for the honor of forming the first improvement association. Newton Center’s association claims to be older by a year than the Laurel Hill Association of Stockbridge. The latter organization was founded in 1833 through the efforts of the Grof Miss Mrs. J. Z. Goodrich, and was caused by overhearing the caustic comments of a summer visitor upon the untidy, unhygienic condition of the village and its undesirability from these causes as a summer residence. Miss Hopkins reported the visitor’s remarks to her town people, and after a year’s agitation the Laurel Hill Association of Stockbridge was formed. The first year $1,000 was raised, 400 shade trees planted, the village green put in order and fenced, and a strip of sidewalk. The offer of these prizes, together with a reward for the detection and punishment of any one caught destroying any of these improvements, had such a marvellous effect that the appearance of the village that interest in the association has never failed. The beauty of the village had much to do with the selection of the famous Lenox neighborhood, part of which pays taxes in Stockbridge. So pleased were the townspeople and summer visitors with the work of the association that it became necessary to obtain a state charter before the association could legally inherit the funds, parks and other gifts to the value of more than one hundred thousand dollars left in its charge.

Bar Harbor, Maine, regards its improvement association in the light of a commercial investment. The summer visitors demand that the village be kept clean and pretty, and they give liberally to the association. This association makes paths over the island and keeps them in repair. It also keeps patrols on these paths in summer to put out camp-fires, well knowing that if the forests are destroyed the charm of the island would be greatly lessened.

The value of an improvement society’s work as a commercial investment is clearly perceived by Europeans. The Schwarzwald Improvement Society of Germany numbers 3,500 members, who are assessed an annual dues of 2.25. This fund is used for the purpose of “making the Black Forest known and accessible to the public, of preserving and protecting ruins, of improving pleasure-grounds, erecting pavilions, towers, etc., and generally promoting the interests of the thirty-nine sections in the immense association, each section working for its own interest after the manner of the American ward associations. Both the German and English associations work to attract capital to their towns. River-sides are made into a continuous parkway through the town, parks are opened to points where beautiful views may be had, and cards in the hotels and public buildings draw visitors’ attention to these matters, and to the fact that comfortable seats will be found in these places. German children are urged to be polite to strangers, and in London the public schools have organized a League of Courtesy. English laws do not permit the pollution of streams by sewage or factory waste, and in European cities roads and clean streets have for so long been a national and municipal concern that they are looked upon as a matter of course. In general, European associations are not obliged to consider these problems, but are free to turn their efforts to the promotion of civic beauty in all its various forms.

It is the leading men and women of each country who are promoting these associations. The society called Sespa, the mission of which is the checking of public advertising. It has more than one thousand members enrolled, some of them members of Parliament. The work of this notable society has attracted the favorable attention of almost every government in Europe.

In America, the “National League of Improvement Associations” was organized at Springfield, Ohio, Oct. 10, 1900. It is now known as the “American League for
Civic Improvement." The object of the organization, as stated in the constitution, "shall be to bring into communication for acquaintance and mutual helpfulness all organizations interested in the promotion of outdoor art, public beauty, town, village and neighborhood improvement." The headquarters of the national organization are at Springfield, Ohio.

The commercial possibilities of the work are beginning to appeal to the American business man. Large owners of real estate and tenant houses are adopting as business methods some of the special features of Improvement associations. Commercial clubs and boards of trade are awakening to the fact that a cleanly and beautiful city containing fine boulevards, river drives and parks, public baths and swimming pools is an inducement to new industries and to new industries to locate as is a cash bonus or good shipping facilities. Firms and good citizens seeking new locations and finding these advantages are assured without further search that the schools will be good, the residence district fine, and that a minimum of undesirable residents will be found. Nurserymen, florists and dealers in paint are the first to reap material benefit from the formation of these associations. Usually the first step in improving property is the planting of trees and flowers, then the house receives a coat of paint. It is an excellent idea for an improvement association to encourage floral shows, with prizes to schools and societies for through the latter medium the infection of beautifying is carried into homes that can be reached no other way.

These associations in no wise interfere with the work of the city officers. Rather, they supplement it by doing the things which for which the local laws make no provision. The officers of towns having one or more of these associations find the enforcement of laws made easier, and should a large sum be needed for necessary improvements, it is likely to find an intelligent public knowledge upon the subject in place of the oftentimes exasperating stupidity.

The results obtained from an active and prosperous association are numerous. These associations make for better citizenship: they create an intelligent civic pride. They make possible practical civics in the public schools. The commercial benefits of such work appeal to the liberal and progressive element among all business men.

JESSIE M. GOOD.

The limitations of space do not allow an historical sketch of the various movements culminating in the organization of the American League for Civic Improvement, nor a list of the various periodicals which are devoted partly or wholly to the work. A great work for which the American League for Civic Improvement is as well as by the special societies devoted to the work. An analysis of these complex social forces is beyond the scope of this Cyclopaedia, but the following outline of the work done by MissFldorf Robinson, author of "The Improvement of Towns and Cities," will be found very suggestive. The work outside the special societies may be roughly summarized as that done, I. By committees (1) Of women's clubs (a) Local, (b) Federated; (2) Of boards of trade, etc.; (3) Of real estate exchanges. II. By political organizations, in securing better officials. III. By the organizations of these officials, (1) The American Society of Municipal Improvements, (2) The League of American Municipalities. IV. By corporations, (1) Model communities, (2) Improvement of home grounds, neighborhoods. V. By individuals (1) For private profit, (2) Out of public spirit.

L. H. B.

VILLARSAIA nymphaeoides is the plant described at p. 925 of this work as Limnanthemum nymphaeoides. The plant is probably to be referred to Limnanthemum petrosius, however. To the list of pictures add Gn. 48:1036 and 48, p. 300.

VINMARIJA (Latin, vineum, a slender twig or with, alluding to the branches). Leguminosae. A single species, an Australian shrub with rush-like stems and long, wiry "leafless" branches, i.e., the leaves for the most part reduced to long, filiform petioles, although at the ends of the more vigorous or lower branches a few oval or lanceolate lvs. are often found. The rather small flowers are pea-shaped, orange-yellow and are produced in long, terminal racemes. Calyx-teeth short; petals yellow, long claws; standard roundish; wings oblong, shorter than the standard; keel slightly curved, as long as the wings; stamens free; ovary nearly sessile; style filiform; pod ovoid-oblong, usually indehiscent: seeds 1-2.

denudata. Smith. The name Leafless Rush-broom has been proposed for this. Leafless yellow-flld shrub, attaining 10-20 ft., formerly cult. in European greenhouses as a small tender shrub: lvs. 3-8 in. long, p. 2-3 lines long. Australia. B.M. 1196. P.M. 11432. Offered in S. Calif.

F. W. BARCLAY.

VINCA (perivinea, old Latin name of Periwinkle, used by Pliny). Apocynaceae. A genus of 10 species including the common Periwinkle or Trailing Myrtle, Vinca minor. This is one of the commonest and best plants for covering the ground in deep shade, especially under trees and in cemeteries. It is a hardy trailing plant with shining evergreen foliage and blue, salver-shaped, 3-lobed lvs. about an inch across, appearing in spring or early summer. It forms a dense carpet to the exclusion of other herbs. It thrives best in moist, half-shaded positions, but will do well in sun or shade even in poor soil, especially if it is stony. It is a useful plant for clothing steep banks, covering rocks and carpeting groves. It can be planted successfully on a large scale any time from spring to fall during mild weather. It thrives when propagated by cuttings, as seeds very rarely mature. The Periwinkle will live in city yards under trees where grass will not thrive. V. minor is the commonest and perhaps most variable species. Varieties with white, purple and double lvs. are kept in most nurseries, as also a form with variegated foliage.

V. rosea is a tender plant of erect habit which is used chiefly for summer bedding. It grows about a foot high and has rosy purple or white lvs. with or without a reddish eye, and often 2 in. across. The plants bloom continuously from the time they are set out until frost. It can be grown in large masses for public parks with little that less expensive than geraniums. Strong buck, head gardener of Lincoln Park, Chicago, has recorded his experience with V. rosea in Florists' Review 1:141 as follows: The seed is sown in Jan. or Feb. in flats of sand and compost. The seedlings show the second leaf, they are pricked out about an inch apart in trays of the same soil, and when the little plants have 5 or 6 lvs. they are potted into 2-in. rose pots, and later shifted to 3-in. pots. The majority are bedded out from the 3-in. pots. The soil of the bed should be a sandy loam if possible, and the plants will not do well in a very heavy soil. In bedding, set the plants about a foot apart. They require more water than a geranium, and when the bed is watered it should be given a good soaking and then left alone for a few days. The plants require no trimming.

The amateur will find V. rosea a satisfactory window plant that will thrive grown with the help of the propagating box. The seeds started as late as April, but of course such plants will not bloom as early as the bedding stock propagated in Jan. or Feb. V. rosea is the largest flowering Vinca, and it seeds freely.

W. M.

Vinca major and varieties are the most useful of the genus to the commercial florist. Some plants in 2- or 3-inch pots should be plants in May. They will make large plants by September. For decorating purposes, some of these plants can be lifted and put in 5-inch pots and will winter in a very cool house. To be used useful sized plants in 3-inch pots in spring for veranda, box and vases, cuttings should be put into sand end of September. The long trailing growths will give an abundance of material. Always make the cutting with two eyes, choosing neither the hard growth at base nor the very soft tips. They root
slowly but surely in about a month, and until February will do very well in a 2½-inch pot. About the middle of February shake off the soil and give them a 3-inch pot, and they will make a fine growth by middle of May. In growing these trailing Vincas in pots the principal point to observe is never to let them want for water.

**William Scott.**

Vinca is a genus of herbs or subshrubs, erect or procumbent: Lvs. opposite; fls. rather large, axillary, solitary; corolla salver-shaped, with a narrow throat which is pilose inside or thickened-calloused; stamens included above the middle of the tube; carpels 2, distinct; stigma annular, thick, viscid; ovules 6-many in each carpel, in 2 series; follicles 2, erect or divergent. The genus may be divided into 2 sections: 1. *Perivinca*, in which the anther-cells are short and divided by a wide connective; 2. *Lochnera*, in which the anther-cells are normal. *V. rosea* belongs to Section 2; the others mentioned below are included in Section 1.

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**A.** **Trailing herbs,** hardy or nearly so, only the short flowering stems ascending; fls. produced in spring or early summer, mostly blue or white. European species.

**b.** **Foliage evergreen.**

c. *V*. _ovata_ or oblong-ovate; corolla-lobes wedge-shaped; calyx glabrous.

**I. minor**, Linn. **COMMON PERIWINKLE.** **BLUE, RUNNING OR TRAILING MYRTLE.** Fig. 2671. Hardy evergreen trailing herb, in all country gardens and running wild in cemeteries and shady places, the blue-fl., or typical form being commonest. Often called "Myrtle" but the classic myrtle is *Myrtus communis*. Very rarely produces seed, but spreads freely by creeping sterile stems which root at every joint. Lvs. ovate or oblong-ovate, glabrous and shining, barely 1½ in. long; petiole very short, with 2 glands near the apex; calyx-lobes lanceolate, glabrous; corolla-lobes wedge-shaped, obtusely truncate. Eu.

The following horticultural varieties are advertised in America: Var. _alba_, with single white fls.; _alba plena_, with double white fls.; _alba variegata_, with single white fls. and variegated foliage; _argentea variegata_, with silvery variegation; _atropurpurea compacta_, with single dark purple fls.; _aurea variegata_, with golden variegation; _caerulea_, with single blue fls.; _plena_, with double blue fls.; _rosea_, with single rosy fls.; _purpurea plena_, with purple double fls., _Gn._ 50:1873. Some of these are advertised without reference to _V. minor_, as if they were good species, thus _V. argentea_ and _purpurea_. _V._ elegantissima _alba_ belongs here, also "The Bride," a white variety with a pink center.

**2. major**, Linn. **LARGER PERIWINKLE.** Larger in all its parts than _V. minor_, not quite hardy north, and rooting only at the tips of the sterile stems. Lvs. broader below the middle than in _V. minor_, subcordate-ovate, often 2½ in. long, ciliate; petiole with 2 glands near the apex; fls. blue; calyx-lobes narrowly linear, ciliate; corolla-lobes obvolute. Eu.—This species is much subject to mealy bug. The variegated forms are popular for veranda boxes and hanging baskets. Some are blotched with yellow, others are margined. Here seem to belong _I._ _aurea marginata_ and _I._ _aurea maculata_, Hort. _V._ _major_, vars. _variegata_ and _reticulata_, are also advertised. _V._ elegantissima, Hort., is a handsome form with lvs. bordered and blotched with yellowish white. It seems to be common with the florists, although it is rarely, if ever, advertised in American trade catalogues. It is one of the best forms for vases for baskets and for decoration indoors. The sprays should be allowed to grow long, in order to develop their characteristics. Cuttings should be struck early in the fall and if kept growing steadily will make satisfactory specimens in five-inch pots. It is a good idea to plant this variety in the front part of a sunny greenhouse bench where the long sprays may reach down to the walk. As a window-box plant it has the merit of withstanding considerable neglect.
Plate XLVII. Vines

Akebia quinata on a porch. Lantana in the basket. A bush of Carpoxyris Mastacanthus in the foreground
VINCA

Vines are really climbing plants. They get up in the world in three general ways: by scrambling or clinging over other plants without any special devices for aiding them in the ascent; by twining about the support; by ascending by means of special organs, as roots or tendrils. The larger number of cultivated climbing plants belong to the last two categories. However, there are many useful climbers amongst the scramblers, as, for example, some of the long-stemmed roses. These plants usually have to be tied to a support unless they are allowed to ramble at will over some expanded surface, as the top of a bush or a broad stone wall.

Each species of twining plant has its own direction of winding about the support, and the species follows this direction under all ordinary circumstances. Some of them, as the hops, wind about the support in the direc-

VINCA

3. herbaceous, Waldst. & Kit. HERBACEOUS PERIWINKLE. Hardy trailing herb, which generally loses its foliage in winter, sends up short flowering stems in spring, followed by sterile creeping stems which root at the tips. The flowers are quite small, but of a very variable nature common Periwinkle, and the corolla-lobes are narrower: IVs. elliptical or lanceolate, margin revolute, ciliate; petiole with 2 glands near the middle: calyx-lobes narrowly lanceolate, ciliate; corolla-lobes oblong-obovate, ovate. Eastern Eu., Asia Minor. B.M. 2002. B.R. 4:301.

AA. Tender, erect subshrub (herb X.), with rosy or white fls. produced all summer.

4. rosea, Lind. MADAGASCAR PERIWINKLE. Fig. 2672. Tender, erect, evergreen-panning plant, somewhat shrubby at the base, cosmopolitan in the tropics: IVs. oblong, narrowed at base, veiny: petiole glandular at the base, fls. with a very small orifice, rosy purple or white, the latter with or without a reddish eye: calyx-lobes linear, corolla-lobes diminishing-ovate, mucronulate. Gn. 36, p. 453; 43, p. 389. V. 13:19; 16:49. B.M. 238. P.R. 1:141. —This is commonly called the "Madagascar Periwinkle," but V. rosea is probably not native to the Old World, while the only species of Vinca that is really native to Madagascar, viz., V. lancea, is not in cultivation. The plant is sometimes called "Cape Periwinkle" and "Old Maid." The three main types should be known as V. rosea, V. rosea, var. alba, and V. rosea, var. occultata; the latter being a white flower with pink or red center. As a matter of fact, these appear in American catalogues as V. alba, V. alba pura, V. alba nova, V. occultata and V. varius, the latter being a trade name for seed of mixed varieties.

W. M.

VINCETOXICUM. The Mosquito Plant or Cruel Plant, known in the trade as Vincetoxicum acumina-tum and V. Japonicum, is Cyananum acuminato-lium, which see.

VINE-CACTUS. Fouquieria splendens.

VINE, GLORY. Claniahus.

VINE PEACH. See under Cucumis Melo.

VINE, PIPE. Aristolochia Siphoph.

VINE, SILK. See Periploca Graeca.

VINE, WONGA WONGA. Tecoma australis.

VINES. In horticultural parlance, a vine is a weak-stemmed, more or less tall-growing plant that needs to have the support of some rigid object to hold it above the earth. Many plants that are grown for their economic uses are vines, although they are ordinarily not so classified in horticultural works; for example, some of the beans, the hop and the sweet potato plant. When vines are mentioned in horticultural writings, plants that are used for ornament are commonly understood. In general literature the term "vine," when used specifically, designates the grape. Sometimes vegetable-gardeners, when speaking of vines, mean cucurbitaceous plants, as melons, cucumbers and squashes.

Vines belong to many natural orders and represent very many types of plant beauty. The larger part of them are useful in horticultural operations as screens for covering unsightly objects or for shading verandas and summer houses. Many of them are the chief plant body being woody and persisting year after year; others are perennial herbs, dying to the ground but the root persisting from year to year, as some dioscoreas; others are true annual herbs, as nasturtiums. Some of them are valued chiefly for foliage, as the Virginia creeper, Japanese ivy, grapes and the true or English ivy; others are prized largely for their flowers, as morning glory, foxgloves and scarlet runners. Vines represent all degrees of hardiness or tenderness; they are also of various heights and differ in rapidity of growth; therefore it is impossible to make a list of vines that shall apply to the whole country.

2673. Hop (Humulus Japoni-cus), twining from the observer’s left to his right, or against the movement of the sun, or from the observer’s right to his left. Fig. 2673. Others, as the morning glory, twine in a direction opposite to the daily movement of the sun, or from the observer’s left to his right. Fig. 2674. The constancy of these directions of climbing was observed long ago. It is interesting to know that Paul Dudley, Chief Justice of Massachusetts, made this observation as long ago as 1721 and reported it to the Royal Philosophical Society. A full discussion of this and related topics concerning climbing plants may be found in Darwin's book, "The Movements and Habits of Climbing Plants."

The special organs by means of which plants climb are of each kind. In general they may be referred to three general categories: roots, as the trumpet creeper and ivies; coiling petioles or leaf-stalks, as the larkspur (Fig. 487) and the nasturtium; tendrils. The tendril is of various morphological origin. Some of them, as
of the grape, are modified branches or stems; others, as those of the pea and cobra, are modified leaflets; still others, as in some species of lathyrus, are modified stipules. True tendrils are always definitely arranged with reference to the position of the leaves. The young extended tendril usually swings about in a circle or ellipse, its end being somewhat bent or coiled. When this end strikes a support it fastens itself securely, and then the plant is drawn to the support or held to it by the coiling of the tendril. This coil also serves as a spring whereby the plant is held to its support during winds. The continuous coiling of the tendril in one direction would twist the tendril in two; therefore, tendrils usually coil in more than one direction, one part of the length being coiled from right to left and another part from left to right. Some of these phenomena may be seen in Fig. 2675, which represents the tendrils of one of the Cucurbitaceae. All members of this family, as cucumbers, melons, pumpkins and wild balsam apple, are excellent subjects on which to observe these phenomena.

Of the very many vines that may be used with good results in the open air in the North the following are common and therefore to be commended. Many greenhouse vines can also be used in the open during the summer, but these are not included in the present list.

**AA. Top shrubby.**

*Amelopsis quinquenervia,* Virginia creeper. Figs. 89, 1866. The best single vine for covering buildings and arbors, since it is perfectly hardy and thrives under many conditions. Plants should be selected from vines of known habit, as some individuals cling much better than others.

*Amelopsis tricuspidata* (J. Veitchi). Fig. 2676; also Fig. 81, Vol. I. A neater and handsomer vine than the Virginia creeper, clinging closer, but it is often injured by winter in exposed places, especially when young. It is best adapted to stone and brick buildings. *Clematis* of various species. *C. paniculata* and *C. Virginiana* are best for general use.

*Tecoma radicans,* trumpet creeper.

*Vitis* or grapes of various species. The wild species are preferable. Fig. 2677.

*Hedera Helix,* true ivy. Fig. 1623. The English ivy does not endure the bright sun of northern winters.

Hardy in middle states, and often does well on the north side of buildings farther north. *Actinidia arguta.* Fig. 29. One of the best arbor vines.

*Akebia quinata.* Figs. 56, 57. Graceful and pretty. *Loniceria sempervirens,* L. inflata and other honey-suckles. *L. Japonica* (or *L. Hattiana*) is half evergreen in the North and is popular.

*Aristolochia macrophylla,* Dutchman’s pipe. Figs. 138-140. A robust grower, with enormous leaves. Useful for covering verandas and arbors.

*Celastrus scandens,* waxwork or false hattersweet.

*Wisteria Sinensis* and *W. spectabilis.* Figs. 2475, 2476.

**AA. Top dying to the ground, or nearly so, in winter.** Some are annuals.

*Menispermum Canadense,* moonseed. A small but attractive native twiner useful for wild gardens.

*Humulus Lupulus* and *H. Japonicus.* The former is the common perennial hop; the latter is a starchy and useful annual.

*Dioscorea divaricata,* yam, Chinese potato, cinnamon vine. The large, deep-seated tuberous roots withstand freezing. Climbs high, but does not produce foliage enough to cover unsightly objects. *Dioscorea villosa* is a small but handsome native species.

*Pueraria Thunbergiana* (known also as *Dolichos Japonicus*), while not yet common, deserves to be better known. It is an herbaceous perennial in the North, but makes a woody top in the South. Very vigorous grower.


*Ipomoea,* various species. Moonflowers and morning-glories belong here. Some are perennials far south; all useful and interesting. Tender.


*Lathyrus odoratus,* sweet pea. Hardy annual.

*Thunbergia alata.* Tender annual.

*Dolichos Lablab,* hyacinth bean. Tender annual.

*Cordia sempervirens* *Halicarbaeum,* balloon vine. Tender annual.

*Adlumia cirrhosa,* Allegheny vine. Tender perennial.

*Cobea scandens.* Tender.

L. H. B.

**Vines for the South.** I. DECIDUOUS. *Amelopsis tricuspidata* and *quinqenervia* are exceedingly popular for covering brick walls, stumps, or dead trees. Being deciduous, they require from the objection of evergreen ivies, whose foliage often accumulates dust and is a harbor for sparrows’ nests. *A. arbores* retains its black berries all winter; the form with variegated foliage is most desirable. *Berchemia scandens* has small, greenish flowers; not showy, but of rapid growth in moist soil. *Celastrus scandens* is desirable for its orange-colored capsules and scarlet seeds, which are retained during a part of the winter. *Centrosma Virginianum,* a twining herb, is a very desirable small vine. The large, pea-shaped lavender flowers are produced from May until autumn. *Clematis.* The best native species are *C. crispa,* with dark bluish purple campanulate flowers, *C. erecta* with scarlet campanulate flowers, and *C. holosericea,* conspicuous for the silky plumose tails of the akenes. All these are herbaceous and lose their stems during winter. Of the hybrid garden varieties
which retain their stems there are only a few that can stand the long, dry summers of the middle South. The most resistant are C. japonica, Fairy Queen, Henry, lanuginosa, Otto Froehle, Duchess of Edinburgh, relatina, but all should be planted where free from the direct glare of the afternoon sun. — Decumaria barbara, a tall climber usually found in rich moist bottoms and bearing numerous fragrant white flowers, is a very showy plant. — Lycium Barbarum is frequently used for trellises; the red berries, which are retained during winter, are its main attraction. —Passiflora incarnata is often as large as some weed on newly cultivated land, but its flowers are remarkably showy and the lemon-like fruits, called may-pops south, are edible, the seeds being coated with a mucilaginous acidulated pulp. P. tenua has very small yellow flowers and also a very small, purple-colored fruit. — Periploca Graecae is of exceedingly rapid growth, and when covered in spring with myriads of flowers is an attractive plant for trellises or rustic summer-houses. — Pueraria Thunbergiana is a most vigorous climber, a single plant frequently covering an enormous space. The pea-shaped flowers appear in spring, are of a violet color and very fragrant. No better plant can be found for covering a large space in a short time. It is excellent for covering dead trees. — Tecoma grandiflora is one of the best exotic climbers, with very large and showy orange-red flowers, which are produced from spring until autumn. It can be trained with a single stem if supported for a few years. Several forms differ only in the size and color of the flowers, as cocinea, deeper red: speciosaflora, yellowish: hybrida, blood-red. The native species, T. radicans, is frequently considered a nuisance south in cultivated fields, but when trained to a pillar or frame few of our native climber are as desirable. — Wisterias. Although the Japanese species frequently produces clusters more than a yard in length, the Chinese species is the favorite, being cultivated in purple, white and double forms. The double flowers are very full and of a beautiful shape, but the variety is unfortunately a shy bloomer. Our native species, W. spectosa, is superseded by an improved European form. Var. magnifica has flowers of a light lavender-blue, which are produced at intervals during the summer. Its growth is unusually vigorous.

II. EVERGREEN. Akebia tobata, with its large leaflets in 3's, yields an abundance of banana-shaped mucilaginous fruit, found in the markets of Japan, but here considered of indifferent value. A very robust climber. The "five-leaved akebia," A. quintata, is one of the most valuable rapid-growing climbers. — Bignonia capreolata, or Cross Vine, is found in rich woodlands; flowers brown-red, with yellow throat: blooms in spring. — Clematis paniculata is almost an evergreen, as it retains its foliage nearly all winter. Flowers are produced in the greatest profusion during midsummer and are very fragrant. One of the most desirable climbers. — Cocculus Carolinus twines to a height of 10-15 feet. When covered during winter with a profusion of coral-red berries there is no other that is more graceful, brown, in higher latitudes it would prove to be one of the most attractive greenhouse plants. — Elaeagnus pungens, var. reflexa, or Japan oleaster, in good soil frequently makes a growth of 100 feet. The attractiveness well with the bright green and silvery reflexed leaves, while the clove-shaped flowers are very fragrant. Ex-
The following native species are all desirable; viz., *L. sempervirens*, with scarlet and orange flowers, and *L. flava*, with bilabiate buff-yellow flowers. In many sections of the South are found large patches of the exotic species *L. Japonica*, *L. chinensis*, and *L. floridiana*; these are frequently troublesome, as they choke out surrounding plants. Its Var. *aseo-reticulata*, with its attractive foliage, and *L. Periclymenum*, var. *Brigitae*, which yields a continuous crop of pink and buff flowers, are the most valuable of the exotic sorts. *Ipomoea*. *B. Bonariensis* (Sellowii) and *Leavii* are the best of the tuberous section, the roots remaining sound during winter if slightly covered with litter. *L. pupleata* grown south as Indian hemp, is frequently found in large quantities in newly cleared oakwood lands, the tubers often weighing 10 to 15 pounds. It is very showy with its large white flowers and purple inner tube.—*Passiflora*. Both *Arc-en-ciel*, with flowers combining white, citron and blue, and *Constance Elliott*, with pure white flowers, are perfectly hardy and profuse bloomers. —Rosas. Of the climbing varieties there is a great profusion. Most varieties are either perfect evergreens or retain their foliage nearly all winter. The White and Yellow Banksias are wonderfully attractive in early spring when laden with innumerable small violet-scented flowers, while the climbing Tea, China, Noirfleuris and Bourbon yield a profusion of variously colored flowers from early spring until winter. The Wieuhrainiana section will hardly become popular, as plants bloom only in spring, while the Cherokee and Maconbars are still used for making evergreen hedges.—*S. Sinilax*. Of the many species growing south, the *S. lacinfolia* is highly valued for its large, shiny leaves; it is of great decorative value for ornamenting ball-rooms. Other kinds are desirable both for leaves and berries.—*T. heterospernum* (jasminoides) is an excellent white-flowering climber. The variegated form does not grow as tall, but its foliage becomes beautifully tinted with gold and red in fall.

III. Half-Hardy Climbers. During the summer southern homes are frequently adorned with a class of climbers that farther north are suitable only for greenhouse culture. Some of the best are mentioned below: The Antigonon, Aristolochia and Tecoma here mentioned will stand the winter if the soil is covered with a coat of straw or leaves. The stems dies down in fall, but the new growth appears vigorously in spring. The others need greenhouse protection north of Savannah, Ga. *Antigonon leptopus*. Flowers in long racemes of a beautiful pink color and produced from June until frost.—*A. elegans*. This blooms profusely from July until frost. The flowers are tubular, but the limb is perfectly flat and curiously marked and laced with purple. *Bignonia*.—*B. variata* is at its best in the extreme South. It is a gorgeous climber. In early spring or even as early as February it is covered with large bunches of bright orange-colored flowers. *B. speciosa* will stand the winters of southern Georgia and produces its purplish colored flowers in early spring.—*Bougainvillea glabra*, var. *Sanderiana*. Those who have seen this plant in Florida when in full bloom must agree that it is not surpassed by any other climber. The brilliancy of the climber is beyond description. Hardy south of Jacksonville.—*Tecoma Opsiwns*. Flowers in clusters of a beautiful orange-red color. Hardy as far as Savannah.

P. J. BERCKMANS.

Vines for Conservatories or Greenhouses. Flowering vines and climbers, when skilfully trained over the roofs, supports and sides of conservatories and other plant houses, add greatly to the attractiveness of such buildings. No other number of plants in cultivation good choice may be had both for cool or warm houses, and to suit every aspect, as well as for flowering at all seasons. Annual, bulbous and tuberous-rooted vines may be planted in pots, or small tubs, but permanent hard-wooded flowering vines must have ample root room. However, in some cases, as with the strong-growing bigonias and thunbergias, the root space must be limited, or there will be an immense growth at the expense of flowers. When possible, the strongest growing vines may be planted under the greenhouse stages and the stems and branches trained up from the back to the sides and roof. In most modern greenhouses, however, the space underneath the plant stages is taken up by the heating pipes. To overcome this difficulty boxes made of one-inch eypress 5 feet long, 1 1/2 feet wide and 1 foot deep are very suitable. These should be well drained, painted olive-green, and placed in convenient positions on the plant stages. In planting young vines the soil should be broken and not sifted; neither should the boxes be filled with soil at the time of planting, but the vine should be planted in a central mound and the box gradually filled as the plant grows. This practice is stimulating to the vines and tends to maintain the desirable qualities of the soil. Most vines may be trained on wires, which should be either galvanized or copper and of sufficient strength to support heavy vines. The wires should be spaced not more than 1 foot apart, and fastened in a horizontal position. The space between the wires and glass should be not less than 18 inches or the vines may freeze in winter.

Some judicious thinning of the growth is generally necessary in order that the vines may receive sufficient light and air. The vines should not be tied too closely, but allowed their natural habit of growth as far as possible in order to obtain the best effects. A few of the most desirable kinds for conservatory and cool greenhouse follow, detailed culture of which may be found under their respective headings in this work. *Lupinera alba* and rosea, producing bell-shaped wax flowers of exquisite beauty, are well adapted for the back wall or north side. Their worst enemies are snails, which eat the young stems as soon as they push through the soil. *Tecoma jasminoides*, a strong-growing vine, produces clusters of jasmine-like flowers. *Lonicera gratissima* makes one of the rarest and most beautiful coolhouse trellis plants. The cymes of rose-colored or pink flowers are produced in the greatest profusion during the early winter months. Its worst enemy is mealy bug. Dipladenias are excellent summer-flowering, tuberous-rooted vines, and their gorgeous flowers well repay the attention given them. *Ficus pumila* is an excellent subject for covering walls, either in cool or warm houses. *Solonum jasminoides* is a strong-growing vine producing clusters of jasmine-like flowers of white or lilac colors. The well-known Mare-
Vines for Southern California. The following list of vines for this section places them very nearly in their proper order as far as popular demand is concerned. One much-used vine, the ivy geranium, is purposely omitted for lack of knowledge as to its proper place in the list, the demand for this vine being somewhat spasmodic. The ivy geranium, being hardy here, is used for a great variety of purposes, as hanging baskets, hedges, and for climbing up the sides and on the roof of a house. Passifloras are unpopular here by reason of the numerous caterpillars that infest them at certain times of the year. Of this list Solanum Wendlandii is probably the most tender, with the Bougainvilleas a close second. For the covering of unsightly objects in the least possible time, Ipomoea Liliaris (Fig. 2678) easily takes first place and the lonicera will rank next. Several species of jasmines are worthy of mention, but space forbids, as the list could easily be extended to 100 or more. Vines occupy an important place in the horticulture of southern California, as in other warm and sunny countries.

Bougainvillea, all species; Bignonia venusta; Solanum Wendlandii; Lonicera, several species; Ipomoea Liliaris, Figs. 2678, 2679; Tecoma Riviolioliana; Jasminum grandiflorum; Bignonia Tweakiana; Solanum Sinistrophyllum, var. azurinum; Wisteria Sinensis; Wisteria Sinensis, var. alba; Solanum jasminoides; Tecoma grandiflora; Tecoma jasminoides; Phloxclava Racemata; Tecoma filicifolia; Hardenbergia monophylla; Hardenbergia Comptoniana; Mandevilla suaveolens, Fig. 2679; Hoya carnosa; Clantus paniculatus; Akebia quinata; Kennedya nigricans; Muehlenbeckia complexa; Physistiazus albens; Various tassanias; Figs. 2457, 2528, 2880.

ERNEST BRAUNTON.

Vines for Middle California.—The number of species of climbing plants cultivated in California for ornamental use in town and country homes is large, because of the newness of the country and the recentness of introduction of many of them, few species are commonly seen in middle California (taking the San Francisco neighborhood as a center) the following are most extensively grown as a covering for porches, arbors and houses: (1) Ampelopsis tricuspidata, (2) Rosa Banksia and other species, (3) Clematis Jackmanii and other varieties, (4) tassanias, (5) tassanias and passifloras, (6) Lonicera Japonica, var. Halliana.

For house adornment the tassanias are not to be recommended, on account of their rampant and dense growth, which tends to keep the building damp. The Lady Banks rose is a general favorite on account of its evergreen habit and the abundance of blossoms which it produces in spring. Wisteria Chinensis is an old and well-tried friend. In spite of a somewhat untidy habit of growth and need of yearly training and trimming, it is probably as much loved in California as in its native land, Japan, on account of the exuberant, lavish freedom with which it showers its wealth upon us in the form of immense trusses of fragrant flowers. Hall's Honeysuckle has such fragrant blossoms, is so easily reproduced by cuttings and blooms so freely and for such a long period, that it is more commonly grown in country places than perhaps any other vine.

The following list are not intended to be complete, but rather suggestive; they are believed to include all the species generally grown in middle California. They are thrown into special-purpose groups.

Section 1.—For houses and places where dense growth would be objectionable. This list 'does not include all the species at present grown in such places, as several that are frequently so grown have proved unsatisfactory.
Section 2. For arbors, porches and trellises where a dense and rapid growth is desirable.

A. Hardy.

b. Evergreen.

Colocasia esculenta. Fig. 502. Pachysandra terminalis. Fig. 154.
Ipomoea purpurea. Fig. 502. Tecomaria cordifolia. Fig. 154.
Passiflora caerulea. Fig. 1053. Tecomaria spicata. Fig. 154.

bb. Tender.

Almamons Hendersonii. Fig. 61. Antigonon leptopus.
Bignonia venusta. Fig. 235. Bignonia speciosa.
Bougainvillea glabra. Fig. 240. Bougainvillea spectabilis.
Bougainvillea glabra, var. Sandersoniana.
Bougainvillea spectabilis, var. lateritia.

AA. Low-growing climbers suitable for planting along a fence or wall or the base of a tree, or for massing against a house.

b. Hardy.

Asparagus javanicus. Fig. 122. Asparagus plumosus.
Asparagus plumosus, var. tenississima. Fig. 126. Asparagus sprengeri. Fig. 123, 124.
Ficus pumila, Tecoma jasminoides, Tecoma Tumbergii, Tecoma radicans, Wistaria chinensis, Wistaria speciosa, Wistaria multiplaza.

BB. Tender.

Allamanda. Fig. 61. Antigonon leptopus.
Bignonia venusta. Fig. 235. Bignonia speciosa.
Bougainvillea glabra. Fig. 240. Bougainvillea spectabilis.
Bougainvillea glabra, var. Sandersoniana.
Bougainvillea spectabilis, var. lateritia.

A. Low-growing climbers suitable for planting along a fence or wall or the base of a tree, or for massing against a house.

bb. Tender.

Pueraria Thunbergiana.
AA. Tender.
Passiflora alata-cerula, Tecomaria manita. Fig. 206. Taconia Eoniensis.

VINES

3. For tree-trunks, unsightly places, etc.—For such places the English ivy, Hedera helix, is one of the very best plants; it can be used with advantage to cover the trunks of eucalypts and to prevent the unseignly shedding of the bark without injury to the tree. The English ivy seems to be thoroughly at home in the coast climate of middle California. Clematis montana can be used with good effect to climb up among the branches of Cupressus sempervirens or Chamaecyparis Lawsoniana, against the dark foliage of which the white flowers of the Clematis contrast beautifully. Roses are often treated in the same manner. Ampelopsis quinquefolia is sometimes made to climb a rugged old specimen of Cordyline australis, and, often reaching the tufts of leaves which crown the short branches of the latter, the young lianas of the creeper hang down in beautiful festoons. In Golden Gate Park, Taconia Eoniensis has been allowed to wander at will over the rounded heads of live elder (Sambucus), T. mollissima is sometimes used in the same way.

4. For slopes, retaining walls and banks of creeks.

—For long, sloping banks nothing has yet been found more effective than English ivy, which withstands the dryness of a warm southern exposure without irrigation. Pelargonium peltatum, Tropaeolum majus, T. Exoniensis, var. procumbens, and J. Sabina, var. prostrata, are also used satisfactorily.

Along the banks of creeks, Senecio miiliioides (here called German ivy), Vinca major and Zebrina pendula are frequently used, growing with the greatest luxuriance. The German ivy has escaped from these special situations and has established itself as a denizen in several places.

For low retaining walls and fences, English ivy is sometimes used, but is not nearly as effective as the following, all of which are met with:

Ficus pumila, Fragaria Californica, Fragaria indica, Fragaria Chiloensis, Fuchsia procumbens, Linaria Cymbalaria, Lotus berthelotii, Mahernia glabrata, Pelargonium peltatum, Polya heterophylla, Tropaeolum majus.

Of the above, Pelargonium peltatum is by far the most satisfactory and most freely used; in fact, it may be considered one of the characteristic features of gardening in middle California.

5. For fences.—Vines are frequently used to form live hedges by planting them thickly alongside a fence. The favorites for such situations are Rosa laevigata, Muehlenbeckia complexa, Lycium Richi, Pelargonium peltatum, the hardy Teconia, and Solanum jasminoides. Convolvulus purpuratus and C. macrostegius can also be used to advantage in this way, and even Tropaeolum majus is sometimes requisitioned for the purpose.

For 6- or 8-foot woven wire fences, around tennis courts, etc., nothing has been found more satisfactory than the delicate treacy of Eremocarpus schauer and the maurusias: Tropaeolum Canariense may also be used, but is less satisfactory because an annual and requiring a shady place. Ipomoea purpurea and I. Quamoclit may also be used for this purpose.

Joseph Burtt Davy.

