Cyclopedia of American Horticulture

Comprising Suggestions for Cultivation of Horticultural Plants, Descriptions of the Species of Fruits, Vegetables, Flowers and Ornamental Plants Sold in the United States and Canada, Together with Geographical and Biographical Sketches

By

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Assisted by

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Associate Editor

And Many Expert Cultivators and Botanists

Illustrated with
Two Thousand Eight Hundred
Original Engravings

In Four Volumes
Vol. IV—R–Z

Sixth Edition

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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 Cyclopaedia 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 cyclopeda 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 nurseriesmen 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 Amian-thium 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; DeCandolle'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, Meek'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 Encyclopaedia 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 Flora Germaniae 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. Griscom, 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. Gebert, 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; 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 Cyclopedia 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 largest 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.

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 Cyclopaedia 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 Cyclopaedia. The great number of signed articles gives the work a somewhat heterogeneous character, and this may be considered by some persons to be a disadvantage; but the Editor has not accepted the current idea that a cyclopaedia must necessarily be uniform and consistent in its treatment of various and unlike subjects.

(4) The book is primarily a cyclopaedia 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

## I. The Number of Articles.

Total number of entries or articles, including cross-references:

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## II. The Number of Plants.

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Total number of species fully described (in black-faced type):

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Total number of varieties (of species) of all grades:

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<th>Number of Varieties</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>1187</td>
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<tr>
<td>II</td>
<td>982</td>
</tr>
<tr>
<td>III</td>
<td>628</td>
</tr>
<tr>
<td>IV</td>
<td>338</td>
</tr>
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<td><strong>Total</strong></td>
<td><strong>3635</strong></td>
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</table>

Total number of synonyms (in italic type):

<table>
<thead>
<tr>
<th>Volume</th>
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<tr>
<td>I</td>
<td>2446</td>
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<tr>
<td>II</td>
<td>2104</td>
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<td>III</td>
<td>1243</td>
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<tr>
<td>IV</td>
<td>1689</td>
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<td><strong>Total</strong></td>
<td><strong>7482</strong></td>
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</table>

Total number of species in supplementary lists (in italic type):

<table>
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<tr>
<th>Volume</th>
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<tr>
<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>
<td><strong>4524</strong></td>
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</table>

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:

<table>
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<tr>
<th>Volume</th>
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<td>I</td>
<td>668</td>
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<tr>
<td>II</td>
<td>631</td>
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<tr>
<td>III</td>
<td>416</td>
</tr>
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<td>IV</td>
<td>704</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2419</strong></td>
</tr>
</tbody>
</table>

## IV. The Dates of Publication:

<table>
<thead>
<tr>
<th>Volume</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>February 14, 1900</td>
</tr>
<tr>
<td>II</td>
<td>July 18, 1900</td>
</tr>
<tr>
<td>III</td>
<td>April 25, 1901</td>
</tr>
<tr>
<td>IV</td>
<td>February 26, 1902</td>
</tr>
</tbody>
</table>
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 Tuberosa- 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-cerrum.)

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, Rheims, Sanquinaria, Silphium, Sisyphinichium, Smilacina, Statice, and many others, mostly hardy herbs.)

*BARKER, MICHAEL, Editor of "Gardening" and "American Florist," Chicago, Ill. (Solanandra. Vallota. Many suggestions.)

*BARNES, CHARLES R., 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.)

*BARRON, LEONARD, Editor "American Gardening," New York, N. Y. (Rose.)

BAYERSDORFER, 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, Biltmore, N. C. (Bamboo.)


BECKERT, THEO. F., Florist, Allegheny City, Pa. (Bougainvillae.)


*BESSEY, CHARLES E., Prof. of Botany, Univ of Nebr., Lincoln, Nebr. (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.)

*BRANDEgee, MRS. KATHARINE, Botanist, editor of Zoö, San Diego, Calif. (Several genera of caeti, as Mammillaria, Melocactus, Perleiphyra, Pereskia, Phyllocactus, Pilocereus, Rhipsalis.)

BRANDEgee, T. S., Botanist, San Diego, Calif. (Nolima.)

*BRUNTON, ERNEST, Landscape gardener, and editor of "California Floriculturist," Los Angeles, Calif. (Nerium, Palms, Phanix, 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 Agrie. 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-b breeder, Santa Rosa, Calif. (Nicotinum. Has read proofs of Gladi- olus, etc.)

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

BURRILL, T. J., Prof. of Botany and Horticulture, Univ. of Ill., Urbana, Ill. (Protoplasma.)

(xvii)
COLLABORATORS


*Cameron, Robert, Gardener, Botanic Garden of Harvard Univ., Cambridge, Mass. (Various articles and much help on rare plants. Alpina, Campanula, Echinocactus, Nemophila, Primula, Ramonda, Urecelina, 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 Laelia.)


*Close, C. P., Horticulturist, Del. Exp. Sta. (Formerly Horticulturist Utah Exp. Sta.), Newark, Del. (Clath.)

*Coates, Leonard, Fruit-grower, Napa, Calif. (Orange. Orange. Has helped on other fruits.)

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

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

*Conard, Henry S., Senior Fellow in Botany, Univ. of Pa., Philadelphia, Pa. (Nymphae. 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, Leucocerium. 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. F., 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,多年生ustomer, and many important subtropical subjects, as Acacia, Calijatemon, Eugenia, Eucalyptus, Maytenus, Pittosporum, Pistacia, Quercus, Schinus, Sollya, Strepotosolen, Tristani, Umbellularia. Washingtonia, Windbreaks, and others.)