VINICULTURE. Wine-making and the subjects associated therewith. The subject is not primarily horticultural. It is essentially manufacture. The growing of the grapes is Viticulture. See Grape and Vitis.
VIOLA

VIOLA (classical name). Viola decora. Violet. There are probably 150 species of Violets. They are widely distributed perennial or rarely annual herbs (or even subshrubs) with interesting irregular flowers on 1- or 2-flowered axillary peduncles. They are plants of the northern and southern temperate zones. About 40 species are native to North America north of Mexico. The flowers are 5-merous as to envelopes and stamens; sepals all similar, persistent with the fruit; corolla irregular, the lower petal spurred, the others similar but usually not alike; stamens short and included, the anthers more or less coherent and two of them with an appendage projecting into the spur; fr. a capsule, 3-valved, with several to many globular seeds. Some of the species (particularly the common eastern V. palmata) have cleistogamous flowers, which are borne at the base of the plant (often under the mold) and are pollinated in the bud. The structure of the corolla of the Violet is shown in Fig. 2681. In Fig. 2682, representing the same species, the cleistogamous flowers are shown at a a.

Three species of Viola are well known in gardens. The Common Sweet Violet is V. odorata. From this the florists’ Violet, in many forms, has been evolved. The Pansy is V. tricolor. See Pansy. The Horned or Butterfly Violet is V. cornuta. These are all European species, and are now considerably modified by cultivation.

Many of the native Violas are offered by dealers in hardy plants, but only V. pedata and V. palmata (with its var. eueutala) are really known to any extent as garden plants; and even these are not frequently seen. V. pedata, the Bird’s-foot Violet, is a most worthy species, and it will some day, no doubt, be the parent of an important garden race. It is very variable even in the wild state. Since the native species are really not horticultural subjects, and the descriptions of them are so easily accessible in the writings of Gray, Britton,

2681. The structure of the corolla of Viola palmata var. cucullata. Somewhat enlarged.

2682. The two kinds of Violet flowers,—the common showy flowers at the right, natural size, and the cleistogamous flowers at a a (X 3/4), Viola palmata var. cucullata.

2683. Clump of common blue Violet of the eastern states—Viola palmata, var cucullata.

given below as a matter of record. In the nomenclature of this list, the monograph of Gray has been followed (Gray’s Syn. Flora, vol. 1, pp. 193-201).

Violets are easy to grow, particularly if an effort is made to imitate the conditions under which they naturally occur. Some of them are woods species, others swamp species, and others inhabit dry plains. They are propagated readily by means of division and in some species by runners. Sometimes seeds are used, but not commonly. Many species that grow mostly to single stems in the wild make large full clumps when given good opportunity in the garden. Fig. 2683.

a. Plant perennial.

b. Spur short and obtuse.

dederaca, Labill. (Erpeton reniforme, Sweet. E. hedericum, petiolare and spatulatum, G. Don). AUSTRALIAN VIOLET.

Tufted, and creeping by stolons, glabrous or pubescent; lvs. reniform or orbicular or spatulate, small, entire or toothed, usually not equaling the sepal; fls. small, usually blue, sometimes white, the spur almost none. Australia.—Offered in S. Calif.

odorata, Linn. SWEET VIOLET. Figs. 2684, 2688-89. Tufted, somewhat pubescent, producing stolons; rootstock short: lvs. cordate-orate to reniform, obtusely serrate, the stipules glandular; fls. blue, fragrant (running into white and reddish purple forms); the spur nearly or quite straight and obtuse. Eu., Afr., and Asia.—It runs into many forms, varying in stature, size of flowers and color. There are double-flowered forms. The parent of florists’ Violets.

bb. Spur long and acute.

cornuta. Linn. HORNED VIOLET. BEDDING PANSY. Plant tufted, glabrous or nearly so, producing evident stems with long peduncles in the leaf-axils: lvs. cor-
date-ovate and usually acuminate, obtusely serrate, the stipules large and lancinate; fls. large, pale blue, the obovate-obtuse petals standing well apart, the spur half or more as long as the petals and acute. S. Eu. B.M. 791.—Frequently seen in gardens and much prized for its large, bright flowers. Good for spring bloom. Hardy. There are several colors, represented in Alba, Purpurea, Mauve Queen and Papilio. The last has very large flowers, violet in color, with small dark eye. Fig. 2065.

AA. Plant annual, or imperfectly perennial in cultivation.

**tricolor**, Linn. PANSY. HEARTSEASE. Figs. 1634, 1635. Glabrous or nearly so, the stems becoming long and branched; lvs. cordate or round-cordate, those of the stem becoming lanceolate, all stalked and crenate-dentate, the stipules large and lancinate; fls. large, usually about three colors represented (except in highbred self varieties), the spur short and inconspicuous. Eu.—When strayed from cultivation, the flowers become small and lose the markings characteristic of the highbred Pansies. A small-flowered field form, thought by some to be indigenous to this country as well as to Europe, is var. *arvensis*, DC. See *Pansy*.

Following are North American Violets that have been offered to the trade:

A. **Blue Violets** (sometimes running into white and striped forms).


**palmata**, Linn. (V. *euculata*, var. *palmata*, Hort.). **Eastern states**.

Var. *euculata*, Gray (V. *euculata*, Ait. V. *obliqua*, Hill). Figs. 2061, 2062. On the Atlantic slope. By Britton & Rose *E. grassii* is regarded as a distinct species for which Hill's name *V. obliqua* (1789) is used rather than Aiton's *V. euculata* (1789). The commonest Violet in the northeastern states. *V. obliqua*, var. *strigosa*, is a striped form in the trade, and not uncommon wild. There are forms known as var. *picta* and *variegata*. One of the most variable species in stature, form of leaves, and color of flowers. It is easily colonized in the garden.


**VIOLET**

AA. **White Violets**


AA. **Yellow Violets**


**pedunculata**, Gray. California seeds are gathered for export.

**pubeccens**, Ait. Fig. 2067. Dakota, east and south. **rotundifolia**, Michx. Nova Scotia to N. Car.

**sarmentosa**, Doug. Idaho to British Columbia and Calif.


**VIOLET, Commercial Cultivation.**—The Violet probable ranks third in commercial importance among florists' flowers in America. It has risen greatly in horticultural importance within recent years. The Violet season is only about seven months, while the season of roses and carnations is fully nine months. As with the other leading flower crops, — roses, carnations and chrysanthemums, — the Violet requires very close attention the year round. Though Violets require no staking, tying or disbudding, other laborious practices are necessary. The status of Violet culture has been below that of the other important florists' flowers as regards general care and efficiency of management, and consequently quality of product. For many years a crop worth millions of dollars annually was raised with scarcely any discussion in the trade papers concerning methods. There are national societies devoted to the rose, carnation and chrysanthemum, but none to the Violet. So low had the interest sunk in Violet culture on its professional side that the "Violet disease" was spoken of by the florists as if it were only one thing, whereas there are at least eight distinct and important kinds of troubles that devastate Violet plants. At last the tide has turned. The various diseases have been investigated by scientists, especially those of the Division of Vegetable Physiology and Pathology, in the U. S. Department of Agriculture, and there is considerable free literature available concerning the nature of these diseases and the methods of controlling them. The wonderful success of certain Violet specialists has awakened general interest and emulation. Violet culture now receives something like its proper share of attention in the trade papers. The practical experiments in Violet culture by Galloway and Dorsett, based upon a knowledge of plant diseases, the introduction of the eyamle method of fumigation, a rigorous system of plant-breeding and a close study of actual market conditions have had an important influence in raising the standard of commercial Violet culture.

There is a popular impression that Violets are an easy
croptogrow. This is true only of blooms of ordinary quality and only as regards the total amount of work required per year as compared with a crop of roses, carnations or chrysanthemums. The best Violets are produced only under the best conditions, and it is a singular fact that many persons who have thought they had mastered Violet culture after a few years' success have failed subsequently. The Violet is still everywhere grown by local florists, but good Violet culture has been the latest to attain a high degree of specialization. The present status of the subject is admirably presented in Galloway's Commercial Violet Culture, New York, 1889.

**Varieties.**—From *Viola odorata*, a species indigenous to Europe, parts of Asia and Japan, many cultivated sorts, both single and double, and of different colors, have been derived. The varieties most highly prized and of the greatest commercial value to American florists are, in the order named: of the double varieties, Marie Louise (Fig. 2688), Farquhar, Imperial, New York (Fig. 2690), and King of Violets, dark blue flowers; Lady Hume Campbell, Neapolitan (Fig. 2689) and De Parme, light blue; Swanley White (Fig. 2691), Queen of Violets and Belle de Chatsenay, white, and Madame Millet, Odorata Rubra and Double Red, red or pink. Of the single sort the varieties most highly prized are, in the order named: California, Princesse de Galles, Luxonne and La France, purple; White Czar and Rawson's White, white, and single red or pink.

**Propagation.**—In commercial Violet growing, plants are propagated chiefly in four ways: (1) by cuttings 3 or 4 in. long, made from well-developed runners and rooted in clean, sharp sand; (2) by divisions, made by taking up the old plants, usually after flowering has ceased, and separating them, all divisions with old roots and hard woody stems being discarded, and the young, well-rooted ones transplanted 3 or 4 in. apart each way, and watered and shaded for a few days, until they are well established, when they can be lifted with a ball of earth and set where desired; (3) by cuttings made from young, unrooted crowns or divisions of the old plant removed during the winter or spring without disturbing the flowering plant, and rooted in clean, sharp sand, as in the case of runners; (4) by removing well-rooted young divisions, crowns or offshoots, without disturbing the flowering plant and caring for them the same as divisions made in spring.

**Soil.**—As a rule, Violets do well in any good, well-enriched soil. The best results, however, are obtained from soil prepared from sod taken from a rather heavy, sandy loam that is well drained and capable of retaining and giving up an abundance of moisture at all times. The soil to be used in the Violet house, stationary frame, or in pots, should be prepared the previous fall. From a suitable loam, strip off the sod to a depth of 3 or 4 in.; compost this with well-rotted manure, preferably cow manure, and pile in alternate layers of from 6 to 8 in. of sod and 2 to 3 inches of manure. In this condition let it stand exposed to the weather until spring, and then, just before it is to be used, chop down and add pure bone-meal at the rate of 27 ounces per cubic yard of soil, after which work over several times, or until the whole is thoroughly pulverized and mixed, when it is ready for use. For movable frame culture, scatter from 1 to 2 in. of well-rotted manure over the soil in the fall, then turn under by spading or deep plowing, and in that condition let it stand exposed to the action of the weather until spring. Just before planting time plow again, top-dress with pure bone-meal at the rate of 6 ounces per square yard of soil, and harrow or work over.

**Methods of Culture.**—Among American florists four methods of growing Violets are in common use; viz., field and house culture, house culture, frame culture with or without artificial heat, and pot culture, the extent to which they are used being in the order named.

**Field and house culture:** Early in the spring the young plants are set in the field and cultivated during the summer. Some time in September or October they are lifted with a ball of earth and transplanted into beds or benches in the house, where they bloom during the winter.

**House culture:** The plants are grown under glass, either on benches or in solid beds, during the entire season. This method should take the place of all others, for with it the very best conditions and closest attention can be given the plants at all times, and as
VIOLET

A rule the results obtained are much better than from any other method.

Frame culture with or without artificial heat: The young plants are placed either directly in the frames, or in the winter as nearly as possible at 45° to 50° F. at night and 56° to 60° in the daytime. The ventilation of the houses should receive careful attention at all times, so that an abundance of fresh air can be supplied to the plants when needed. Watering is a difficult problem, usually taxing to the utmost the best judgment of the grower. No fixed rules can be laid down as to the proper amount to apply or when to apply it, this depending upon a number of factors, such as the character of the soil, temperature and moisture of the atmosphere, amount of light, etc. As a rule, however, the soil should be kept moist at all times, and the watering should be thorough, but never to such an extent as to cause the soil to remain saturated for any considerable length of time.

Violet Houses and Frames (Fig. 2692).—There is probably little choice between any of the standard styles of greenhouses, provided certain features are observed in their construction. Provision should be made for supplying an abundance of fresh air, either from the sides or top, whenever it is needed, the ventilators being so arranged as to be easily operated either from within the house or from the outside, the inside arrangement to be used in general ventilation of the houses, the outside whenever fumigation with hydrocyanic acid gas is necessary. The arrangement and location of the house should be such as to secure the maximum amount of sunshine during December and January, and the minimum amount during the growing season, when it is necessary to maintain as low a temperature as possible so as to insure good, vigorous, healthy-growing plants. The location of the house and the direction in which it should run depend largely on the section of the country, the character of the ground on which it is to be erected, and the style of house selected. Generally speaking, the even-span house should run north and south, the three-quarter span and the lean-to east and west. The best site for the house is a level piece of land or one sloping gently to the south. Three kinds of greenhouse framework are in common use in this country: viz., wood, wood and iron, and iron. On account of its comparative cheapness and durability the wood and iron framework is coming into general use.

2688. Violet, Marie Louise (X 1).

2689. Neapolitan (X 1).

2690. New York (X 1).
The Violet frames, which are either stationary or movable, are made of rough boards, and are about 5 ft. 10 in. wide, of any desired length, from 12 to 15 in. high in front and 18 to 20 in. high at the back. The best location for the frames is a piece of ground sloping to the south, with a wind-break of some kind to the north and northwest to protect them during the winter from the cold winds.

Marketing is one of the most important factors connected with commercial Violet-growing and is seldom understood in all its details. The grower should be thoroughly familiar with the many needs and requirements of the market and be able to supply these demands, for upon his ability to do this depends largely his success or failure from a financial standpoint. Violets are picked chiefly for their delicate perfume, and as this diminishes in proportion to the length of time they are picked, the best market, other things being equal, is the one which requires the least possible delay between picking the flowers and placing them in the hands of the customer.

The crop may be disposed of at retail or wholesale or through a commission merchant. Each method has its advantages and disadvantages, and in deciding which one to adopt the grower must be guided by existing conditions. He must in any event have a thorough knowledge of the requirements of the market as regards quality of the flowers, size, shape and arrangement of the bunch, and should at all times exercise the utmost care in picking, packing and shipping, so that the flowers may reach the customer in the best and most attractive condition. The kind of bunch varies from year to year, and each large city is likely to have its own style. The various styles are wonderfully exact in their requirements and great skill is required to bunch the flowers properly.

Diseases. The cultivated Violets are subject to a number of diseases, each of which is characterized by one or more distinct symptoms. The principal diseases are as follows, their destructiveness being in the order in which they are discussed:

1. Spot. Violets are attacked by Cercospora viola. This disease, also called the disease, leaf-spot, leaf-rust and small-pox, is the most widespread and destructive known in America. It attacks principally the foliage, normally producing definite circular whitish spots, frequently with concentric rings, of a darker shade, very often with a light central portion resembling the bite or sting of an insect. Cercospora viola. Phyllosticta viola. Septoria viola.

2. Root rot (Thielavia basivola).—This disease is very troublesome and destructive in some localities especially to young plants that are transplanted during hot, dry weather. It causes the browning or blackening of the parts attacked and the final death of the plant.

3. Wet rot (Botrytis sp.).—This fungus attacks leaves, petioles, flower-stalks and flowers, causing a wet or soft rot. It is sometimes very destructive, especially with large plants growing in a damp, stagnant atmosphere, where there is insufficient ventilation and light.

4. Leaf-fading or yellowing.—This is induced by a variety of conditions, but as yet little that is definite has been ascertained regarding its cause.

Remedies.—It is difficult to exterminate any of the diseases named after they once gain a foothold. However, they can be held in check and often entirely prevented by selecting and propagating exclusively from strong, vigorous, disease-resistant plants, and by keeping them in the best possible growing condition. Careful attention must be given to watering, cultivation and ventilation, and the dead and dying leaves and all runners should be destroyed as fast as they appear.

Animal Enemies.—Although Violets are attacked by a number of insects and other animal enemies, only a few do sufficient injury to warrant discussion here.

1. Aphides (Aphis sp. and Rhopalosiphum violae).—These pests are generally known as the green and the black aphides or the green and the black fly. They cause the young, growing parts to curl and twist, resulting in a stunted, ill-formed plant. They work their way into the young, unopened flower-buds, and, thrusting their bills through the overlapping petals, feed on the juice. Each puncture produces a greenish white blotch on the petal and the flower becomes dwarfed, distorted and worthless for market. Aphides can be easily controlled by fumigating with hydrocyanic acid gas, and this is the method of treatment which should come into general use. To each cubic foot of space in the house or frame use .15 gram of 98 per cent cyanide of potash for double varieties and .10 gram for single varieties. Handle the cyanide and gas with utmost care, as both are very poisonous. Divide the total amount of cyanide into as many equal parts as there are jars used, which latter should be one for every 50 to 75 linear feet of a house 12 to 18 feet wide. Put each part into a 2-pound
VIOLET

VIRGINIA

VIOLET, farmer, tions the sects them causes recommended morning v., commercial sulfuric acid until steam is evolved, then from the outside lower the bags into the jars beneath. Fumigate double varieties thirty minutes and single varieties twenty minutes, after which open ventilators from outside, leaving them open at least sixty minutes before entering the house (for full information, see Circular 37, Dept. of Agric., Div. of Entomology). Aphides may also be combated by using tobacco in some one of its many forms, but tobacco is likely to weaken the leaves and make them more liable to the attack of fungi, and on this account is very objectionable.

Red spider (Tetranychus telarius).—This pest lives on the under surface of the leaves, and when present in sufficient number causes considerable damage. It is widely distributed on a great variety of plants, and when established in the Violet house is most difficult to combat. It can be held in check, and often the plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of 20 to 30 pounds per square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

Eel worms, or nematodes (Aegyllina sp.).—This causes swellings on the roots of the plants known as root galls. Another species attacks the buds, causing them to "go blind." There is no known method of exterminating these pests, but their injurious effects may be reduced to a minimum by adopting the methods recommended for controlling fungous diseases.

Gall fly (Diosia viaticola), violet sawfly (Emphitus Conadenas), greenhouse leaf tier (Phytelasis rubigalis) and several species of cutworms (Agrotis al.).—In some parts of the country the larvae of these insects injure the plants to some extent by feeding on the foliage. Fumigating with hydrocyanic acid gas is the best means of combating them.

Slugs, snails, sow bugs, etc.—Under certain conditions these pests do considerable damage, especially to the flowers. They also can be controlled by the hydrocyanic acid gas treatment.


VIPER GOURD. Trichosanthes Anguina.

VIPER'S BUGLOSS. See Echium.

VIRGINIA COWSLIP or V. Lungwort = Merriansia pulmonaria or late.

VIRGINIA CREEPER is Ampelopsis quinqufolia.

VIRGINIA, HORTICULTURE IN. Fig. 2693. Historically Virginia horticulture began with the earliest colonists in Jamestown Island in 1607. The London Company sent vines in 1619 and seions and trees in 1622 which were rapidly disseminated, so that before 1700, orchards of considerable size had been established. The settlers pushed westward into the Piedmont section, favorable results with the tree fruits became more common. In this section Thomas Jefferson took an active interest in horticulture, and from the vicinity of "Monticello," apples first won their supremacy in the markets of the world.

Virginia is separated into six main physical divisions known as Tidewater, Middle Virginia, Piedmont, The Valley, Blue Ridge and Appalachian. These are sections of varying width, extending northeast and southwest through the state, with marked variations in soil, altitude and climate.

Orcharding.—It is in the larger fruits that Virginia horticulture has won most renown. The present production of apples is about 500,000 barrels, the bulk of which is produced in the Valley and Piedmont sections. Piedmont, Virginia, with a varying altitude of 500 to over 1,000 feet, and a soil ranging from dark red to black, is famous as the producer of the most perfect type of Alibemarle Pippin and Winesap apples. Situated in mountain coves, and on hillside farms, few orchards in this section are not covered with apples. These orchards enjoy specially favored conditions, and yield almost fabulous returns, an individual tree having produced $1,000 worth of fruit in a season though practically uncared for. In this section the apple probably reaches its greatest development of tree growth, with a maximum of 9 ft. 5 in. in circumference of trunk; 90 ft. spread of branches, and a yield of 150 bus. at one picking. The Valley leads in apple production, and here the largest orchards are found with 40,000 or more trees under one management. Limestone in formation and with an altitude of from 500 to 2,500 feet, this section is admirably adapted to fruit culture. It grows York Imperial and other varieties to perfection.

The Blue Ridge and Appalachian sections, with altitudes of from 2,000 to 4,000 feet and rich limestone soils, have been practically undeveloped horticulturally, but so far as tested are a field of rich promise. Among the cultivated fruits of Virginia the apple takes first rank. Early May, Red June. Early Harvest and Yellow Transparent are the leading first early; open the season the latter part of June and carry the season into July, when the succession is taken up by Sweet Bough.
There has been a rapid increase of grape acreage in recent years devoted primarily to the production of carnations, violets, and chrysanthemums as cut-flowers. The soil and climate of Middle Virginia have been found especially favorable to violet production and in Louisiana, 15 to 25 or more acres are devoted exclusively to violet culture. The interest in landscape gardening is gradually on the increase.

Geo. E. Murrell.
pinnatifid, grayish tomentulose beneath, the middle one 2-3 in. long, the smallest ones often entire; fls. smaller, scarcely 1/4 in. long, in more slender and looser terminal panicles; stamens shorter than limb; throat villous. July, Aug. N. China, Mongolia. B.M. 364 (as V. Ne-

gando). Less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.


INDEX.

VIETCUTUR. See Grape and Vitis.

VITIS (classical Latin name). VINE. GRAPE. Vitaceae or Ampelidce. A widespread genus of mostly tendril-bearing climbing vines, most abundant in temperate countries. In its stricter limitations, the genus includes less than 50 known species, but some authors unite Cissus and Ampelopsis with it, when it includes some 250 species. The latest monographer (Panchon, DC. Monogr. Pl. Amer. 5), refers thirty or more species to Vitis in the main account and in the addendum, and more than 200 to Cissus. North America is particularly rich in Vitis, not only in number of species but in the widespread distribution and the abundance of the plants. From our native species have been developed the outdoor Grapes of this country except those of California and the extreme southwest (which are Vitis vinifera). For an account of the evolution of these

natural cuticular varieties, see Grape; also Bailey's "Sketch of the Evolution of Our Native Fruits."

Many of the species of Vitis are excellent ornamental plants, when it is desired to cover arbors, porches or trees. All of them are readily grown from seeds, and most of them from hardwood cuttings. Only a few of the native species are regularly in the trade; but with the possible exception of V. Treleasei they have been offered for sale to experiment stations and amateurs by T. V. Munson, of Texas, who is a well-known authority on both the botany and horticulture of the Grape. The popular interest in these species is primarily pomological; for, although the fruit may not be directly useful, the species give promise of development through hybridization and plant-breeding, and some of them afford useful stocks on which to graft kinds that do not resist the phylloxera or root-house. The following discussion includes all the species native to North America; it is adapted from the writer's account in Gray's Synoptical Flora, vol. 1, 420-430. These American Grapes are very difficult to distinguish in many cases; hence the subjoined descriptions are very full in order to bring out the contrasting characters. Some of the best recent systematic works on American Vitis is from French sources, since the American species have come into prominence in France as phylloxera-resistant stocks for the Wine Grape. See, for example, the works of Millardet, and Viala and Ravaud; also "Amphigraphie Universelle," by Viala and Ver- morel, now publishing.

As understood by Gray, Vitis is distinguished as follows: Plants climbing by the prehension and coiling of naked-tipped tendrils. Flowers polygamo-dioecious (i.e., some individuals perfect and fertile, others sterile with at most only a rudimentary ovary), 5-merous; corolla calyptrately caudate,—the petals in anthesis cast off from the base while cohering by their tips (Fig. 2695); hypogynous disk of 5 nectariferous glands alternate with stamens; style short and thick, or conical; berry pulpy; seeds pyriform, with contracted beak-like base.

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The structure of the key to the following species, when standing alone, is as follows:

A. Species grown wholly for ornament, recently introduced from various parts of the Old World.

B. Less simple, cissus-like.

1. antártica, Benth. (Cissus antártica, Vent. Vitis Baudiniana, F. Muell. Cissus Baudiniana, Broun.). Vigorous tall woody climber, the young growths red-hairy or sometimes glabrous; lvs. ovate to oblong, on hairy petioles, toothed, glandular in the axils of veins beneath; fls. greenish, tomentose, in short cymes, the petals 4 and falling separately: berry globose. Australia. - Offered in southern California and said to be suitable for covering rocks and walls.

Bb. Less simple, often lobed, vitis-like.

2. Coignetie, Pullat. Very strong-growing vine, covering trees and arbors with a thatch of heavy showy foliage: branches floccose-tomentose when young: tendrils intermitted; lvs. cordate-ovibrate, with 3-5 lobe-like points, the margins shallowly apiculate-toothed, dull above, the hairs gray-pubescent beneath: thyrse stalked, short: fr. globular, about ½ in. in diam., practically indehiscent, although said to be eaten after being frozen by the Japanese. N. Japan. Gu. 49, p. 48; 50, p. 449. B.F. 1898, p. 236-238. - One of the best of all strong-growing vines, and hardy in the northern states. Its foliage becomes brilliant scarlet in the fall, whence it has been called the "Crimson Glory Vine." In general appearance it much resembles Vitis Labrusca. It is not yet well known. It grows readily from imported seeds. It can also be propagated by layering and by grafting on other stocks. Named for Mme. Coignet, of Lyons, France.

Bb. Less with 3-5 leaflets.

3. hypoplaquea, F. Muell. (Cissus hypoplaquea, Gray). Foliage handsome and persistent, dark green above and glaucous beneath; leaflets usually 5, obovate to elliptic, acuminate, stalked, with a few or none towards the apex; fls. yellowish: fr. rather small and nearly globose. Australia. - Offered in S. Calif.

VITIS

4. pteróphora, Baker (V. youggiiodes, Lynch, not Baker). A most remarkable species, the branches bearing cylindrical or club-shaped tubers at their ends, which fall and produce new plants: tall, climbing by means of long forked disciferous tendrils, the stem winged and hairy: lvs. large, of 3 lips, which may be again lobed, the stipules large and purple on one side, the petiole winged: cyme pedunculate: floral envelopes of a thickened calyx and 4 minute petals. Brazil. G.C. H. 1953. B.M. 6833. Gu. 55, p. 170. - Offered in S. Calif.

VITIS 1949

2696. Vitis rotundifolia, the Muscadine grape of the South (× 42).

Aa. Species grown primarily for their pomological (fruit) interest, all native except No. 28.

B. Skin of the mature berry usually separating freely from the pulp (Nos. 5-27).

C. Bark bearing prominent lenticels, never shredding: nodes without diaphragms: tendrils simple: flower-clusters small and not much elongated: seeds oval or oblong, without a distinct stipe-like base. (Muscadinia.)

5. rotundifolia, Michx. (V. taurina, Bartram. V. vul- pina, Authors, not Linn. V. muscadina, angulata, verrucosa, pendula, Floridana, Raf.). MUSCADINE, SOUTHERN FOX GRAPE, BULLACE OF BULL OR BULL GRAPE. Fig. 2696. Vine with hard, warty wood, running rampanantly even 60 to 180 ft. over bushes and trees, and in the shade often sending down dichotomous aerial roots: lvs. rather small to medium (2 to 6 in. long), dense in texture and glabrous both sides (sometimes pubescent along the veins beneath), cordate-ovate and not lobed, mostly with a prominent and sometimes an acuminate point (but somewhat contracted above the termination of the two main side veins), the under surface finely reticulated between the veins, the teeth and the apex angular, coarse and acute, the basal sinus shallow, broad and edentate; petiole slender and (like the young growth) fine-scabby, about the length of the leaf-blade: tendrils (or flower-clusters) discontinuous, every third node being bare: fruit-bearing clusters smaller than the sterile ones, and ripening from 3 to 20 grapes in a nearly globular bunch: berries failing from the clusters when ripe, spherical or nearly so and large (½-1 in. in diameter), with very thick and tough skin and a tough musky flesh, dull purple in color without bloom (in the Scuppernong variety silvery amber-green), ripe in summer and early autumn: seeds 4-6 in. long, shaped something like a coffee berry. River banks, swamps, and rich woodlands and thickets, S. Delaware to N. Fla. and west to Kansas and Texas.
6. **Mussoniana**, Simpson. **Mustang Grape** of Florida. Bird or Everbearing Grape. Very slender grower, preferring to run on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously: lvs. smaller, thinner, and more shining, more nearly circular in outline and less prominently pointed, the teeth broader in proportion to the blade and more open or spreading; clusters larger and more thyrse-like; berries a half smaller than in the last and often more numerous, shining black, with a more tender pulp, acid juice, no muskiness, and thinner skin; seeds half smaller than in the last. Dry woods and sands, Florida, at Jacksonville, Lake City, and southwards, apparently the only Grape on the reef keys; also in the Bahamas.—Difficult to distinguish from *V. rotundifolia* in herbarium specimens, but distinct in the field.

2697. *Vitis monticola* (on the left) and *V. vulpina* (× ½).

Vitaceae

2697. A slender trailing or climbing plant (reaching 20 to 30 ft. in height, with very long and slender branches, the young growth angled and floccose (sometimes glabrous), the diaphragms plane and rather thin: lvs. small and thin (rarely reaching 4 in. in width and generally from 2 to 3 in. high), cordate-ovate to triangular-ovate, with the basal sinuses ranging from nearly truncate-oblique to normally inverted U-shaped, rather dark green but glossy above and grayish green below; when young more or less pubescent or even arachnoid below, the blade either prominently notched on either upper margin or almost lobed, the point acute and often prolonged, margins irregularly notched with smaller teeth than in *V. rupestris*: clusters short and broad, much branched: berries medium or small (averaging about ½ in. in diameter), black or light-colored, seedy, sweet: seeds large (about ½ in. long) and broad, Limestone hills in S. W. Texas.—This species has been the subject of much misunderstanding.

9. **vulpina**, Linn. (V. riparia, Michx. *V. odoratissima*, Donn. *V. tilicola* and *V. Misouriensis*, Prince! *V. tenellifolia*, Le Conte! *V. cordifolia*, var. *riparia*, Gray). **Riverrank or Frost Grape.** Figs. 2697, 2698. A vigorous tall-climbing plant, with a bright green cast to the foliage, normally glabrous young shoots, large stipules, and plane very thin diaphragms: lvs. thin, medium to large, cordate-ovate, with a broad but usually an evident sinus, mostly showing a tendency (which is sometimes pronounced) to 3 lobes, generally glabrous and bright green below, but the veins and their angles often pubescent, the margins variously deeply and irregularly toothed and sometimes cut, the teeth and the long point prominently acute: fertile fls. bearing reeling or curved stamens, and the sterile ones long and erect or ascending stamens: clusters medium to large, on short peduncles, branched (often very compound), the fls. sweet-scented: berries small (less than ½ in. in diameter), purple-black with a heavy blue bloom, sour and usually acid, generally ripening late (even after frost): seeds rather small and distinctly pyriform. New Brunswick, according to
Vitis

Macoun, to N. Dak., Kans. and Colo. and south to W. Va., Mo. and N.W. Texas. B. M. 2421.—The commonest Grape in the northern states west of New England, abundant along streams. Varied in the flavor and maturity of the fruit. Forms with pedioles and under surfaces of its pubescent sometimes occur. Occasionally hybridizes with V. Labrusca eastward, the hybrid being known by the tomentose young shoots and unfolding leaves, and the darker foliage, which is marked with rusty tomentum along the veins of the less jagged leaves.

Var. praecox, Bailey, is the June Grape of Missouri, the little sweet fruits ripening in July.

10. Trelesac, Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the leaves) tendrils deciduous the first year unless finding support, internodes short, the diaphragms twice thicker (about one-sixteenth in.) than in V. vulpina and shallow-bicrenate: stipules less than one-fourth as large as in V. vulpina: leaves large and green, very broad-ovate or even reniform-ovate (often wider than long), thin glabrous and shining on both surfaces, the basal sinus very broad and open and making no distinct angle with the petiole, the margin unequally notched (not jagged as in V. vulpina) and indistinctly 3-lobed, the apex much shorter than in V. vulpina: fertile flowers with very short, recurved stamens, sterile with ascending stamens: cluster small (2 to 3 in. long); berries ⅛ in. or less thick, black with a thin bloom, ripening three weeks later than V. vulpina when grown in the same place, thin-skinned: pulp juicy and sweet: seeds small. Brewster county, S. W. Texas and New Mexico to Bradshaw Mountains, Arizona. —Little known, and possibly a dry-country form of V. vulpina. In habit it suggests V. Arizonicus, var. glabra, from which it is distinguished among other things, by its earlier flowering and larger leaves with coarser teeth and less pointed apex.

11. Longii, Prince (V. Solubilis, Planch. V. Nuevomexicana, Lemm.). Differs from vigorous forms of V. vulpina in having floccose or pubescent young growth: leaves decidedly more circular in outline, with more angular teeth and duller in color, often distinctly pubescent beneath: stamens in fertile flowers short and weak and laterally reflexed, those in sterile flowers long and strong: seeds larger. N.W. Texas and New Mexico. —Regarded by French authors as a hybrid, the species V. rupestris, was very likely originally a hybrid between V. rupestris (which it sometimes closely resembles in herbarium specimens except for its wooliness) and some tomentose

2698. Vitis vulpina (or V. riparia). Natural size.

Probably the most widespread of American native grapes.
species (possibly with V. Arizonica or V. Doaniiana), but it is now so widely distributed and grows so far removed from its supposed parents and occurs in such great quantity in certain areas, that for taxonomic purposes it must be kept distinct. It is not unlikely that it has originated at different places as the product of unlike hybridizations. Late French writers designate the jagged leaved forms as V. Solonis, and the dentate forms as V. Nueva-Mexicana. This interesting grape was found some thirty years ago by Engelmann in the Botanic Garden of Berlin under the name Vitis Solonis, without history. Engelmann guesses (Bushberg Cat. ed. 3, 18) the name to be a corruption of "Long's." It is probable that the plant was sent to European gardens as Vitis Longii—very likely from Prince's nursery—and the name was misread on the label. The original name, which was duly published by Prince with description, may now be restored.

Var. microspérama, Bailey (V. Solonis, var. microspérama, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

12. Châmpini, Planch. Probably a hybrid of V. rupestris or V. Berlandieri and V. canadensis, bearing medium to large reniform or reniform-cordate lvs., which are variously pubescent or cobbled, but become glabrous, the growing tips mostly white-tomentose: berries very large and excellent. S. W. Texas.

A.G.1891:579. In some places associated with V. canadensis, Berlandieri and monticola only, and in others with the above and V. rupestris. Often composing dense thickets in the wild.

Diaphragms very thick and strong: young shoots bright red: lvs. often strongly lobed.

13. rubra, Michx. (V. monospérama, Michx.). Red or Cat Grape. A slender but strong-growing vine, with small, long-jointed angled red glabrous herb-like shoots and red petioles; lvs. small to medium, ovate-acuminate, dark green and glossy, sometimes indistinctly pubescent on the nerves below, the sinus obtuse, the blade either nearly continuous in outline (commonly) prominently lobed or even parted, coarsely notched; stamens in the sterile fls. long and erect: clusters loose and long-peduncled, branched, the fls. opening very late: berries small and late (½-¾ in. in diam.), black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Illinois and Missouri to Louisiana and Texas. A. G. 1891. A handsome plant. V. palmata, Vahl, founded on Virginian specimens, is probably V. rubra, although it is sometimes made to replace the name V. rubra.

EE. Cordifolia—like Grapes, with leathery and dull-colored orangy-brown lvs. often holding some close, dull pubescence below at maturity and the shoots and lvs. nearly always more or less pubescent when young, the teeth mostly short, the point mostly rectangular and conspicuous (Nos. 11-18).

F. Plant strong and climbing, with stout, persistent tendrils.

g. Young shoots terete, and glabrous or very soon becoming so.

14. cordifolia, Michx. (V. pullária, LeConte). True Frost Grape, Chicken, Raccoon, or Winter Grape. One of the most vigorous of American vines, clinging on the tops of the tallest trees, and sometimes making a trunk 1 or 2 ft. in diam.; diaphragms thick and strong; lvs. long-cordate, triangular-cordate with rounded base, or cordate-ovate, undivided or sometimes very indistinctly 3-lobed or 3-angled, the basal sinus rather deep and narrow, the margin with large, acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower bright green and either becoming perfectly glabrous or bearing some close and fine inconspicuous grayish pubescence on the veins; petioles long; stamens erect in the sterile lvs., and short reflexed in the fertile ones; clusters long and very many-flowered, most of the pedicels branched or at least bearing a cluster of lvs.; berries numerous and small (about ½ in. in diam.), in a loose bunch, black and only very slightly glaucous, late and persistent, with a thick skin and little pulp, becoming edible after frost: seeds medium and broad. In thickets and along streams from Fla. (and probably S. New York) to E. Kau., Fla. and Texas.

Var. latifolia, Engelm., has fertilly aromatic berries, and grows in the Mississippi valley.

Var. sempervíreus, Munson. A glossy-leafed form holding its foliage very late in the season: lvs. sometimes suggesting forms of V. ruhbr. S. Fla.
2706. Vitis Californica (X one-fifth).

maturity only on the veins, the point only rarely prolonged and often mutinous, the teeth comparatively small and notch-like and not prominently acute, sinus more open; petioles shorter and often pubescent; floral organs very small, the stamens reflexed in the fertile fls.; pedicels short, making the bunch very compact: berries about the size of V. cordifolia, black and nearly or quite bloomless, late; seed small and notched on top. Mountain valleys, 800 to 3,000 ft. altitude, southwestern Va. and adjacent W. Va. and W. N. C., Tenn. and N. Ga.; also at common levels in the uplands of west-central Ga.—The eastern counterpart of V. Berlandieri.

16. Berlandieri, Planch. Mountain, Spanish, Fall or Winter Grape. Fig. 2699. A stocky, moderately climbing vine, with mostly short internodes and rather thick diaphragms; lvs. medium large, broadly cordate-ovate or cordate-oreibicular (frequently as broad as long), glabrous and glossy above, covered at first with gray pubescence below but becoming glabrous and even glossy except on the veins, the sinus mostly inverted-U-shaped in outline but often acute at the point of insertion of the petiole, the margin distinctly angulated above or shorty 3-lobed and marked by rather large, open, notch-like acute teeth of varying size, the apex mostly pronounced and triangular-pointed: stamens long and ascending in the fertile fls., laterally recurved in the fertile ones; clusters compact and compound, mostly strongly shouldered, bearing numerous medium to small (1/2 in. or less in diam.), purple and slightly glaucous very late berries which are juicy and pleasant-tasted: seed (frequently only 1) medium to small. Limestone soils along streams and hills, S. W. Texas and Mex.—Well marked by the gray-veined under surface of the leaves.

17. cinerea, Engelm. Sweet Winter Grape. Fig. 2699. Climbing high, with medium to long internodes and, thick and strong diaphragms: lvs. large, broadly cordate-ovate to triangular-cordate-ovate (generally longer than broad), the sinus mostly wide and obtuse, the margin small-notched (teeth much smaller than in V. Berlandieri) or sometimes almost entire, mostly distinctly and divergently 3-angled or shortly 3-lobed towards the apex, the angular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (not glossy), the under surface remaining ash-gray or dun-gray, webby-pubescent: stamens to sterile fls. and abort hesitate a little, and the fertile ones short and laterally recurved: cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all, glaucous, ripening very late, and after frost becoming sweet and pleasant: seeds small to medium. Along streams, mostly in limy soils, central Ill. to Kans. and Texas; also N. Fla. and in Mex.—Readily distinguished from V. aestivalis by the triangular-pointed sharply toothed ash-gray lvs. and the gray tumescence of the young growth.

15. Baileyana, Munson (V. Virginiana, Munson, not Lam.). Possum Grape. Less vigorous climber than V. cordifolia, rather slender, with short internodes and very many short side shoots: lvs. frequently smaller, the larger ones shortly but distinctly 3-lobed (lobes mostly pointed and much spreading), bright green but not shining above, gray below and pubescent at the margin small-notched (teeth much smaller than in V. Berlandieri) or sometimes almost entire, mostly distinctly and divergently 3-angled or shortly 3-lobed towards the apex, the angular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (not glossy), the under surface remaining ash-gray or dun-gray, webby-pubescent: stamens to sterile fls. and abort hesitate a little, and the fertile ones short and laterally recurved: cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all, glaucous, ripening very late, and after frost becoming sweet and pleasant: seeds small to medium. Along streams, mostly in limy soils, central Ill. to Kans. and Texas; also N. Fla. and in Mex.—Readily distinguished from V. aestivalis by the triangular-pointed sharply toothed ash-gray lvs. and the gray tumescence of the young growth.

18. Arizonica, Engelm. (V. Arizonensis, Parry). Canon Grape. Plant weak, much branched, with short internodes and thick diaphragms, branched angles: lvs. mostly small, cordate-ovate and with a prominent triangular-pointed apex, the sinus broad or the base of the blade even truncate, the teeth many and small and pointed or mucronate, the margin either continuous or very indistinctly 3-lobed (or sometimes prominently lobed on young growths), the leaves and shoots white-woolly when young, but becoming nearly glabrous with age: stamens ascending in sterile fls. and recurved in the fertile ones: bunches small and compound, not greatly, if at all, exceeding the lvs., bearing 20 to 40 small black berries of white or yellowish-green color, a medium size. Along river banks, W. Texas to New Mex. and Ariz., mostly south of the 35th parallel, to S. E. Calif. and northern Mex.

Var. glabra, Munson. Plant glabrous, with glossy and mostly thinner and larger lvs. in mountain gulleys, with the species and ranging northwards into S. Utah. Distinguished from V. monticola by its triangular-pointed and small-toothed lvs. Probably a form of V. Trelfast.

EE. Orbicular-scallop-toothed species of the Pacific coast.

19. Californica, Bentham. Fig. 2700. A vigorous species, tall-climbing upon trees but making bushy clumps when not finding support, the nodes large and diaphragms rather thin: lvs. mostly round-reniform (the broader ones the shape of a horse's hoof-print), rather thin, either glabrous and glossy or (more commonly) cottony-canescent until half grown and usually remaining plainly pubescent below, the sinus ranging from very narrow and deep to broad and open, the margins varying (on the same var.) from free to broadly recurved (the latter a characterist feature), the upper portion of the blade either perfectly continuous and rounded or sometimes indistinctly 3-lobed, and terminating in a very short acute apex, medium mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor: seed large (1/4 to 5/6 in. long), prominently pyriform. Along streams in central and N. Calif. and S. Orc.—Lvs. becoming handsomely colored and mottled in fall.
20. **Girdiana**, Munson. **VALLEY GRAPE.** Strong, climbing vine, with thick diaphragms; lvs. medium to large and rather thin, broadly cordate-ovate, with a rather deep and narrow sinus and nearly continuous or obscurely 3-lobed outline (sometimes markedly 3-lobed on young shoots), the teeth many and small and acute, the apex short-triangular or almost none, the under surface remaining closely ashy-tomentose; clusters large and very compound, each one dividing into three or four nearly equal sections, which are in turn shouldered and thyrse-like; berries small, black and slightly glaucous, the skin thin but tough, pulp finally becoming sweet; seeds medium in size, pyriform. S. Calif., south of the 36th parallel.

-Differs from *V. Californica* in the more pubescent shoots and foliage, smaller and sharp teeth, decomposed clusters, smaller less glaucous berries, and smaller seeds. Shoots of *V. Californica* often bear lvs. with small and mucilaginous teeth, and such specimens without the fl.-clusters are difficult to distinguish from this species. Some of the forms which have been referred to *V. Girdiana* are apparently hybrids with the wine Grape, *V. vinifera*; and at best the plant is imperfectly understood and its merits as a species are yet to be determined.

21. **Doaniana**, Munson. Plant vigorous, climbing high or remaining bushy if failing to find support, with short internodes and rather thick diaphragms; lvs. bluish green in cast, mostly large, thick and firm, cordate-ovate or round-ovate in outline, bearing a prominent triangular apex, the sinus either deep or shallow, the margins with very large, angular, notch-like teeth and more or less prominent lobes, the under surface usually remaining densely pubescent and the upper surface more or less floccose: cluster medium to small, bearing large (5/4 in. and less in diam.), black, glaucous berries of excellent quality: seeds large (5/4-5/2 in. long), distinctly pyriform. Chiefly in N. W. Texas, but ranging from Greer Co., Oklahoma, to beyond the Pecos river in New Mexico. The G. F. 8:435. This species varies in pubescence, in some specimens being very nearly glabrous at maturity and others densely white-tomentose. The plant would pass at once as a hybrid of *V. vulpina* and *V. candidans* except that the former does not often occur in its range. It is very likely a hybrid, however, and *V. candidans* seems to be one of the parents.

22. **cestivalis**, Michx. ( *V. syylectris*, occidentalis and *American*, Bartram. *V. Nortoni*, Prince. *V. Labrason*, var. *cestivalis*, Regel. *V. brasheata* and *V. aranea*, Le Conte). **SUMMER, BUNCH, or PIGEON GRAPE.** Strong, tall-climbing vine, with medium short internodes, thick diaphragms, and often pubescent pedioles: lvs. mostly large, thinish at first but becoming rather the ovate-cordate or round-cordate in outline, the sinus either deep (the basal lobes often overlapping) or broad and open, the limb always lobed or prominently angled, the lobes either 3 or 5, in the latter case the lobed sinus very usually enlarged and rounded at the extremity, the apex of the leaf broadly and often obtusely triangular, the upper surface dull and becoming glabrous as it retains a covering of copious rusty or red-brown pubescence which clings to the veins and draws together in many small, tufty masses: stamens in fertile fls. relaxed and laterally bent: clusters mostly long and long-peduncled, not greatly branched or even nearly simple (mostly interrupted when in flower), bearing small (5/4 in. or less in diam.), black, glaucous berries, which have a tough skin and a pulp ranging from dryish and astringent to juicy and sweet: seeds medium size (5/4 in. or less long), two to four, Southern New York to central Fla. and westward to the Mississippi and Missouri. -A marked type among American Grapes, being readily distinguished from other species by the reddish fuzz of the under sides of the leaves.

Var. **glauca**, Bailey ( *V. Lineacecimii*, var. glauca, Munson). lvs. and mature wood glaucous-blue on the body beneath, but the veins rusty: berries and seeds larger. S. W. Missouri to N. Texas. -Much like *V. bicolor*, but lvs. thicker and more pubescent below, and tips of shoots rusty-tomentose.

Var. **Lineacecimii**, Munson ( *V. diversifolia*, Prince. *V. Lineacecimii*, Buckley). **POST-OAK, PINE-WOOD, or TURKEY GRAPE.** More stocky than *V. estivalis*, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below: berries large (5/4-5/3 in. in diameter), black and glaucous, mostly palatable: seeds mostly much larger than in *V. estivalis* (often 5/4 in. long). High post-oak (Quercus stellata) lands, S. W. Missouri to N. Texas and E. La. -Very likely derived from the *estivalis* type through adaptation to dry soils and climates. Perhaps worth recognition as a geographical species. The name of this Grape was spelled Lineacecanii by Buckley, with whom the name originated. The name of the person whom he commemorated was spelled Lineacenii, and Munson has therefore changed the spelling of the name of the Grape. However, Buckley's spelling should persist, as a matter of nomenclatural priority.

Var. **Bourquiniana**, Bailey ( *V. Bourquiniana*, Munson). A domestic offshoot, represented in such cultivated varieties as Herbemont and Le Noir, differing from *V. estivalis* in its mostly thinner leaves which (like the young shoots) are only slightly red below, the pubescence mostly cinereous or dun-colored or the under surface sometimes blue-green: berries large and juicy, black or amber-colored. -A mixed type, some of its greenish surface covered with *estivalis* and some hybridized with the wine Grape ( *V. vinifera*). Much cultivated south.
23. Bicolor. Le Conte (V. argenteifolia, Munson). Blue Grape, or Summer Grape of the North. Fig. 2701. A strong, high-climbing vine, with mostly long internodes and thick diaphragms, the young growth and canes generally perfectly glabrous and mostly (but not always) glaucous-blue, tendrils and petioles very long: lvs. large, round-cordate-ovate in outline, glabrous and dull above and very heavily glaucous-blue below, but losing the bloom and becoming dull green very late in the season, those on the young growth deeply 3-5-lobed and on the older growths shallowly 3-lobed, the basal sinus running from deep to shallow, the margins mostly shallow-toothed or sinuate-toothed (at least not so prominently notch-toothed as in V. asitivitis); cluster mostly long and nearly simple (sometimes forked), generally with a long or prominent peduncle: the petioles purple and densely glaucous hermaphrodites of medium size (½ in. or less in diameter), sour but pleasant-tasted when ripe (just before frost); seeds rather small. Abundant northwards along streams and on banks, there taking the place of V. asitivitis. Ranges from New Eng. and Ill. to the mountains of W. North Carolina and to W. Tenn.—Well distinguished from V. asitivitis (at least in its northern forms) by the absence of rufous tumefaction, the blue-glaucous small-toothed leaves, and long petioles and tendrils. It has been misunderstood because it loses its glaucous character in the fall.

24. Carolina, DC. Fig. 2702. Climbing, with floccent-twentiethly (or rarely almost glabrous) and striate shoots: tendrils rarely continuous: lvs. cordate-ovate or even broader and mostly acuminate-pointed, sometimes obscurely angled above (but never lobed except now and then on young shoots), becoming glabrous above but generally remaining rufous-tomentose below, the margins set with very small, micro-tipped sinuate teeth; cluster long and long-peduncled, generally large and very compound: berry small and globose, purple: seed obvolute, grooved on the dorsal side. Widely distributed and variable species in the Appalachian range running into white-leaved forms (as in V. Blancii, Munson). Little known in the United States: La., Lake City, N. Fla., swamp near Jacksonville, Fla.

25. Caribaea, DC. Fig. 2703. Vitis candidans, var. coriacea (×½).

27. Labrusca, Linn. (V. Blandi, Prince). Fox Grape, Skunk Grape. Figs. 949, 956, Vol. II. A strong vine, climbing high on thickets and trees, young shoots tawny or fuscou, with much scurfy down; lvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly obscurely 3-lobed towards the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded or sometimes nearly con-}

and more or less poplar-like, ranging from reniform-ovate to cordate-ovate or triangular-ovate, dull above but very densely white-tomentose below and on the petioles, the basal sinus very broad and open or usually none whatever (the base of the leaf then nearly unusually flattened), deeply 5-7-lobed (with enlarging rounded sinuses) on the strong shoots and more or less indistinctly lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the sterile fls. long and strong, those in the fertile fls. very short and laterally reflexed: cluster small, mostly branched, bearing a dozen to twenty large (½ in. or less in diam.) purple or light-colored or even whitish berries, which have a thin skin and a very disagreeable fiery flavor: seeds large, pyriform. E. Texas, mostly on limestone soils.

Var. coriacea, Bailey (V. coriacea, Shuttl.). LEATHER-LEAF OF CALLOOSA GRAPE. Fig. 2703. Differs from the species chiefly in bearing much smaller (about ½ in. in diam.) thinner-skinned and more edible Grapes with mostly smaller seeds, and perhaps a less tendency to very deep lobing in the lvs. on young shoots and possibly rather more marked rustiness on the young growths. Florida, chiefly southward, in which range various Texan plants reappear.—The more agreeable quality of the fr. is probably the result of a more equable and moister climate.

26. Simpsoni, Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin, large and large-toothed ones of the main shoots, rusty-white tomentum below and very prominently brown-tomentose young growths,—the character of the lvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fla.—This is likely a hybrid of V. asitivitis and V. candidans, var. coriacea. Some forms of it are very like V. Labrusca, and might be mistaken for that species.

FF. Tendrils mostly continuous (a tendril or inflorescence at every node).

27. Labrusca, Linn. (V. Blandi, Prince). Fox Grape, Skunk Grape. Figs. 949, 956, Vol. II. A strong vine, climbing high on thickets and trees, young shoots tawny or fuscou, with much scurfy down; lvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly obscurely 3-lobed towards the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded or sometimes nearly con-
simple or very nearly so, in anthesis about the length of the peduncle; berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. New England and southwards in the Alleghany region and highlands to west-central Georgia. Not known to occur west of E. New York in the North, but reported from S. Indiana.

The parent of the greater part of American cultivated Grapes. It is often confused with *V. aestivalis* in the South, from which it is distinguished by the habitually continuous tendrils, the more felt-like Ivs. which are not deccious, and especially by the small-toothed Ivs., very short clusters and large berries and seeds.

**2704.** *Vitis vinifera* (X 3/4).

**VITTARIA**

1956. *VITIS*. n.l. str. heads L. brown of ranging 1956 var. fruited. burg., notched drils, great fruited. See Cissus Japanica. — *V. lanata*, Roxbg. Vigorous species with large, coriaceous leaves, with small spatulate teeth and very white-tomentose beneath. China. Spring in fall. — *V. Lindeni*, Hort. See Cissus Lindeni. — *V. Pag nusiti*, Romanet (Ampelopsis Davidiana, Mott. Ampelovitis Davidiana, Carr. Vitis Davidiana, Hort. in part 3). Climbing tendrils intermediet; Ivs. mostly small, very various, sometimes 3-5-foliate but usually only 3 lobed or even ovate coriaceous leaves of the margin nearly or quite crenate-dentate, with a toothed or rounded dentate, whits beneath. China. Has much the aspect of an Ampelopsis. — *V. Romaneti*, Romanet (Spinovitis Davidiana, Carr. Ampelovitis Davidiana, Hort. in part 7). Stems very hairy or almost spiny, the hairs glandular and purplish; tendrils intermediet; Ivs. large, coriaceous, shiningly, foliated, strongly crenate-dentate, becoming nearly or quite glabrous above, hairy beneath; clusters 3-4 in long, the berries black, small, edible. Vigorous vine from China, little known in this country, and its hardiness in the northern states not yet tested. R.H. 1885, p. 55. 1892:152 (variegated form said to belong to this species). Apparently closely allied to *V. Cogetes*, from which the following distinguishes it. — *V. rutilans*, Carr. R.H. 1880:444, belongs with *V. Romaneti. — V. serjana-folia*, Maxim. is Ampelopsis serjana-folia. *V. Juan*, Mes. 1878:54. — *V. Thunbergii*, Regel. is *V. Amurensis. — *V. tricuspida*, L. H. B. *VITTARIA* (Dr. C. Vittadinii, an Austrian who wrote on fungi 1826-1842). Composita. About 14 species of perennial plants, natives of Australia, New Zealand, S. America, and Hawaiian Islands. With a thick caudex, or branching subshrubs: Ivs. alternate, entire or variously cut; heads rather small, with a yellow disk and white or blue rays, terminal, solitary or in loose, leafy corymbs: involucres several rayed: rays sterile, numerous, crowded, in more than one row: achenes narrow, compressed or flat, with or without ribs on the faces: pappus of numerous, often unequal capillary bristles. The genus is closely related to *Erigeron*, differing in habit and in the style-tips of the staminate branches, those of *Erigeron* being short, while those of *Vittadinia* are awl-shaped.

*Vittadinia tribo a* of the California trade is said by Dr. Franceschi, of Santa Barbara, to be a charming dwarf plant, well suited for rockeries, borders and hanging baskets; covered with myriad of daisy-like white flowers." However, *V. triloba* of the trade is not *V. tribo* of the botanists; the latter is a synonym of *V. australis*, of which a description taken from Flora Australiensis is here given for comparison. The plant known to the California trade as *V. triloba* has been examined by J. Burr Davy, who sends the following account: "*V. triloba*, Hort., not DC. *V. Mexican*, or *V. Daisy*, is really an *Erigeron* and should be known as *Erigeron mucronatus*, DC. Fig. 2705. It is a much-branched perennial, 6-12 in. high; Ivs. alternate, irregular, 5-1 in. long, from linear-subulate to lanceolate to ovate or obluncoate-cuneate, entire, toothed, or 3-several lobed; peduncles 1-2 in. long; solitary; heads daisy-like, about 3/4 in. diam.; rays numerous, narrow, white above, purplish on the back, especially in age; style-tips obtuse. A useful garden plant, looking best in a mass or as an edging; drought-resistant, hardy and becoming naturalized near San Francisco; readily propagated by cuttings. The freshly broken stems smell strongly of camphor, July-Aug.

*australis*, A. Rich. (F. triloba, DC., not Hort.)*. Herbaceous plant of uncertain duration, 1 ft. high or less, homed: Ivs. obvate or spatulate to linear-cuneate, entire or coarsely 3-toothed or lobed; heads solitary; rays narrow. A useful garden plant, said to be revolute (whitish) only to dried specimens. Australia, Tasmania.

—has 4 distinct botanical varieties.

W. M.

**VITTARIA** (Latin, *a lilla* or *head-brand*). Polyploda. A genus of ferns with narrow, grass-like foliage, growing pendant from trees. *V. lineata*, Swz., is a tropical American species which is found as far north as central Florida, where it grows on the eabbage palmetto. Rare in cultivation.

L. M. UNDERWOOD.
VOLKAMÉRIA. Consult Clerodendron.

VRIÉSIA (named for Dr. W. de Vriese, of Amsterdam). Browne/de/feke. Often spelled Vriesia, but not so spelled by Lindley, who founded the genus. According to Mez (DC. Monogr. Phaner. 9), 84 species are to be referred to this genus. They are very like tillandsias, with which they are united by Bentham & Hooker and others. The chief technical difference is the presence in Vriesia of 2 ligules or a single cleft or cuneate ligule on the inside of the base of petals. Culturally Vriesias are like tillandsias. They run to forms with marked and banded leaves. They are tropical American stiff-leaved plants, with mostly distichous spikes bearing large and showy bracts. Several species have been introduced in recent years, and many garden hybrids have been produced. Few kinds are offered in the American trade, and only these kinds are described here. For other kinds, see the monographs of Baker and Mez; also the Kew List of Introductions for 1876-1886. For culture, see Tillandsia.

a. Stamens longer than the petals.

b. Inflorescence branched.


bb. Inflorescence simple.

c. Bracts of inflorescence strongly imbricate.

splendens, Lem. (V. speciosa, Hook. Tillandsia speciosa, Bronn. T. pieta, Hort. T. zebrina, Hort., in part). Fig. 2706. Strong-growing plant, with broad, strong, arching-ascending lvs. 1 ft. or more long, which are bright green and marked with dark brown transverse bands: spike with densely imbricated bright red-acuminate bracts, the scape spotted: ffs. exerted, yellowish white. Guiana. B.M. 4328. F.S. 2:107; 6, p. 162. R.H. 1846:41.—One of the best and most showy species. A robust form is var. major, Hort.—See Supplementary List below for additional note on V. zebrina.

carinata, Wawra (V. brachystachya, Regel. Tillandsia carinata, Baker). Fig. 2707. Lvs. rosulate, about 6 in. long, the base sheathing, mucronate at the tip, somewhat glaucous, not spotted: spike with wide-spreading nearly divaricate acuminate bracts which are scattered with yellow tips, bearing green-spotted ffs. protruding, pale yellow. Brazil. B.M. 6014.

VRIÉSIA. Consult Clerodendron.

2705. Erigeron mucronatus, known in the trade as Vittadídia trióba. (X ¾.)

somewhat glaucous, not spotted: spike with wide-spreading nearly divaricate acuminate bracts which are scattered with yellow tips, bearing green-spotted ffs. protruding, pale yellow. Brazil. B.M. 6014.

2706. Vriésia splendens.

paitacina, Lindl. (Tillandsia paithacina, Hook.). About 1 ft. high when in bloom: lvs. rosulate, 6-10 in. long, dilated at the base, yellowish green: ffs. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. R.R. 29:10, where the genus is founded. B.M. 2841. R.H. 1855:221.—A showy species when in bloom.

aa. Stamens shorter than the petals.

b. Lvs. not barred, mottled or tessellated.

heliconioides, Lindl. (V. helloniana, Hort. Tillandsia hellonoides, H.B.K.). Dwarf and tufted, with many rosulate recurving or arching lanceolate lvs. (about 12 in. long), which are bright green above and purple tinged beneath. Seape overtopping the foliage, simple and erect, with wide-spreading distichous boat-shaped bracts that are light red at the base and greenish at the tip: ffs. white. Colombia. I.H. 30:490. G.C. 11:21:140.

bb. Lvs. tessellated (marked in small checker-work) or minutely variegated.


1958

VRIESIA

VRIESIA

_Leaves_ marked with strong transverse bands.


*V. fulgida*, Hort., has been catalogued in this country. It is a garden hybrid (*V. incurvata* × *Duvali*). It has short green _lvs_. and an exerted simple spike with distichous bright red imbricated _bracts_. I.H. 35:67.—*V. glaucophylla*, Hook., is referred to *Tillandsia fasciata*.—*V. muscica*, Cogu., is Guzmania, for which see *Tillandsia*. It is also known as a Massangea (see p. 992).—*V. zebrina*, Hort., is sometimes *V. splendens*, and sometimes Cryptanthus zonatus. For the latter, see discussion under *Tillandsia* and Fig. 2515.

**VULNERARIA.** *V. Anthyllis*, Scop., is Anthyllis Vulneraria, which see in Vol. I. The other Vulnerarias are referred to the same genus.

**VYÉNOMUS** is another spelling for *Euonymus*.

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2707. Vriesia carinata.
WAHAHO, WAHOO, or BURNING BUSH is Euonymus atropurpureus. Utina atala, the Winged Elm, is also called Whahoo or Wahoo.

WAFFER ASH. Ptelea trifoliata.

WAHLENBERGIA grandiflora. See Plantago.

WAITZIA (F. A. C. Waitz, born 1768, state physician to the Dutch at Samarang, Java; wrote on Javanese plants). Compositae. Includes one of the rarer "everlasting flowers," a half-hardy annual which grows about 1½ ft. high and bears flat-topped clusters of yellow flower-heads, with a golden disk. The clusters are about 5 in. across, and the heads 2 in. across, the showy part being the involucral bracts, which are arranged in 4 or 5 series, and are petal-like in character but of stifler texture than ordinary petals. Waitzia is a genus of 7 species of Australian herbs, mostly annuals: lvs. alternate, linear or nearly so; fl.-heads in terminal corymbs or rarely in oblong, leafy racemes; involucral bracts various in outline, the bracts overlapping in many rows, all colored and petal-like; receptacle flat, without scales; anthers provided with tails of microscopic size; akenes somewhat compressed, glabrous or papillose, terminal in a slender beak; pappus of capillary bristles, usually cohering at the base, simple, barbellate or plumose. The genus is distinguished from Helipterum and Helichrysum by the beaked akenes. Flora Australis, vol. 3.

grandiflora, W. Thompson. (The authorship of this species is credited to Naudin by Index Kewensis.) Half-hardy everlasting or "immortelle," annual, exceeding 8 in. in height: lvs. lanceolate, long-acuminate, sessile, green above, slightly villous beneath, prominent midrib beneath: fls. yellow, in terminal corymbs. Fl. 1855-41, where it was originally described. Probably the most desirable of the genus. It seems to have replaced W. aurea, the favorite of the previous generation, being larger-flowered, more robust, and rather easier of cultivation.

W. M.

WALDSTEINIA (Franz Adam, Count of Waldstein-Wartenburg, born 1759 at Vienna; wrote with Kitaibel an illustrated work on rare plants of Hungary; died 1823). Rosaceae. The Yellow or Barren Strawberry, Waldsteinia fragarioides, is a little plant that looks much like a strawberry plant, but it has yellow flowers and bears no edible fruit. It is a hardly North American tufted perennial herb, about 4 in. high, with glossy lvs. composed of 3 wedge-shaped lfts. and 5-petaled fls. less than ½ in. across. It comes with the first rush of spring, and continues to bloom until summer. There is no satisfaction in growing only a few plants of this wild flower. The plant is appropriate to the rockery, where every effort should be made to induce it to form a dense mat. Masses of the Yellow Strawberry have been used with good effect for edging shrubbery borders, and the plant is listed by several nurserymen.

Only 4 species of Waldsteinia are well known. They are hardy, creeping, perennial, strawberry-like plants: lvs. alternate, mostly basal, long-stalked, entire, lobed, 3-5-cleft or with 3-9 lfts., the lfts. entire or incised; segments offered, barbellate or pinnatisect; petals 2-5 yellow fls.; stamens about as long as the calyx-lobes; staminodia indefinite; carpels 2-6; akenes obliquely obovate, dry or slightly fleshy. Natives of north temperate zone.

fragarioides, Tratt. Fig. 2708. Popular description above. Pubescent or nearly glabrous; lfts. dentate or crenate except at the base, 1-2 in. long; sepal 3-8-fld.: akenes 4-6. May, June. Woods and shaded hill-sides, New England to Minn. and Ind., along the Alleghanies to Ga. B. B. 2:218. R. H. 1890, p. 516. B. M. 1907 and L. B. C. 5:498 (both as Distichia fragarioides).

W. M.

WAKE ROBIN. In England Arum maculatum. In America, Trillium.

WALDMEISTER is Asperula odorata.

WALKING-LEAF FERN is Campylosorus.

WALL CRESS or ROCK CRESS is Arabis.

WALL FERN. Polypodium vulgare.

WALLFLOWER. Consult Cheiranthus Cheiri.

WALLICHA (Nathanial Wallich, 1780-1854, Danish botanist; wrote on plants of India). Palmaceae. Three species of Himalayan palms, one of which, the first described below, is cult. outdoors in S. Fla. and S. Calif., and in Eu. under glass, and the second, while not advertised in America, is believed to be in a few northern greenhouses.

Low palms, cespitose, with short branching caudices, or in 1 species tall: lvs. densely fasciculate, terminal, distichous, scaly, unequally pinnate; segments solitary or the lowest in groups, cuneate at the base, oblong-ovate or oblanceolate, cross-dentate, the terminal one cuneate; midrib distinct; nerves fasciulate; margins recurved at the base; petiole slender, laterally compressed; sheath short, split, with the margins deeply crenate; spadices short-peduncled, the staminate drooping or recurved, ovoid, much branched, densely fls., the pistillate looser, erect; spathes very numerous, slender-coriaceous, the lower ones the narrower, tubular, the upper ones sylmiform, entire, imbricated: fls. medium, yellow: fr. ovate-oblong, red or purple. Stove palms. For culture, see Didymosperma.

Wallchia is allied to Didymosperma. Arenga and Caryota, differing in having 6 stamens instead of an indefinite number. Caryota is the only one of this group with ruminate albumen. Didymosperma has a cup-shaped, 3-lobed calyx, and in Arenga the calyx has 3 distinct sepals.

2708. Yellow, or Barren Strawberry—Waldsteinia fragarioides (×⅔).

DISTICHIA, T. Anders. Caudex 10-15 ft. high, 5-6 in. in diam.; naked: lvs. distichous, 6-10 ft. long, alternate, erect; lfts. 1½ ft. long, 2½ in. wide. Fasced, linear, narrowed to the base, truncate and dentate at the

(1899)
apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy; lvs. disposed in a ½ spiral; fls. in many spiral series. Himalaya.


W. porphyrocarpa, Mart. See Didymosperma.

WALL PEPPER. *Sedum acre*.

**WALNUT** is a name applied to any species of the genus *Juglans*. The Walnut of history is *Juglans regia* (Fig. 2709), a native of southeastern Europe and regions beyond. Etymologically, the word Walnut signifies a nut that comes from a foreign source. It is interesting to note that in this country *Juglans regia* is known as English Walnut, apparently because the imported nuts are likely to reach us by way of England. In eastern North America, the word Walnut usually applies to the native *Juglans nigra* (Figs. 2710, 1193), although it sometimes, but erroneously, designates the large-fruited Hickories. A related species, the butternut (*J. cinerea*, Figs. 2711, 1194) is sometimes called White Walnut. The Black Walnut (*J. nigra*) is often planted on roadsides and about yards, but it is scarcely a horticultural product yet. A very similar species in California is *Juglans Californica* (Fig. 2712), which makes a fine large tree and often bears excellent nuts. The eastern *J. nigra* was early introduced into California and it seems now to be common. In fact, it is sometimes difficult to distinguish the two species. The Californian species attains a height of 50 ft., making a broad-topped handsome tree. Commercial Walnut culture is concerned with *J. regia*, and this culture is practically confined to California. The species is hardy even as far north as parts of New York, and in the Middle and Southern states it often bears well, but its culture is not attempted on a large scale in the East. The Japanese Walnut, *J. sieboldiana* (Figs. 1190-8) is now becoming known in the East and it is perfectly hardy in central New York. It is a handsome tree, but probably will not become an important fruit tree. For the species of Walnuts, see *Juglans*.

**2709. Juglans regia, the Walnut of commerce (× ½).** Often known as the "English" Walnut.

**WALNUTS IN SOUTHERN CALIFORNIA.** Fig. 2713. The Walnut industry in certain limited areas of California occupies a place second only to the growing of citrus fruits. About 6,000 tons will be exported from California the present season (1901), which will be worth f. o. b. California more than one million dollars.

Commercial Walnut culture is confined to four southern coast counties of California—Santa Barbara, Ventura, Los Angeles and Orange. For this there are good and sufficient reasons. Although called the "English" Walnut in this country, the climate of England is not very well suited to its production, and the greater part of the product in that country is used in the manufacture of pickled Walnuts. The Walnut is fairly hardy when dormant, but very tender when growing. Therefore, no place subject to late spring frosts can grow Walnuts with success. The extension of Walnut culture into the more northern coast counties of California must be done by planting varieties which lie dormant until the time of the spring frosts is past. The immature nut is also very tender, and cannot endure very hot weather. Even in the coast counties a small percentage of the crop is often destroyed by hot weather, and the hot interior valleys of southern California, or places very distant from the ocean, do not produce Walnuts. The area of successful production is still further limited by the requirement of well-drained and deep alluvial soil for the tender roots. Any soil of a clayey nature or underlaid with a hard clay subsoil will produce only stunted trees, while on soil where the water comes nearer than twenty feet of the surface the trees will grow only a few years, hardly long enough to produce a full and profitable crop.

In nursery practice the nuts are scattered at a distance of about 1 ft. in drills 4 ft. apart, late in the fall, in soil that has been deeply plowed. As soon as a sufficient number of the plants break through to distinguish the rows, the cultivator is run through to kill the weeds. The young seedlings are irrigated and cultivated frequently during midsummer, the object being to force them as much as possible and yet harden them before winter. During the first year the seedlings reach a height of 5-12 ft. The taproot, however, grows down from 5-8 ft. If grown in the nursery the second year, they are treated in the same manner, and usually reach a height of 8-12 ft. Of late years the practice of grafting has been growing in favor. The 1-year-old seedlings are root-grafted, just as they stand in the row. The grafts will grow about 8 feet in one year. Grafting is much more successful than budding. When trees are budded, ring-buds are used, and the tie is a strip of waxed cloth.

The trees are planted in orchard form at either 1 or 2 years of age, preferably the latter. They are usually set in squares 50 ft. apart. The trees make very little
growth the first year, many of them not more than 6 inches. After this the growth is rapid. The trees are tied to stakes with strips of cloth, since they are very tender when growing, and the swaying of the tree by the wind quickly causes any stake to cut through the bark. Walnut trees are pruned very little. At first small limbs are allowed to start about the trunk, but later these are pruned off to a height of 4 feet. Some of the longer growths are shortened back, while the trees are young; and after they are older the low limbs which bend down in the way of cultivating are removed.

The Santa Barbara Softshell begins to bear the third year from planting, but does not produce profitable crops before the fifth or sixth year. Proficiency in bearing is not a desirable quality in Walnuts, since no Walnut tree will produce a profitable crop until it attains sufficient size to support it. Hardshell trees do not bear as young, and they are not regular bearers.

Walnut orchards in California receive thorough tillage. They are heavily irrigated in winter, and plowed about 8 in. deep in the spring. After this they are irrigated and cultivated until the nuts begin to fall,—about the 1st of September. Late irrigation fills out the nuts and causes the hull to open readily. Heavy fogs are also desirable during harvesting. The nuts are shaken down and picked up. They are then spread in trays about 5 in. deep until dry, when they are bleached and shipped to market. Walnuts were formerly bleached with fumes of sulfur, but this was found injurious to the nut. They are now usually dipped in a solution of chloride of lime (chlorinated lime) and sal-soda, to which a sufficient amount of sulfuric acid has been added to set free the chlorine.

The majority of Walnut-growers are organized into local associations. Representatives of these associations form the executive committee of the Southern California Walnut-Growers' Association. This executive committee provides the form of contract which the local associations may enter into with brokers, and fixes the price. The local associations are managed in several ways. In some the growers bleach their own crop, while in others the association performs this work at its own packing house.

The Walnut tree has very few pests. The red spider sometimes attacks the trees, but it is not considered a serious pest. Of late years a bacterial growth has developed to a considerable extent which is more serious. This attacks and destroys the immature nut and the small limbs of the tree.

Arthur Staley.

THE WALNUT IN CENTRAL CALIFORNIA. Walnut-growing is quite rapidly extending in both the coast and interior valley regions of Central California and is also successfully accomplished in favorable situations in the foothills up to an elevation of 2,800 ft. There are also many large and numerous native and prolific trees in northern California and southern Oregon. This northward extension of the native and naturalized Walnut growing is conditioned upon the use of the best French varieties and the rejection of the varieties popular to the chief commercial districts in southern California, viz., Preparuturienis, Mayette, Chaberte, Parisienne, Francois, etc. These varieties are hardier in resistance of frost and leaf-burn from summer heat. They are largely root-grafted upon the seedlings of the California Black Walnut in the nursery and are also being top-grafted upon old native trees.

E. J. WICKSON.


WALNUT BACTERIOSIS.—Chief among the more serious diseases of Juglans regia in the United States is a bacterial blight of the nut, branch and leaf of that tree. This blight now has its greatest development along the Pacific coast, especially in Orange and Los Angeles counties, California. The germ which causes this disease is a newly described species of Pseudomonas (P. juglandis). Different effects of the disease are shown in Fig. 2714.

The organism of Walnut bacteriosis winters in the fallen nuts, in the diseased tissues of affected branches, and especially in the pith cavity of the latter. Now infections occur as soon as spring growth begins, taking place near the growing point of branches, in the opening leaves, and upon the young and tender nuts. The finer lateral veins of the leaves and the adjoining parenchyma are destroyed, and the midrib is often affected. The injury resulting from infection of the branch will largely depend on the tenderness of the latter at the time and point of infection. If the tissue is tender a canker-like spot will be eaten through to the pith, or the entire end of the shoot may be destroyed. If the nut is infected while small, its complete destruction usually follows, the digestive action of the germ involving hull, shell and kernel. Nuts infected early in the season mostly fall when small, while later infections frequently result only in the destruction of the hull and the blackening of the outer layers of the shell, the tissues having become too hard for the further progress of the disease. As in the case of pear blight, rapidly growing trees are more subject to injury than those making a slower and harder growth. The spread of the microorganism through infected branches is generally only local—it rarely extends more than a few inches from the point of infection. A marked blackening of the injured parts results from the rapid oxidation of the tannic acid they contain, though this is not distinctive of injury from this disease. Pseudomonas juglandis is actively motile; hence fogs, rain or dew aid in its spread and increase the number of infections. The water of irrigation may carry the germ for miles.

The destruction of the tissues of the Walnut is effected
by means of two fermenters or enzymes secreted by the organism. One is a diastatic ferment which converts the starch of Walnuts into grape sugar; the other is a peptizing ferment which digests the proteids of the cells. The action of these fermenters becomes manifest in the development of a water-soaked band immediately surrounding the margin of the blackened infected spot if the disease is active, and this appearance readily distinguishes this malady from all other injuries to the nut or branch. As the secretion of the two fermenters depends largely upon a temperature of 65° to 75° F., a much lower temperature is unfavorable to the destructive action of the blight upon the tissues, and when such low temperature prevails the infected points are likely to be cut out through the action of the cells of the Walnut.

The losses from Walnut bacteriosis are often heavy, especially in individual orchards or special localities. A loss of 50 per cent of the crop is not uncommon, and occasionally as high as 80 per cent of the nuts are affected in badly diseased orchards.

The treatment of this Walnut disease has been found to be difficult, but the spraying of the dormant tree has shown a considerable saving when Bordeaux mixture is used. It has also been learned that the hardshell Walnuts are comparatively free from this disease, and that certain softshell varieties are so nearly free that the grafting of nursery stock from these resistant trees is contemplated for new orchards. As no species of Walnut except J. regia has thus far shown this disease under natural conditions, many hybridizations have been undertaken in hope of obtaining resistant and satisfactory trees by this means.

NEWTON B. PIERCE.

WALNUT, INDIAN. *Aleuria triloba.*

WAND PLANT. *Galax aphylla.*

WANDERING JEW. *Zea marina pendula* and *Tradescantia fluminensia.* Also *Saxifraga sarmentosa.*

WARATAH. *Telopea speciosissima.*

WARDER, JOHN ASTON, physician, author, horticulturist and forester, was born at Philadelphia, January 19, 1812. His early life was spent in a suburban home, where he evinced a love of nature which he cherished through life. Bartram and Darlington were among his neighbors and he met in his father's house men like Audubon, Michaux and Nuttall. In 1830 his parents moved to Springfield, Ohio, where he helped clear up a farm and first became interested in agricultural sciences and comparative anatomy. He was graduated at Jefferson Medical College, Philadelphia, in 1836. He settled in Cincinnati in 1837 and began the active practice of medicine. He was early elected a member of the school board and did faithful service for his city. After a brief period of time he gave up his business to travel through the eastern states and cities to study systems of teaching in order to introduce improved plans into the Cincinnati schools. He was actively interested in a profound interest and was a member of the Cincinnati Astronomical Society, the Western Academy of Natural Sciences, the Cincinnati Society of Natural History. He was one of the founders of the Cincinnati Horticultural Society and was its first president. He was also prominent in the old Cincinnati College and afterward in both the Ohio and Miami Medical Colleges. He was for many years president of the Ohio Horticultural Society and vice-president of the American Pomological Society. He was among the first to draw public attention to the improvement of public grounds, private parks and cemeteries. The present interest in landscape gardening in this country is largely due to his efforts and writings. He was interested in establishing the famous Spring Grove Cemetery, one of the earliest and best of landscape or lawn cemeteries, and was one of the first residents of Clifton, where he settled. He moved to a farm near North Bend, Ohio, formerly owned by President Harrison. There he spent most of his time in testing varieties of trees and fruits, and in the propagation of rare and choice plants, and prepared numerous practical papers for horticultural societies and other readers, and in fact established a private experiment station.