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

*Dean, James, Florist, Bay Ridge, N. Y. (Nephelopsis.)

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


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

*Dorssett, 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.)
COLLABORATORS


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

DUPUY, Louis, Wholesale florist and specialist in hard-wooded 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)

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

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

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


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


*FAWCETT, Wm., Director Dept. Public Gardens and Plantations, Kingston, Jamaica. (The article "Tropical Fruits:" also Cherimoya, Cucumis, Marmalade Plum, Egg Fruit, Mango, Mangosteen, and others.)

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

FINLAYSON, 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 Dasylirion, Flacouria, Fouquier, Furcraea, 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.)

GANNET, 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, Muscari, Narcissus.)

GILLET, 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. (Ixia.)

*GREENER, 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 Cypripedium, Epidendrum, Lycaena, Mazillaria, Masdevallia, Odontoglossum, Oncidium, Orchid, Phalanopsis, Saccoblamium, Stanhopea, Zygodetalum.)

*GROFF, H. H., Gladiolus specialist, Simeone, Out. (Gladiolus.)

GURNEY, JAMES, Gardener, Mo. Botanical Garden, St. Louis, Mo. (Cacti.)

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

HALSTED, Prof. B. D., N. J. Exp. Sta., New Brunswick, N. J. (Diseases. Fungus.)
Hansen, 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. Medinilla.)

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

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


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

Hassebring, Heinrich, Asst. Pathologist, Ill. Exp. Sta., Urbana, Ill. (Iris. The article "Orchids," and botany of most orchid genera from Gorgora to Zygodipetalum. Several aca-nthas, 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 Berria, Berthelletia. A few grasses, as Hierochlo, Holcus, Hordeum.)

Hatfield, T. D., Gardener, Wellesley, Mass. (Numerous and varied contributions, as Gesneria, Gloxinia, Lachenalia, Leea, Macrozamia, Euphor- era, Oxalis, Pelargonium, Reinwardtia, Rhexia, Ricardia, Rondelita. Has read many proofs.)


Heinz 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. Hollycock.)

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, Thurber.)

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

Hicks, Henry, Nurseryman, Westport, L. I. (Ligustrum. 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, Colo. (Celery.)

Hoopef, 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.)

Huey, 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. Lactuca. Pepper. Tetragonia.)

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

Jackson & Perkins Co., Nurserymen and spe- cialists 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. (Re- seda. 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 Roquette. The article Sweet Herbs, also Sage, Savory, Scurry Grass, Tansy, and other sweet, pot or medicinal herbs. Also Chichory, Ginseng and Glycerina.)


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, Leucothoë and Paronychia. Help on proofs.)
COLLABORATORS


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

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.)

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

LANDRETH, BURNET, Seedsman, Philadelphia, Pa. (David Landreth.)

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

*LÉ MOYNE, F. J., Amateur in orchids, Chicago, Ill. (Sobralia.)

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

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

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

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

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

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

*MADDOUGAL, 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.)

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

McWILLIAM, GEO., Gardener, Whitinsville, Mass. (Dipladenia. Luculia.)

*MANNING, J. WOODWARD, Landscape Architect, Boston, Mass. (Pachysandra. Pyrethrum. Rho-

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

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

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

MATHEWS, Prof., C. V., Horticulturist, Ky. Exp. Sta., Lexington, Ky. (Kentucky.)

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

MATHEWS, WM., Florist and orchid grower, Utica, N. Y. (Various orchids, as Gongora, Grammato-

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

MEAD, T. L., Horticulturist, Oviedo, Fla. (Crim-

*MEEHAN, JOSEPH, Nurseryman, Germantown, Philadelphia, Pa. (Idesia. Tozylon.)

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

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

*MISCHIE, EMIL, Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (Quisqualis. Tozy-

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

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

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

*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, 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, Pontella, Va. (Virginia.)

*NEHRING, H., Milwaukee, Wis. (Phamix, Sabal, Serenaca, Tabernamontana, Tecoma, Thunbergia and other plants cultivated in his garden at Gotta, 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 Euphorbiaceae. 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.)

OREPPE, EDWARD O., Gardener, So. Lancaster, Mass. (Border. Cycamen. Dianthus, and certain orchids.)

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

PEACOCK, LAWRENCE K., Dahlia specialist, Ateo, 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. (Phaonia. 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, Prof. G. HAROLD, Div. of Pomology, U. S. Dept. Agric., Washington, D. C. (Cherry Delaware. Help on Peach, etc.)

POWELL, GEORGE T., Dir. School of Practical Agriculture and Horticulture, Briar Cliff Manor, N. Y. (Pear. 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 Erodium, Calochortus, Erythronium, Fritillaria, Stropholiun. Help on Lilium.)

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

RAWSON, GROVE P., Florist, Elmira, 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. JONSSON, Landscape Gardener, Dept. of Parks, New York, N. Y. (Various exotics.)

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

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


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

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

*SCOTT, WM., Florist, Buffalo, N. Y. (Important florists' plants and flowers, as Acaea, Convolvula, Cycamen, Cytisus, Simalx, Mesiwsidores, Peperomia, Perilla, Piqueria, Stephanotis, Syringa, Verbena, etc. Also Packing Flowers.)

SCOTT, WM., Gardener, Tarrytown, N. Y. (Ber-tolonia and other tender foliage plants.)


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

*SEAVEY, MRS. FRANCES COPLEY, Landscape Gardener, Chicago, Ill. (Railroad Gardening.)
SEMLE, JAMES, Specialist in China asters, Bellevue, Pa. (Aster.)