In 1850 he began the publication of the Western Horticultural Review, the Western Woodlands, and the Western Medical Review, which continued for several years. In one number is contained the first description of the Catalpa speciosa, now recognized as one of the valuable forest trees. His report of the Flux and Hemp commission, published by the government in 1865, was the result of much patient study and investigation. "Hedges and Evergreens" appeared in 1858. "American Pomology—Apples," published in 1867, was the result of more than 15 years of careful study, aided by hundreds of correspondents in various parts of the central states. It is still considered a standard authority on the subject of apple culture.

A report upon Forests and Forestry was the result of his visit to the World's Fair at Vienna in 1873, as United States Commissioner. In 1875 he issued a call for a convention at an intermediate point for the purpose of forming a society for the propagation of hardwoods, and the Ohio State Forestry Society, which organization was completed at Philadelphia in September, 1876. The public was not yet impressed with the importance of the subject, but this pioneer association gave impetus to the plans for united effort. In 1879-80, with the approval of various societies, Dr. Warder memorialized Congress, asking for a commission in 1881 for the study of forestry in Europe, but general interest was not thoroughly aroused until, largely through his efforts, the American Forestry Congress held its meeting in Cincinnati in April, 1882. He was honorary president of the Ohio State Forestry Society, prepared strong memorials to Congress on behalf of the forest service, and was shortly afterward appointed agent of the Department of Agriculture to report upon forestry of the northeastern states. He was devoted in his interest in all which concerns rural life and industry; his efforts had a great and marked effect on the horticulture and outdoor art of the country. Death ended an active and useful life July 14, 1883.

R. H. WARDER.

WARDIAN CASES are nearly air-tight glass cases used for transporting growing plants on long journeys. They furnish the best and safest method. They furnish the necessary light, protect the plants from salt spray and foul gases, and require a minimum of care, as the plants need no watering. They maintain nearly uniform conditions of tempera-
ture, moisture and atmosphere. Similar cases are also used in greenhouses for growing filmy ferns, dwarf foliage plants and other small specimens that require a very moist and close atmosphere. They were invented about 1836 by N. B. Ward, who wrote a book of 95 pages "On the Growth of Plants in Closely Glazed Cases," published at London in 1842.

WARCEWICZELLA. See Zygopetalum.

WAREA (named for Frederick Warre, who discovered the first species in Brazil). Orchidaceae. Lvs. few, long, plicate: scape tall, bracted, bearing a raceme of terminal, showy sepals and petals subequal, concave, the lateral sepals united with the base of the column; labellum not spurred, united with the base of the column, undivided, concave, with longitudinal ridges: column without appendages; pollinia 4, with a narrow stigma. Plants with the habit of small forms of Phaius. They require the same treatment as that genus.

bidentata, Lindl. ([W. Lindeni

WASHINGTON, Horticulture In. Fig. 2715. The state of Washington may be said to have two distinct climates, that to the west of the Cascades, and that to the east of this range of mountains. The climate of western Washington may generally be said to be very temperate. There are no very great variations in temperature. The summers are cool, and in some parts somewhat dry. The winters are warm, or at least not cold. In some parts of western Washington the rainfall is abundant, amounting to 70 or 80 inches; in other parts the annual rainfall does not exceed 25 inches. Those portions of western Washington not bounded on the east by the Olympic mountains are subject to a much greater rainfall than those parts lying immediately east of these mountains. Thus, parts of Jefferson county and of Island county are comparatively dry, even though on what is known as the wet side of the mountains. The whole of western Washington is a vast forest; yet there are numerous valleys in which trees do not grow. The natural forest growth is coniferous, except along the waterfronts where there is a considerable growth of deciduous trees, such as alder, poplar, willow, etc. In a few places scattering specimens of oak, ash and maple are found. Vast areas of land have been reclaimed from the sea, or at least from Puget Sound, and these tide-lands are amongst the best in the state. The summers are comparatively bright and dry, the winters wet and almost sunless.

In eastern Washington a wholly different condition exists. The desert is bright, the temperature high, and during the months of June, July and August practically rainless. Eastern Washington has a varying rainfall. Those portions immediately east of the Cascade range have a very scanty rainfall, but the eastern borders of the state the rainfall becomes greater. In and near the Yakima valley, the rainfall is from 4-6 in. per annum. As we go east the rainfall becomes greater, until at the eastern borders of the state it is greater than 40 inches, quite sufficient in this climate to produce good crops. Altitude has a marked influence on the climate of eastern Washington. In the valleys of the Columbia and Snake rivers, from 400 to 600 feet above sea-level, the summers are long, and hot, and in these portions severe frosts are not felt. In these low valleys the tenderer fruits grow to perfection, but of these there are only a few thousand acres. There are two large valleys; viz., the Walla Walla and the Yakima, each having an altitude of about 1,000 feet, where the winters are more severe. Fruit trees often suffer in bud and twig, and where vegetation is at a standstill for a longer period in winter than in the lower altitudes. All lands in eastern Washington at a lower altitude than 1,500 feet must be irrigated to produce crops. The larger portion of eastern Washington, and especially that bordering on Idaho, is high, ranging from 1,800 to 2,600 feet above sea. It is in these high portions that there is rainfall sufficient to raise good crops without irrigation.

The whole state is rolling. The Cascade range cuts the state into two very unequal parts, the larger part lying to the east. The watercourses, for the most part, run deep channels, and the table-lands are anything but level. The soil varies from the deep basalt clay loams to the volcanic ash, and from the sand and silica of the river bottoms. The higher lands grow the hardy fruits to perfection; the river bottoms grow the peach, apricot and the grape, while midway between these is grown a great variety of fruits, garden products and alfalfa. The best wheat lands are the heavy clay soils at an altitude of about 2,000 feet.

Fruits.—The state of Washington is fast coming to the front in fruit production. There are now planted within its borders about 80,000 acres of fruit. Whittman county, on the eastern border, has an average of 5,000 acres planted to fruits, mostly apples and prunes. Clark county, on the west of the range, is the greatest prune producer. The Puyallup valley, close to Puget Sound, is the leading small-fruit section, but the whole state is adapted to many of the fruits. The counties producing the largest amount of fruit are Walla Walla, Yakima, Whittman, Clark, Spokane and Kittitas. The islands of Whidbey and Orcas are famous for their fruits. Of the 80,000 acres growing within the state, 25,000 acres are in prunes, mostly Italian, 40,000 in apples and the remainder in plums, cherries and grapes.

Pears.—The Italian prune (Pellenberg plum) is planted in great numbers on both sides of the state. Clark county has not less than 5,000 acres planted to
this fruit, and is still planting more. There is no other portion of the United States, and perhaps not in the world, where this variety is so largely planted. There is a demand for a large, somewhat acid prune, and the Italian is satisfactory. The demand is growing and new markets are constantly being opened up.

The French prune (Agen, Prune d’Agen, Petite, etc.), is planted in considerable numbers, but nothing like the Italian. Washington seems to be unable to compete with that which comes from the low warm valleys of the Snake, the Columbia, Walla Walla and Yakima. The Harvest is the great supplier of early high class plums of the Flemish Beauty. For fall and winter, Anjou, Clairette, Easter and Winter Nelis are largely grown. Pears have been successfully shipped from the Pacific coast to Liverpool and London. The prune industry is not receiving the same attention as the planting of plums, yet a number of acres are annually added to the orchards of the state.

Plums.—Certainly nowhere on this continent is the plum more at home than on the Pacific coast. Unfortunately plums are not profitable. At present there are no canneries to take care of the surplus fruit, and most of the plums are poor long-distance shippers. There is a local demand for a considerable quantity of plums, but great quantities annually go to waste under the trees. The varieties mostly planted are Washington, Jefferson, Peach, Pond, Lombard and the Damsons.

Cherries.—Sweet cherries grow to great perfection in all portions of the state, but especially so in the Puget Sound region and in the warm valleys of the east side. Some new varieties, natives of the coast, notably Bing, Lambert and Lewelling, give great promise, and already are leaders in the markets of the West. These new varieties also grow and yield abundantly. Sweet cherries attain their greatest perfection at an altitude of about 1,000 feet. Sour varieties do best on the high lands, at an altitude of about 2,000 feet. Cherries have been found to be profitable, yet few new plantations are being set. The reason for this is probably to be found in the later market, it being almost impossible to get the necessary help to care for a large crop of cherries.

Grapes are not planted to the same extent here as in the eastern and middle states. The native varieties do not seem to succeed so far north, except in favored spots. In the low warm valleys of the Snake and Columbia all varieties seem to do well. Even the European (Vitis vinifera) here grows to perfection, and usually receives no special winter protection. These Old World grapes are fairly profitable, the local market usually being good.

Small Fruits.—The raspberry, blackberry, dewberry, strawberry and gooseberry all do well in the state. In some sections of western Washington these fruits are grown in great quantities and are mostly shipped to the Montana markets. While the prices realized are not large, the crops are so abundant that small-fruit farming pays well.

Cranberries grow in the coast counties and on some parts of Puget Sound. Where suitable land is found the returns from cranberry culture are said to be very satisfactory.

Cauliflower and Cabbage Seed.—The production of these seeds is now carried on in an extensive way on Lacooner Flats (reclaimed tide-lands) on Puget Sound. The demand is good, and the crop profitable. Cabbage and onion seed is produced in small quantities.

Bulbs.—At Whatcom, Whatcom county, an attempt is now being made to cultivate what are known as Holland bulbs. There are two establishments engaged in growing hyacinths, tulips, narcissus, etc., and the results are promising. Tulips make a large number of bulbs, and hyacinths propagate freely by the same methods practised in Holland.

Horticulture, as an occupation, may be said to be profitable within the state. It is true, markets are at a great distance, but the mines in Idaho, Montana and
Plate XLVIII. Washingtonia filifera, the most characteristic palm in California
British Columbia take great quantities of fruit and vegetables. Shipments of perishable fruits have always been found to be profitable, but the state has been sitting up, and the outlook for the horticulturist is very bright.

J. A. BALMER.

WASHINGTON GRASS. See Cabomba.

WASHINGTONIA (named for George Washington). Pulmonarce. Tall palms, with the robust trunks clothed above with remains of the sheaths and petioles: leaves terminal, ample, spreading, orbicular, flabellately plicate, lobed nearly to the middle; segments induplicate, filamentous on the margins: rachis short; ligule large, appressed: petiole long, stout, plano-convex, very spiny along the margin: clefts on the sides of the segments 2-4, branched, glabrous; branches slender, flexuous; spathes long, membranous, split, glabrous: fls. white: fr. small, ellipsoid, black. Species 3. Ariz., S. Calif. and Mexico.


robusta, H. Wendl. (Washingtonia Sonora, Hort. in part). Stem: more robust: petiole shorter and more densely spiny, the young plants with yellow spines and black-violet sheaths and petioles, at length brown: blade light green, 3½ ft. long by 3½ ft. wide: segments 60. Western Mex. G.F. 38:49. R.H. 1885, p. 106.

Sonora, Wats. Stem 25 ft. high, 1 ft. in diam.: 1½ yrs. 3-4 ft. in diam., somewhat glaucescent, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, ½ in. at apex, flaccose-hairy along the margins and with stout curved spines: fr. ½ in. long, elliptic. Mex.

JARED G. SMITH.

FURTHER NOTES ON WASHINGTONIA.—Our nursery catalogues show that the identity of the three species of Washingtonia is a matter of conjecture in the minds of growers. In middle California there are two distinct types in general cultivation: (1) the one having very filamentous deeply cleft leaves, long (3-5 ft.) petioles with yellow margins and spines, which is the Colorado Desert species, W. filifera, Wendl.; it is less hardy in San Francisco than W. robusta, suffering from cold winds and fogs and often rotting at the center of the growing part. (2) The species with more robust habit, the growing part of the stem shorter and therefore more distinctly conical, dark leaf-sheaths, short, stout petioles with brown, often very dark margins and spines, and shorter, more rigid, less deeply cut and often less filamentous leaf-blades, which is the one from Mexico and Lower California, W. robusta, Wendl. (W. Sonora, Hort. Calif. in part). This dark color of the petiole margins and spines is equally noticeable in the young as well as in older specimens. Comparative study of the specimens may perhaps establish this palm as a mere geographical variety of W. filifera, but we have not been able to study flowering specimens. It is certain that a part of the material offered by nurserymen under the name of Washingtonia Sonora is really W. robusta. Its greater hardness in the climate of San Francisco shows that Washingtonia robusta is by far the most desirable species for cultivation along the coast of middle California.

All the foregoing data give evidence that many of the specimens in cultivation in the San Francisco bay region have originated from Mexican seed and are not, as is sometimes suggested, mere cultural varieties developed from seed of the typical form of the Colorado Desert. According to Charles Abraham, for many years proprietor of the Western Nursery, San Francisco, seed of Washingtonia robusta was introduced some twenty-five years ago by Mr. Stessovitch, a commission merchant of San Francisco, from the coast of Mexico near Guayas. Of the trees raised from this seed there is a specimen at Abraham's nursery, and Mr. Abraham states that there is a fine one in the grounds of St. Ignatius College, San Francisco, and another at the Crocker residence in Sacramento. The latter has already matured seed, from which Mr. Abraham has raised a young plant. In the old Bolton garden at Greenwich and Jones streets, San Francisco, there were growing until this year several well-marked specimens. According to Miss Lizzie Bolton, these were raised from seeds presented to her mother, Mrs. James R. Bolton (formerly Mrs. Estrada) by friends who brought them from Mazatlan. These specimens are now in Mr. Abraham's possession. A third importation of seed was made by Mr. John Rock, manager of the California Nursery Co. at Niles, but we do not know whence it came. Washingtonia Sonora is rarely seen in cultivation, though frequently mentioned in nurserymen's catalogues, and it is certain that much of the material offered under this name is really W. robusta. In his "Flora of the Cape Region of Baja California," in Proc. Calif. Acad. Sci., series 2, vol. 3, pp. 105-112, Mr. T. S. Brandegee records that Washingtonia Sonora occurs at La Paz and San José, and notes that "a species of Washingtonia is abundant in the canons of the mountains and may be this one." A few years ago Dr. Gustav Eisen is reported to have collected seeds of a Washingtonia at La Paz, which were handed to a gardener in San Francisco for propagation; some of the seedlings were obtained by Mr. Abraham, but only one survived; this specimen shows the characteristic slender petiole and glaucous leaf of the true W. Sonora. This variety appears to be much less hardy under cultivation than W. robusta.

From the above notes it would appear that both W.
Sonora and W. robusta are found along the Pacific slope of Mexico, on the mainland or on the peninsula of Baja California. While the type locality of the former is given as Guaymas, on the mainland of Mexico, the few specimens in cultivation have come from the peninsula, and though the type locality is not certainly known, most of the specimens in the trade apparently came from Guaymas and Mazatlan on the mainland.

In cultivation in California Washingtonias respond gratefully to an abundance of water during the dry season. It is a mistake to suppose that because they are desert plants they will thrive without moisture; on the borders of the Colorado desert, where they grow in abundance and luxuriance, they occur beside saline or brackish springs.

Jos. Burt Davy


WATERING. An abundant and convenient supply of pure, fresh water should always be a first consideration in locating a garden or greenhouse. Having this, the next matter is knowing how to use it, for here, good gardeners say, lies nine-tenths of the elements of success. Certain it is, especially in the indoor cultivation of plants, that more depends upon knowing when to give or withhold water than upon any other single matter. The art of watering is unteachable; it requires experience, judgment, skill. Some knowledge of the commoner facts of vegetable physiology, physics and soil physics will be helpful, but even then experience will be necessary. Two common types of watering cans are shown in Fig. 2718. In American gardens, however, watering is usually performed with a hose from a stored water supply.

General Rules.—A fairly safe guide is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough watering. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, a useful test is to thump the jar. If it rings the soil is dry; if the sound produced is dull the soil is sufficiently moist. Such rules, however, are only for the novice. They presuppose activity of growth, and take into account only one consideration aside from this, and that is the condition of the soil as regards moisture. The experienced gardener reads his practice in his plants and the conditions under which they are being kept. The following suggestions are based upon the most important considerations.

Actively growing plants may be watered very freely, as a rule, whereas in a dormant or semidormant state the same plants will require only occasional waterings.

So-stemmed or rapid-growing plants ("soft-wood" and "hard-wood" plants), and those with large leaves, need, as a rule, an abundance of water when growing actively. Hard-wood or slower-growing plants, with smaller leaves, must be watered with greater care. Soft-wooded plants, with some exceptions, may receive flag somewhat for want of water, and recover without permanent injury when a fresh supply is given. Hard-wooded plants, as camellias, azaleas and heaths, on the other hand, suffer permanent injury from becoming too dry. It is safest to allow no plant in active growth to flag.

The amount of foliage affects the plant's capacity for using water. Plants which have been cut back, or which from disease, insects or other causes, have lost most of their foliage, must be kept drier until they have regained their foliage.

Unhealthy plants are benefited, as a rule, by being kept rather dry until they begin to show signs of renewed vigor.

Small cuttings, or any plants freshly potted or newly transplanted, are not in condition to use much water until the root-hairs have attached themselves to the soil-particles and growth has begun. A thorough watering at the time of potting or repotting the plants, especially if they are subsequently shaded for a few days, is usually sufficient until they have become established.

The character and bulk of soil should be kept in mind. Porous and warm soils dry out much sooner, while the heavier clay soils are in danger of becoming water-logged and soon, unless watered freely, are likely to rot. When there is a large mass of soil in proportion to root development, as in the case of greenhouse beds newly set with young plants, care must be used in watering until the soil is occupied with roots.

Serious trouble often begins in the greenhouse from a heavy watering at the beginning of a period of dark, muggy weather. Not only does such watering do damage to the soil and roots, but the excessive humidity of the air about the plants and its weakening effect upon their tissues, invites the attacks of various mildews, fungi and insect pests.

The time of day is important. In the greenhouse it is a matter of principle to have free ventilation. It is seldom advisable to let plants go into the night with wet foliage. It gives the fungi a chance. Especially hazardous is it to water cutting benches or boxes of young seedlings late in the day in the winter season. The various damping-off fungi find under such treatment the condition suitable for their development. Excessive humidity on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is large and renders the air of the house drier. During summer, when it is frequently necessary to water daily, the ventilation may be advantageously done late in the day. Midday watering at seasons when
the sunshine is very bright is often followed by scalding of the foliage unless the plants are well shaded. Ferns, Rex begonias, Chinese primroses and richardias are among plants easily injured in this way.

Consider the temperature. The temperature at which the plants are kept, the position of the heating pipes, the amount of light, and the freedom of ventilation permissible, need to be kept in mind in watering plants in glasshouses. It is better, as a rule, to have the watering conform to these conditions; but frequently the practice must be reversed.

Experiments by the writer show, beyond question, that the temperature of water used in watering plants exerts a marked effect upon the growth, flowering and fruiting of plants. It is now held that, in general, the water should be at a temperature close to that of the air in the house where the plants are growing, or about 10°F. below.

Watering may be indirect. Shading the glass of greenhouses in summer with some suitable material is much practiced by florists for the purpose of sheltering plants from too great intensity of light, and for the purpose of reducing evaporation and transpiration. Certain kinds of plants, as palms, and some kinds of ferns, require this; also newly potted plants. Syringing of walks, by reducing the temperature and increasing the humidity of the air, also tends to reduce transpiration and save watering. Watchfulness and attention to ventilation are necessary, however, to avoid excessive humidity, which tends toward a soft watery growth and extreme sensitiveness and susceptibility to disease.

Vessels to contain plants should always be provided with openings at the bottom for perfect drainage. This, in a measure, is a safeguard against overwatering. Investigation has shown that a soil which is kept continuously wet through bad drainage or otherwise is rapidly impoverished through loss of nitrogen. A fermentation is also set up in the roots, which through the formation of alcohol and other products, results in their destruction.

While a constantly wet soil is always very objectionable, thoroughness in watering as often as the plants need water is of the greatest importance. When enough water has been supplied there will be more or less dripping from the bottom of the pot. It is a good plan to leave a space of ½-2 in. or more at the top of the pot for the reception of water. This space should be so large that when filled, the supply of water in soaking downward will penetrate to the bottom of the vessel. See also, Greenhouse Management, p. 696.

2718. Watering-cans.

The can on the left, flattened on the sides, is generally preferable. It can be carried in greenhouse walks and in narrow rows. The long spout enables the operator to apply the water directly to the roots; and the sprays of the discharging water makes a better spray from the rose.

Subwatering.—A method of watering known as "subwatering" has been made use of in recent years for supplying moisture to plants growing in beds. W. W. Green, of the Ohio Experiment Station, was one of the first in this country to point out, as the result of experiments, some of the advantages of this method of applying water. The essential features of this system are a light-tight bench, with earth-colored tile placed in rows upon the bottom either crosswise or lengthwise to the bed. Soil is placed about and over these. Openings into the runs of tile are left at convenient points. Water poured into these openings runs along the length of the tile and is carried through the soil by capillarity—thus moistening the soil from below upward. In beds over 50 ft. long a fall of 2 in. every 50 ft. is recommended. See Figs. 1182-3, Vol. II.

J. C. Arthur has experimented with a plan which, in many respects, is an improvement upon the "tile system." Here porous brick, having the lower edges cracked off, are placed edgewise and close together over the bottom of the bench. The shattering of the brick meets that of its neighbor. A network of channels is thus formed over the bottom of the bed, whereby water is distributed over the entire bottom. Capillarity carries the water upward, through the layer of bricks to the soil resting upon them. The amount of water applied at a given time is indicated by a gauge near the edge of the bench. This consists of a U-shaped tube, placed at some convenient place, having one end inserted through and soil the bottom of the bench; the other rises an inch or so higher outside the edge of the bed. Carnations and lettuce have given excellent results grown by this method of subwatering.

Subwatering in connection with borders in the open ground has also proved very advantageous. It tends to prevent the formation of a crust on the surface of the soil, and keeps it loose and porous, carrying the soluble plant-foods upward instead of downward. For further notes, consult the article Irrigation.

Watering Lawns and Flower-Beds.—In watering beds in the open ground, and lawns, the chief thing is thoroughness. Superficial waterings induce the formation of roots near the surface. Neglect then proves more disastrous than ever. The evening is the best time for surface sprinkling. Watered in the heat of the day, grass and various other plants are likely to have the foliage injured. Ordinarily it is better to avoid watering beds of plants in the open ground if possible or delay it until really necessary, and then water thoroughly. ERNEST WALKER.

Plunging.—While it is true that most of the water given to the plant passes through the soil and escapes from the hole in the pot, yet a part of the water is left in the soil,—which is considerable if the soil is saturated as it should be,—is evaporated from the porous sides of the earthenware pots. In warm sunny weather the plants in small pots standing on bricks, dry out very quickly. This can be avoided by plunging the pots in some material, as coal ashes, tan bark, or, better than all, spent hops. When plunged to the rims, only half of the surface watering is needed, and the advantage of less watering is shown by a marked improvement in the health and vigor of the plants. Such a benefit is this plunging that plants which would otherwise need a shift into a size larger pot, can be carried along another month in perfect health. This applies more particularly to quick-growing, soft-wooded plants, geraniums more especially, for these are quickly exhausted by too frequent waterings.

WILLIAM SCOTT.

WATERLEAF, Hypophyllum. W. Lemon. See Par...
There is probably no country in which the Watermelon is grown to such a large extent as in the United States. All the central and southern states can grow Watermelons to perfection, and there are some of the short-season varieties that thrive well as far north as New England. It is always important that light and "quick" soils be selected for the Watermelon, but this is particularly true in the northern part of the country, since the plants must get off very early to grow sufficiently in order to mature in the short seasons. It is probable that a well-matured Watermelon raised in the North has as good quality as one grown in the South. Some persons believe that seeds from melons grown in the southern states do not reproduce in the North, and cultivate the melons grown in the South. The Watermelon is generally not so adaptable to the northern states as the muskmelon is, and is not so largely grown. The Watermelon can be so cheaply grown in the South and the West, and it transports so readily, that there is practically no Watermelon growing for profit in the northern states. Nearly every home garden can grow its own supply. The seeds may be sown directly in the open ground; or, in the northern sections, it is better to start them indoors in transplanting boxes or on the soil, as explained under Masknelon and Cucumis. It is well, also, in the southern states, to use rather freely of some quickly available fertilizer in the hill, in order to start the plants off early. If the lands are loose and loamy and likely to drain the water off, or if the other hand, they tend to become lumpy, it is well to make "hills" by mixing one or two large shovelfuls of manure with the earth; but it is important that this manure be short and well rotted and then very thoroughly mixed with the soil. If the manure is coarse and not well incorporated with the soil, the hill is likely to dry out and the fertilizing elements are usually too tardily available that the plant does not get a quick start. The smaller-grown melons may be planted as close as 2 or 8 feet, but it is customary not to plant them closer than 8 feet either way. In the South, where general field practice is employed, the melons are usually planted about 10 feet apart. The fleshy beetles and the striped cucumber beetles are likely to be serious on the young plants. Hand-picking and thorough spraying with Bordeaux mixture and Paris green are the most available remedies. In the northeastern states, the Georgia Watermelon is chiefly known, although nearly all parts of the South grow the melon with satisfaction. Lately very large melon industries have developed in Colorado. A very large part of the United States is really well adapted to the commercial growing of the Watermelon. The common Watermelons are used as dessert fruits. However, there is a race of hard-fleshed very firm melons that are used for the making of preserves (Fig. 2729). Such these are usually treated as the true citron of commerce, they are commonly known as citrus. They come true from seed.

**Watermelon Culture in Georgia.**—The Watermelon is the only important fruit or vegetable that has no valuable by-products. Its saccharine matter cannot be profitably converted into sugar. Its enormous reservoir of juice or sap refuses to be turned into vinegar or wine as some reactive instead arctic or fermentation results. For this reason, also, it does not, like the cantaloupe, produce a good brandy when distilled. Its substance cannot be successfully used in any of the nutrition—serving, at best, as a mere diuretic or digestive.

**Habitat and Distribution.**—Throughout the entire territorial region of the Atlantic and Gulf states, from the southeastern to a certain extent southward, they grow in large numbers, and are found throughout this vast area—"the land of the long-leaf pine" (and of the wiregrass)—the Watermelon flourishes unrivaled, attaining there its serpentine, fullest perfection. And of this area Georgia in particular is noted as producing not only the bulk of the crop shipped to northern trade centers, but the choicest selection as well.

To a certain limit perfection in the melon is found to directly parallel latitude—regulated and modified, of course, by the corrections imposed by isotherms, geological formation and local conditions and environment. Every year a large export is made from the mainland toward this limit, which corresponds, practically, to the boundary between Georgia and Florida on the Atlantic slope and to the Brazos river in Texas, the peculiarities of that melon enlarging—its size increases, its sugar content increases, its flavor refines and intensifies. Beyond the limit southward, deterioration again begins, progressing with even greater rapidity than in the opposite sections, or northward from the climatic or formal "line of perfection." It happens that the melon of extreme Southern Florida or of the Rio Grande country is little if any superior to its colder and more impasive sister of New Jersey or Long Island. In this the melon follows a fixed morphological rule, prominent emphasized by many familiar products of the garden and orchard.

The "line of perfection" referred to—which, indeed, is ultimately reducible to a focal "point" of perfection—is, like the center of population, liable to change as conditions and methods vary or improve under local development. At present this point or center may perhaps be located with more reason at Vicksburg, in South Mississippi, than anywhere else. Augusta, however, in eastern Georgia, was formerly considered the great center of southern melon production—its very "thrones of empire"—and was, for many years, noted for shipping the largest, choicest and most succulent specimens found in the markets of the North and West.

**Varieties.**—Twenty years ago, and for many years previous, the bountiful if rather startling announcement, "Augusta Rattlesnakes" could be seen invitingly plastered over every progressive ice-dealer's door in all of the big cities of the land. Then crept in the "Kob Gem," an Alabama product, somewhat superseding, though the former for a time, the amount known and esteemed. "Sugarloaf," among the "Queen," a market favorite, and the public began to prefer the round to the oblong form, thought still partial to the "striped rind.

In antebellum days, besides the Rattlesnake only two varieties obtained general recognition at the South for excellence—the Lawton and Cuba melons, with their evaded offspring—the former dark green, the latter belonging to the white or gray type (pale green rind with delicate, darker green tracery) but both of them of oblong shape. These were in great measure gradually displaced by the Georgia (or Augusta) Rattlesnake, and it, as stated, was in turn forced to partially yield precedence to the Kob Gem. The "Round Rattlesnake"form became fully established in public favor by the later advent of the "Jones" type, which soon dominated the market, its refreshing dark green color proving particularly attractive. Selections of this strain, culminating in the "Lord Bacon" and others, each ultimately brought the melon up to its highest perfection, though the Girardian innovations from Florida, such as Florida Favorite, New Favorite and Triumph, still contest their supremacy, while the older standards, as Rattlesnake, Sugarloaf, Sheephead, Scalibark and the like are by no means "back numbers."

Nor have the North and West been altogether side in the work of development, or the development of the "King Rattlesnake" type. New recent introductions among the older strains coming from these sections, Indiana, for instance, gives us Sweetheart and Hoosier King; Cuban Queen, Delaware and Boss come from the Middle States; while Virginia contributes Orange Gem and Conch Gem. Many points combine to form the ideal melon. The scale of excellence for the southern type is probably about as follows:

<table>
<thead>
<tr>
<th>Quality</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color of flesh</td>
<td>2</td>
</tr>
<tr>
<td>Color of rind, or marking</td>
<td>1</td>
</tr>
</tbody>
</table>

| Productiveness | 25 |
| Shipping capacity | 25 |
| Quality | 10 |
| Earliness | 8 |
| Shape | 7 |

Total 100
As southern melons are intended, primarily, for sale, a hard, thick rind, with firmness and solidity of flesh, is a paramount requisite, as it makes a safe shipper and long keeper.

Unfortunately, quality, which is based mainly upon a high sugar content, is generally inseparable from a thin rind and tender flesh—contradictory features to those requisite for a good shipper. This accounts for the relatively inferior quality of such melons as Rattlesnake, Kolb Gem and Jones, which are grown, of course, for distant markets. The metropolitan seldom realizes the supreme lusciousness which it is possible for some of the best local varieties in the South to attain unless he has been lucky enough to test them in the field. Even a Lord Bacon, the best of the shipping melons, cannot stand table comparison with Ramsay, Dixie, Jordan Gray Monarch, Kleckewie Sweets, McVeer Sugar, Phinney Early or Mountain Sweet.

Shape is of minor consideration, if only ordinary symmetry or freedom from distinct deformity is pre-

served, as preference appears to be divided between the round or ovoid and elongated forms, while the marking or color of rind is of still less moment; although of late a solid green tint seems to find a ready market than either the striped or "gray" marking, while an irregular, blotched surface, as with Scalybark or Mount-

tain Sprout, though attached to good quality and size, is distinctly objected to.

With regard to color of flesh, the public is united in demanding a deep red or crimson heart, with few seeds; for white or golden-fleshed varieties have never found favor. They are generally regarded as wanting in character or insipid, although some melons of this type unquestionably attain superior quality.

Little difference is observable between varieties in their capacity to resist disease and insect predation. Vigor of growth depends mainly upon individual cultur-

al methods and little upon variety; nor is there such marked difference in time of maturity between the differ-

ent strains.

Of all the physical features enumerated, size and shipping capacity are by far the most important—togeth

er aggregating 60 per cent of the requisites for an ideal type. Size is almost as necessary as resistant rind, and it is fatal to attempt to ship small melons. Results would be far better if stricter culling should be universally followed.

To summarize: For shipping purposes the following varieties may be confidently listed as superior, in the order named: Lord Bacon, Kolb Gem, and Georgie (preferably Augusta) Rattlesnake. For table or family: Jordan Gray Monarch, Sibley Triumph and Seminole.

For early melons: Memphis, Augusta Sugarloaf and Augusta Rattlesnake.

For late melons: Boss, Scalybark and Sweetheart.

Culture.—While the Watermelon is extremely cosmopoli-

tan and will readily accommodate itself to a variety of soils, and, particularly in its own best region—the "Wiregrass"—will submit to an infinity of rough and unscientific treatment without rebelling, yet a warm, light, gray, sandy soil is its delight, especially when supplemented by a strong clay subsoil that will daily

yield its medium of moisture, little by little, when called on. Like the cat and the grape, the melon cannot bear "wet feet." Still, the soil should not be too dry. Sufficient capillarity must exist to keep the roots of the plants well supplied with their proper amount of mois-

ture, although not enough to cause the external re-

voir of water in the subsoil to enter the atmosphere. A soil too rich in humus is not desirable. Sufficient nitro-

gen for its use can be supplied artificially where it does not exist naturally. Assurably may, and generally does, produce larger melons, but at the expense of quality. They will prove soft, watery and insipid—poor ship-

pers, and with a small percentage of sugar. Therefore, an ideal location for a melon plat on a small scale will be found on the site of a drained hillside or garden spot. "Second bottoms"—the accumulated de-

tritus of hillsides—serve admirably, but creek bottoms or heavy meak of any sort would be no more admissible for the melon than for grapes or peaches.

Rotation of crop area is all-important. Never should two crops of melons occupy the same plat with an inter-

val of less than three years between them. In that time, insect depredateors, attracted by the first melon crop, will probably have become exterminated, and the drain from the soil of specific plant-food (especially potash) will also have been, to a great extent at least, made good.

Preparation of the land should be thorough, but not necessarily deep. The roots of the melon extend quite a distance under ground laterally, but close to the surface. The deeper the land is broken, the deeper the roots will be induced to penetrate, distorting natural habit and producing surplus vine at the expense of fruit. But because shallow plowing is permissible, for that very reason the surface pulverization should be thorough and effective. What is saved on the subsoil should be expended on the harrow. After breaking, two harrowings, one with a cutaway, the other with an Acme harrow, should follow. This leaves the plat in a condition condition, especially if a crop of manure have been grown on the land the previous year, as is always advisable.

The richer the soil or the higher the fertilization, the more luxuriant will be the resulting growth of vines. Hence, the distance apart at which the "hills" should be located must correspond. On very rich land 12 feet apart each way is none too much; indeed, many growers prefer this distance even on poor land. It is entirely a matter for individual control. Probably 10 x 10 feet is the distance most frequently employed, and in no case should it be less than 8 x 8, and this very rarely. What-

ever the distance, the land should be checked in squares, leaving the hills equidistant both vertically and horizontally.

Whatever the distance adopted, the plat, after its final "freshening up" with the harrow, is "laid off" with cross furrows made by a light "seeder" plow. Then, in one direction, with a wide "strip," the furrowing furrow is run, which the fertilizers is drilled and thoroughly mixed with a seeder—two trips to the row—on which four furrows are next "laid" with a turn-plow, thus forming the bed for planting, which will warm up sooner than the surrounding soil. The "middles" are broken out later.

Many growers still cling to the obsolete practice of dragging up the dirt with a hoe into individual hills at the intersection of the furrows, and therein concentrating the manure, as in garden squash culture, instead of employing the more modern and economical "continuous beds." Where compost is used on a small scale the manure may be extraneous; but it is not only preferable, but on a large scale necessary, to drill the commercial fertili-

zers.

A crop of cow-peas the previous year is the best preparation that can be given an area intended for melons. It leaves the soil well stored with nitrogen, light, porous and easily worked. In midwinter or early spring, according to latitude, the manure, if commercial fertilizer is employed, should be put in; compost or AD PL US I NGS. The droppings should be spread partially decomposite by planting time. Stable manure, however, is always variable in its content of plant-food, and therefo-

re for more reliable results commercial fertilizers are preferable, particularly when operations are conducted
on a large scale. The following formula will be found to be well adapted to the average soil:

<table>
<thead>
<tr>
<th>Nitrate of soda</th>
<th>High grade superphosphate</th>
<th>Sulfate of potash (or muriate of potash)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lbs.</td>
<td>300</td>
<td>1,200</td>
</tr>
</tbody>
</table>

This is rather a high grade formula and will analyze:

- Nitrogen (ammonia equivalent 4.0 per cent) 3.3
- Phosphoric acid (available) 8.4
- Potash (K2O) 7.3

It may be used advantageously at the rate of from 400 to 800 lbs. per acre; the maximum amount, however, will rarely be justified. As a precaution finish of nitrate of soda—say a thimbleful per hill—applied just after the plants are well up, will give them a good start.

Planting is performed by hand and the seed put in quite shallow. Seeds should not be spaired. Field mice, pigeons, poultry, crows, cockroaches and other depredators frequently prevent a perfect stand where but few seed are used, and the time lost thereby, when replanting is necessitated, can never be regained. Twenty seeds to the hill is not too many—preferably rather more than less—each seed pushed down separately into the mellow soil with the forefinger to the depth of an inch or less. They should on no account be placed deeper. This fosters the main growing agency—whatever it may be—to discover and destroy each seed in succession, which gives some a chance to escape; whereas, if planted together in a mass, so soon as the pocket was found the seed would all be scattered or devoured at once. The process of planting as described seems slow and laborious, but it really takes much less time than

2720. The Preserving Watermelon, commonly known as "Citron."

its details indicate. On dry soil, during a time of drought, it is sometimes necessary to put a "hoe-dab" of earth on each hill, after planting, to serve as a mulch and to induce germination. This is removed before the cotyledons of the young plants appear.

In addition to starting under glass and transferring to paper (Neposnet) pots, in order to have the young plants ready for permanent planting as soon as all danger of frost is over, the growth of the vine, after final transplanting, may be forced by artificial means. A section of small sewer-pipe or tiling is embedded perpendicularly in the hill and nightly draughts of water (liquid manure, if desired, weak, with a solution of phosphates) fed the plant. This stimulates rapid growth in early spring and development of root surface. When acid phosphate is used in solution, the fruit is also said to increase rapidly in size, quantity and quality. Careful thinning to one or two melons per vine will also lessen their grain development.

"Christmas" melons—should any one care for as cold cheer at that season—may be had by selecting a thick-rinded variety, as Kolb Gem, planting late in June, handling carefully when pulled, and storing in some dry, yielding substance, like cottonseed hulls, in a cool cellar where the temperature is uniform and can never drop below freezing.

After the plants are up they are at first thinned down to three or four to the hill, and subsequently to one or at most two. One vigorous root system, well attended to, will usually succeed in extracting from the soil as much plant-food as will two, and will give a better account of it, also, on settling down.

Cultivation is commenced early and should cease early. It is effected with either the five-toothed or eleven-toothed cultivator or with scower and "heel-scrapers," and should invariably be done for the first plowing after planting, when the middles are customarily "run out" with a turn-plow or "twister." "Laying by," or the cessation of cultivation, should occur soon as the vines have reached the ground well. Vines are never turned at any stage, if it can be avoided, and under no circumstances after "laying by." Nor is the land ever plowed in the early forenoon. To prevent the wind from rolling and tumbling the vines, a thin broadcasting of cow-peas is usually made at the last plowing. They serve also, later, to partially shade the melons and leave the soil in excellent condition for the next crop.

Marketing.—Large areas for shipment are always located directly on some line of railroad—if possible, with a spur or side-track into the plantation. The heaviest servitude attached to melon culture is the insulation, which should invariably be on springs. A mile's jolt in a springless vehicle acts more severely than a thousand-mile journey, subsequently, in a ventilator car—the mode of shipment now almost exclusively employed where a water route is not convenient. Fruits should largely depend on two or three considerations: judicious and severe culling, and the proper selection of a market. The first measure cannot be practiced too severely. Underseeded fruit is unsalable, and the car-load average is invariably gauged by the smallest melons it contains, as the strength of a chain is measured by its weakest link. Nothing under sixteen pounds should ever leave the field, and it would be better to limit the minimum weight to twenty pounds. Anything over thirty pounds ranks as large, only by quite large, and melons remaining fifty pounds are of the first rank, although it is not uncommon to meet with monsters of sixty, seventy or even eighty pounds, while occasionally a phenomenally big one tops the hundred mark. It is believed that the largest melon on record (officially) attained the weight of 124 pounds. This was grown near Decatur, Ga., some twenty years ago, outside the established "Melon Belt."

In shipping, the smaller melons should occupy the floor of the car, with the larger forming the upper tiers—not for the purpose of deception or for the sake of appearance, but because the smaller sizes better withstand the jolting and pressure and there is also less loss if they are injured.

As the importance of avoiding glibbed markets is self-apparent, and the judicious selection of his point of shipment means to the grower success or failure, it follows that shipping associations are almost an absolute necessity—the ordinary planter who depends on his individual judgment generally "going to the wall." The "Shipper's Unions," however, are usually able to cope successfully with the problem and manage to distribute the season's crop over the country in such manner as to leave a living profit to the planter. Yet the industry is now by no means so remunerative as formerly. Supply seems to more than equal demand, and grower complaints are made by the grower of excessive freight charges, while the transportation lines insist that their rates at present figures are not profitable. And yet the grower still continues to plant his melons, the railroads to haul, and the public to purchase them!

Affections and Remedies.—After a stand is once obtained—spontaneously and promptly—and this, when all is said, is perhaps the main problem underlying successful melon culture—growth is relatively few and simple. Indeed, the Watermelon may be said to be free from any vital disease, and its maladies are almost entirely confined to those resulting from the attacks of a few insect pests, as follows:

1. The melon worm (Margaronia hyalinata).—A
Watermelons.—The Orange variety
WATERMELON
small moth, the larvae of which, light, yellowish green caterpillars about an inch long, destroy only the leaves of the Watermelon, but both the foliage and fruit are occasionally attacked by it. The whole plant is consumed by the larvae. They are "chewers," not "suckers."

2. The melon louse (Aphis gossypii).—This attacks the foliage, only, in the form of adult—a small waxy-green, ovoid, viviparous, ungulate louse, which infests the leaf surface of the young plants as they emerge from the ground, its larvae at the same time destroying the roots.

3. The striped cucumber beetle (Diabrotica vittata).—A small black and yellow-striped beetle, a quarter of an inch long, is occasionally found on the young plants in spring, after maturing under rubbish and stones. The adult insect eats the upper surface of the leaves, in irregular patches, and the larvae are said to burrow their way through the interior of the leaf structure under the surface.

Remedies: The commercial grower is generally prepared to accept the fact that none of these pests is going to neglect him, and therefore makes his preparations to combat all separately, and so plans his schedule to cover the entire list. The following is a detail of the operations advised:

1. Apply a pinch of nitrate of soda to each hill as soon as the young plants are up and vigorous, and power of resistance to all enemies as they arrive upon the scene.

2. For the melon worm, striped cucumber beetle and flea beetle, spray with Paris green—4 ounces to 50 gallons of water—for two or three sprayings, at intervals of a week apart.

3. Spray immediately, at intervals of a week (midway between the arsenical applications) if the melon leaves are extremely infested with aphides, in 10 parts of the usual spray, with a 1 to 10 mixture of kerosene and water (using Weed kerosene attached to sprayer) or with kerosene emulsion, same strength. White-oil soap, 1 lb. to the gallon, may be substituted for the kerosene treatment in ordinary cases, but when obdurate resort must be had to carbon bisulphide, a teaspoonful to the hill, in box-tops, clamshells or cheap vessels of any kind, under canvas-covered hoops. This remedy is unsatisfactory, but somewhat troublesome, and is only justified when the commercial grower is fighting desperately for his crop and livelihood. A detail of the methods of preparing the remedies here suggested may be found from the article on Insecticides, in Vol. II of this work (p. 786).

WATSONIA (Sir Wm. Watson, M.D., 1715-1787, electri-cian and professor of botany at Chelsea). Indicae. A genus of 16 species of tender bulbous plants, one from Madagascar, the others from the Cape of Good Hope. They bloom from July to September and have scarlet, rose or white 6-lobed flowers, usually a long, slender tube which is bent near the base. Watsonias are very much like Gladioli, having the same kind of a corn, the same sword-shaped, rigid lvs., the same kind of a spike and the same season of bloom. It is, therefore, a great mistake that those who have them are not only the greenhouse cultivation. The main differences between Watsonia and Gladiolus, from the horticultural as well as botanical points of view, are the longer tube and regular flower of Watsonia; three of the six perianth-segments in Gladiolus being usually different in size, shape and direction of spread. An important botanical difference is that the style-branches of Watsonia form a simple, while those of Gladiolus are bifid. Great interest has been aroused recently by the introduction of the "White Watsonia," known to the trade as W. Arderene. The plant might be roughly described as a white Gladiolus. It is likely to receive commercial attention. It grows 3 or 4 ft. high, strong stems being branched, and bears about a dozen fls., each 2½-3 in. long and about 2 in. across. The purity of its color and its value for commercial purposes justify a description. There are other white-flowered Watsonias, but none of them seem to be in the American trade. Pure white is the exception in the iris family, while it is a common, if not dominant, "color" in the lily and amaryllis families.

The White Watsonia has acquired so many names that a short historical sketch of the plant is desirable. All the stock in the trade at present is supposed to be descended from plants introduced by H. J. Arderne, of Cape Town. The original bulb was found 80 miles away in a pest bog amongst thousands of the common pink-flld. kind. In Oct., 1892, Mr. Arderne had 400 spikes in bloom and in March, 1893, some of his plants were pictured in The Garden, under the name of Watsonia kewensis. However, a pure white-flld. form had been previously found near Port Elizabeth and a bulb sent to J. O'Brien, of Harrow, flowered in England in 1889 and was then fully described as W. iridifolia, var. O'Brieni, the name adopted in this work. In the recent discussions of the plant the fact has been overlooked that T. S. Ware, of Tottenham, cultivated a white variety in 1880, it being figured in The Garden for that year as Watsonia alba. A nearly white form was cultivated in England as early as 1801, but the tube was pinkish outside and there was a rosy spot at the base of each perianth-segment.

William Watson, of Kew, was the first to emphasize the close horticultural parallel between Watsonia and Gladiolus and to urge the whole group upon the attention of the plant-breeders. This suggestion, coming from the man who may be said to have created the modern Cape Primrose or Streptocarpus, should result in another fine race of hybrids before many years. However, the Watsonia "bulb" is not so easily and safely stored as that of Gladiolus.

Generic characters: perianth with long, curved tube, the lowest and narrowest part ascending a short distance above the calyx; the tube is then dilated into a cylindrical or funnel-shaped portion which bends down, usually at a sharp angle, segments equal, oblong, spreading; stamens unilateral, arnate, inserted below the throat of the tube. Baker, Handbook of the Irises. Flora Capensis, vol. 6.

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A. Upper part of tube cylindrical or narrowly funnel-shaped.
B. Length of perianth-segments ½-3½ in. 1. albo-rosea

1. albo-rosea, Ker. Bright scarlet or pale pink-flld. species, 1-2 ft. high, remarkable for the short perianth-segments: stem simple or branched: spikes 6-12-flld. B.M. 583 (rose scarlet, splashed with cardinal, the inner segments white at the tip).

2. angusta, Ker. (W. iridifolia, var. coccinea, Ker.). Scarlet-flld., species distinguished from W. Meriana by the color of the fls., and by the shape of the perianth-segments. In W. angusta the segments of the modern acuminata, while those of W. Meriana are more nearly oblong and come to a point suddenly. Also the style of W. angusta reaches to the tip of the perianth-segments, while in W. Meriana it does not. B.M. 680. Go. 17: 229 (as W. Meriana, var. coccinea), 14: 125.
3. Meriana, Mill. This seems to be the dominant species among the genus and hence the most variable and the one most interesting to the plant-breeder. In its widest sense it includes W. iridifolia, but for horticultural purposes it will be convenient to consider the latter a distinct species. W. Meriana is best restricted to the common type at the Cape, which is a rose-flowered species 3-4 ft. high, the stem usually branched, lvs. ½-3¼ in. wide and the spikes 12-20-fl. This is the plant figured in B.M. 418 as Anthotheca Meriana, G. 17. 122. Truly rose-flowered and typical in color. The white-fl. form, which is rarer in nature, is treated under W. iridifolia. Baker says that there are scarlet-fl. forms of this species, but he gives them no name, and it is probable that all such should be referred to W. angusta.

4. iridifolia, Ker. This is treated by Baker as a variety of W. Meriana characterized by broader lvs. than the type; fls. closer and more numerous, white or pinkish. For horticultural purposes it will be convenient to treat it as a distinct species and restrict the name to the pink or rose-colored type.


5. densiflora, Baker. This very distinct and handsome rose-colored species more nearly resembles a gladiolus than any other by reason of the density and regularity of its flower spikes. Stems unbranched, 2-3 ft. high; spikes a foot long; fls. bright rose-red. B.M. 6400.—There is a choice variety with pure white fls. Var. alba, Hort., was introduced as early as 1891.

6. cocinea, Herb. This showy scarlet-fl. species differs from W. Meriana in its stem being shorter and unbranched, the spikes fewer-fl., and the styles a trifle longer. Stem 1 ft. high; spikes 4-6-fl. B.M. 1194 (W. Meriana variety).

7. humilis, Mill. This species has rose-red fls. apparently the same size and color as W. densiflora but only 4-6 in a spike and the stem only a foot or so high. B.M. 631.—A variegated form figured in B.M. 1193 as W. roseo-alba has a spike of 8 flesh-colored fls. with broad bands and splashes of scarlet.

8. rosea, Ker. Robust rose-colored species, growing 4-6 ft. high and the fls., though fewer than those of W. densiflora, are perhaps capable of greater size. Spikes about 15-fl. B.M. 1072.

W. arguta, Hort. John Sault, 1863, is presumably a catalogue error, as no such name appears in Baker’s latest monograph.

W. M.

WATTLE. See Acacia.


Hoya carnosa. Waxwork. Celastrus scandens.

WAYFARING TREE. Viburnum Lantana.

WEATHER PLANT. See Abras.

WEEDS. It would have been a sorry thing for agriculture if there had been no weeds. They have made us stir the soil, and stirring the soil is the foundation of good farming. Even after we have learned that crops are benefited by the stirring of the land, we are likely to forget the lesson or to be neglectful of it unless the weeds constantly remind us of it. Necessity is always the best teacher; and of these necessities, we must expect the chief.

A weed is a plant that is not wanted. There are, therefore, no species of weeds, for a plant that is a weed in one place may not be in another. There are, of course, species that are habitual weeds; but in their wild state, where they do not intrude on cultivated areas, they can scarcely be called weeds. The common pigweed and the purslane are sometimes vegetables, in which case potato plants would be weeds if they grew among them.

The one way to destroy weeds is to practice good farming. Judicious tillage should always keep weeds down in cultivated lands. In idle lands weeds are likely to be a serious nuisance. In sod lands they are likely to take the place of grass when for any reason the grass begins to fail. The remedy for weeds in grass lands, therefore, is to secure more grass. In order to do so, it may be necessary to plow the land and resod. In some cases, however, it is only necessary to give the land a light surface tillage, to add clean and quickly available fertilizers and to sow more grass seed. This is the way for(or, rather, the weeds are perennial, as dandelion and plantain, it is advisable to pull them out; but in order to keep them out, a stiffer sod should be secured. The annual weeds that come in the first year are usually destroyed by frequent use of the lawn mower.

Foul lands may usually be cleared of weeds by a short and sharp system of rotation of crops, combined with good tillage in some of the crops of the series. When the land for any reason is fallow, as when it is waiting for a crop,—surface tillage with harrows or cultivators will serve to keep down the weeds and to make the land clean for the coming crop. Often lands that are perfectly clean in spring and early summer become foul in the fall after the crops are removed. Cleaning the land late in the season, therefore, may be one of the most efficient means of ridding the land of weeds. Coarse and weedy lands are not so well rotted, may also be a conveyer of weed seed. The seeds of weeds are sometimes carried in the seed with which the land is sown, particularly in grass and grain seeds.

It does not follow that weeds are always an evil, even when they are abundant. In the fall a good covering of weeds may serve as an efficient cover-crop for the orchard. They are likely to entail some extra care the next year in order to prevent them from gaining a mastery, but this extra care benefits the orchard at the same time. It is, of course, far better to sow the cover-crop oneself, for then the orchardist secures what he wants and of the proper quantity and at the right season; but a winter cover of weeds is usually better than bare earth.

From the above remarks it will be seen that weeds are scarcely to be regarded as fundamental difficulties in farming, but rather as incidents. In the most intensive and careful farming the weeds bother the least. There should be a careful oversight of all waste areas, as roadsides and vacant lots. Experience has shown that the greatest difficulty arises on commons and waste lands, not on farms.

Weeds are often troublesome in walks, particularly in those made of gravel. If the walk were excavated two feet deep and filled with stones, rubble or coal ashes, weeds cannot secure a foothold. It is particularly important that gutters be not laid directly on the soil, else they become weedy. There are various preparations that can be applied to walks to kill the weeds, although, of course, they also kill the grass cuttings if carelessly applied. Strong brine, applied hot, is one of the best (1 lb. of salt to 1 gal. of water). There are also preparations of arsenic, vitriol, lime and sulfur.

L. H. B.

WEEPING TREES. Consult Trees.

WEIGELA. Referred to Dierella.

WEST INDIA RATTLE BOX. Crotalaria retusa.

WESTERN CENTAURY. Hesperochiron.

WESTRINGIA (J. C. Westring, physician and author). Labiata. An Australian genus of 11 species of shrubs with entire whorled leaves and solitary, 3-lipped, white or purple-spotted flowers in the leaf-axes or rarely in terminal heads. Calyx with 5 sepals; corolla with a short tube and dilated throat: the upper lip flat and broadly 2-lobed, the lower 2-lobed: fertile stamens 2: staminodia 2, short.

rozmariniformis, Sm. VICTORIAN ROSEMARY. A bushy shrub with the branches and under side of the leaves silvery white with appressed hairs: lvs. in whorls of 4.
oblong-lanceolate to linear, ½-1 in. long: fls. white, axillary, almost sessile; calyx 3 lines long; corolla not twining about the calyx. Sandy hills, near the seacoast. Australia.—Offered in S. Calif.

F. W. BARCLAY.

WEST VIRGINIA HORTICULTURE (Fig. 2721.), like that of most other states, has its beginning as a side issue of the usual operations of the farm. In fact, even to-day it is considered as a sort of complement to grain-growing or stock-raising in most sections of the state. In the localities where towns have sprung up as the result of coal, oil or railroad operations, the demand for vegetables and small fruits has been largely met by local producers. The market-garden work, aside from the orchards for peaches and tomatoes, as has been encouraged by the growth of the neighboring towns. Melon-growing, which has an extensive acreage along the Ohio river bottom, is only a branch of vegetable-gardening which seeks markets outside the state. What has been said of vegetable-gardening applies equally well to small-fruits culture, but the tree fruits—notably apples and peaches—fall under quite a different category.

The apple industry in West Virginia is chiefly of two characters and has two regions,—the lower, and the northern Ohio valley counties of the state. The former region gives considerable attention to the production of early apples for the northern markets. Several early varieties are grown, Yellow Transparent, Red Astraehan and Pomme Royal predominating; these are followed by Maiden Blush, Grimes Golden and Rome Beauty. Because of the favorable climate in this region, the production of this class of fruits has grown to be a profitable, although not a large industry. The northern Ohio river valley counties, including what is known as the Northern Panhandle, and the counties in the eastern part of the state, bordering on the Potomac, form the present areas for the commercial growing of winter apples.

The Hancock county orchards (northern end of Panhandle) are unique in storage facilities. Here nearly every grower with any considerable acreage (forty or more acres) is provided with a storage-house, so that in seasons of greatest fruit production there is sufficient capacity for storing the crop. Previous to the fall of 1896 all the houses were constructed of stone and provided with ice chambers for maintaining artificial cold. In 1896 one house was built of wood on the principle of confined air between walls constructed of wood and paper. In this house, which has been used two years, not a single cold room has been necessary. These houses are of various capacities, ranging from 2,500 up to 35,000 barrels.

The plan most in vogue is to have the fruit removed from the tree at the picking season, placed in barrels in the orchard, headed and then transferred immediately to the storage-house. In general, the barrels are stored in tiers on the sides. They are left in this position until shipping season arrives, which usually begins in March or early April and extends well into May. Before shipment each barrel is opened, the contents placed in a sorter and the fruits carefully assorted and graded. The barrels are then equipped with the grower’s trade-mark and with the grade of the fruit. Through a series of years these practices have been strictly adhered to and as a result the fruit, the bulk of which goes south and west, has a reputation in the markets to which it finds its way. This region along the upper Ohio is peculiar also in possession of a variety suited to its climate and to the practices of the growers. This is known as the Willow Twig, an apple of good size, good appearance and fair quality, and long keeper. Willow Twig and Ben Davis yield the greater part of the crop of this region, although among varieties of minor importance the Rome Beauty and Bentley Sweet are of some importance.

The varieties chiefly grown in the eastern counties differ quite as much from those of the Hancock region as do the varieties of New York. In the eastern counties, New York Imperial or Johnson Pine Winter is the variety upon which most dependence is placed. It is not only a sure cropper, but is a good market variety, possessing high color with good flavor and fair keeping qualities. It is one of the ten varieties included by Taylor in his export list. This variety, placed in store in October, can be moved from the cold room in February, with little or no shrinkage from loss of moisture and an equally small loss from decay. Ben Davis here, as well as in Hancock county, forms a valuable second, although the crop is better in the northern than in the eastern counties. Among fall varieties for both sections of the state none exceeds the Grimes Golden. This apple, as well as the Willow Twig, is a native of the state. Another apple belt in which young orchards give much promise lies at the extreme southern border of the state.

Peaches thrive in various sections of the state. In fact, hardly a locality is without its supply; but strange to say, in many instances the trees are chance seedlings, and the quality of the fruit is correspondingly low. In the five counties bordering upon the Potomac, however, the industry has grown to important commercial proportions. The orchards under the control of the Allegheny Orchard Company aggregate nearly 150,000 trees. Besides this there are numerous private enterprises with orchards ranging from 500 to 5,000 trees. The most successful orchards are situated upon the first terrace of the mountain, usually three to five miles from the Potomac, and at an elevation of from 900 to 1,500 feet above tide. The soil is gravelly in nature, resulting from the breaking down of shale and sandy rocks. The methods of the Orchard Company above mentioned mark a new era in the manner of handling the peach crop. Instead of sending their product to some commission house to be again scattered over the country to the small towns, this company has a head office in the city of Cumberland, and from there, as a distributing point, peaches go direct to the dealers in the small towns and cities, the commission of the middleman is saved, the retailer gets a fresh product direct from the orchard, and the consumer is provided with a better article.

In West Virginia, where lack of transportation is often an obstacle, canneries are valuable as furnishing a market for horticultural products. In the city of Wheeling there are three extensive pickling and canning factories where large quantities of cucumbers, tomatoes and onions, as well as various fruits, are prepared for winter consumption. In Martinsburg, in connection with the cold storage house already mentioned, a modern canner of large capacity is operated, which furnishes an annual market for the products of both orchards and gardens. Besides these there are several smaller concerns which confine their packing to one or at most to two vegetables, tomatoes being the favorite.
It becomes evident that a state with the limited territory of West Virginia must have some other compensating feature to render it capable of such varied products. A glance at its geographical location, at the varied altitudes and exposures, is sufficient to account for the variety of climate. Persimmons, papaws and watermelons thrive on the lowland, cranberries on the mountain, and in the higher altitudes the huckleberry finds a congenial home. Huckleberries are annually gathered in great quantities both for domestic uses and for shipment. Certain local areas are expressly adapted to the cultivation of sweet cherries, others to pears of the better sorts, and nearly every corner of the state furnishes ideal conditions for the blackberry and dewberry—the Lucretia dewberry being a native.

The mountainous character of the state has been a barrier to cheap railroad construction, and as a result facilities for moving perishable products are not good, and to-day lack of railroad facilities is the greatest check to commercial horticulture.

L. C. CORBETT

WHITLOW-WORT. See Paronychia.

WHORTLEBERRY. See Compileum.

WIDDINGTONIA (Capt. Widdington, formerly Cook, who traveled in Spain). Compileum Widdingtonia, M. Wood, is a coniferous tree from southeastern Africa, probably not hardy. It grows at an altitude of 3,000 to 7,000 ft. on Mt. Milanj in Nyassaland and is known as the Milanj Cypress or Cedar. Seedlings of it were first cultivated in 1894 at Kew, and plants have recently been offered in Calif. According to Davy, it is proving to be quite hardy near San Francisco. The wood is dull reddish white, strongly aromatic, and locally used for furniture and for doors and windows. The tree attains a maximum height of 140 ft., with a girth of 5 ft. above the ground, the trunk being clear for 40 ft. The species has glaucescent, linear, juniper-like foliage and a cone smaller than a chestnut and longer and broader than Widdingtonia. It is considered by Bentham and Hooker as a subgenus of Calitris. Franceschi, however, reports that it has proved quite delicate to raise in S. Calif.

WIGANDIA (Johannes Wigand, Pomeranian bishop; wrote on plants in 1590). Hydrophyllaceae. About 7 species of tall, coarse perennial herbs or subshrubs native to mountainous regions from Mexico to the Argentine Republic. The fls. are 5-lobed, mostly violet, 1-1 ½ in. across and borne to the number of 30 or more in lax terminal, cymose panicles. Wigandias are chiefly valued as foliage plants for subtropical bedding, because of their very showy character. Their leaves are covered with stinging hairs, the young plant specimens may be seen in California, but the plants are considered to be rather coarse and struggling.

WIGANDIA Caracasana (X ¾). They are generally raised from seed every year, the seed being started indoors as early as January. The plants attain a height of 6-10 ft. in a single season. They are unsatisfactory greenhouse plants as they do not grow vigorously indoors. The roots may be kept over winter in a frostless place and stock may be secured in spring by cuttings.

Wigandias have large, alternate, wrinkled lvs. with

2722. Wigandia Caracasana (X ¾)
WIGANDIA

Vigieri, Carr. Imperfectly described species of unknown nativity. Carriere merely said it was a silvery hair plant and placed it under the genus "Wigandia" (by which he perhaps meant W. macrophylla). Nicholson says the Ivs. are bluish, passing through various red to fawn-color before fading. In the American flora the red color of the Ivs. is considered distinctive. N. 1:399.

W. M.

WIESTREMA (after a Swedish botanist) Thyme-leaved W. panellifera is offered by importers as a Peruvian plant. "From its bark the celebrated Japanese copying paper is made." Wiestrema is a genus of about 20 species of trees or shrubs native to tropical and subtropical parts of America. The American lvs., opposite, rarely alternate; fls. hermaphrodite in terminal racemes or spikes; perianth-tube long; lobes 4, spreading; stamens 8, in 2 series; filaments short; disc of 1-4 scales; ovary villous, 1-loculed; style short; stigma large, globose: fr. fleshy and naked or more or less included in the base of the perianth.

carunculosa, Meissn. (W. panellifera, Franch. & Sav.). Small shrub, 1-3 ft. high; Ivs. 1-3 in. long, thin, alternate and opposite, oblong-lanceolate: perianth 3-4 lines long: fr. silky. Himalayas, Ceylon, China.

WILDER, MARSHALL PINCKNEY (Plate XI). Distinguished amateur pomologist and patron of horticulture, died at his home near Boston, Dec. 16, 1886, in his eighty-ninth year. He was born at Ridgway, Pa., Jan. 22, 1798. His inherited love of country life soon showed itself, and at the age of sixteen he chose farm work in preference to a college course. At twenty-seven he moved to Boston, where he was long known as a perspicacious merchant and president of many societies and institutions. His active interest in horticulture may be dated from 1832, when he purchased a suburban home at Dorchester, where he lived for more than half a century. His pear orchard at one time contained 2,500 trees, representing 800 varieties. During his life he tested 1,500 kinds of pears and in 1873 he exhibited 404 varieties. He produced several new pears. In 1844 he introduced the Anjou. He imported many fruits and flowers new to America, and from 1833 to the end of his life he was constantly contributing to the society exhibitions the products of his garden. He carried a camel's hair brush in his pocket and was always hybridizing plants.

He delighted in floriculture, and his camellia collection, comprising at one time 300 varieties, was the best in all the new world. He gave his camellias 150 names, though he lost 500 seedlings by fire. His Camellia Wilderi he sold to florists for $1,000. He also had a notable collection of azaleas. As early as 1834 he produced a double California poppy. Among the many horticultural novelties which he first reported, or exhibited in America were Dierettia rosae (1851), hardy kinds of Azalea mollis (1747). Cissus discolor (1854), "the harbarger of the infinite variety of ornamental-leaved plants now so generally cultivated and admired," Clematis carulata, var. grandiflora (1841), Lilium lancifolium, var. album, the first of Japanese lilies, Gladiolus floribunda (1836), and Oncidium Reuvenum (1837), a plant of which bore ninety-seven fully expanded flowers and was the first orchid reported at any American exhibition. The Marshall P. Wilder rose makes his name familiar to a later generation.

Wilder's greatest service to botany was his intimate connection with the Massachusetts Horticultural Society and the American Pomological Society. Of the former he was a member for fifty-six years, and president from 1841 to 1848. He was one of the founders of the American Pomological Society, and with the exception of a single term was its president from its organization in 1848 until his death in 1886.

Wilder was an organizer. He was one of the founders of the Massachusetts Board of Agriculture and of the Massachusetts Agricultural College, and of the United States Agricultural Society (1852). He was president of the last from its foundation until 1857, and from 1858 until his death was president of the English Historic Genealogical Society. At twenty-six he was a colonel, and in 1857, after declining the nomi-
nation four times, he was elected commander of the Ancient and Honorable Artillery Company. He was a trustee of the Massachusetts Institute of Technology. At one time he was president of the state senate. In his early days, he held all degrees, including the thirty-third. It is said that when Wilder was 27 there were no horticultural societies in America, and that he lived to see more than 1,500 societies devoted to horticulture and kindred subjects.

In 1883 Marshall P. Wilder urged upon the American Pomological Society the necessity of a reform in the nomenclature of fruits. He took an active part in the great work that followed.

Wilder’s personality was most engaging, being characterized by geniality, dignity, tact and conservative humor. Horticulturists remember with what graciousness he met and recognized the younger men of merit at the meetings of the American Pomological Society. He was by nature a peacemaker, and in the early days when the conflicting interests of the Massachusetts Horticultural Society and the Mount Auburn Cemetery required separation, he was an important factor in solving the complicated and delicate problem. The settlement of this difficulty laid the foundations of the unparalleled wealth of the Massachusetts Horticultural Society. Wilder was a man of habit. Until he retired from business it was his life-long practice to rise early, devote the morning to books, garden and orchard, the middle of the day to business and the evening to family and study. He was married three times and had fourteen children, only five of whom survived him. He was sitting in his chair at home and engaged in conversation when death came to him instantly.

The portrait of him in Plate XLIII was considered by Mr. Wilder to be his best likeness. At his death he left the American Pomological Society $1,000 for Wilder Medals for objects of special merit and $4,000 for general purposes. He left the Massachusetts Horticultural Society $1,000, to encourage the production of new American varieties of pears and grapes. Wilder wrote no book, but his occasional contributions and presidential addresses make a notable body of writings when gathered together into the bound volume presented by him to the library of the Massachusetts Horticultural Society. "The Proceedings at a Banquet given by his Friends to the Hon. Marshall Pinckney Wilder ... to Commemorate the Completion of his Eighty-fifth Year," is a stately memorial of 116 pages published in 1883. The best account of him seems to be that by the secretary (Robert Manning) of the society, in Trans. Mass. Hort. Soc., 1887: 26-29, from which the present article has been chiefly compiled.

W. M.
plenty of land and to all persons who delight in making nature-like pictures with the help of plants. It may also be in keeping in many small and humble areas. The plants in a wild garden require less care than those cultivated according to any other system. The main work is that of establishing the plants. If they are the right kind they will soon become colonies. All that remains to do is to remove brambles, thistles and other uncomfortable weeds and occasionally check the exuberance of the too vigorous species. On the other hand, wild gardening demands the highest intelligence and taste, close sympathy with nature, and that rare and precious quality—enjoyment of common and every-day things.

There is no finer feature of autumn landscape in America (so far as herbaceous growth is concerned) than the roadside asters and goldenrods. Yet when William Robinson conceived the idea of wild gardening, these lovely flowers were banished from the English hardy borders. In such an environment they waxed too strong and crowded out many slender-habited plants of delicate beauty. It seemed a pity to exclude these American plants from English gardens. The important question was to find a proper environment for them. In the wild garden such plants require less care than in the hardy border, and they present nature-like effects, and are in place.

Asters and goldenrods are only two examples of the class of plants for which the wild garden was created. There are literally thousands of hardy plants from all over the world that will take care of themselves when once established in wild gardens. Many of these plants are unfit for intensive cultivation. They will never become general garden favorites. Some of them crowd out weaker-growing plants. Many of them have their "dramatic moment" and then lapse into the commonplace or unsightly. Others are too tall or rank or coarse or weedy for conspicuous and orderly positions. Again, many plants are insignificant as individuals but very effective in masses. There are hundreds of interesting plants that fail when measured by the conventional standards. Their foliage may be ill-smelling, sticky or prickly, but usually their flowers are too small or their season of bloom not long enough. The garden gate is locked against them all.

Among our common native plants that revel in the wild garden are yarrow, Joe-Pye weed, milkweed, rudbeckias, compass plants, sunflowers and a host of other perennial yellow-flowered composites, Bouncing Bet, bed-straw, evening primrose, St. John's-wort, lupines, button snakeroot, certain lilies, Oswego tea, orange hawkwheat, asters, bugbane, goldenrods. All such plants tend to improve wonderfully when the struggle for existence is somewhat eased for them. Nor does this list exclude such treasures as the forget-me-nots, cardinal-flowers, blue flags, water lilies, pitcher plants and other marsh and aquatic subjects which properly belong to the moist or bog garden, though that is merely a department of the wild garden. Then there are the vines; and what wonders can be accomplished in a wild garden with wild grape, Clematis, Virginia creeper, perennial pea, Trumpet creeper and bitter-sweet! Think, too, of all the spring flowers and delicate woodsy things,—anemones, columbines, moss pink, Jack-in-the-pulpit, bloodroot, hepatica, Solomon's seal, Dutchman's breeches, ferns, trilliums and violets! Evidently there is sufficient material for a wild garden composed exclusively of American plants, and naturally such material is least expensive. But the wild garden spirit is essentially cosmopolitan. Many of the exotic flowers can be raised from seed, for it is not necessary that all the subjects be perennial. Some of the exotic mulleins, for example, are bold and striking plants; nearly all of them are biennial, but they resow themselves. Finally there is a vast number of rare plants that are dear to the heart of the collector, but their names mean nothing to the uninhibited. The native shrubs and trees may also have their places in the wild garden.
While the wild garden was created to make a place for plants outside the garden proper, it does not exclude the garden favorites. For example, an individual larkspur, foxglove, or horehound in rich garden soil often grows to tall and slender as to require staking, and stakes are always objectionable. In the wild garden a lusty colony of any of these species may be self-supporting. All the leading border favorites can be used in the wild garden—peony, poppy, phlox, larkspur, iris, columbine and the rest. The tall-growing plants that are used in the back row of borders are nearly all suit-

### WIND-BREAKS

In horticultural usage, are plantations of trees or other plants designed to check the force of the wind or to deflect it to other directions. Wind-breaks are often of the greatest use, and at other times they are detrimental. In regions of very strong prevailing winds, they may be necessary in order to prevent positive injury to the plants. This is true along seashores. In the dry interior regions, wind-breaks are often useful, also, to check the force of dry winds that would take the moisture from the land. In other cases, they are employed for the purpose of sheltering the homestead in order to make it more comfortable for human occupancy; such wind-breaks are usually known under the name of shelter-belts.

Whether wind-breaks shall be used for orchard plantations, depends wholly on circumstances. In regions of very strong prevailing winds, as near large bodies of water or on the plains, such breaks are usually necessary on the windward side of the orchard. However, if the prevailing winds are habitually warmer than the local temperature, the wind should not be stopped or wholly deflected, but they should be allowed to pass through the windbreak with diminished power in order that, while their force may be checked, they may still prevent too low temperature. In regions that are very liable to late spring and early fall frosts, a tight wind-break is usually a disadvantage, since it tends to confine the air—to make it still—and thereby to increase the danger of light frosts. If wind-breaks are employed in such instances, it is best to have them somewhat open so that atmospheric drainage may not be checked. In most regions, the greatest value of the windbreak for orchard plantations is to protect from the mechanical injuries that result from high winds and to enable workmen to pursue their labors with greater ease. The lessening of windfall fruit is often sufficient reason for the establishment of a windbreak. Usually very cold and very dry winds should be turned from the orchard; very strong winds should be checked; temperate winds should nearly always be allowed to pass through the orchard, if their velocity is not too great; care must be taken to allow of adequate atmospheric drainage.

Wind-breaks for orchards require much land, and crops near them are likely to suffer for lack of food and moisture, and also from shade. In small places, therefore, it may be impossible to establish large wind-breaks. It is well to plant the wind-break at some distance from
WIND-BREAKS

the last row of orchard trees, if possible. It is usually best to use native trees for the wind-break, since they are hardy and well adapted to the particular climate. Wind-breaks often harbor injurious insects and fungi, and care must be taken that species of trees liable to these difficulties be not used. In the northeastern states, for example, it would be bad practice to plant the wild cherry tree, since it is so much infested with the tent caterpillar. In some cases, very low wind-breaks may be as desirable as high ones. This is true in the open farming lands in the dry regions, since it may be necessary only to check the force of the wind near the surface of the ground. Wind-breaks only two or three feet high, placed at intervals, may have this effect. Fence-rows sometimes act as efficient wind-breaks. Along the sea-coast, gardeners often plant low hedges for the purpose of protecting the surface of the garden. Along the Atlantic coast, the California privet is considerably used. This is Ligustrum ovalifolium, a Japanese plant. In parts of California, one of the mallow tribe (Lavatera assurgentiflora, Fig. 2730) is used for this purpose. Farms in the open windy country may be efficiently protected by belts of woodland, or if the country is wholly cleared, rows of trees may be established at intervals of a quarter or half mile across the direction of the prevailing winds.

L. H. B.

Wind-breaks in Middle California.—The most common wind-break seen in middle California is composed of a tall thick hedge of Monterey Cypress (Cupressus macrocarpa), either clipped close or allowed to grow naturally; it withstands heavy winds better than almost any other heavy-foliated tree and is rapid in its growth. The Osage orange was at one time somewhat extensively planted as a wind-break, but is now rarely met with.

The Italians and Chinese, who have almost complete control of the truck-gardening industry in and around San Francisco, make extensive use of a Californian tree-mallow, Lavatera assurgentiflora, Fig. 2730—as a wind-break and protection from the drift-sand, surface so such a prominent feature of the outskirts of the city. This plant is indigenous to some of the islands off the coast of southern California and, probably, was introduced into the San Francisco peninsula by the Mission Fathers, as the pioneers of 1851 and '52 report that it was then growing spontaneously and in great abundance on the sand dunes where the city now stands. This Lavatera proves to be well adapted to the peculiar conditions under which it is cultivated; it stands long seasons of

2727. The Giant Reed—Arundo Donax.
A tall plant of striking habit suitable for wild gardens and borders.

2728. A small wild garden at the rear of a building.
drought and heavy winds, bears close trimming, makes a rapid and dense growth, and continues in bloom almost throughout the year. When larger wind-breaks are required, to resist the force of heavy and steady winds sweeping over the interior plains through mountain passes, the manna gum, Eucalyptus viminalis, is used with advantage; this species suffers much less from strong wind than the more tender blue gum, Eucalyptus Globulus, which is used for the same purpose in the more equable climate of the Coast Range hills. Both the red gum, Eucalyptus rostrata, and the Lombardy poplar, Populus nigra, var. Italica, are used in the vineyard region near Fresno, to check the force of the periodic north-winds. Arundo Donax is also frequently grown around vineyards, particularly in the immediate vicinity of water. The olive, European walnut, fig and almond are frequently planted for the outside row of an orchard of deciduous fruit trees, to act as a partial wind-break. Arundo Donax makes a charming shelter-hedge for a suburban garden, being light and graceful in appearance and not too exclusive, while answering all necessary purposes by providing a certain amount of privacy.

Joseph Burtt Davy.

**WINDFLOWER. Anemone.**

**WINTER PROTECTION**

**WINDMILL FINGER GRASS.** See Chloris.

**WINDOW GARDENING.** See House Plants.

**WINEBERRY.** Rubus phoenicolasius.

2730. Lavatera assurgentiflora, a native plant much used for low wind-breaks in California.

**WINTER ACONITE.** Eranthis hyemalis.

**WINTER BERRY.** Ilex verticillata.

**WINTER CHERRY.** Physalis Atkeengi.

**WINTER CRESS.** Barbarea.

**WINTER GARDEN.** In England, a very large glass structure suited for trees and plants that are not quite hardy and require only a small amount of artificial heat in winter. Winter gardens are especially adapted to strong-growing plants from Australia and the Cape, as acacias and araucarias. Himalayan rhododendrons, camellias and the hardier palms and tree ferns are also favorite subjects. The term "winter garden" is practically unknown in America. The word is sometimes used as synonymous with glass-house or conservatory.