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

*SHEPARD, CHARLES U., Special agent U. S. Dept. Agric. 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 Aechyma, Bedding, Dichorisma, Episeta, Fittonia, Hymenophyllum, Thysacanthus, Trachelospermum, Vases.)


*SIMMONS, O. C., Landscape Gardener, Buena Ave., Chicago, Ill. (Landscape Cemeteries. Shrubbery.)

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

SMITH, A. W., Grower of cosmos and moonflower seed, Americus, 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 Centaurea, 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.)


*STEELS, W. C., Fruit-grower, Switzerland, Fla. (Talinum. 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.)

TAFT, Prof. L. R., Horticulturist, Mich. Agric. College, Agriagicultural College, Mich. (Greenhouse h...ing. Hotbeds.)

*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 acast, as Echinocereus, Epiphyllum.)

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

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

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


*TRELLESE, DR. WM., Dir. Mo. Botanical Garden, St. Louis, Mo. (Certain desert plants of the city family, as Aloe, Apicea, Gasteria, Haworthia, Yucca. Shave. Sturtevant. Ozaelis.)

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

TRUOP, 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.)

TURNER, WM., Gardener, Oceanic, 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.)
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. (Olive.)
Alverson, A. H., Grower of cacti, San Bernardino, Calif. (Cacti.)
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. (Palm and decorative plants.)
Barker, Charles, Fruit-grower, Milford, Del. (Peach.)

Whitten, Prof. J. C., Horticulturist, Mo. Exp. Sta., Columbia, Mo. (Missouri.)
Woolson, G. C., Nurseryman, Specialist in hardy herbaceous perennials, Passaic, N. J. (Mertensia. Has read numerous proofs.)
Wortman, S. W., Mushroom-grower, Iselin, N. J. (Mushroom.)
Wright, Charles, Fruit-grower, Seaford, Del. (Peach. Help on Delaware.)
Wyman, A. P., Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (Dirca, Epigaea, Eucorhiza, Halesia, Hypericum, Kerria, Liquidambar, and other hardy trees and shrubs. Also Lathyrus, Lupinus, Veronica.)
Ziringiebel, Denys, Florist, Needham, Mass. (Pansy.)
BRECK & SONS, JOSEPH (Corporation), Seedsmen, Boston, Mass. (Portrait of Joseph Breck.)
BRESEE, J. S., Nurseryman, Fayetteville, N. C. (North Carolina.)
BROWN, O. H., Amateur, Bordentown, N. J. (Aquatics.)
BUDLONG & SON CO., J. A., Manufacturers of pickles and vinegar, market-gardeners, Providence, R. I. (Cucumber. Martynia.)
BURPEE, W. ATLEE, Seedsmen, 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 Kewensis.)
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.)
CRANEFIELD, FREDERICK, Asst. Horticulturist, Wisconsin Exp. Sta., Madison, Wis. (Irrigation.)
DAILLEDOUZE BROS., Wholesale florists, Flatbush, Brooklyn, N. Y. (Mignonette.)
DAILEY, CHARLES L., Fruit-grower, Salem, Ore. (Prune.)
DANBY, CHARLES E., Prune-grower, Salem, Ore. (Prune.)
DANDRIDGE, MRS. DANSKE, Amateur, Shepherds-town, W. Va. (Hardy plants.)
DAVENPORT, GEO. E., Botanist, specialist in ferns, Medford, Mass. (Several genera 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, Pittsburg, Pa. (Kochia, Oak, and some 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.)
HALLIDAY, ROBT. J., Florist, Baltimore, Md. (Azalea. Camellia.)
HARRIS, J. S., Fruit-grower, La Crescent, Minn. (Minnesota.)
HAYS, Willet 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. (Polygala, and some other native plants.)
COLLABORATORS

HOWARD, A. B., Seed-grower, Belchertown, Mass. (Verben. Zinnia.)

HUTT, H. L., Prof. of Horticulture, Ont. Agric. College, Guelph, Ont. (Kale. Kohlrabi.)

JACK, MRS. ANNIE L., Chateauguay Basin, Prov. Que. (Native Plants.)

JEPSON, Willis L., Botanical Dept., Univ. Calif., Berkeley, Calif. (A few Californian sub-
jects.)

JENNINGS, E. B., Specialist in pansies, Southport, Conn. (Pansy.)

JONES, Rev. C. J. K., Los Angeles, Calif. (Various Californian plants.)

JORDAN, W. H., Dir. N. Y. Exp. Sta., Geneva, N. Y. (Fertility. Fertilizers.)

KATZENSTEIN, Otto, Manager Pinehurst Nurseries, Pinehurst, N. C. (Stillinia.)

KEDZIE, Dr. R. C., Prof. of Chemistry, Mich. Agric. College, Agricultural College, 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.)


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., Minneapolis, Minn. (Minnesota.)

LEIB, S. F., Prune-grower, San José, Calif. (Prune.)

LINDLEY, J. VAN, Nurseryman, Pomona, N. C. (North Carolina.)

LUKE, Fred K., Gardener, Mo. Botanical Garden, St. Louis, Mo. (South Dakota.)

LUPTON, J. M., Market-gardener, Gregory, L. I. (Cabbage.)

LYON, W. M., Census Bureau, Washington, D. C. (Palms.)

MACDOWELL, J. A., Nurseryman, City of Mexico, Mex. (Cacti.)


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.)


MAXWELL BROS., Fruit-growers, Geneva, N. Y. (Quince.)

MCDOWELL, Prof. R. H., Agiculturist and horticulturist, Nev. Exp. Sta., Reno, Nev. (Nevada.)

McTEAR, John, Gardener, Montecito, Calif. (Some plants cult. in Calif.)

MEAD, Prof. Elwood, Cheyenne, Wyoming. (Wyoming.)

MEEKAN, Thos., Nurseryman, Germantown, Pa. (deceased). (The article "Horticulture.")

MERIAM, Dr. Horatio C., Salem, Mass. (Paeonia. Papaver.)

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.)

MOORHEAD, James R., Grower of Cacti, Cactus Farm, Moorhead, Texas. (Cacti.)

MOSES, WallacE R., Fruit-grower, West Palm Beach, Fla. (Orange. Pineapple.)

MUDGE, W. S., Fruit-grower and melon raiser, Hartland, N. Y. (Muskmelon.)

NANZ & NEUNER, Florists, seedsmen, and nurserymen, Louisville, Ky. (Kentucky.)

NASH, Geo. V., Gardener, N. Y. Bot. Garden, Bronx Park, N. Y. (Genera of grasses.)

NICKELS, Miss ANNA B., Grower of Cacti, Laredo, Texas. (Certain genera of Cacti.)

OHME, 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 "Pomology.")

PENDERGAST, W. W., Pres. Minn. Hort. Soc., Hutchinson, Minn. (Minnesota.)

PENNOCK, C. J., Florist and Gardener, Kennet Square, Pa. (Tomato.)

PERICAT, Alphonse, Gardener, West Philadelphia, Pa. (Latiocattleya.)

PIERSON, F. R., Nurseryman, Tarrytown-on-Hudson, N. Y. (Bulbs.)


RAMSAY, F. T., Nurseryman, Austin, Tex. (Texas.)

REA, Frederic J., Nurseryman, Norwood, Mass. (Polemonium.)
COLLABORATORS

REBBMAN, JEREMIAH, Lincoln, Neb.  (Philippine Islands.)

RICHARDSON, E. A., Landscape gardener, Boston and Albany, 40 Austin St., Newtonville, Mass. (Railroad Gardening.)

RIDER, Prof. A. J., Philadelphia, Pa. (Cranberry.)

ROBINSON, Prof. B. L., Curator, Gray Herbarium of Harvard Univ., Cambridge, Mass. (Various articles on native plants.)

ROBINSON, CHARLES MULFORD, Author of "The Improvement of Towns and Cities." Rochester, N. Y. (Village Improvement.)

ROBINSON, JOHN, Author of "Ferns in their Homes and Ours," Salem, Mass. (Several articles on ferns.)

ROCK, JOHN, Fruit-grower and nurseryman, Niles, Calif. (Plum. Prune.)

ROHNERT, WALDO, Specialist in sweet peas, Sargent, Calif. (Sweet Pea.)

ROOT, A. I., Dealer in bee-keepers' supplies, Medina, Ohio. (Tomato.)

ROSS, J. J., Fruit-grower, Seaford, Del. (Peach.)

ROTHROCK, J. T., Commissioner of Forestry, West Chester, Pa. (Rothrockia.)

RYALS, G. M., Market-gardener, Savannah, Ga. (Tomato.)

SALTFOORD, WM. G., Florist and specialist in violets, Poughkeepsie, N. Y. (Violet.)

SASER & CO., Nurserymen of St. Albans, Eng. (A. Dimmock, New York agent). (Recent importations, particularly orchids and palms.)

SANDIFORD, ROBERT, Specialist in pelargoniums, Mansfield, Ohio. (Pelargonium.)

SCHNEECK, JACOB, Amateur botanist, Mt. Carmel, Ill. (Vitis.)

SCHULTHEIS, ANTON, Florist, College Point, N. Y. (Woody plants from Australia and the Cape, as Erica.)

SCOON, C. K., Fruit-grower, Geneva, N. Y. (Cherry.)

SCOTT, ALEX. B., of Robert Scott & Son, Sharon Hill, Pa. (Rose.)

SHADY HILL NURSERY CO., Boston, Mass. (Herbaceous perennials.)

SHAW, THOS., Prof. of Animal Husbandry, Univ. of Minn., St. Anthony Park, Minn. (Medicago. Melilotus.)

SHINN, J. C., Fruit-grower, Niles, Calif. (Pear.)

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.)

STEWARD, W. J., See. Soc. American Florists, Boston, Mass. (Syringa.)

SOLTZAU, 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.)

STURTEVANT, 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. R., 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.)

WHILLIDIN 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.)
### ABBREVIATIONS

#### I. OF GENERAL EXPRESSIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td><em>cult.</em></td>
<td>cultivated, etc.</td>
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<tr>
<td><em>diam.</em></td>
<td>diameter</td>
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<tr>
<td><em>E.</em></td>
<td>east</td>
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<tr>
<td><em>ft.</em></td>
<td>feet</td>
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<tr>
<td><em>in.</em></td>
<td>inches</td>
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<tr>
<td><em>N.</em></td>
<td>north</td>
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<tr>
<td><em>S.</em></td>
<td>south</td>
</tr>
<tr>
<td><em>trop.</em></td>
<td>tropics, tropical</td>
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<tr>
<td><em>W.</em></td>
<td>west</td>
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#### II. OF BOTANICAL TERMS

<table>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td><em>fl.</em></td>
<td>flower</td>
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<tr>
<td><em>fls.</em></td>
<td>flowers</td>
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<tr>
<td><em>fld.</em></td>
<td>flowered</td>
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<tr>
<td><em>fr.</em></td>
<td>fruit</td>
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<tr>
<td><em>h.</em></td>
<td>height</td>
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<tr>
<td><em>lf.</em></td>
<td>leaf</td>
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<td><em>lfet.</em></td>
<td>leaflet</td>
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<tr>
<td><em>les.</em></td>
<td>leaves</td>
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<tr>
<td><em>st.</em></td>
<td>stem</td>
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<tr>
<td><em>sts.</em></td>
<td>stems</td>
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<tr>
<td><em>syn.</em></td>
<td>synonym</td>
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<tr>
<td><em>var.</em></td>
<td>variety</td>
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</table>

#### 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 account 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.