**WINTERGREEN.** Gaultheria and Pyrola.

**WINTERGREEN, FLOWERING.** Polygala paucifolia.

**WINTER PROTECTION**, or preparing plants to withstand the winter (Figs. 2731–2742). All plants are usually hardy in their own habitat, but many become tender when removed to a colder climate, requiring artificial protection. A permanent covering of snow furnishes ideal protection, but unfortunately our American winters are very changeable. Continued, steady cold is seldom injurious, but the alternate freezing and thawing towards spring are often fatal, the damage varying according as the situation is wet or dry and the soil light or heavy. For example, shallow-rooted plants, as Lobelia cardinalis, will often be thrown out of the ground in clayey soil. Such damage may be prevented by placing sods over the plants. Gallardias will winter safely in light, well-drained soils with ordinary protection, but perish if wet and heavy. The remarks in this paper are meant to apply in the vicinity of Chicago.

Winter covering intercepts the sun's rays and retards premature activity. It is an essential "to keep in the cold" during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but anything of an herbaceous nature may be covered much earlier. Where field mice are troublesome it is well to defer covering until after a good freeze, so that these nibblers may seek other winter quarters. Rabbits are fond of the Japan quince, Spiraea Van Houttei, Erysimum alatum and some others, and often damage newly planted material the first winter. When the
branches are beyond their reach, protect the trunk with straw, tar paper or burlaps, which will also prevent sun-blistering. If the shrubs are in groups or low-branched, run wire netting around them. Fall-planted material should be better protected against frost than established plants of the same species. All the Japanese-flowering forms of the plum, peach and cherry tribes should have their roots mulched four or more inches deep. The fatal damage in the winter of 1898–99 was at the roots, not overhead. Figs. 2731, 2732 show protection by means of straw and boughs; 2733–35, protection inside of boxes, barrels, and wire netting.

Plants with evergreen foliage, like Henchera sangui-nea, are safer with a covering that will not mat down and rot the foliage, or injure the crown. The danger is in open, wet seasons. Forest leaves are excellent for winter covering, provided they do not mat down. Oak leaves are good, but those of elm, maple and other trees that shed their foliage early are soft and mat too much. Leaves may be held in place by evergreen boughs, brush, or tops of bushy perennials like our native asters, or coarse strawy material. When leaves are used in barrels or boxes, the top of the package should be water-tight, and the leaves dry when put in. This precaution is not essential in all cases, but it is a safe rule to follow. Tar paper is comparatively cheap and comes handy in many phases of winter covering. Gather the leaves when they are dry, and store under shelter until wanted. Save vines like those of Clematis paniculata and pole limas; they are good for covering climbing roses that are almost hardy. These keep off the bright sun when the plants are in a semi-frozen condition, place an old wooden shutter or anything to shed rain, placing leaves or manure over those that remain.

Where permanent wind-breaks, such as plantations of evergreens, buildings or solid fences, do not exist, temporary ones should be made of boards, evergreen boughs, corn-stalks, etc., to protect arboreal plants that are not quite hardy, e.g., in this climate Halesia tetraptera, and in the eastern states Magnolia grandiflora, holies, etc. Place the wind-break at the sides towards the prevailing winds, generally north and west, and at the sunny side of any evergreen that grows. The boughs or stalks may be attached to wire netting or to cords fastened to stakes.

The so-called rethosporeas may have placed over them an empty box open at the top. Shrubs that are still more tender should be boxed, the box having a tight top and ventilation at the sides. In all cases mulch well at the roots. Magnolia soulangeana, M. speciosa and plants of similar degrees of hardiness may have their branches tied in and empty casks placed over them, one sitting partially inside the other, and held in place by stakes. Put a cone-shaped covering over the top to shed the snow. Or poles may be set close to the tree, wigwam fashion. Wrap these with burlaps, or wind string around them for the straw to lean against, and in both instances wrap with straw.

The so-called hardy climbing roses, such as the Seven Sisters and Prairie Queen, which are hardy without protection but are benefited by it, Wichuriana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Penzance Sweetbrier hybrids, if against a wall, may have clematis or

2732. A tender tree bound with branches of hemlock. The protected tree is a specimen of Gordonia about 10 feet high, at Arnold Arboretum, Boston.

2733. One way of protecting young rhododendrons. The space inside the wire netting is filled with autumn leaves.
other vines placed thickly over them; or if in an open exposed situation, they may be wrapped in straw. Fig. 283. Pull up the high at either ends,—to prevent breaking and to afford protection and drainage,—and extend the mound in the form of a gradually diminishing ridge. Bend the canes along the ridge, cover them with manure, and then the mound cover with soil or sod. If the presence of a lawn pre-

vent this method, lay on the grass and cover with a water-tight box filled with leaves. Canes will rot di-
agnoses knotholes, and if the root is in the hollow and cover with soil or sod. Those in beds may be bent over, the tops tied to the base of their neighbors, lead tags bearing numbers fastened to each plant, and a record taken of their labels, and all summer labels stored to prevent loss when removing the leaves in the spring. Make a solid frame around them, higher at one end, and fill with leaves so as to cover the plants. Lap the roof boards; they will shut water and allow ventilation. In the spring remove the leaves, replace the top for a few days, but let the sides remain for a week or so to shield from cold winds. Keep the plants prostrate until cut back. The tenderer Teas are placed in coldframes or similar places. No manure is used until spring, as there is no moisture to wash it in. Tree peonies and yuccas should have an empty box placed over them, large enough to prevent the plant from growing. Hibiscus, Acanthus, Angelicas, Umbellifers, Asclepias, Asparagus, which are hardy—Hea Virginica, Cuprus Mos, etc., are wrapped in straw, and when the wrappings exceed four feet in height they should be staked to prevent high winds from toppling them over. The trunk and all over which the roots are wrapped in sacking, and Azaela mollis when planted out are taken up, the roots given a good soaking in a tub, and replanted in cold pits, or in boxes placed in a cold house or pits. In the spring, another bath is given them and the soil firmly pounded around them before replanting. This is essential for continued vigor. Cut all vines of the climates to within one or two feet of the ground and lay them down, first mounding the soil a few inches if surface drainage is not good and cover with ashes, boxed leaves, or soil, or mulch well and wrap the canes with straw. If close to a porch or steps, do not let the swept snow stay over them, unless well protected, as this snow solidifies and excludes air. If, as some now think, the broken outer skin of the hybrid forms,—Jackmanii, etc.,—subjects them to disease, then these varieties should not be bent over, but staked and wrapped. It is best not to cut the foliage of the cumbias or the Japanese iris, as it, of itself, is a good protection, but manure at the base is essential. Cut down Arundo Donax, cover heavily with any material, and cover all with tar paper or water-tight shutters. Place half-rotted leaf-mold over farms in their original English and Spanish iris or any early-blooming bulbous plant, or a light-straw covering that is easily removed. Fine old manure a few inches thick is good and can remain. Place a good coating of stable manure around the trees on the outside when they have been established any length of time.

bear in mind that the feeding roots extend out as far as the branches do. The soil under them has a double dissection performed and can injure both the trees and the grass. Place short stakes around groups of phloxes, As-

pleias tuberosa, or any other plants that are late to appear in the spring. Otherwise they may be overlooked in assuming and are buried by digging. Examine all labels and see that none are cutting into the limbs of trees. Replace all rotten or defaced ones in the borders, using heavy labels, as thin ones often break off and are carried away when the surplus manure is removed. Cypress is a good material for labels. A good label for young trees and shrubs is made of a thin sheet of copper. The name is written with a stylos. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the branch of the young plant, and tied with a string or thread. This label is folded upwards and placed in a ring on the stem. The rings are used to hold the label against the stem. The ring is bent in a curve and inserted into the stem. The label is then wound around the stem and secured with a string or thread.

W. C. EGAN.

Fits, Cold Pits, Storage Pits and Plant Cellars (Figs. 2730-2741) are structures, with the greater part sunk beneath the surface of the ground, built for the purpose of protecting plants in winter without continued firing. They are employed almost exclusively for storing dormant plants. They are not suitable for storing growing plants any length of time, neither are they houses in which to grow plants. They should face the south and be so sited as to avoid the strong winds of buildings or other wind-breaks. Owing to their position they should be put in well-drained ground only and well protected against surface water. A well-designed frame-

No. 3. These pits are useful for storage in winter and also for carrying some of the hardy greenhouse plants in autumn until the houses are relieved of the chrysanthemum crop. Nos. 1 and 2 make light hotbeds in spring, if filled with the leaves which formed their winter protection, and are also available for growing such plants as euphorbia during the summer. They are generally too deep for dung hotbeds. Nos. 1 and 2 are planned to run east and west. If No. 3 is thus placed, the roof on the north side may be made of planks instead of glass, but if it runs north and south it should have a glass roof on both sides. Easy access to all is obtained through the roof by removing a sash. Sometimes a door can be put at one end of No. 3. No. 2 does not cost much more than No. 1 and furnishes more room. By putting a few doors in the boarded roof, excellent ventilation is provided. No. 3 gives the best head-room, but is rather dark for evergreens with soft foliage, e.g.,

2734. Protecting plants by covering with a box, inside which are placed leaves or straw.

2735. Plants protected in a barrel covered with burlaps.
Cytisus Canariensis, unless the whole roof is glass. A pit like this has always been used in the Arnold Arboretum for wintering seedlings, rooted cuttings and grafts—young stock grown in flats but too delicate for the open ground. The arrangement of shelves shown in the diagram gives storage to large numbers of these small plants.

In No. 4 is shown a small plant cellar, more expensive but with better capacity for large plants. It should run north and south, and, excepting the glass roof, is wholly below ground, and consequently extremely well protected against frost. The door is at either end or side. By taking advantage of sloping ground it is possible to enter on the ground-floor level, which is important when large plants in tubs must be handled. In such cases a concrete floor may be built. The monitor roof provides plenty of light and ventilation; wooden shutters cover the glass in cold weather. This form of pit is not only well adapted to plants, but also is excellent for storing vegetables and fruits. The forms of buildings larger than those above described vary much with different circumstances. Sometimes the cellar of a stable, tool-house or other outbuilding can be utilized. The chief consideration is protection against frost, but provision must be made for thorough ventilation, and against a too high temperature in the autumn and early spring. It is because it is hardly possible to provide for these matters that dwelling-house cellars do not make good pits; they cannot be sufficiently ventilated to keep the temperature low enough except in the middle of winter. Growth is incited and cannot be maintained owing to lack of light.

Construction of the Pits. — Owing to their position, pits cannot well be made of wood, plank and cedar posts lasting from 4-6 years only. For large pits, stone and brick are most economical for walls and ceilings; for small ones concrete probably makes the cheapest and best wall. At the Bussey Institution the concrete walls of several small pits have stood 10 or 12 years without showing any sign of deterioration. It is not necessary to use high-priced Portland cements, because the structures are secured against frost by the winter protection required for their contents. An excavation of the required dimensions is made, with due allowance for the walls. Inside the excavation a plank molding frame is built at the proper distance; viz., the thickness of the walls, from the walls of earth which should have been cut as true as possible. This frame, which should also be true and plumb, is carried to the required height for the inside face of wall and another frame is made at the proper distance on the surface of the ground. The outer face of which will be the outside face of the completed wall. These frames must be well braced; they carry a heavy load until the cement hardens. It is not necessary to make a complete frame for the whole pit at once; one end and a half of both sides can be built first, and the same frame reversed will serve for the remainder. The concrete is made by mixing dry one part of cement (a good brand can be obtained at about $1.20 per barrel) to two parts of clean sharp sand. After a thorough mixture, add enough water to make a thick paste. Add to this paste three parts (sometimes four are used) of clean gravel. Broken stone is better but more expensive. No stones larger than a goose egg should be used. The whole should be completely and quite carefully blended with hoe or shovel until each stone is coated. Throw this mass into the space between the molding frame and earth wall and settle compactly with a rammer. It is not advisable to mix more than a barrel at once, nor so much as this unless at least six men are employed. Continuous batches are made until the work is finished. When the top layers are going in, insert ¾-in. iron bolts 6-8 in. long at intervals of six ft. These secure the wooden sills. In warm dry weather the frames can be removed within twenty-four hours or less, but first examine carefully the condition of the cement. After removal, smooth off any roughness and grout in with a whitewash brush a coat of Portland cement mixed with water, but without sand, thus obtaining a good color and a more homogeneous surface. For several days the work should be shaded.

2736. Deep pit built like a coldframe, for carrying half-hardy woody plants over winter.

2737. An outside cellar, in which to store roots and tubers, and pots of resting stuff.
and occasionally sprinkled with the hose. Do not attach the woodwork until the concrete is fully hardened. One and one-half barrels of cement make about one cubic yard of concrete, that costs, in place, between five and six dollars, somewhat less if the cost of labor, sand and gravel is moderate. Build in June or July, so that the concrete will be thoroughly dry before frost.

The construction of a brick roof is shown in Fig. 2741, No. 4. Concrete could also be used. A crooked roof or a crooked sash makes the best glass roof. All sills, cross-bars, etc., should be made of cypress and painted. The woodwork must be made strong to endure the continual exposure. It is false economy to stint in quantity or quality. In cellars for nursery stock, Figs. 2737-41, a comparatively small amount of light is required, and the low roof is boarded in and shingled, building paper being used. Planks may be substituted for boards, or the roof may be double.

Sand or gravel, one foot deep, makes the best floor, or half sand and half loam where plants are to be heeled-in. A concrete floor should be used only where the drainage is absolutely perfect.

The sides and ends should be banked with leaves or other material. See Fig. 2738. In the vicinity of Boston this should be done about November 15. The same covering can also be given to low roofs. The glass is protected by mats and shutters. See Hotbeds. It is a good plan to have on hand an extra supply of dry meadow hay to give additional shelter in zero weather.

Care and Management.—Pits, e.g. Nos. 1, 2 and 3, in Fig. 2741, like greenhouses, should carry more than one "crop." In early autumn they hold chrysanthemums, carnations, stiveas, etc.; next the Azalea Indica, Cyrtisus Canariensis, heaths, etc., some of which re-main for the winter while others are replaced by hardy shrubs, bulbs and other plants for forcing. For spring and summer use, see above. In eastern Massachusetts gardeners begin to use them in September, but the final storage sometimes is not finished until Christmas. The longer the plants can be kept in the open air the better fitted they are for their winter quarters.

In the care of pits, watering and ventilation are of prime importance. When first housed the plants should be well watered, and, if this is carefully done, it will often be found that no further water is required for plants in tubs and large pots (10 in. or more). This also is true of heeled-in stock. Everything, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the shelf, particularly in small pots (4-inch), will go dry oftener than those placed on the gravel floor. It is best to water on bright days, when the sashes can be removed. The great difficulty in keeping plants in good condition is owing to the condensation of moisture within the pits at times when it is impossible to open them on account of severe weather; therefore no more water should be given than is absolutely needed. As long as the weather permits, keep the sashes off or the windows open night and day, and afterwards open up whenever possible. On sunny days ventilate whenever the thermometer registers over 20°F, but do not begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the mercury above freezing, remove the sashes entirely. This is the best way to get rid of the moisture-laden air, and is essential for keeping evergreen plants with soft foliage in good condition. To change the air in large cellars is more troublesome; here it is advisable to build an open fireplace, in which a brisk fire may be kindled on mild days when all windows can be unlosed, thus obtaining ventilation than is otherwise possible. Sometimes these large cellars have a line of hot-water pipes or other means of heating, by which not only is better ventilation secured but also additional protection in severe weather. Occasionally in heavy snows the pits must remain closed for a week or more. This is undesirable but unavoidable. At such times there is special danger from field mice and other vermin. Concrete walls give them a poor harbor, but they must also be trapped or poisoned. If the plants are clean when housed, there is nothing to be feared from ordinary greenhouse pests, either insect or fungus, except the moulds. For related discussions, see Nursery and Storage.

Following is a list of plants that may be wintered in pits and frames with satisfactory results. The list is made for the neighborhood of Boston.

LIST OF PLANTS THAT CAN BE WINTERED IN PITS.

1. Hardy plants. 2. Seedlings, cuttings or grafts for forcing. 3. Young nursery stock for forcing or winter decoration. 4. Hardy plants of all kinds for forcing or winter decoration.

The temperature of pit or cellar for the above plants should be 35°F. or even lower occasionally. The larger plants should be heeled-in on the floor in sandy loam or in box-like shelves of loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock that is too small to be heeled-in on the floor in sand or loam, is placed in shallow pans with a pebble bottom in which it has been grown. Particular care must be given to ventilation when evergreen plants are handled. For forcing stock, see Forcing, pages 600-602.
WINTER PROTECTION

AA. Tender and half-hardy plants.
Those marked with a star (*) are tender and should not be exposed to
frost. They should also be kept in the driest part of the pit.

1. Alstroemeria, canna, dahalia, gladiolus, Milla billora, monchre-
tia, oxalis for summer bedding, tuberose, tidrigia, Zephyranthes
Atamasco, Z. caudata. Keep the above in dry house-cellar, where
no frost penetrates, temperature 35°-40° F. Dahlias and canna can be
covered with dry sand if prone to wilt. Tidrigia should be hung up
in bags to avoid mice.

2. Agave, alo, Lippea eitrodiora, Datura

WISCONSIN

Prunus Lauro-cerasus and others,
*Psidium Guajava, *Panica
Granatium, retinospora in variety,
rhododendron (tender hybrids),
Romneya Coulteri, roses (Bourbon,
Noisette, China, Bengal and other
tender varieties), Rosmarinus offi-
cinalis, Sequoia gigantea, *Trachosporum
Jasminoides, *Ulex Europaeus.

The above plants are commonly handled in pits for various seasons. In eastern Massachusetts,
with the possible exception of those marked thus (*), they will
bear a few degrees of frost, but not too long continued, without harm.
The average temperature of the pit should be just
above freezing, say 35° F.
The value of these plants
depends upon not only
on the winter in good condition,
but also to produce a good start in the spring.
For this purpose a cool
house must be provided; or
house constructed from
the sashes used on the pits
is equally good, in which
the plants can be properly grown until it is warm
enough to put them out-of
doors.

1. Anemone Japonica and A. coronaria, Bellis perennis,
Dianthus Caryophyllus (clove pinks and
European carnations from seeds), Galearis, Myosotis, mysorita, and
Persian ranunculus, Viola odorata (tender sorts), pansies, wall-flowers,
lettuce, cabbage, cauliflower and parsley. These

WISCONSIN, HORTI-
CULTURE IN. Fig. 2743.
The surface of Wisconsin
mostly varies between gently rolling plains and
hills of moderate height.
Small lakes are numerous,
particularly in the north.
The soil presents all va-
riations, and with the ex-
ception of the rather
large sandy and marshy
tracts, is mostly very

2. Agave, alo, Lippea eitrodiora, Datura

No. 1.—One of the simplest and least
expensive forms of cold pit for small
and medium-sized plants.

No. 2.—A well-ventilated cold pit, rosemier than the preceding
one and not much more expensive.

No. 3.—A shelved cold pit for wintering young stock grown in
flats. seedlings, rooted cuttings and grafts.

No. 4.—A small plant cellar for wintering large plants.
It is also excellent for storing vegetables and fruits. It
combines perfect ventilation with extremely good protection
against frost.

2741. Various forms of storage pits.
Owing to the proximity of Lakes Superior and Michigan, the climatic extremes are less severe than might be expected in a region so remote from the ocean. The skies, while clearer than in the eastern states, are somewhat more cloudy than in Iowa and Minnesota.

Damaging frosts are not common in Wisconsin except in certain districts of comparatively small extent. As in all of the northwestern states, summer droughts are rather frequent, but are rarely so severe as to seriously injure crops that are properly cared for. The numerous lakes and streams offer excellent opportunities for irrigation, which has, however, received little attention as yet. The prevailing winds are westerly, hence the influence of the Great Lakes in tempering the climate is less marked than in the southern peninsula of Michigan, but the climate of the eastern counties, and especially that of Door county, which lies between Green Bay and Lake Michigan, is comparatively mild.

The winters of Wisconsin are such as to preclude the extensive cultivation of the tree fruits, except of the harder species and varieties, saved in the eastern counties. But the summers are very favorable to annual crops, and to fruits that are readily protected in winter. The change from winter to summer is often rather abrupt. This brings on an exuberant growth early in the season, which while satisfactory for most crops, promotes blight in the pome fruits. An equally precipitous advent of winter sometimes causes damage to nursery stock. These sudden changes, with the rather frequent droughts in summer, combine to render the Wisconsin climate severe for most perennial plants. When an exceptionally dry summer is followed by a winter of unusual severity, a disastrous thinning out of fruit trees is likely to occur. The pioneer fruit planters, coming mainly from New York and New England, with pardonable ignorance of the severity of the Wisconsin climate, planted freely of eastern varieties, most of which proved too tender for the new conditions. As the natural result, the first orchards were mainly short-lived, and the idea gained wide credence that Wisconsin would never produce the tree fruits successfully. But the experience of a few persistent planters has disproved, in a measure, this hasty conclusion.

Wisconsin is one of the newer states in horticultural development. A large part of its northern half is still forest-clad. The cities are mostly small, hence the local demands for horticultural products are not large. But Milwaukee, a city charted to the west, and the cities bordering Lake Superior, make an export demand for fruits and vegetables, for which the markets are generally good.

The hardest varieties of the apple succeed in southern and eastern Wisconsin, when planted on sites some what higher than the surrounding country, especially those inclining to the north or northeast. The principal orchards are located in Fond du Lac, Green Lake, Richland, Sauk, Door, and Waupaca counties. The largest named county has one orchard of about 6,000 trees, mostly Oldenburgh, located near Ripon, and a second of about 4,000 trees of various sorts at Eureka. These orchards are mainly the largest.

The older orchards of Wisconsin are the outcome of a long process of climatic selection. But the farmers who were most anxious to grow apples continued to plant trees in the hope of finding hardier varieties, and these hopes have been in part realized. Occasional scalding trees that grew up in fence corners and elsewhere, from chance seeds, or from seeds planted by pioneer farmers who felt unable to purchase trees, were found to endure the severer winters, while whole orchards of old varieties were destroyed. Several of these have been adopted into cultivation, and a few, as the Pewaukee, Wolf River, McMahon, Northwestern Greening and Newell, have become standard varieties of the northwest. The Wealthy apple, from Minnesota, is also a standard winter sort in Wisconsin. The orchards now being planted are largely of the so-called Oldenburg variety. The Russian apples imported by the United States Department of Agriculture and the Iowa Agricultural College have been quite largely planted experimentally in Wisconsin, but thus far very few if any of them have proved superior in any respect to Wisconsin. Crab apples are considered for market in Waupaca and Eau Claire counties. The chief hindrances to apple culture in Wisconsin, aside from winters, are the fire-blight which destroys the tips of the growing shoots in early summer, and sunscald, which causes damage to the trunk in early spring or during hot weather in summer. The latter is readily prevented by shading the trunk. The codlin-moth is destructive unless prevented by spraying or other means.

The pear is not grown to any great extent in Wisconsin, owing to the liability of the trees to fire-blight and winter-killing. The varieties imported from Russia have not proved more resistant to these afflictions than the hardier sorts of American origin, or from western Europe. Pears are frequently grown for home use in the eastern counties, and the trees are sometimes quite productive and long-lived. The Flemish Beauty has proved one of the most successful varieties.

The quince is less hardy in Wisconsin than the pear. Trees are occasionally found in gardens in the eastern counties that sometimes bear fruit after exceptionally mild winters.

The Americans are the only plums that can be depended upon to bear fruit regularly in all parts of Wisconsin. The hardier sorts of the European plum, Prunus domestica, and of the Japanese plum, Prunus triloba, are nearly fruitful in the eastern part, notably in Door and Kewaunee counties. The trees of the last two species, as those of Prunus tortulana and Prunus angustifolia, endure the winters without harm throughout the state, but the flower-buds are destroyed whenever the thermometer registers much lower than 20° below zero. Few plum orchards have been planted in Wisconsin, and these are mainly of the European class. A plum orchard of 14 acres at Sturgeon Bay is supposed to be the largest in the state.

The early Richmond and Morello cherries are fairly successful in Wisconsin, in localities suitable to the apple. The flower-buds of these cherries appear to be somewhat more hardy than those of the Japanese plum. The trees are, however, subject to sunscald, and unless protected are usually short-lived. Several varieties of Prunus Cerasus, introduced from Russia, have not been tested sufficiently to show whether the flower-buds of these do not appear to be harder than those of the above-named sorts, their fruit matures over a longer period, which will give them value. Sweet cherries (Prunus Avium) are not successful in Wisconsin.
The peach and apricot are not fruitful in any part of Wisconsin except after unusually mild winters. The trees are frequently grown in gardens, and sometimes attain considerable size, but they freeze back more or less in the average winter. Trees of the apricot imported from Russia have been frequently planted in Wisconsin, by way of experiment, but are nowhere fruitful. Even if the flower-buds escape destruction, the fruit almost invariably falls soon after setting.

The grape, with winter protection, is successfully grown throughout southern and eastern Wisconsin when planted on light soil, with southern exposure. The later varieties are, however, liable to be caught by frost, unless the site is chosen with special care.

The small fruits are grown with marked success, on favorable soils, throughout Wisconsin. Winter protection is generally given to all but the currant and gooseberry, but in the southern and eastern counties this precaution is not absolutely necessary. The strawberry and raspberry are grown in excess of home demands, and many thousand cases of these fruits are annually shipped to other states. Blackberries were largely destroyed by the severe freeze of 1899. Huckleberries and blueberries are extensively gathered from wild plants in certain parts of west-central Wisconsin, and are shipped in large quantities to cities of the northwest. Wisconsin is one of the chief cranberry producing states. In parts of Wood, Adams and Juneau counties, and in less degree in Waupaca and Green counties, the cranberry plant was native over very large areas, and before the settlement of the country, the Indians gathered the fruit extensively in bearing years. Laterly, the wild marshes have been largely improved by clearing and providing flooding facilities. In some seasons the total output of cranberries from Wisconsin has aggregated nearly 100,000 barrels.

The varieties grown are mostly native, and the quality and keeping of the fruit are excellent. During the years 1894 and 1895 the cranberry industry of Wisconsin suffered a serious check by the destruction of many marshes by fire during an exceptionally dry period. But the business is rallying, and may, in a few years, recover its former magnitude.

Market-gardening is carried on in the neighborhood of cities and towns to a sufficient extent to supply local demands, except in the extreme northern part of the state. The ordinary garden crops of the temperate zone are all successful. Melons are grown rather extensively for shipment in a few localities. Peas are extensively grown for seed, for market and for canning in Kewaunee and Door counties, this section being free from the pea weevil. Lentils are considerably grown in Kewaunee and Manitowoc counties. Several vegetable canning factories are in operation in Wisconsin, peas, sweet corn and tomatoes being chiefly canned. Kitchen-gardening is less practiced in Wisconsin than it should be. The farmers generally employ little hand labor, and the hot summers render city gardening more or less unsatisfactory, even the private growing of flowers receives less attention than in the eastern states.

Horticulture is taught at the agricultural college connected with the University of Wisconsin, at Madison. Openings are good for commercial culture of apples, cherries, native plums and cranberries in the parts of Wisconsin best suited to these crops, and in the neighborhood of northern cities the growing of vegetables for market is at present remunerative.

E. S. Goff.
WISTARIA

bears profusely dense, drooping clusters of purplish pea-shaped flowers. The clusters are about a foot long. This is the commonest and best form. The others furnish the connoisseur with variety in habit, color and season of bloom, but they are not as prolific, and doubling adds nothing to the beauty of the flowers. Moreover, the double flowers decay quickly in wet weather. The Chinese Wistaria was introduced into England about 1816. Twenty-five years later there was a specimen in England with branches attaining 100 ft. on each side of the main stem, and another specimen that covered 905 square feet of wall space.

The Chinese Wistaria blooms in May and usually gives a smaller crop of flowers in August or September. The spring crop is borne on spurs, while the autumn crop is borne on terminal shoots of the season. There are several ideas about training a Wistaria. A good way


Wistarias will live in rather dry and sandy soil, but they prefer a deep and rich earth. Cuttings root with difficulty and the common practice is to make a small shoot on a piece of root. The roots are long and few and go down deep, making few fibers. They resemble hibiscus root. Wistarias are hard to transplant, unless they have been potted up for purpose or frequently transplanted in the nursery row. Unless matured heavily when transplanted, they are very slow in starting into vigorous growth. The most satisfactory method of propagation for the amateur is layering. Those who wish to give a year's trial to a new variety can make a good start may sink a bottomless tub in the ground and fill it with good soil. If a Wistaria is to be trained to a tree, select an old tree, if possible, which is past the height of its vigor.

INDEX.

W. alba, 1, 2, 3, 4. flor-e-pleno. 1
W. albiflora. flore-pleno, 4. rubra, 4.
W. brachybotrys. flore-pleno. 4. Stenaxis. 1.
W. Chinensis, flor-e-pleno. 1. macrobotrys. 4. speciosa, 3.
W. conspicua. flor-e-pleno. 1. variegata. 1.

B. Clusters 2–3 in. long, and looser; fls. odorless. 2. W. multijuga


The typical form has single purple fls. and is sometimes called var. purpurea. Hort. Var. alibiflora. Lemaire (var. alba, Hort.), has double white flowers. Var. flor-e-pleno, Hort., has double purple flowers. F. 1882:233. G.N. 17, p. 105; 34, p. 376. Var. macrobotrys, Beau. (W. macrobotrys, Hort.), has fls. of a paler shade of blue-purple, the clusters longer and green, not adv. in America. Var. variegata, Hort., has variegated foliage and is inferior to the common form in habit and productiveness. Unsuitable except for foliage effects.


W. chinensis, var. macrobotrys, Beauverd (W. macrobotrys, Hort.).
WISTARIA

2:463 (both erroneously as W. Chinensis). M.D.G. 1898:747. Botanically this is a variety of W. Chinensis, but for horticultural purposes its distinctness needs emphasis. It is often cult. under the name of W. Chinensis. Var. alba, Hort., is also cult.

2745. Wistaria Chinensis.
(× about ½.)

3. speciosa, Nutt. (W. frutescens, Poir.). AMERICAN WISTARIA. KIDNEY BEAN TREE. Not as vigorous as the Chinese Wistaria but climbing over trees and bushes to a length of 30-40 ft., with dark green foliage and short racemes of lilac-purple fls., borne about 3 weeks after W. Chinensis. Lfts. 9-15, glabrous and dark green above, pale and sometimes slightly pubescent beneath; racemes 2-7 in. long, about 14-fld.; fls. ½-3/4 in. long; pods long, tomentose, hardly coriaceous, with convex valves; seeds reniform, freely produced. June. Low grounds, Va. to Kans., south Fla. to La. B.M. 2103 (as Glycine frutescens). B.B. 2:294.—Var. alba, Hort., has white flowers. Var. magnifica, Hort. (W. magnifica, Hort.), has racemes 6-8 in. long and 50-60-fld., with fls. 1 in. across. The fls. are lilac with a yellow spot, and borne earlier than the type. The clusters are larger and denser. A great improvement. F.S. 11:1151.

4. brachybotrys, Sieb. & Zucc. SHORT-CLUSTERED WISTARIA. Japanese species, distinguished from all others by its low growth. It is said to attain only 2-3 ft. and should therefore be particularly desirable for standards and bushy specimens. Lfts. 9-13, silky; racemes about 6 in. long, about 25-fld.; fls. purple, 1 in.

across; pods tomentose. Late bloomer. Japan. S.Z. I:45. F.S. 9:880.—Var. alba and rubra, are offered.

W. alba has been used in trade catalogues for W. speciosa, var. alba, W. japonica, Sieb. & Zucc. See Miletta.—W. nivea, Hort. John Saul, was doubtless a white-fld. variety of some common species.

W. M.

WITCH ELM. Ulmus seabra.

WITCH HAZEL. Hamamelis.

WITHANIA. Consult Salpichroa.

WONGA WONGA VINE. Tecoma australis.

2746. Wistaria multifluga, often called Japanese Wistaria. (× 3¼)
WOOD BETONY. Stachys Betonica.

WOODBINE. In England, Lonicera Periclymenum; in America, Ampelopsis quiquetofia.

WOODRUFF. See Asperula.

WOOD LILY. Trillium.

WOODSIA (Joseph Woods, an English botanist). Poly-podiaceae. A genus of mainly rock-loving ferns characterized by their inferior indusium, which is attached beneath the sorus, inclosing it at first but soon splitting into star-like lobes, and later hidden beneath the sorus. Some fifteen species are known, of which seven grow wild in this country. The following native species are sometimes cultivated in borders. Treatment given other hardy ferns will suit them well. Both grow best amongst rocks.

W. Ilvensis, B.B. Fig. 2747. Lvs. growing in rosettes or tufts, 3-8 in. long. 1 in. or more wide, bipinnatifid; segments crowded, obscurely crenate; sori confluent when old. Eu. and N. Amer. north of Va.


L. M. Underwood.

WOOD SORREL. Orlis Acetosa.

WOODWARYDIA (Thomas J. Woodward, an English botanist). Poly-podiaceae. A genus of rather coarse-foliated ferns of diverse habit and structure, but all bearing the sori in rows arranged parallel to the midrib like links of sausages. Commonly known as the Chain Fern. See Fera.

W. areolata, Moore (W. Augustifolia, Sm.). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinnae; sporophylls with narrowly linear pinnae 3-4 in. long. Mich. to Fla., mostly near the coast.

A. Lvs. uniform.

B. Veins forming one or more series of areolae.

radicans, Sm. Lvs. rising from a caudex 3-5 ft. long, gracefully curved; pinnae 8-15 in. long, 2-4 in. wide, pinnatifid nearly to the midrib. The true W. radicans from Europe bears scaly bulbs toward the apex of the leaf and roots to form new plants. The Californian and Mexican species, which has often been referred to this species, is really distinct and never roots.

orientalis, Swz. Lvs. 4-8 ft. long, 12-18 in. wide, with lanceolate pinnae and sinuate pinnales; veins uniting freely. Japan and Formosa.

BB. Veins free between the sori and the margin.

Virginiensis, Smith. Fig. 2748. Lvs. 12-18 in. long, 6-9 in. wide on stonk stipes; pinnae linear-lanceolate, 4-6 in. long, cut nearly to the rachis into oblong lobes. Can. to Mich., Ark. and Fla.

L. M. Underwood.

WOOLLY BUTT. Eucalyptus longifolia.

WORMS. Fig. 2749. Under the name of "Worms," "Snails," and "Caterpillars," various odd fruits of leguminous plants are grown as curiosities. The pods are often put in soups as a practical joke, not for their edible qualities. The plants chiefly grown for this purpose are Scorpiurus vermiculatus, Linn., S. subtilissima, Linn., S. muricata, Linn., S. sulcata, Linn., Medicago scutellata, Mill., and Astragalus humosa, Linn. The last is the one usually known as "Worms." The picture, Fig. 2749, shows species of Scorpiurus, chiefly S. vermiculatus (beneath) and S. subtilissima (above). All these various plants are animals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See Caterpillars. L. H. B.

WORMSEED. See Chenopodium.

WORMWOOD (Artemisia Absinthium). Fig. 2750. An erect, hardy herbaceous perennial, native of middle and western Europe and the countries that bound the Mediterranean, and sometimes found in waste places as an escape from American gardens, having angular, rather shrubby stems 2-4 ft. tall, which bear abundant, much divided, hoary leaves of intensely and persistently bitter flavor, and pinnacles of greenish or yellowish flowerheads. The seed, grayish and very small, retains its vitality for about four years, but is usually soon blown after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and,
as its name implies, anthelmintic properties, although now, for no apparent reason other than caprice of practice, they are less popular with the profession than formerly. In domestic medicine they are employed as mentioned and as a diuretic; locally as a fomentation or as a decoction with vinegar to ulcers, sprains and bruises. In the dry state they are occasionally placed among clothing as a moth repellant. Formerly Wormwood was used by brewers to embitter and preserve liquors, but at the present time it finds its most extensive use as the principal ingredient in absinthe, in the manufacture of which peppermint, angelica, anise, cloves and cinnamon are also ingredients. According to Richter, the green color of this liquor is due not to Wormwood but to the chlorophyll of spinach, parsley or nettles. The plant may be grown without trouble in light, dry, rather

titude. This includes the high mountain ranges, which as a rule are covered with forests that catch and hold the winter snow, the melting of which supplies the numerous perennial streams flowing in every direction from the mountain summits. In the north, there is great diversity of soil, climate and exposure. There are wind-swept plains, rolling uplands, protected mountain valleys and bottom-lands along streams, with corresponding lengths of the growing season, free from frost, of from eighty days or less to more than one hundred and fifty days. The mean

poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out the few specimens necessary to furnish a family supply should be placed not closer than 15 in. each way the first year. If alternate plants be removed with a good ball of earth early in the following spring and planted 30 in. apart, they will be sufficiently close together and the transplanted ones should suffer from no check. Ripened cuttings taken in March or October may be used for propagation. Clean cultivation and slight annual dressings of manure are the only other requisites. In the middle western states there are several localities where Wormwood is grown for export. M. G. KAINS.


WYCH ELM. Ulmus scabra.

WYOMING, HORTICULTURE IN. Fig. 2751. The agricultural land in Wyoming is at a higher average altitude than that in any other state, being about 6,000 feet above the sea. As shown in the accompanying map more than one-half the total area is above 6,000 feet a.

2751. Map of Wyoming, showing horticultural possibilities.

The areas marked by semi-circles are deserts. The areas shaded by diagonal lines have an altitude of less than 6,000 feet.

annual temperature varies from less than 40° F. to about 50° F.

The rainfall is as little as 4 or 6 inches per annum in the Red Desert and reaches a maximum of 30 inches or more on the high mountains. The average for the agricultural regions is about 12 inches. With the exception of a very small area in the northeastern part of the state, and small valleys at high altitudes in the mountains, where some quickly growing plants will mature without being artificially watered, no crops can be raised without irrigation. It has been estimated that there is sufficient water supply to reclaim about 12,000,000 acres of agricultural land, and about 2,000,000 acres are already covered by irrigation canals.

The natural conditions make live-stock husbandry of paramount importance. The soil is cultivated principally to increase the amount of stock feed and little intensive farming has been inaugurated. Some ranches extend 10-15 miles along the streams, and some of them have not yet known the use of plow except in the construction of the ditches to irrigate the native meadows. The state is yet in the transition period between the time of the nomadic stockman, or the large stock ranch and range business, and the time of permanent home building and a stable agriculture. In the
last decade the sentiment of the people in regard to cultivating the soil has changed in a marked degree. They are turning their attention to a better agriculture and the production of horticultural crops, both for profit and for greater home comfort.