**A.F.** The American Florist. Chicago. A trade paper founded August 15, 1885. The volumes end with July. Many pictures repeated in “Gng.” (14:1524=vol. and page.)


**B.F.** See F.

**B.H.** La Belgique Horticole. Ghent. 35 vols. (1831–1885.)

**B.M.** Curtis’ Botanical Magazine. London. Founded 1787. The oldest current periodical devoted to garden plants. The vol. for 1890 is vol. 125 of the whole work. Index to first 107 volumes by E. Tonks. London. (7690=col. plate.)

**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 23rd vol.) contains an index to the first 23 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. 1893. (396=page.)

**Em.** Emerson, G. B. Trees and Shrubs of Massachusetts. Boston. 2 vols. 149 plates.


F.J. . . . See F.


F.P. . . . See F.


F.S. . . . Flore des Serres. Ghent. (1845-1880.) Inconsistent in numbering, but the plate numbers are always found on the plate itself or on the page opposite. Valuable but perplexing indexes in vols. 15 and 19. (24:228=vol. and col. plate.)


I. H. . . . L'Illustration Horticole. Ghent. (1854-1896.) (45:72=vol. and col. plate.) The volumes were numbered continuously, but there were 6 series. Series I.=1854-68. Series II.=1869-70. Series III.=1870-80. Series IV. =1881-86. Series V. =1887-93. Series VI. =1894-96. The plates were numbered continuously in the first 16 vols. from 1 to 614: in vols. 17-33 they run from 1 to 619: in series V. from 1 to 190: in Series VI, they begin anew with each vol. Valuable indexes in vols. 10 and 20. Series V. in 4to, the rest 8vo.


K.W. . . . See F.C.

L. . . . In vol. 1 of this work, sometimes means Lindenia, sometimes Lowe's Beautiful Leaved Plants. See "Lind." and "Lowe,"


R.B. . . . Revue de l'Horticulture Belge et Etrangère. Ghent. Founded 1875! (23:288=vol. and page opposite col. plate.) In the first vol. of the CYCLOPEDIA "R.B." sometimes means Belgique Horticole, but the confusion is corrected in later vols., where Belgique Horticole is abbreviated to "B.H."

R.H. . . . Revue Horticole. Dates from 1836, but is now considered to have been founded in 1829. (1899:590=year and page opposite col. plate. 1899, p. 590=year and page opposite black figure.)


S.H. . . . Semaine Horticole. Ghent. Founded 1897 (3:54=year and page.)

S.M. . . . Semaine Horticole. Erroneously cited in this fashion a few times in first vol.


Additional abbreviations and explanations will be found in the introductory pages of Vol. I.
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 expensive 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 3-5 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 specimens. 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 first crop is removed, the ground may be thoroughly raked, fertilized, and the new plants put in. In some cases the new crop is transplanted between the rows of the old crop a few days before the latter is removed; but, unless the soil is rich and in good condition, it is better to wait until the crop is removed in order that the land may be thoroughly fitted for the new plants. Radishes are often 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; or as globular, half-long and long Radishes; or as red, white, gray and black Radishes. Figs. 2060-2062 show some of the forms. The origin and maturity 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 the wild it is often found in the same field as the cultivated Radish.
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 grew it in a few years to produce edible Radishes from the wild plant. While these investigations seem to be conclusive, the Radish cannot be produced from the charlock, 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. Frat., 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 1½–10 inches, the thickness from ½–5 inches, the weight from 22 to 651 grams. In terms of percentage the length was increased 666 per cent, the thickness 1,000 per cent, the weight 383 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 pickles. It is rarely grown in American gardens, although it is well worth raising as a curiosity. It is annual, and its cultivation presents no difficulties.

Garden Notes on Radishes.—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 the better it can be made, 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 fine and smooth as possible, form drills about 1 in. deep and 10–18 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 un-leached 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 often scatter a few seeds of early Radish in their rows of onions and beets. The Radishes start quickly and enable the gardener to see and cultivate the rows sooner; and the Radish crop is matured and pulled before the space is all needed for the more permanent crops.

Petite Côte, Ontario, is a little hamlet of French set-
CLERS on the Detroit river, in which nearly every cottage has a Radish garden, ranging from a few rods to an acre. On the product of these gardens the owners depend for a large share of their income. The soil is rich, black, sandy and alluvial with permanent water at a depth of 3 feet. The surface is by no means wet or marshy. The gardens are heavily manured, not only in the spring but before each crop is started. They make at least two, and sometimes as many as five crops during the season. The beds are manured, spaded and replanted within a day or two after the roots have been pulled. Beans are never seen in a Petite Cote Radish garden. They prepare only tools until a spading fork, a steel rake, a marker (made by fixing a row of pegs $\frac{1}{2}-\frac{3}{4}$ in. in diameter and $\frac{1}{2}-\frac{3}{4}$ in. long, 1 in. apart in the rounded edge of a narrow board), and a standing board 8-12 in. wide and as long as the beds are wide. Having made the soil as fine and smooth as possible, they lay the board across the bed and, standing on it, they make a row of holes by pressing the marker into the soil along its inner edge. They then drop one or two seeds into each hole, covering them with soil with the edge of the standing board as they then repeat the process. Only a small part of the garden is planted at once, but sowings are made once or twice a week throughout the season, so there is a constant succession of roots in prime condition. The variety used is the Long Scarlet. There is a large list of varieties of these spring or forcing Radishes, all of them tracing back to the Scarlet Turnip, Scarlet Half-Long or Long Scarlet type.

Summer Radishes. These are a little slower in growth than the preceding but remain longer in condition. The Long Scarlet type appears in both summer and winter Radishes, but the Charlter, Celestial, Stuttgart, etc., are used only for summer or late fall supply. The culture of the summer sorts is the same as that of the spring sorts, except that they should be given more room.

Winter Radishes. These are of still slower growth and firmer flesh and can be held in good condition almost as readily as turnips. The seed may be sown from the last of July till the middle of September, and at the approach of severe freezing the roots should be gathered, packed in sandy soil and either buried out of doors or stored in a cool, damp cellar, where they will remain in good condition all winter.

Seed-Growing. In growing seed the summer sorts are treated as annuals. The seeds are sown in early spring, and as soon as the plants reach a size they are taken up, topped, carefully sorted and the best ones reset, whereupon they will speedily take root and throw up seed-stalks. Sometimes seed is grown without transplanting the roots, but as there can be no selection nor even roguing, the seed so grown is necessarily unreliable. The seed requires a long time to mature, and is not thoroughly ripe until long after the pods have turned brown, and growers are in the habit of partially drying the stalks and allowing them to stand in the stack or mow for some time before threshing. The later sorts are treated as biennials, the roots being stored during the winter. Most of the Radish seed used in this country is grown in this manner; in other communities some form of 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, things that are there is no reason, unless it be the question of cheap labor, to prevent its being grown to advantage here.

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 1883 on the Great Western, and for a shorter time on the Great Western railway. The prizes range from 5s. to £5, and in 1900 aggregated £300 on the Midland railway. The little planting that is done by the railway companies themselves is confined to a few trees of low growth near stations, to a background of shrubs for some of the so-called "platform gardens," and to sowing broom and gorse on certain slopes of the permanent way between stations. The "allotment gardens" that attract attention on English roads are small tracts near 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 furnishing 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) snow shelters; (4) vegetation on embankments as a protection against erosion; (5) 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 coniferous. These nurseries, as well as the entire planting, are under the supervision of a "plantor," 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 extend for some distance along the 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 Nationel Belang, at Utrecht, says that the association has contracts with the State Railway Company and the Holland Railway to plant the dykes of their roads. Different kinds of willows, low apple and pear trees (half-stam appelen peerenbloezen) and wild prune trees are used, the fruit of the last being "used for jams."

The common quince is used to a limited extent in the Netherlands 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 Railway Department of Siam reports through M. Kloeke, acting Director General of Railways, that efforts have formerly been made to establish protective Tamarind hedges along embankments in the Royal allotments which were destroyed by cattle; Eucalyptus trees grown from seed received from Australia have developed 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

2055. Ameliorated Radishes, fourth generation (X 3/4).

After Carrière. (See Radish, page 1488.)

2065. Rat-tailed Radish (X 3/4).

Grown for its enormous pods. (See Radish, page 1488.)

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.)

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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 di-
rector of the P. L. M. Railroad Company writes that about 200 trees were planted between 1860 and 1875, of which 495,000 were forest trees and 30,000 fruit trees. The prevailing forest trees are eucalyptus and lo-
custs; others are mulberry, plane, pine, cypress, wil-
low, poplar, oak, sycamore, and mimosa. 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-
granate, apricot and almond. This information comes through Daniel S. Kidder, U. S. Consul at Algiers.

In Mexican line companies, notably the Mexican Cen-
tral, 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 mainte-
nance among prosperous and progressive companies
seeking to develop local passenger business."

Leading Spirits.—As nearly as can be determined with certainit,y 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 railroad, 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 official order, as far as can be 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 railroad, J. T. Johnston. That gentleman was therefore one of the pioneers, if not actually the first American railroad official to recognize the advantages, and to encourage the development of such improvement of station-grounds.

An 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
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-
don 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 & Quinley, the Archison, Topeka & Santa Fe with its San Francisco & San Joaquin Valley line, the Cleveland, Cincinnar, 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 per-
manent planting. A number of others have reserved plots for future improvement, and some have turfed such spaces. Several prominent companies do no direct 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-beding, 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 lim-
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

2067. Plans of Railroad Gardening.

On the left, Auburndale Station, Boston & Albany R. R. The plan provides for a porte cocher.
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 inarticulate and fleeting summer show of perishable material. For instance, the New York Central & Hudson River Company, under the direction of the late Mr. Stiles, has changed it into a permanent feature, and what is more, has adopted a policy towards the permanent improvement of station-grounds with ornamental flowers and vines that is destined to improve. This policy has been adopted by nearly all the larger companies, and the result is that the permanent beauty of a number of stations has been increased. In 1882 and 1884 several new and exceptionally artistic stations had been built for the Boston & Albany Railway Company after designs by the late eminent architect H. H. Richardson, and the latter date marks the adoption of the principle that station-grounds are to be treated as a portion of the station-service, and that the station-grounds are to be the work of an artist. The question of station-grounds is now a matter of some importance, and the artistic treatment of station-grounds is destined to become a permanent feature of all the larger companies.

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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 company.