The state will not reach great commercial importance through her horticultural products, but the people are beginning to appreciate the value of the home-garden and some are raising hardy apples, cherries, grapes, small fruits and vegetables to supply local markets. At the present rate of increase the production of fruits for home consumption will soon be of great importance.

The agricultural land lies along the watercourses, and naturally the first areas to be brought under cultivation were the bottom-lands along the smaller streams where the canals necessary to bring water to the soil could be easily and cheaply constructed. The bench areas, or uplands, have better drainage both for water and air, and are more likely to be free from injurious late and early frosts, than the lowlands near the streams. With the extension of agriculture to the higher bench lands horticultural plants can be raised with more success. The modifying influence of wind-breaks makes it possible to grow fruits in a way that was not dreamed of when the country was first settled. Many early plantings of fruit trees failed because of drying winds or late frosts, and in some instances because the plants were drowned by over-irrigating the lowlands where first attempts were made.

Because of the varying conditions, the kinds and varieties of fruits which can be successfully produced vary in different parts of the state. The high plateaus are characterized by frost every month in the year except July, and only such crops can be grown as will stand a degree of frost in the spring months. In the warmer valleys, even up to 5,000 feet altitude, such tender vegetables as tomatoes, melons, sweet potatoes and peanuts have been successfully raised. Where the season is short because of the altitude, plants grow very rapidly, reach maturity in a short time and do not seem to be so seriously affected by light frost as they do where the season of growth is long.

In those portions of the state which are below 6,000 feet in altitude (see map) many varieties of apples, Morello and Rocky Mountain dwarf cherries and plums (varieties from Prunus americana) are fruiting, and hardier kinds are successful at much higher altitudes in protected locations. The Wealthy apple has been successfully fruited on the Laramie Plains at an altitude of 7,400 feet. Tree fruits have been most successfully raised in Fremont, Sheridan, Natrona and Laramie counties, which also produce all the varieties of small fruits usually grown in this altitude.

Above 7,000 feet the only small fruits that succeed well are currants, strawberries, dewberries and gooseberries, named in the order of their apparent hardiness. Because there is not sufficient snowfall to cover the ground and keep it covered during the winter, it is necessary to give winter protection to raspberries, blackberries and grapes by laying down and covering with earth to prevent their parts above ground drying out and dying in the dormant season. Under unfavorable conditions such treatment becomes necessary with strawberries and gooseberries.

Under irrigation the kinds of fruit suitable to the climate produce large crops. Years of failure are rare, and when they do come are traceable to sudden unseasonable changes of temperature, such as late spring frosts or early fall storms before the plants are mature and ready for winter. The first trees were set out in Wyoming between 1882 and 1885. Planting began in earnest in 1892, and every year there is good increase in the area devoted to fruits.

Following is a list of apples which have fruitcd in the state, arranged as nearly as possible in the order of their apparent hardiness and present abundance: Standard—Wealthy, Oldenburg, Antonovka, Gideon, Fameuse, Wolf, Tetofoisky, Ben Davis, Transparent, Pawnee, Pippin. Creata—Siberian, Montreal, Whitney, Martha, Van Wyck, Soulard, Transcendent.

B. C. Buffum.
XANTHISMA (Greek, dyed yellow, referring to the color of the fls.). Composite. A genus of only one species, a summer-blooming, yellow-flowered composite with heads 1½ in. across, composed of a small disk and about 20 rather slender rays. This plant is known to flower-seed catalogues as Centaurea Drummondii. In cultivation the plant is treated like a hardy annual, the seed being sown in the open border early in spring.

Generic characters: fls. all fertile; achenes top-shaped, 4-5-ribbed or angled; pappus persistent, composed of 10 or 12 rigid bristles which are minutely sebaceous above, gradually chaffy-dilated towards the base, and longer than the disk-corolla, as many or one-half shorter, and usually 5 still smaller and shorter external ones.

Drummond, DC. (Centaurea Drummondii, Terr. & Gray). Fig. 2752. Nearly glabrous biennial or annual, 1-4 ft. high; lvs. narrowly oblong to lanceolate; stem-lvs. entire or with a few teeth toward the apex; fls. attaining a diam. of 2 in. even in the wild.

W. M.

XANTHOCERAS (Greek, xanthos, yellow, and keras, horn, alluding to the yellow horn-like processes of the disc). Sapindaceae. Ornamental deciduous shrub or small tree with alternate, odd-pinnate lvs., showy white fls., terminal and axillary racemces, appearing with the leaves in spring on last year's branches. The large greenish fruits are similar to those of the buckeye. X. sorbifolia, the only species, is hardy as far north as Mass., and is a very handsome shrub well suited for solitary planting on the lawn. The dark green, glossy foliage is not attacked by insects and retains its bright color until frost sets in. The flowers are very showy and appear even on small plants. Xanthoceras is also sometimes used for forcing. It is not very particular as to soil. A porous, loamy soil and a sunny position seem to suit it best. Prop. by seeds, stratified and sown in spring, and by root-cuttings, which succeed best with moderate bottom-heat. A monotypic genus from N. China, allied to Ugnadia and Koelreuteria: fls. polygamous, the upper ones of the terminal raceme pistillate, the lower ones staminate, those of the lateral racemes staminate, with rarely a few pistillate ones at the apex; sepals and petals 5; disc with 1 suberecylindrical horns about half as long as stamens; stamens 8; ovary superior, 3-loculed, with a rather short, thick style: fr. a capsule, with thick walls dehiscing into 3 valves, each locale with several globose, dark brown seeds.


Alfred Rehder.

XANTHORRHEA (Greek, yellow flowing, referring to the resin which exudes from the trunks). Junaceae. The "Grass Trees," "Grass Gums" or "Black Boys," which form a conspicuous feature of the Australian landscape, are among those strange members of the rush family that have a decided trunk or caudex. The Grass Trees often have a trunk 2 or 3 feet high, surmounted by a dense, symmetrical crown of foliage, composed of a multitude of brittle, linear leaves 2-4 ft. long which spread or curve gracefully in all directions. From the center of this tuft of leaves arises a solitary, sceptre-like flower-stalk, terminating in a dense cylindrical spike of numerous, closely packed greenish flowers. These picturesque desert plants are well worth trial in the arid regions of the U. S. The trunk varies from almost nothing in some species to 15 ft. in the case of aged specimens of X. Preissii. The tall and palm-like trunks are thickly covered with the bases of the old dead leaves, which are cemented together by the black or yellow resinous gum that flows freely from the stems. In Australia the trunks are often charred and warmer and more arid regions of the U. S. They are said to thrive in a compost of peat and loam and to be propagated by offsets. X. Preissii seems to be the most desirable species.

Xanthorrhoea is a genus of 11 species of Australian

(1993)
plants of the general appearance described above: perianth persistent, of 6 distinct segments, the 3 outer glume-like, erect, concave or almost hooded, 3- or 5-nerved, the 3 inner much thinner, usually 5-nerved, erect, but more or less protruded beyond the outer segments into a short, hyaline or white, petal-like, spreading lamina. Flora Australensis 7:112.

2753. Xanthoceras sorbifolia (× 3⁄4). (See p. 1993.)

a. Trunk very short.

b. Spike 5–8 in. long.

minor, R.Br. Lvs. 1–2 ft. long, 1-2 lines wide: scape longer than the lvs.; spike less than 3⁄4 in. wide. B.M. 6297. — Belongs to the group in which the inner perianth-segments have a white blade conspicuously spreading above the outer ones, while in the next two species the inner segments have a short whitish tip, little longer than the outer and scarcely spreading.

2754. Fruit of Xanthoceras sorbifolia (× 3⁄4).

low, sending up suckers in spring: lvs. in clusters from terminal buds; lfts. about 5, cut-toothed or lobed, with wedge-shaped bases and entire sinuses; fls. small, dark or purple. April. Damp and shady places, southwestern New York southward. A.G. 1891:286. B.B. 2:55. — Var. ternata, Huth. Lvs. only ternate; lfts. often more deeply lobed, the sinuses entire. Same distribution. K. C. Davis.
XANTHOSOMA

XANTHOSOMA (Greek, yellow body, referring to the stigma). Aráceae. This genus is interesting to the horticulturist as containing the handsomely variegated stove foliage plant known to the trade as Phyllotetum Lindeni, and part of the vegetables known as "Malanga," a crop to which two per cent of the arable land in Porto Rico is devoted. Many species of the arum family are noted for their huge tubers, some of which are edible "after the acid and more or less poisonous properties are dispersed by the expression of the juice, or by its dissipation through heat" (B. M. 1889). Of this class the best known is the Elephant’s Ear, or Colocasia esculenta. The Malanga is said to be "little, if at all, inferior to Caladium esculentum; in wholesomeness and delicacy far superior to spinach; and in this respect it may vie with any European vegetable whatever."—Bot. Mag. The "Yautia Malanga" of Porto Rico is, according to Cook, Colocasia antiquorum, var. esculenta. Other Yantias are species of Xanthosoma. The botany of them is confused.

Xanthosoma is a genus of 25 species, according to Engler, who has given an account of them in Latin in DC. on Planer, vol. 2 (1879). They are milky herbs of South and Central America with a tuberous or tall and thick rhizome. lvs. arrow-shaped, 3-cleft or pedately cut; lvs. unisexual, naked; males with 4-6 stamens connate in an inversed pyramidal synandrium with 5 or 6 faces; ovary 2-4-loculed; ovaries anatropous.

A. Caudex a short, thick, erect rhizome.

1. sagittifolium, Schott (Arum sagittifolium, Linn.), MALANGA. A tropical vegetable. "Young plants of this are stemless, but in age, from the decay of the old lvs., an annulated caudex is formed some inches in height, each throwing out stout fibers from the base, and from time to time producing offsets, by which the plant is easily propagated, or if suffered to remain the plant becomes tufted, and numerous lvs. are produced from the summit of the short, yet stem-like trunks" (B. M. 1889). lvs. 1-2 or almost 3 ft. long, broadly sagittate - ovate, suddenly and shortly acute at apex, basal lobes obtuse: spathe large, with a creamy white limb. Tropical Amer. B. M. 1889.—In northern hot-houses said to bloom in winter.

2756. Xanthosoma Lindeni. Leaves a foot or so long.

AA. Caudex tuberosa.

Lindeni, Eng. (Phyllotetum Lindeni, Andrè). Fig. 2756. Tender variegated foliage plant with large, arrow-shaped lvs. marked with white along the midrib and parallel veins which run therefrom to the margin. I. H. 19:88. A.G. 19:573 (1898).—Tuberous plant from Colombia. G. W. Oliver, in his "Plant Culture," remarks that this stove ornamental plant should be more used for decorative purposes than it is at present, for it will stand more rough usage than one would suppose. After a goodly number of leaves have been developed in a warm, moist atmosphere, the plants will maintain a good appearance in a greenhouse temperature and may even be used as house plants. The lvs. are firmer in texture than caladiums. Prop. by division. Before repotting, put the pieces in a warm sand-bed to encourage new roots. Lvs. oblong-hastate, with acute basal lobes.

X. belophóllum, Kunth, has a short, thick, erect rhizome and a cordate-hastate leaf. Venezuela. Var. Caracasannum, C. Koët. (X. Caracasannum, Schott. Colocasia Caracasana, Eng.). has lvs. pale green beneath, the posterior lobes more produced at the apex and the midrib and nerves often rose. Caracas.—X. Mafatta, Schott (Colocasia Maffata, Hort.), closely allied to the preceding, has a similar caudex and a cordate-ovate leaf but the posterior costs are separated by a right or acute angle, the angle in the preceding species being obtuse. W. M.

XANTHOXYLUM (Greek, zanthos, yellow, and zylon, wood). Sometimes spelled Zanthoxyum, including Fagara. Rutáceae. PRICKLY ASH. TOOTHACHE TREE. Ornamental deciduous or evergreen trees and shrubs, mostly prickly, with alternate odd-pinnate or sometimes simple leaves and small greenish or whitish flowers in axillary clusters or terminal panicles followed by small capsular, often ornamental fruits. X. Americana is the only species which is hardy north, but some of the species from E. Asia will probably prove fairly hardy in the middle Atlantic states. As ornamental shrubs they are valued chiefly for their fruits, but some have handsome foliage also, and X. ailanthoides is called by Sargent one of the most beautiful trees of Japan. They seem to be not
very particular as to soil and position. Prop. by seeds and by suckers or root-cuttings.

The genus contains about 140 species in the tropical and subtropical regions of both hemispheres, and a few in temperate regions. Trees and shrubs, with mostly prickly branches; most parts, particularly the fruits, emit a strong aromatic odor when bruised: lvs. odd-pinnate, 3-fofoliate or rarely simple; fls. dioecious or polygamous, small, in cymes or panicles; sepal, petals and stamens 3–8, sepal often wanting; pistils 3–5; fr. composed of 1–5 separate small dehiscent capsules each with 1–2 shining black seeds. Several species are used medicinally. The wood of some W. Indian species and that of the Australian X. brachycanthum is considered valuable. The fruits of X. piperitum are used like pepper in Japan.


**Alfred Rehder**.

**XERANTHUMUM**. The immediate influence of pollen—the influence on the fruit that results directly from a given pollination.

**XERANTHÉMUM** (Greek, dry flower: it is one of the "everlastings"). Compositae. There are four or five species of Xeranthemum, of which X. annuum is one of the oldest and best known of the "everlastings" or immortelles. They are inhabitants of the Mediterranean region. They are annual erect herbs, densely pubescent or tomentose. The heads are rayless, but the large involucral scales are petal-like and persistent, giving the plant its value as a subject for dry bouquets. Outer flowers few and sterile, inner ones fertile; receptacle chaffy; involucral scales in many series, of various lengths, glabrous; heads solitary on long naked peduncles.

The culture of Xeranthemum is very simple. Seeds are usually sown in the open, where the plants are to stand; but they may be started indoors and the seedlings transplanted. Hardy or half-hardy annuals.

**XERANTHÉMUM annuum**, Linn. Fig. 2758. Annual, 2–3 ft. tall, erect, white-tomentose: lvs. alternate, oblong-lanceolate, acute, entire: heads purple, 1–1 1/2 in. across, the longer scales wide-spread and ray-like. S. Europe.—Runs into many varieties. Var. ligusticum, Voss (X. pleniscinum and X. imperiale, Hort.) A double or half-

**double form.** Var. periglousum, Voss (X. superbusinum, Hort.) has very full double heads. In these and the single types there are white-fl.d. (var. alba), rose-fl.d. (var. rosatum) and purple-fl.d. (var. purpurescens) varieties. There are also violet-fl.d. forms. Var. multiflorum, Hort. (var. compactum) has a more compact and
bushy habit, with somewhat smaller heads. *X. varius*, Hort., is a trade name for mixed varieties.

*X. uniflorum*, Mill. (X. erectum, Presl.) has white heads of which the scales are little or not at all open or spreading. S. Eu. to S. W. Asia. L. H. B.

**XERANTHEMUM** (Greek, dry leaf). *Liliaceae*. Turkey's Beard. The Turkey's Beard of our eastern states is a strong perennial herb, 3 or 4 ft. high, resembling the asphodel. It has a dense tuft of numerous long, wiry leaves from the center of which springs a stately shaft sometimes 5 ft. high, with an oval or oblong raceme 6 in. long, crowded with yellowish white 6-perted fls., each ¼ in. across. It blooms from May to July, fls. with delicate fragrance lasting a long time. It is a handsome plant than the asphodel, but, like many other native plants, its beauty was first appreciated in England and it has only lately found favor in American gardens. *X. setifolium*, or *asphodeloides* as it is known to the trade, is considered one of the choicest plants for English bog gardens. The possession of several large clumps is especially to be desired, as each plant flowers so freely that it requires a year or two to recover. Unfortunately the plant does not seed freely and propagation by division is a slow process which must be performed with great care in the spring. It needs a moist and somewhat shaded situation and a peaty soil. The probability is that the Turkey's Beard can be grown in any sandy soil that has been liberally enriched with well-rotted leaf-mold in a spot that is reasonably dry in winter. The species is a native of the dry pine barrens from southern N. J. to eastern Tenn. and Ga. The chief species of the Pacific coast, *X. tenax*, has white and violet flowers, the latter color supplied by the stamens. Each region should cultivate its own species. The forms are too much alike for the same garden. A third species, *S. Douglasii*, is a rare plant ranging from Montana to Oregon. It is distinguished by its 6-valved capsule and is said to be inferior as a garden plant to the other species.

**XEROPHYLLUM** are tall perennial herbs with short thick, woody rootstocks, unbranched leafy stems and linear, rough-edged leaves, the upper ones shorter than the lower; fls. small, white, in a large, dense raceme, the lower fls. opening first; perianth-segments oblong or ovate, 5-7-nerved, devoid of glands; stamens 6; ovary dehiscing; styles 3, reflexed or recurved; capsule loculicidally and sometimes also septically dehiscent. Watson in Proc. Am. Acad. Arts. Sci. 14:284.

A. Raceme 3-6 in. long or more: perianth-segments exceeding the stamens; lvs. one line or less wide.


2759. Xerophyllum setifolium growing near the margin of a pond.


AA. Raceme 1-2 ft. long; perianth-segments scarcely equalling the stamens; lvs. about 3 lines wide. pedicels longer, mostly 1-2 in. long.

Ximénia (Francis Ximenes, Spanish monk, wrote on plants of Mexico in 1615). Olacáceae. Here belongs the Hog Plum, a tropical fruit of minor importance which grows wild throughout the tropics, and in the U.S. is native to Florida south of Tampa Bay. The fruit is about an inch long, shaped like a plum, and the pulp is sweet and aromatic. The "stone" which incloses the seed is proportionately very large. The fruit is borne on a small tree, each branch of which ends in a thorn about ½ in. long. The fruits are generally eaten, but although it is fairly common in Fla. it is not cultivated. The species has been suggested by the American Pomological Society as worthy of cultivation with a view to improvement.

Ximenia is a genus of 8 species of tropical shrubs or trees, often thorny: lvs. alternate, entire, often clustered: fls. whitish, in short axillary cymes or rarely solitary; calyx small, 4-toothed; petals 4, united at the base, villous within; stamens 8: ovary 4-loculed; locules 3-4-ovuled: drupe baseate, not inclosed in the calyx.

Americaná, Linn. Hog Plum. Also called Mountain or Seaside Plum and False Sandalwood; "Wild Olive" in Jamaica. Tropical fruit-bearing tree described above. Lvs. 2-3 together, oblong, obtuse, short-petioled; peduncles 2-3-fl., shorter than the lvs.: fls. small, yellow; petals thick, lanceolate, rusty-hairy within: fr. yellow; nut white, globose. Tropics.—The "Hog Plum" of Jamaica is Spondias tatea.

W. M.

XYLOSMA longifolium has been offered in southern Florida, but no plants have been sold and the stock has lately been destroyed, as there seems to be no reason for cultivating the plant. It is a bush from the Himalayas and belongs to the family Bixaceae. See Flora of British India.
Y

**Yam.** See *Dioscorea* and *Sweet Potato*. Circular 21, Div. of Bot., U. S. Dept. Agric., has valuable cultural notes on the introduction of West Indian Yams (*Dioscoreas*) to subtropical agriculture in the U. S.

**Yarrow.** Consult *Achillea*.

**Yate.** See *Eucalyptus occidentalis*.

**Yellow Root Shrub.** *Xanthorrhiza*.

**Yellow-Wood.** *Cladrastis tioutoria*.

**Yerba Buena.** *Micromeria douglasii*.

**Yew.** See *Taxus*.

**Youth-And-Old-Age.** *Zinnia*.

Most species may be fertilized if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. *Y. filamentos* commonly fruits freely, but the others rarely fruit spontaneously in cultivation except *Y. filamentos* and *Y. flaccida*, which are pollinated by a small white moth (*Pronuba vvcaselia*) that accompanies them when cul-

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2761. *Yucca Whipplei*.

The great Yuccas, or "Yucca Palms," of southern California (Fig. 2760) are chiefly \textit{Y. arborescens}. They grow in the higher lands bordering the Mojave and adjacent deserts, reaching a height of 15-20 ft. The old plants are exceedingly weird and picturesque. Occasionally this species is transferred to gardens, but it is apparently not in the trade.

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\section*{4. glauca, Nutt. (Y. angustifolia, Pursh. Y. Hamburyi, Baker). Fig. 2766. Lvs. less than 3/ in. wide, thin but stiff, flat, usually concave, pungently pointed, with white margin from which slender fibers detach themselves, whiteish green: panicle with 1 or 2 short branches within the cluster of leaves, or usually reduced to a raceme; fls. greenish; style green. Rocky mountain region and plains. B. M. 2236, G.F. 2:247. Rept. Mo. Bot. Gard. 6, p. 57. B.H. 1:427. -Var. \textit{variegata}, Prel. (Y. striata, Sims). Inflorescence freely branched at top of the leaf-cluster. Southern plains. B. M. 2992.

\section*{5. gloriola, Linn. Nearly stemless or with slender trunk, 10-15 ft. high: lvs. 1-2 in. wide, thin but not re-}

\section*{2764. Adam's Needle—Yucca filamentosa. From a plant 4 feet high.}

\section*{2763. Flower of Yucca Whippeli. Three petals removed to show structure of blossom.}

\section*{2762. Flower of Yucca filamentosa (X 5/).}
with median whitish stripe on the lvs. is var. medio-striata, Planch. Among the numerous varieties and forms into which this, the first-cultivated Yucca, has sported, the following are most worthy: Var. pliocata, Carr. Lvs. very glaucous, strongly plicate. G.C. III. 53:304. Rep. Mo. Bot. Gard. 3, pl. 6. Var. recurvifolia, Carr. Mexitalia (Y. recurvifolia), Salish. Y. recurvata, Haw. Y. pen-dula, Hort. Has the lvs. less plicate, soon green, gracefully recurved, occasionally with a few detaching marginal threads. Carolina coast region. Gn. 47, p. 337. R.H. 1858, p. 433; 1859, p. 488. Variegated forms of this are the following: Var. marginata, Carr. Lvs. yellow-margined; var. variegata, Carr. Lvs. with yellow median band; and var. elegans, Hort. Lvs. with reddish median band. Var. nobilis, Carr. (Y. Elzacomberti, Bak.). Lvs. glaucous, not plicate, less recurved. Var. flexilis, Trej. (Y. flaccida, Carr.). Lvs. long, narrow, less than an inch wide, scarcely plicate, glossy green, gracefully recurved, occasionally a little rough on the margin.—Hybrids of Y. gloriosa with both capsular and fleshy-fruiting species have been artificially produced in Europe, and are in some European gardens under the names Y. Deleuilii, Y. subulata, Y. Carrierei, Y. Andreaeana, Y. dracofoioides, Y. striata, Y. Massiliensis, Y. ensifera, Y. lividata and Y. juncea. R.H. 1886, p. 63; 1895, p. 81. For descriptions see R.H. 1895, p. 169. Other hybrids not yet in the trade have more lately been produced by Sprenger, of Naples.

6. aloifolia, Linn. Slender simple trunk 10–15 ft. high; lvs. dagger-shaped, 1–2 in. wide, flat, very stiff and pungent, not plicate; panicle compact, close to the lvs.; fls. white, often tinged with green or purple; ovary distinctly stalked. Southeastern U. S. and West Indies. B.M. 1700.—Variegated forms are: Var. marginata, Bonnier. Lvs. with yellow margin, and often when young also tinged with rose. Var. quadricolor, Hort. Lvs. with median yellow band, and also when young with rosy coloration. Var. Dracopus, Engelm. (Y. Dracopus, Linn.). Branching above. Lvs. broad and arching, less pungent. B.R. 22:1894. Var. conspicua, Engelm. (Y. conspicua, Haw.). Tall, the stems clustered at base; lvs. broad, recurved, softly green-pointed.


8. Treculeana, Carr. (Y. canaliculata, Hook. F. dispera, Regel. Y. longifolia, Buckley. Y. Vanden-steiniana, Koch. Y. argospalatha, Verlot.) Fig. 2767. Usually loosely branched in cultivation; lvs. thick and very rigid, deeply concave, rough, blue-green, at length with a few fine fibers detaching from the brown margin: panicle short-stalked, compact. S. W. Tex. to N. E. Mexico. B.M. 5201.

2765. Flowers of Yucca filamen-tosa (× 1/3). and are in some European gardens under the names Y. Deleuilii, Y. subulata, Y. Carrierei, Y. Andreaeana, Y. dracofoioides, Y. striata, Y. Massiliensis, Y. ensifera, Y. lividata and Y. juncea. R.H. 1886, p. 63; 1895, p. 81. For descriptions see R.H. 1895, p. 169. Other hybrids not yet in the trade have more lately been produced by Sprenger, of Naples.

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8. Treculeana, Carr. (Y. canaliculata, Hook. F. dispera, Regel. Y. longifolia, Buckley. Y. Vanden-steiniana, Koch. Y. argospalatha, Verlot.) Fig. 2767. Usually loosely branched in cultivation; lvs. thick and very rigid, deeply concave, rough, blue-green, at length with a few fine fibers detaching from the brown margin: panicle short-stalked, compact. S. W. Tex. to N. E. Mexico. B.M. 5201.

2767. Yucca Treculeana—A much suckered specimen.

9. baccata, Torrey. SPANISH BAYONET. Low, from a stout running caudex: lvs. of a yellow-green, with very thick marginal threads: panicle rather loose within the leaf-cluster: fls. and fruit very large. S. Colo. to Ariz. B.R. 1:426. WM. TRELEASE.

2766. Group of Yucca glauca, better known as Y. angustifolia.
ZALUZIANSKYYA (after a Pole, who wrote Methodus Herbariorum, Prague, 1592). Including Nycteris, Serophulariaceae. About 16 species of S. African herbs and subshrubs, including three plants known as Night Balsam or Star Balsam, from their night-blooming habit. The name Night-blooming Phlox would be better, as the flowers are salver-shaped and 5-lobed, each lobe being deeply cut. These plants are generally treated as half-hardy annuals, the seed being sown indoors in early spring. The plants die down in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very unsatisfactory and urge that the seed be sown in the autumn and the young plants wintered in a cold frame. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night.

Zaluzianskys are more or less viscosous plants: lowest lvs. opposite, upper ones alternate, usually few-toothed; fls. sessile but long-tubed, disposed in leafy spikes which are cylindrical or flattish; calyx 5-toothed, 2-lipped or 2-parted; corolla persistent, the 5 lobes entire or 2-fld, equal or the 2 posterior ones a little wider; stamens usually 4; style club-shaped; capsule oblong, leathery or membranous. The Zaluzianskys are little known in American gardens. The botanical status of the group is in need of revision.

A promise was made to give some account under Zaluzianskya of the puzzling trade names Erinus duplex, gracilis, Paxtoniana and spectabilis. It is probable that these are all varieties of Erinus alpinus. In the American trade they are considered as trailing plants suitable for hanging-baskets, or in window boxes, to sows to which Erinus alpinus is eminently adapted. E. spectabilis is said to have ultramarine blue fls.; E. gracilis, light blue fls., and a spreading habit; E. Paxtoniana, pure white fls., blue-edged; E. duplex, double blue fls. Erinus gracilis of the botanists is a true Zaluzianskya, being a synonym of Z. lychnidea, a plant of erect habit with white fls. that are violet outside. Although Erinus and Zaluzianskya are placed in different Tribes of the Flax family, it is difficult to separate them by any one important botanical character unless it be the shape of the stamens, which is oblong in Zaluzianskya, reniform in Erinus. The horticulturist, however, may readily distinguish them by the lowest leaves, those of the former being opposite, those of the latter tufted. To the account of Erinus in Vol. II, p. 543, should be added the fact that the genus has only one species, or other name which appear to be good species of Erinus in Index Kewensis are presumably to be referred to other genera, as they are mostly South African plants—Europe and the Cape having few genera in common.

All the species mentioned below have their corolla-lubes biform.


Lychnidea, Walp. (Nycteris lychnidea, D. Don. Erinus gracilis, Lehm., not Hort.). Subshrub, 2 ft. high, with fls. 1/4 in. long, 5/8 in. across, white, violet or pink. B.M. 2504, B.R. 9.748 (both as Erinus lychnidea).

b. Duration annual: bracts oblong-lanceolate: lvs. linear or the lower ones lanceolate.

Capensis, Walp. (Nycteris Capensis, Benth.). Differs from the above, according to Bentham, in stature, duration, strict stems and smaller lvs., but unfortunately Bentham does not give the height of the plant or color of the fls. According to R.H. 1851:221 the fls. are 5/8-1 in. long and less than 3/4 in. across.

AA. Corolla-tube glabrous.

Selaginoides, Walp. (Nycteris selaginoides, Benth.). Dwarf annual, branched at the base, 3-5 in. high, rarely 6 in., with spatulate lvs. and fls. 2-4 in. long, color of fls. not stated by Bentham, but in R.H. 1856, p. 308 (same picture as Gn. 24, p. 89) the fls. are said to range from white to lilac and darker depending upon their stage of development, with an orange-colored eye which becomes crimson later. This suggests the preceding species, and it is evident that the two must be distinguished by technical characters until the colors can be verified. The plant advertised in America as Nycteris selaginoides is said to be a pink fl., half-hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardy at San Francisco.

W. M.

ZAMIA (name used by Pliny, meaning loss or damage, and first applied to barren pine cones, and transferred to these plants apparently because of the cone-like fructification). Cycadaceae. One of the nine genera of the Cycas family, as constituted by Alphonse De Candolle (Prodr. 16, pt. 2, pp. 522-547). Other genera of horticultural interest and discussed in this Cyclopedia are Ceratozamia, Cycas, Dioon, Encephalartos and Macrozamia. The Zamias are stocky short and usually simple-stemmed cycas-like plants, the trunk sometimes subterranean, with long pinnate evergreen leaves or fronds, the leaflets being thickened and usually broadened at the base, and jointed. There are about 30 species in the American tropics, and two are native to Florida. The flowers of cycads are dioecious, without envelopes; the pistillate flowers are mere naked ovules inserted under scales in cones, and the staminate flowers are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not enclosed in a pericarp or ripened ovary) and are allied to the conifers. The fruit is a berry-like drupe. In Zamia the floral scales are peltate (and not horned) and form a cylindrical cone, the anthers are numerous, and the ovules pendulous in pairs. Leaves nearly straight in venation. The fucemation of Zamia has been studied by H. J. Webber (Bull. 2, Bureau of Plant Ind. U. S. Dept. Agr.). His conclusions respecting the Florida species are accepted below.

Zamias are warmhouse plants, to be treated like species of Cycas or Encephalartos, which see. The plants are propagated by means of seeds and offsets; also by division when there is more than one crown.

(2002)
A. Petiole prickly.

**furfuracea.** Ait. Trunk cylindrical, 1–2 ft. tall; petioles dilated and concave at the base, with several small prickles; Ifts. about 10–12 pairs, opposite or alternate, oblong-obovate, entire on the lower half but serrate at the top, acute or obtuse, sepals lanceolate, (as also the racemes) cone oval-conical, downy, pedunculate, pale yellowish brown, the pistillate ones 4 in. or less long. Mexico. B.M. 1689.

**Lindeni.** Regel. Trunk cylindrical, 2–4 ft. or more tall when well grown; petioles long, cylindrical, sparsely provided with tawny wool, the prickles short conical and spreading; Ifts. 20 or more pairs, glabrous or somewhat puberulous, nearly or quite opposite, sessile, long-lanceolate and acuminate, dentate-serrate towards the top. Ecuador. I.H. 22:195.

AA. Petiole not prickly.

B. Species growing beyond the limits of the U. S. integrifolia. Ait. Trunk 12–18 in. tall, erect, globular or oblong; lvs. glabrous; Ifts. alternate, 7–16 pairs, oblong to linear-lanceolate to lanceolate, mostly obtuse, entire or somewhat dentate towards the apex; cones oblong and obtuse, short-peduncled. West Indies. B.M. 1851.—The Florida plants, usually referred here, are apparently all Z. Floridana and Z. pumila.

**Mexicana.** Miq. Distinguished by De Candolle as follows: scales of the leaf-buds tomentose and also the petioles at the base, the petioles 3-corned, unarmed, glabrous, somewhat hairy; Ifts. of 9 or more pairs, sub-opposite, narrow-lanceolate, straight or slightly curved, acute or acutish, rigidly coriaceous, dark green, many-nerved, spinless, more serrate from the middle to the apex. Mex.—By Index Kewensis referred to Z. Lodigesi, a species with prickly petioles.

**Pseudo-parasitica.** Yates (Z. Rezlii, Regel). Distinguished as follows by De Candolle: trunk cylindrical; Ifts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cuplicate at the apex, with 18 strong nerves which are twice bifurcate. Panama.—Grows on tree trunks.

**anguinfolia.** Jacq. Foliage glabrous when mature: Ifts. 5 in. long; 4–20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrulate or entire, the base not narrowed, 6–8-nerved: pistillate cone obtuse but cuspidate. Bahamas, Cuba.

**Species native to Florida.**

**Zamia Floridana.** DC. Coontie. Comptte. Figs. 2768–71. Lvs. ovate or ovate-lanceolate; petiole triangular in outline, sericeo-tomentose at base, with scattered hairs above; Ifts. mostly opposite, 14–20 pairs, glabrous above and with scattered hairs beneath, linear, falcate and somewhat twisted, narrowed at the base and obtuse at the apex, the margin revolute and with a few obscure teeth; mature pistillate cones oblong, 5–6 in. (12–16 cm.) long, markedly umonate (projection on the scales), densely tomentose.—Very abundant in southern Florida on the east coast below lat. 28° 30', in open comparatively dry pine woods.

**pumila.** Linn. Differs, according to Webber, in having shorter and broader leaflets which are less twisted and not so erect and rigid, and in its shorter and non-umonate cones with seed-bearing scales thinner and more flattened at outer end.—Abundant in central Florida, ranging from 28° to 30° north for one degree of latitude, in dense moist woods.


**ZANNICHELLIA palustris.** Linn. (Vitiodactylor)., or Horne's Pondweed, is offered by collectors of native plants, but has little horticultural value. It is a hardy aquatic plant (probably annual) widely distributed in the New and Old Worlds. It has thread-like submerged lvs. 1–3 in. long and flowers under water. It is found in fresh or brackish water. B.B. 1:89.

**ZANTE CURRANT.** See Raisin, page 1496.

**ZANTHORRHIZA.** See Xanthorrhiza.

**ZANTHOXYLUM.** See Xanthoxyllum.

**ZAUSCHNERIA** (named for a professor of natural history at Prague). *Onagreatum.* The **CALIFORNIA FUCHSIA,** or HUMMINGBIRD'S TRUMPET, is a half-hardy perennial plant $\frac{3}{4}$–2 ft. high, with drooping, trumpet-shaped vermilion flies, $\frac{1}{2}$ in. across and under 1 in. wide at the mouth. It is the calyx which forms the showy trumpet, and its 4 acute lobes are rather larger than the 4 petals, which are obcordate and inserted at the throat of the calyx-tube. The length of the calyx distinguishes this genus from Epilobium, to which Zauschneria is closely allied by reason of its 4 petals, 8 stamens, 4-loculed ovary and comose seeds. The genus has only one species, but this varies greatly in the width of its, and hairiness. Varieties have been made based upon linear, lanceolate or ovate lvs., but they run into one another. The plants also vary from glabrous and pubescent to tomentose. As a bedding plant it has been occasionally used for novelty effects by European gardeners. To overcome its thin and leggy habit, it is well to set the plants rather closely and pinch out the young shoots until compact bushes are secured. The plant is sometimes grown in pots for greenhouse decoration in late autumn. There are said to be forms that vary considerably in hardiness. The plant is hardy in most parts of England with slight winter covering. In favored spots it is considered to be a choice plant of pendent habit for the steep sides of rockeries and for naturalizing on old walls. In light and dry soils it spreads underground like the epilobiums. It is prop. by division, by cuttings made in autumn and wintered in a coldframe, or by seeds sown in early spring in mild heat. In California the plant is considered objectionable on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.

**CALIFORNIA.** Presl. **CALIFORNIA FUCHSIA.** HUMMINGBIRD'S TRUMPET. Half-hardy perennial with the flower of a Fuchsia and the fruit of an Epilobium: height
ZAUSCHNERIA

2772. Indian Corn — Zea Mays.

by a long, shallow furrow on each side) correspond to a single spike of Euchlaena. Grain developed at the expense of the other parts, projecting beyond the thin bracts, which rarely become coriaceous and inclose it." Fig. 2773. The staminate flowers are in the "tassel."

Dent or Field Corn (Z. indentata, of Sturtivant). The bulk of the Corn raised for home use and for export belongs to this subspecies. It is characterized by the presence of horny or corneous endosperm along the sides of the grain, while the starchy endosperm extends to the summit. In drying, the floury portion shrinks more than the horny, and this gives rise to the dent at the summit. Both the horny and the floury portion of the endosperm consist of starch, but the former is more compact. The varieties vary greatly in size of plants and appearance of the ear, but in general the plant and the ear are both larger than the Sweet or Flint Corns. The color of the kernels varies, the chief color varieties being white, yellow, and calico, the latter mottled with red; red varieties are less common, but red ears occasionally occur in all varieties.

Flint Corn (Z. indurata, Sturt.). Kernel with horny endosperm enveloping a starchy or floury portion, this being hard and flinty and with no dent at apex. Ears in most varieties smaller and rows fewer (often 8) than in the Dent Corn. Color of kernel white, yellow, red, blue, and variegated. Commonly cultivated through the northern portions of our country and in Canada, where the seasons are too short for Dent Corn. Has been grown as far north as 50°.

Soft Corn (Z. amylacea, Sturt.). Kernels without horny or corneous endosperm, hence shrinking uniformly. Seems to have been commonly grown by the Indians in many localities of both North and South America. At present it is cultivated to only a limited extent in the United States. Brazilian Flour Corn sold by seedsmen is a type of the Soft Corn.

A form of Flint Corn with variegated leaves goes under the name of Zea Japonica, or Japanese striped Corn. Z. quadrivora and Z. gracilicoma are seedsmen's names for other similar forms, the former being variegated and the latter dwarf.

For cultural account, see Corn. A. S. Hitchcock.

2773. Ear or pistillate spike of Maize.

The husks are a kind of involucre. Each kernel represents a flower. The "silk" is the style.
from the Teosinte (Euchlora Mexicana), a fodder grass that is much grown in Mexico. See Teosinte.

This latter view has arisen from experiments in crossing Teosinte and Maize, whereby a maize-like plant has been produced, thus showing the very close affinity of the two species. Plants of this hybrid were thought by the late Sereno Watson and others to constitute a new species of Zea, and Watson named it Z. canina. This plant quickly reverts to ordinary Corn when grown in the North (see Harshberger, G. F. 9:722; Contr. Bot. Lab. Univ. Penn. 2:231. Also Bailey, Bull. 49, Cornell Exp. Sta.), Figs. 2774, 2775. Zea Mays, therefore, may be (1) a true species, of which the wild prototype is unknown; (2) a direct offshoot by domestication of Euchlora Mexicana; (3) a product of crossing between Euchlora Mexicana and some unknown related species; (4) a product of crossing between Euchlora Mexicana and a domesticated race of the same species. Our knowledge is yet insufficient to enable us to offer much more than conjecture on these categories.

Maize is remarkably variable, although most of the variations intergrade in different regions and under different conditions. The most extended American study of variation and varieties in Maize has been made by the late Dr. E. Lewis Sturtevant. The summary of his study of varieties is published as Bull. 57, Office of Experiment Stations, U. S. Dept. of Agric. ("Varieties of Corn," 1899). Sturtevant throws the varieties of Maize into seven "species groups" or "agricultural species." The distinguishing characters of these groups are founded on the kernels. Aside from these there is at least one well-marked race of European origin, Zea Japonica, which for horticultural purposes may well be separated from the others. In the following classification, the characters of the races, except of the ornamental sorts, are copied from Sturtevant. It is probable that a strict inquiry into the nomenclature of Zea Mays would find other names to replace some of those given by Sturtevant; but his names have the advantage of definiteness and of applicability to American forms of Zea Mays, Linnaeus meant the name to cover the whole range of forms then grown in European gardens. Tender annual. If an original specific form of Maize were to be discovered, this form would no doubt be taken as the type, and all other forms ranged as varieties of it.

A. Maize grown for ornament.


Var. gracillima, Koern. (Z. gracillima and Z. minima, Hort.). Very dwarf, slender form with green lvs., sometimes cult. in Eu. A variety variegata is also mentioned.

Var. Curagua, Alef. (Z. Corogag, Molina), is described as a very robust green-leaved form. Sturtevant places it in the Pop Corn tribe.

Gr. 12, p. 207.
Var. indentata (Z. indentata, Sturt.). Dent Corn. Fig. 2780. Plate VII. A group recognized by the presence of cornous endosperm at the sides of the kernel, the starchy endosperm extending to the summit. By the drying and shrinkage of the starchy matter the summit of the kernel is drawn in or together, and indented in various forms. In different varieties the cornous endosperm varies in height and thickness, thus determining the character of the indented surface.

2779. Flint Corn. Var. undulata (X ½).

Var. amylovæa (Z. amylovæa, Sturt.). Soft Corns. This group is at once recognized by the absence of cornous endosperm. Through the uniformity of the shrinkage in ripening there is usually no indentation, yet in some varieties an indentation may more or less frequently appear, but splitting the kernel infallibly determines the class.

Var. saccharata (Z. saccharata, Sturt.). Sweet Corn. Figs. 2781, 2782, 551. Plate VII. A well-defined group characterized by the translucent, horn appearance of the kernels and their more or less erinkled, wrinkled, or shiveled condition.

Var. amylovæa-saccharata (Z. amylovæa-saccharata, Sturt.). Starchy-sweet Corn. This group is founded upon three varieties found in the San Pedro Indian collection of Dr. Palmer and sent in 1886. The external appearance of the kernel is that of a sweet, but examination shows that the lower half of the kernel is starchy, the upper half horny and translucent. These varieties all had a white cob, the kernels deeper than broad.

L. H. B.

ZEBRINA (name refers to the striped leaves). Commelinaceæ. Differs from Tradescantia chiefly in the fact that the corolla is tubular (petals not free); stamens 6, equal; fls. few, sessile, in 2 compound bracts. Two species.

pendula, Schnizl (Tradescantia zebrina, Hort. T. tricolor, Hort., in part. Cyamoides vittata, Lindl. Commelinaceæ zebrina, Hort.). Wandering Jew, in part. Figs. 2783-84. Trailling, half-succulent perennial herb, rooting at the joints; lvs. lance-ovate, sessile, the leaf-sheath about ½ in. long and hairy at top and bottom and sometimes throughout its length; under surface of leaf red-purple; upper surface silvery white, suffused with purplish, the central part and the margins purple-striped; fls. about 2, rose-red, contained in two boat-shaped bracts, one of which is much smaller than the other. Mexico.—A very common greenhouse plant, much used for baskets and for covering the ground underneath benches. Commonly confused with Tradescantia fluminensis, Fig. 2785, and sometimes with Commelina nudiflora. See Tradescantia. The lvs. of Z. pendula seem never to be green. They vary somewhat in color. All forms are easily grown, and they propagate readily from pieces of stem. Var. quadriflor; Voss (Tradescantia quadriflora and T. multiflorum, Hort.). Lvs. with metallic green undente, and striped with green, red and white. Handsome. L. H. B. 2784. Zebrina pendula. (X ½).

ZELKÖVA (after the vernacular name Zelkova in Crete, or Selkwa in the Caucasus). Syn., Abelica. Urticaceæ. Ornamental deciduous trees, with alternate, short-petioled, toothed leaves and insignificant flowers in axillary clusters or solitary, followed by small drupe-like fruits. Z. aestivata is hardly north and Z. crassata hardy as far north as Mass., at least in sheltered positions. The Zelkoves, particularly Z. aestivata, are handsome trees of graceful habit, much resembling a small-leaved elm tree. They seem not to be very particular as to soil and position. Prop. by seeds sown soon after ripening; also by layers and by grafting on Ulmus. Four species are known, natives of Crete, the Caucasus and E. Asia. They are allied to Celtis and Aphananthe and are chiefly distinguished by the conuate sepal. From the elms, which they much resemble in foliage, they are easily distinguished by the drupe-like fruits.
mens 4-5; styles 2; fr. a 1-seeded drupe, usually broader than high, oblique, with the style eccentric. *Z. acuminata* is an important timber tree; the wood is very durable, and considered the best building material in Japan. The young wood is yellowish white in color; the old wood is dark brown and has a beautiful grain.


crenata, Spach (Z. *carpinifolia*, C. Koch. *Pländera Richardi*, Michx. *Abeleea ulmoides*, Kunze). Tree, attaining 80 ft., with slender branches forming an oval or oblong head; Ivs. oval or ovate to oblong, slightly cordate or rounded at the base, coarsely toothed with obtusish teeth, with 6-8 pairs of veins, usually almost

c, supposed to be Japanese; it is distinguished from *Z. crenata* chiefly by the lvs. being somewhat smaller, more palescent and rough above. Var. Verschaffeltii, Dipp. (Z. *Umbra Verschaffeltii*, Hort.), has the lvs. deeply incised dentate and broadly euneate at base.

ALFRED REHDER.

2787. *Zelkova acuminata* (×½).

2786. *Zelkova acuminata* (×½).


েঁটক একটি জাতীয় বৃক্ষের ফুল, যার ফুলের মাঝে মাঝে সুন্দর ফুল।}

**Zephyranthes**

2007

**ZENOBIA** (after Zenobia, queen of Palmyra, who lived in the third century; a fanciful allusion to her having been chained as was Andromeda, whose name is commemorated by a closely allied genus). *Eriochortes* Ornamental low deciduous or half-evergreen shrub, with alternate, short-petioled, simple and white, campanulate, nodding flowers arranged in clusters along the last year’s branches. Hardy as far north as Mass., and a very handsome shrub for borders of shrubbery, particularly when in bloom; the glaucous form is one of the most conspicuous shrubs with light-colored foliage. Zenobia is also recommended for forcing. It thrives best in a sandy or peaty soil. Prop. by seeds sown in spring and by layers; also by greenwood cuttings from forced plants. See, also, *Andromeda* and *Pieris* for culture. Monotypic genus native of N. America, closely allied to Andromeda and Pieris but chiefly distinguished by the open-campanulate fls. and 4-awned anthers; calyx 5-lobed, with short valvate lobes; corolla campanulate, as broad as high, obtusely 3-lobed; stamens 10; anthers with 4 slender awns; capsule depressed globose, obscurely 5-lobed, somewhat carinate at the dorsal sutures, dehiscent into 5 valves: seeds numerous, small, oval, angled.


**ZEPHYRANTHES** (Greek, flower of the west wind). *Amaryllidaceae*. *Zephyr flower*, *Pony Lily*. About three dozen species of bulbous plants native to the warmer parts of America. Unfortunately they are not quite hardy, but some of them are very satisfactory plants for window-gardens, resting somewhat in winter and blooming in summer under such treatment. They all have linear Ivs. contemporaneous with the fls., and slender scapes about 6-9 in. high, crowned by solitary 6-lobed fls. of white, rose or yellow. The fls. are 1-3 in. across. Other generic characters. Prop. by seed or suberect: corona none; anthers dorsifixed, versatile; ovules many, superposed: seeds black, flat.
The latest revision of Zephyranthes is found in Baker's Handbook of the Amaryllidaceae, 1888, where the following subgenera are made:

**Subgenus Zephyranthes Proper.** Flower erect; tube short; stamens inserted near its throat. (Eighteen species, including all described below except No. 11.)

**Subgenus Zephyrtales.** Flower slightly inclined; tube short; stamens inserted near its throat; style more declinate than in the other two subgenera. (Eleven species, including No. 11 below.)

**Subgenus Pyrolirion.** Flowers erect; tube longer, dilated in the upper half; stamens inserted at the middle of the perianth-tube. (Five species, none in cult.)

For the further separation of the species Baker uses the characters which appear in the key below, except the foliage characters and the color of the flowers. However, the genus may be readily separated into three sections based upon the color of the figs, and this arrangement is here used as being more convenient to the horticulturist. The seasons of bloom indicated below are those for localities where the plants will thrive outdoors the year round.

The Zephyr Lilies must be wintered in a place free from frost, and as the best kinds are natives of swampy places it is fair to presume that they will need more moisture during the resting period than the generality of bulbous plants. The four best species are: **Z. candida**, white, autumn; **Z. Atamasco**, white, spring; **Z. carinata**, rosy, summer; **Z. rosea**, autumn. All of these will probably survive the winter out of doors in our middle states if given a fair degree of protection.

**Z. candida** deserves special notice. William Watson, of Kew, England, writes in Gn. 37, p. 174: "The most satisfactory of all is **Z. candida**. This species differs from all others known to us in several particulars, the chief being its hardiness and ease of management under ordinary cultivation in a sunny border out of doors. We have tried almost all the other species of Zephyranthes with this treatment, but they every one failed, whilst **Z. candida** flourished and multiplied rapidly, until we now have a border filled with it. This border is against the south wall of a greenhouse and it is always moist. The soil is ordinary loam, in which the bulbs were planted about 4 inches apart. They have each since become crowded tufts, their leaves completely hiding the soil. This border was as gay with the flowers of Zephyranthes last autumn as any border of crocuses in spring. On very sunny days the flowers opened quite flat, and glistened like snow in the sunshine. Another character which distinguishes this species from the others is its evergreen foliage." It is said that the river La Plata was so called (the name meaning "silver") because of the profusion of these white flowers on its shore.

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1. **Atamasco.** Herb. (Amarillis Atamasco, Linn.). **Atamasco Lily.** Fig. 2789, 2788. Most popular and largest of the spring-blooming white-flowered species; the commonest Zephyr Lily native to the U. S. Bulb short-necked, less than 1 in. thick: **Ivs.** 4-6, linear: scape 6-12 in. high: **Fls.** pure white, about 3 in. long. March–June. Va. to Fla. and Ala. B.B. 1:444. B.M. 239. L.B.C. 19:1899. Gn. 21, p. 199; 37, p. 155.

2. **Treatiae.** Wats. Closely allied to **Z. Atamasco** and best distinguished by the **Ivs.**, as indicated in the
key. The perianth-segments are sometimes keeled with rose, but in both species the fls. turn pinkish with age. It is a Florida species, found in dampier localities and blooming several weeks later than *Z. Atamasco.* V. 6:299. Gn. 33, p. 11.

3. *eubescens,* Wats. (*Amaryllis* eubescens, Horsford). Rare white-fl. August-blooming species supposed to be native to sandy plains of Texas, but perh. from northern Mexico. Distinguished from the two preceding species by the larger, longer-necked bulb, shorter perianth and fls. strongly tinged with rose outside. Bulb ±1 in. thick; neck ±1 in. long; fls. ±1½ in. long, greenish white, more or less tinged outside or keeled with rose. Highlands of central Mex. B. M. 2583.—Offered by Dutch dealers.

4. *verecundus,* Herb. Rare spring- and summer-blooming species, distinguished from other white-fl. species in cult. by the sessile ovary and long-necked bulb. Bulb ±1 in. or less thick; neck ±1–2 in. long; fls. ±1½ in. long, greenish white, more or less tinged outside or keeled with rose. Highlands of central Mex. B. M. 2583.—Offered by Dutch dealers.

5. *candida,* Herb. Fig. 2790. Most popular of white-fl. Zephyr Lilies, being distinguished from the others by its autumn-blooming habit and capitate stigma. Lvs. appearing in autumn with the fls. and lasting through the winter in favored localities, over 1 ft. long; fls. pure white or slightly tinged rose outside. 1½–2 in. long. Marshes of La Plata. Gn. 37:740. B. M. 2607. L. B. C. 15:1419.


7. *Lindleyana,* Herb. Rare summer- blooming rosy-colored species from the mountains of Mexico, inferior to *Z. carinata* for general culture. Bulb globose, ±¾ in. thick; neck short; fls. ±1–2 in. long; ovary stalked; stigma tribed; spathe 3-fl. only at tip. —Once offered by Lovett, of Little Silver, N. J.

8. *rosea,* Lindl. Autumn-blooming rosy-fl. species, with much smaller fls. than *Z. carinata* but, according to American catalogues, the most popular rosy-fl. species. The fls. are only about an inch long and ±½ in. broad; bulb globose, ±¾ in. thick; neck scarcely any; spathe 2-fl. at tip only: ovary stalked; stigma 3-fl.; spathe 3-fl. only at tip. —Once offered by Lovett, of Little Silver, N. J. —Trade plants of *Z. rosea* should be compared with *Z. carinata*.


10. *Texana,* Herb. Yellow-fl. Texan species. Bulb globose; neck 1–1½ in. long; spathe bidual at the tip; pedicel much longer than the spathe; fls. yellow, coppery outside, 1 in. long, ±½ in. across. B. M. 3596 (*Habranthas Andersonii, var. Texana*).


ZEPHYRANTHES

ZINGIBER 2009

ZINGIBER (name ultimately derived from a Sanskrit word meaning *horn-shaped*; probably referring to the (Ginger root). *Sesamum indicum.* Ginger. The Ginger plant is a small reed-like plant about 2 ft. high, as cultivated in greenhouses, with tuberous rhizomes, aromatic leaves and dense cone-like clusters of bracts. The flowers, however, are very rarely produced in cultivation, and Roxburgh wrote that he never saw the seeds. The plant is supposed to be native to India and China, but, like many other tropical plants of the highest economic importance, its nativity is uncertain. Some idea of the importance of Ginger to the world may be gained by the fact that in 1884 Great
Britain imported 5,600,000 pounds of Ginger valued at $820,000. Medicinal Ginger is prepared from the dried "root;" continental Ginger from the green. Candied Ginger is made from carefully selected, succulent young rhizomes which are washed and peeled and then preserved in jars of syrup. Housewives often preserve their own Ginger; it is important to have the hands protected while scraping the roots or they will "burn" for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies Ginger may be cultivated up to an altitude of 3,500 feet.

Zingiber officinale is a Chinese species offered by Rea soner Bros. in 1899 but poorly not in cultivation now. It is not described in any work to which the undersigned have access.—Z. Zermbrt, Rosco, is cult. and escaped in Porto Rico. It has broadly lanceolate lvs. and large pale yellow fls.; about 4 ft. B.M. 2000.

E. J. Canning and W. M.

**ZINNIA** (Johann Gottfried Zinn, 1727-1789, professor of botany at Göttingen). *Compositae*. Youth And Old Age. Plate L. The familiar Zinnias, Figs. 2794-96, are hardy annual plants, growing a foot or more high and covered from July until the first hard frost with double flowers 2 in. or more across. At least fifteen well-marked colors are commonly seen in Zinnias,—white, sulfur, yellow, golden yellow, orange, scarlet-orange, scarlet, flesh-color, line, rose, magenta, crimson, violet, purple and dark purple. There are also variegated forms, but the solid colors are most popular. The Zinnia is rich in shades of purple and orange, but lacks the charming blue and pink of the China aster and is poor in reds.
compared with the dahlia. Among garden composites its only rivals in point of color range are the chrysanthemum, dahlia, China aster and chenaria. Among garden annuals in general the Zinnia ranks with the most useful kinds, and many persons would place it among the twelve popular annual flowers. Zinnias are formal flowers, rather stiff in habit, with exceptional depth of flower, and in technical perfection a little short of the dahlia: the rays are rather rigid and overlap one another with somewhat monotonous precision, and the colors are metallic as compared with the soft hues of the China aster.

Historical Sketch.—The Zinnia (Z. elegans), with its great range of color and perfection of form, is now so much a matter of course that the present generation is surprised to learn that it is one of the most recent of "florists' flowers." A double Zinnia probably was not seen in America before the Civil War. In the early sixties, the Zinnia was a sensation of the floral world; in the seventies it ceased to be fashionable and as early as 1882 it was spoken of as an "old-fashioned" flower. Its course was run in twenty years.

The single form of the Zinnia is now cultivated only for its scientific or amateur interest. Single Zinnias are not offered by tradesmen and occur only as degenerates from the double form. The first double forms appeared in 1858 at the nursery of M. Grazau, at Besancon, France, amongst a number of plants raised from seed received from the West Indies. The double forms were introduced to the public by Vilmorin in 1859. Probably the earliest colored plate of double Zinnias is that in Flora des Serres published toward the end of 1866. This shows that the first double forms were much flatter and rougher (i.e., less regular) than to-day and often exhibited some remnant of the disk. The fixation of bright, distinct colors proceeded rapidly, but the production of the white sections to be a slow process. The depth of the flower has increased from an inch or so in the earliest double forms to an average of 2 inches for first-class specimens, with a maximum of 4 inches in the robust type. The rays are now arranged in 15 or more series, as against 5 or 6 in the first double forms. The first double forms are shown as 2½--3 in. across, which is a good average for to-day.

The accepted type of Zinnia flower is essentially that of Fig. 2795, but the florist's ideal represents a much deeper flower of absolute fulness and regularity. Of recent years several minor variations have appeared. Tubular forms are known to the trade as "Z. potentilla form." The curled and crinkled forms, introduced in the nineties, represent the reaction against formal flowers in general. Much care has been bestowed in perfecting the habit of Zinnias, and there are five well-marked degrees of height, which for purposes of explanation and general convenience may be considered as three,—tall, medium and dwarf.

1. TALL ZINNIA are ordinarily 20 to 30 inches high. This size and the next smaller size are the favorites for general purposes. The tall kinds are available in 12-16 colors. A robust race, which attains 28 to 40 inches under perfect conditions, is known to the trade as Z. elegans robusta grandiflora plenaissima. It is also known as the Giant or Mammoth Strain. This strain was developed after many years by Herr C. Lorenz and was introduced in 1886. A maximum diameter of 6 inches is recorded for flowers of this strain. In C.C. II. 1881 is given a flower measuring 1 x 4 in., with about 18 series of rays, the latter being so numerous and crowded that the flower is less regular than the common type. A specimen Zinnia plant 3 ft. high is attained in the North only after starting the seed early and giving perfect culture.

II. MEDIUM-SIZED ZINNIA range from 12-20 inches in height. They are available in about 8 colors. Here below are some forms known to trade catalogues as pumila, marna and compacta.

III. DWARF ZINNIA range from 3-12 inches in height and are of two sub-types, the pompons and the Tom Thumb types, or "Liliputians," or rather growing and smaller flowered, generally about 9 inches high, with a profusion of flowers about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are available in several colors, not all of which are yet fixed in the seed.

Zinnia Haageana is second in importance to Z. elegans. The single form was introduced to cultivation about 1861 and the double about 1871. It is dwarfer than most Zinnias, and has smaller flowers, with a color range restricted to shades of orange. It is distinct and pretty but less showy than the common Zinnias. The first race of hybrids between Haageana and elegans appeared in 1876 under the name of Z. Darvini.

3794. Single Zinnia (X 3/4)
necessary. Dwarf varieties should be set 14–16 in. apart; taller kinds 2 ft. each way.

Zinnias have two kinds of seeds, triangular and heart-shaped. The triangular seeds are long, narrow, thick

ZINNIA

2012

ZINNIA

2795. Double Zinnias (X ½).

and ridged. The heart-shaped seeds are short, broad and flat. Some growers believe that the heart-shaped seeds tend to produce single flowers; others hold the opposite opinion.

Generic Description.—Zinnia is a genus of 16 species of annual, perennial and subshrubby plants, mostly Mexican but ranging from Texas and even Colorado to Chile. They have opposite, mostly entire lys, and terminal heads of fls., which are peduncled or sessile. Rays pistillate, fertile; disk yellow or purple, its fls. hermaphrodite, fertile; involucre ovate-cylindric or campanulate, the scales in 3 to many series, broad, obtuse or rounded, more or less colored; akenes laterally compressed, 2-toothed at the


A. Plant annual.
B. Akenes of the disk fls. short and broad, obturate, 2-3½ lines long.
C. Colors various; lvs. clasping, corolate-ovate or elliptic............. elegans
CC. Color orange; lvs. sessile, narrowly lanceolate..................... Haageana
BB. Akenes longer, narrower, oblong, 3-4 lines long.
C. Color of rays yellow; disk yellow. pauciflora
CC. Color of rays red or purple.
D. Rays suberect or scarcely spreading; disk yellow................. multiforma
DD. Rays revolute; disk dark-colored, tenuiflora
AA. Plant perennial.......................... grandiflora

elegans, Jacq. YOUTH-AND-OLD-AGE. The common species from which most of the garden Zinnias are derived. Figs. 2794-96. Erect annual, a foot or more high, but varying from 3 in. to 3 ft.; lvs. ovate or elliptic, clasping, about 1 in. wide; rays reflexed, originally purple or lilac, but now of nearly every color except blue and green; disk originally yellow or orange, but nearly or quite absent in the common double forms; fls. 2-5 in. across. July to Oct. Mexico.—Single forms ill. in B.M. 527, P.M. 1:223 and B.R. 15:1294 (the last two as Z. violacea). Double forms, F.S. 13:1394, R.H. 1861:251; 1864:351. Pompons in Gn. 48, p. 464 (Liliput); 30:562 (deceptive as to size). R.B. 20, p. 152.

Haageana, Regel (Z. Mexicana, Hort.). Fig. 2797. Distinguished from Z. elegans by the orange-colored fls., which are generally smaller; also the plant is dwarfer, as a rule, and the leaves are merely sessile, not clasping. Tropical America. Single forms. Gn. 30, p. 270; 48, p. 464. Double, Gn. 30, p. 271; 48, p. 301. F. 1871, p. 229. A.G. 1892:218. This is considered by Robinson and Greenman as a horticultural species not certainly distinguishable from Z. anguillifolia in spite of its broader leaves.

pauciflora, Linn. An erect annual, with yellow heads about 1 in. across, with rather broad, spreading rays. Plant hirsute, with spreading hairs;

somewhat corymbosely branched above: peduncles at maturity enlarged upwards and hollow. Mexico, Peruvian Andes.

**Zinnia**

**multiflora, Linn.** This and the next are included by most writers in *Z. pauciflora*, but *Z. multiflora* may be distinguished from *Z. pauciflora* by the pubescence of the stem being much finer, appressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B. M. 149.

**tenuiflora, Jacq.** Fig. 2798. Very distinct by reason of its revolute, linear rays which are cardinal-red in color. It has a dainty flower about 1 in. across hardly comparable with the showy *Z. elegans*. This species has been cult. in America but seems not to be longer advertised here. It is referred to *Z. pauciflora* by most writers, and to *Z. multiflora* by Robinson and Greenman. B. M. 555. A. G. 1890:243.

**grandiflora, Nutt.** Hardy, low-growing, Colorado perennial, with woody root, shrubby base, linear 1-2 ft. long and 3-nerved leaves. Sow in mud bottom, or on low marshy places which are covered with water the year round. In running water, sow as much out of the current as possible. Most cultivators are not generally aware that seed can be obtained in large quantities and at a reasonable price from seedsmen. Wild Rice is very desirable for aquatic gardens, being one of the hardiest of all hardy grasses for the margins of ponds.

**Zizania** (I. B. Ziz, Rhenish botanist). *Umbelliferae*. A genus of three species of hardy perennial North American herbs 1-2½ ft. high, with ternate or ternately compound leaves and compound umbels of yellow flowers. The genus has no horticultural status, the two following species being advertised only by collectors of native plants. For full account, see Britton and Brown's *Illustrated Flora*, Coult. and Rose's *Monograph of the North American Umbelliferae*, Contrib. U. S. Nat. Herb. 7:90 (1900), and Manuals. Zizias are mostly referred to Thaspium by previous botanists, but the authors cited above retain it as a separate genus mainly on account of the wingless fruit.

**A.** *Rays of umbels 5-10, stout, ascending.*

**Zizia aurea, Koch.** Early or *Golden Meadow Parsnip*. Height 1-2½ ft.: basal and lower 1-2 ½ ternately compound: upper 1½-2½ ft. long and 3-nerved leaves. Found in Indiana, Ill., and Wis. April-June. Fields, meadows, and swamps. New Bruns., Ill., and Wis. 2:534. B. B. 2:534. W. M.

**AA.** *Rays of umbels 2-12, slender, diverging.*

**Zizia (from Ziz, the Arabian name of *Z. lotus*).** *Rhamnaceae*. *Jujube*. Deciduous or evergreen shrubs, or sometimes trees usually with prickly branches, alternate, short-petioled, 3-5-nerved, entire or serrate leaves, and small greenish or whitish flowers in axillary cymes followed by drupe-like sometimes edible fruits. They are not much cultivated in this country.
and none of the species is hardy north; the hardest seems to be Z. vulgaris, but it is tender north of Wash-ington, D.C. Most kinds have handsome foliage and are well adapted for planting in shrubbery in the southern states and California. They seem to thrive in any well-drained soil. Prop. by seeds, by greenwood cuttings, and by root divisions. A number of about 40 species distributed through the tropical and subtropical regions of both hemispheres, allied to Palaums, but chiefly distinguished by the drupe-like fruit. Shrub or slender, often procumbent or trailing branches. No. stems usually transformed into spines, often only one stipule spiny or one a straight and the other a hooked spine: fr. 5-merous; ovary 2-4, usually 2-loculed; style usually 2-parted; fr. a subglobose to oblong, brown or yellow fruit of Z. Lotus, Z. Zygadenus are edible and the first named is much cult. in China.

**Jujaba, Lam.** Tree. 30-50 ft. high: branches usually pricky; young branchlets, pedicels and infructescence densely rusty tomentose; lvs. broadly oval or ovate to oblong, obtuse, sometimes emarginate serrate or entire, dark green and glabrous above, tawny or nearly white tomentose beneath, 1-3 in. long: fls. in short-stalked many-fl. axil. subglobose to oblong, cracked 1-3 in. long, on a stalk about half its length. March-June. S. Asia, Africa, Australia. Gn. 13, p. 194.

**sativa, Gärtn.** (Z. vulgaris, Lam.). **Common Jujube.** Shrub or small tree, attaining 30 ft.: pricky or unarmed: young branchlets and by root fusions, slender and having frequently the appearance of pinnate lvs.: lvs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes emarginate, serrulate, glabrous, 2-3 in. long; pedicels fleshy, fr. ovoid to oblong, dark red or almost black, 2-3 in. long, short-stalked. March-June. S. Eu. and E. Asia; naturalized in Ala. A.G. 1891:79 (as var. therimia). The Jujube is somewhat planted in Florida and California, although it has no commercial rating as a fruit plant. According to Wickson, it was introduced into California in 1876 by G. P. Rixford, and is "fruiting regularly and freely in several parts of the state." The fruits or berries are ripe in November and December, and the plant begins to bear at three years from planting. The Jujube fruit is used in confectionery.


**Z. Parryi, Torr.** Belongs to the genus Cordiala, which is easily distinguished by not having spiny stipules and leaves. The branches are usually spiny, the leaves long and narrow, and by its entire, usually penninerved lvs. —Z. Parryi. Weber., is a much branched, glabrous thorny shrub, 4-12 ft. high: lvs. elliptic to obovate, obovate, cuneate at the base, 1-3 in. long: lvs. slender pediceld, in sessile clusters: fr. ovoid, 2-3 in. long, S. Calif. This plant was once offered by a collector of native plants, but it is probably not in the trade now.

**ZYGADENUS** (Greek, poke and gland, some of the species having two glands in the base of the perianth). *Lilacce*. As outlined by Bentham & Hooker, the genus has 12 species, some of which is Siberian and the remainder North American and Mexican. This disposition includes Amlithion and Zygadenus, but many of the names do not unite the two. They are smooth, rhizomatous or bulbous plants, with simple erect stems bearing a raceme or panicle of white, yellowish or greenish flowers; lvs. mostly crowded at the base of the flower-stems. The fls. perfect or polygamous, the segments many-nerved and often adnate to the base of the ovary, the parts withering and persistent; stamens 6; capsule 3-loculed, the locules in fruit separate at the top, so that their entire length. The species of Zygadenus are little known in cultivation. They are sometimes recommended for the wild garden, where they thrive in wet or boggy places. Increased by division; also rarely by seeds. Some of the species have poisonous bulbs, rhizomes and foliage.


A. Locules of the capsule dehiscing to the base: stamens free from perianth-segments: glands usually 1 or 2 in the base of the perianth. *Zygadenus* proper.

B. Glands large, covering nearly the whole base of the perianth-segments: bulb tunicate.

c. Fls. usually perfect, rather large.

elegans, Pursh (Z. glabrescens, Nutt. Helianthus glabrescens, Ker.). Three or less tall, the lvs. 3½ in. long and broad and very glaucous; bracts purplish: fls. greenish, in simple or sparingly branched racemes the segments broad and less than 3½ in. long, coherent to the ovary, the fl. opening about 3½ in. across. Across the continent from New Brunswick south to New Mexico. B.M. loc. B. 24:67.

**Fraxmontii, Torr.** Lvs. often in leaf less than 3½ in. wide, scarcely glaucous, light green: bracts scabrous: fls. 3½ in. across, in a simple or branched raceme, the segments free from the ovary. Kans. to Colo. and Texas.

**Nutallii, Gray.** Lvs. from 3½-3 in. wide, scarcely glaucous, light green: bracts scabrous: fls. 3½ in. across, in a simple or branched raceme, the segments free from the ovary. S. Dakota to California.—*Bulb poisonous.*

**paniculatus, Wats.** Usualy stouter, the lvs. broader and shorter; raceme compound: perianth-segments deltoid, acute, short-clawed. Saskatchewan to Calif. —*Bulb poisonous.*

**venenosus, Wats.** Slender, 2 ft. or less tall: lvs. very narrow (3½ in. or less), searbirds, not glaucous, the stem, the lvs. not sheathing; bracts narrow, searbirds; fls. in a short simple raceme, the penianth free from the ovary, the segments 3½ in. or less long, triangular-ovate to elliptic, short-clawed. S. Dakota to California.—*Bulb poisonous.*

cc. Fls. polygamous, small.

**Zygopetalum** (from referring to the united flower parts). *Orchideae*. Plants with numerous dichotous lvs. sheathing a short stem which usually becomes thickened into a pseudobulb: lvs. membranaceous, venose or plicate: fls. solitary or in racemes, showy: sepals and petals nearly alike in form and color, often united to each other at the base, the lateral sepals forming a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a narrow, oblong, yellowish column or disc; column curved, wingless or with small wings; pollinia 4, not appendiculate. Includes Bollia, Huntleya, Wareczewzela and Botanemedia, which are often separated as distinct genera.

**Zygia.** See Albizia.

**ZYGOPETALUM** (name referring to the united flower parts). *Orchideae*. Plants with numerous dichotous lvs. sheathing a short stem which usually becomes thickened into a pseudobulb: lvs. membranaceous, venose or plicate: fls. solitary or in racemes, showy: sepals and petals nearly alike in form and color, often united to each other at the base, the lateral sepals forming a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a prominent fly-oblong ovate on the disc; column curved, wingless or with small wings; pollinia 4, not appendiculate. Includes Bollia, Huntleya, Wareczewzela and Botanemedia, which are often separated as distinct genera.

**Zygia.** See Albizia.
zygopetalum

zones, like *Z. maxillare*, thrive best on sections of tree
tern, osmunda rhizome or in baskets. A good compost
consists of equal parts of chopped sod, peat fiber and
sphagnum moss, well mixed and interspersed with
pieces of rough charcoal, about one-half of the pot
space being devoted to clean drainage material. After
 distributing the roots, the compost should be worked in
carefully but not too firmly about them, leaving the
base of the plant even with, or just above, the rim of
the pot. Repotting should be done when the plants
show new root action. The temperature should range
about 60° F. by night and 65° to 70° by day in winter,
and in summer, as possible, with free ventilation
during inclement weather. A cool, light location in the
cattleya department is favorable. The compost should
be kept in a moist condition at all times. The plants
are propagated by cutting through the pseudobulb at
the old pseudobulbs at a good eye, potting up the parts
and removing them to a rather higher temperature un-
til they start into new growth.

The Bateamia, Pescatoria and Warzzewiczella
groups are very similar in habit of growth, and all
thrive well in orchid baskets suspended from the roof
of the odontoglossum or coolhouse, in a compost con-
sisting almost entirely of chopped live sphagnum,
freely interspersed with rough pieces of charcoal. Au-
tumn is the best time to rebasket the plants, as they
suffer during the warm weather if disturbed at the
roots during spring. They need a shaded location, a
moist atmosphere and a liberal supply of water to
the roots at all seasons. Never allow them to remain dry,
as they have no resting season.

The Bollea group is closely allied and requires the
same general culture but needs 5° F. higher tempera-
ture during the winter season.

The Promea group comprises a few small-growing
species, all good subjects for the cool department.
They grow best suspended from the roof in small bas-
kets or perforated pans in a mixture of peat fiber and
chopped sphagnum with a liberal supply of water and
good drainage.

R. M. Grey

INDEX.

*Burttii*, 12.

colost. 9.

carnose. 5.

*crinum*. 5.

discor. 13.

A. *Scape short than the leaf.* 1-4 fls.

B. Petals uniformly colored.

C. Column not hood-like.

D. Column hood-like, arching over

the crest.

1. rostratum, Hook. Pseudobulbs oblong-compressed:

2. Mackaii. Hook. Fig. 2799. Pseudobulbs large,

ovate; lvs. many, linear-lanceolate, 1 ft. long; scape

18 in. long, bearing 5 or 6 large fls.; sepals and petals
dingy yellowish green, with blotches of purple on the

inside, lanceolate, acute, erect, spreading, all united
toward the base; labellum large, rounded, emarginate,
white with radiating vein-like deep blue lines, glabrous.

Brazil. B.M. 2748. B.R. 17:1433 (as *Eulophia Mack-


—This is distinguished from *Z. intermedium* and *Z.

crinum* by its smooth labellum and narrower lvs.

2. Mackaii, Zygopetalum


broadly linear-lanceolate; fls. on long, stout scape;

sepals and petals 2 in. long, oblong-lanceolate, green

with rather few brown blotches; labellum 2 in. across,

spreading, wavy, scarcely emarginate, white with purple

veins radiating from the thick crest, disc hairy. Fls.

at various times. Brazil. L.B.C. 17:1637. B.M. 3402

(8 *Z. Mackaii*, var. crinum*).—This has fewer brown

blotches on the sepals and petals than *Z. intermedium*.

There are varieties with pink, blue, or almost colorless

veins on the labellum. Var. *corleum*, Hort., has the

vines deep vivid blue.

2799. Zygopetalum

Mackaii (×5).
6. **intermedium**, Lodd. Lvs. ensiform, 1¾ ft. long, 1½ in. wide; scape longer than the lvs., bearing 3-5 fls. each nearly 3 in. across; sepals and petals obovate, acute, green with large, confluent blotches of brown; labellum rosette, narrowed at the base, deeply 2-lobed in front, pubescent, bluish white with radiating broken lines of purplish blue; column green and white. Fls. in winter, remaining in perfection about two months. Brazil. L. H. 1873:190 (as *Z. Rivieri*).—Plants of *Z. Mackaii* are often cultivated under this name.

7. **Bédéni**, Reichb. f. Plants strong, with the scape about as long as the lvs. and bearing several fls.: sepals and petals deep purple-brown, bordered with green; labellum pale purple in front, becoming deep purple toward the base. F. M. 1880:417.—A garden hybrid raised by Veitch.

8. **violaceum**, Reichb. f. (Húntleya violácea, Lindl.). Fig. 2830. Lvs. as in *Z. Lalindei*; fls. on nodding scapes 4-6 in. long, deep violet; sepals and petals ovate revolute, tipped with yellowish green; labellum ovate, cordate, crest of thick ridges covered by the arching column. Guiana. F. S. 7:678. P. M. 8:1.

9. **celeste**, Reichb. f. (Bóltea céleste, Reichb. f.). Lvs. 6-10 on a shoot, obovate-lanceolate, 6 in. long, 2 in. broad, with 6 paler sheaths 3-4 in. long; fls. solitary, on stout peduncles 6 in. in length; sepals broad, violet-purple, darker toward the top and margined with yellow at the tip, the lateral pair larger; petals like the dorsal sepal but paler; labellum short-clawed, ovate, deeply cordate, margins recurved and tip revolute, deep violet with yellowish margins and a thick yellow crest. Fls. freely in summer. Colombia. B. M. 6155. Ga. 51, p. 121; 43:102.

10. **Páttini**, Reichb. f. (Bóltea Páttini, Reichb. f.). Lvs. linear-oblong; fls. large, rose-colored, paler than those of *Z. Lalindei*; sepals obovate attenuate, wavy, the lower half of the lateral pair darker; petals triangular-oblong, undulate; labellum triangular hastate at the base, yellow, tip revolute; column pink, covering the thick yellow crest. Colombia. F. M. 1875:147. G. C. II. 3:9.

11. **Lalindei**, Reichb. f. (Bóltea Lalindei, Reichb. f.). Lvs. elliptic-lanceolate, about 1 ft. long; peduncles 3 in. long, with solitary fls. 2½–3 in. broad; sepals obovate-oblong, recurved at the tips, rose-colored, with straw-colored tips; petals undulate-oblong, colored like the sepals or with white margins; labellum ovate-hastate, margins and tip recurved, golden yellow, disc with a semi-circular crest of thick, radiating lamellae: column broader than the disc, arched over it. Aug. Colombia. B. M. 6331.—Color of the flower varies to bright violet.


13. **discolor**, Reichb. f. (Wárrea discolor, Lindl. Warczemczilla discolor, Reichb. f.). Lvs. narrowly lanceolate, jointed, 9 in. long; sepals 1-6 in., shorter than the lvs.; sepals spreading, lanceolate, white: petals shorter, ovate, white with a tinge of purple, half-spreading; labellum large, broadly obovate, somewhat convolute, white, changing to deep purple toward the disk, and having a whitish or yellowish crest. Central America. B. M. 4830.


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