"If railroad gardening is ever to become a potent and permanent means of public education, it must be organized upon a more economical basis and must be less expensive 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 recommends the plan of the then new station-grounds of the Boston & Albany railway for "convenience, neatness and simplicity. No beds, no brilliant flowers, no startling effects. They rely for attraction on the solid and substantial advantages of the few trees that are allowed to grow. The plan is simple, and when thoroughly carried out in the beginning it is easy to maintain." This editorial seems succinctly to express the crystallized ideas of the lamented editor of Garden & Forest on the subject of railroad gardening.

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

"The essential features are: convenient and abundant features, and some treatment of the ground not needed for approaches. This treatment should be at once economical and permanent, and of a character simple enough to be successfully maintained by the station-master and his assistants, under the inspection and with the aid of the railroad managers who have usually failed. Most railroad gardens, and this is true of Europe as of America, consist of a badly laid out and constructed approach, bordered with turf in which the grass is cut as many large regular-shaped beds as can be crowded in and filled during four months of the year with the most showy and ill-assorted plants, and quite bare of all covering during the remaining ten months. The result of a few seasons of past recognition by bad pruning, and by a clump of pampas grass to complete the decoration; also often the name of the station in stones (mere 'toys'). As Bacon wrote two 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 company.

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RAILROAD GARDENING

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 station-grounds 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 places dating from the Spanish occupation, a collection of semi-tropical shrubs, and a display of yuccas, cea-tl and other curious vegetation from the Arizona desert.

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, eucalypti and other succulents is general. Where water is available, passifloras, ipomeas 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 José to the ancient capital of the state. At Castroville there is a picturesque "wilderness" garden overshadowing 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 road, 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 than any other. The grass retains its dark, 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 strong winds."

Other trees and plants mentioned include the paulownia, pepper, catalpa, mulberry, fig, the brachychiton (Sterecolla) and cassuaria, which latter does exceptionally well, eucalypti, acacia in all except the most tender varieties, crape-myrtles, 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 mid-summer away from the coast. Vines used are passifloras, which thrive in the heated valleys, bignonias and wisterias, also jasmines, 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; Phoenix Camarissiensis does well, and Chamaerops grows slowly. A long list of plants, tender in the east, are mentioned, among them magnoliu-s, 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 eucalypti. 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-

RAILROAD GARDENING 1493

2068. One method of treating a railway ground.

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2069. A better method of treating the area.

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 recently 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 sumacs, sweet fern, bayberry, etc., when once established will prevent surface soil from washing, will not grow tall enough to interfere with operating the road, and if destroyed by fire would soon grow again from the root and re-cover the ground."

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

Railway officials offer no practical objections to the use of small trees and of shrubs between stations 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 tracks should never be menaced by the danger of trees falling across them in wind storms, nor should the telegraph
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 600,000 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, the inner edge being 125 feet from the center line and parallel with the tracks through the 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 drifting 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 planting are to be eventually utilized by railway companies whose lines are exposed to this danger.

Planting for Economic Purposes.—Possibilities are considered great in the direction of producing fuel for furnishing crossing ties, poles and posts. It is asserted that the wind power of this branch can be made not only to pay the entire expenses of the department but to become a source of revenue. This branch of the work appeals to practical railway men as perhaps no other phase can be expected to, and to what extent the fortunes of various groves of locust, catalpa and tamarack influence the 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, as well as for the same purposes. This is also true in Indiana, 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 results would be accomplished from comprehensive and extended efforts to secure legislation looking to the prevention of further defacement of the palisades of the Hudson.

Disastrous Features and their Suppression.—There are two important classes of disfigurement: disfigurement 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 disgrace railway rights of way and, indeed, seem to have the right of way on highways of every description. These amount to a public nuisance that should be legally controlled, but as they are placed on adjacent land or are违章 structures, the problem of direct suppression by highway officials is out of the question. These eyesores, however, furnish an added and cogent reason for massing plantings of small trees, shrubs and hedges along the line of approach to the right 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 objectionable farm buildings, while the approach to villages and towns is announced in screaming colors by the crowding together of these frightful adjuncts of civilization.

While railway companies are not strictly responsible for these conditions, it is certain that they might sway public opinion and effect a much needed reform by continuous, systematic work in the way of "planting out" the disastrous points, and establish certain bright "eyesores" or attractive plantations wherever possible. This policy is likely to result in a reformation in the direction of the second source of unpleasant views from trains; viz., the unkempt, even quite unremoved, hedges and shrubbery of adjoining rights of way through villages, towns and small cities. If a park is maintained on the station-grounds, near-by residents are likely to catch the good spirit and improve certain stretches of neighboring back yards. To this end, a rule against dumping on railway ground should be strictly enforced. The objectionable features that obtain in large cities must probably be tolerated until the efforts of municipal art and social service leagues.

Attainable Ideals.—Railway companies can do no
RAISIN of the Raisin industry is the best. Irrigation has been realized, the fruits are considered ripe.

The vines are all headed 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 percent, the grapes are considered ripe. The bunches are then cut with small shears (care being taken not to rub 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 the point where the consistency of jelly the Raisins are placed in "sweat boxes" to undergo the "sweating" process in order to equalize the moisture content of 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 Association has endeavored to establish a few brands to maintain distinctly Californian brands. "5-Crown Imperial Clusters," "5-Crown beams," "4-Crown Clusters," "3-Crown" and "2-Crown London Layers" are some of the principal brands. The lower grades, loose or detached berries are, of course, always marketed separately as distinct grades. A number of them have lately been "seeded" by means of a specially designed machine, put up in 1-pound and 34-pound packages, and marketed for cook-
RAISIN

ing purposes. Some "bleached" Seedless Sultana and Thompson Seedless are prepared, and command a higher price for no other reason than that they are considered more palatable being made of the delicacy in flavor and aroma are entirely destroyed in the bleaching with sulfur, and all possible efforts should be made to discourage the practice. Few, if any, "dipped" Raisins are now prepared.

The varieties prepared are: White Muscat of Alexandria, the Muscatel Gordo Blanco and Malaga; and for seedless Raisins, the Seedless Sultana and Thompson Seedless. It is safe to say that the first two prevail most in California and the varieties produced are a few of the few methods. Downy mildew is unknown in California, and up to the season of 1900 no phylloxera 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 milder. 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, 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. Wickson.

ARNOLD V. STUBERNAUER.

RAISIN-TREE, JAPANESE. Hovenia dulcis.

RAMÓNDA (L. F. E. von Ramond de Carbonnieres, French botanist and traveler, 1753-1827). Often spelled Ramonda, but properly written Ramonda. **Gnaphalium** Ramonda Pyrenaica is one of the choicest and most popular alpine plants. Few, if any, inhabitants of rock gardens have been so often potted. It is a small, tufted, alpine herb, the most alpine plants, and its scapes bear one or two fls. in spring. These are an inch or so across, and normally purple or violet, but there is a pure white variety which is in great favor. The Ramondas vary in the number of their petals, or rather corolla-lobes. For example, **R. Nathalia** 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 essentially tropical.

A genus of about 3 species: corolla with scarcely any tube, and distinctly bell-shaped, perfect stamens, and many as the corolla-lobes, affixed at the base of the corolla: ovary superior: capsule oblong: seeds minus. Ramondas are woolly or villous plants with soft, wrinkled leaves. The plants require perfect drainage.

Although three Ramondas 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 cold frame, they will make neat little plants by the end of autumn. They should be kept in a cold frame 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.**

Pyrenaica, Rich. Fig. 2072. Sometimes called Rosette Melunin. Well-grown specimens may have 6-12 scapes, each bearing 3-4 fls. 1% in. across. Native of Pyrenees. Many inferior forms have been sent out in the name of var. alba. (46), p. 129 (repeated in 27, p. 197); 29, p. 343 (repeated in 44, p. 555); 27, p. 197; 37:735 and p. 31; 51, p. 206; 56, p. 228. G.C. III. 12:773; J.H. III. 34:187. R.H. 1865:330. B.M. 236 (Verbasinum Myconi).

BB. Corolla 4-parted, more concave, short bell-shaped to funnelform.

Hédreichii, Janka (Jančka, or Janková, Hédreichi, Bolsa, Lva., ovate, entire, obtuse, silky white above, rusty-brown below: scapes 1-2-fls.: fls. violet. According to Boissier it normally has a 5-parted calyx, 4-lobed corolla and 4 stamens. Thessaly. Gn. 55, p. 394.

AA. Color of fls. yellow.

Sérica, panic. This is said to be distinguished by its blue anthers; also the fls. are said to be normally 5-lobed. Servia.—R. Nathalia above.

RAMÓNDA. See Ramonda, above.

RAMPION (Campanula Rapunculus) 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 Vilmorin'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 minute 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 firmed 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.
RANUNCULUS

RAMPIEON. Phyleaana.

RAM'S HEAD. Cypripedium arietinum.

RAMSTED. Linaria vulgaris.


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, eorymbose, or fascièd: fr. a berry, globose or ovoid, 2-loculed, many-seeded. For distinctions from Mitriostigma and Gardenia, see Gard. Bull. I:35.

AA. Shrubs having spines.

duetorum, L. (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 3/4-1 in. across: berry globose or ovoid, 3-1/2 in. long, yellow. Tropical Asia. Cult. In S. Fla.

BB. Shrubs or trees without spines.

Coryllos-tube 1/4 in. long.


CC. Lobes of corolla acute.

Ruiziana, 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. BURLEY.

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

Hildebrandtii (Ravena Hildebrandtii, Bouché). Becoming 8-12 ft. high, but flowering under cultivation when half that height, spineless, erect: lvs. elliptic-oblong or obovate-oblong in outline, long-stalked, pinnate, the pinna 20 or more pairs and narrow-lanceolate-acuminate: spadix long-stalked, the stamine recurved and with short densely flowered spreading branches, the pistillate erect with filiform strict branches thickened at the base: fls. pale straw-color, the calyx 3-lobed, the petals 3 and joined at the base, the stamens 6: fr. black. Co- moro Islands (east of Africa). I.H. 27:403. B.M. 6776. G.F. 4:238.—An excellent dwarf palm, described by W. W. Wight, in 1881, Trimaran. The plants are very hardy and grow equally well in the herbage border or in some shade during the warmer parts of the day, or a place in a rock garden with a northern aspect. The roots are tuberos, being like miniature dahlias roots.

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. Ravena 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). Ranunculaceae. Buttercup. Crowfoot. The genus is by far the largest in the family, comprising few or over 1500 species. Nearly all 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 marcescent, persistent. Some of the most common cultivated species are: 2074. Head of a "Aakens of Buttercup."

The cultivated forms of R. Asiaticus are constantly increasing in number. They are of two main types:

1. The florists' section, called Persian Ranunculus, or true R. Asiaticus. These require more care than the others. They are 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. Aletesians. Compared with the first section, these have larger, broader, 3-parted lvs., not so much cut: lvs. larger and broader, with many crisp petals, not flat and spreading but erect and curved inward, forming a spherical flower, as in the double palms.

See No. 7.

K. C. DAVIS.

CULTURE OF THE ASIATIC RANUNCULUSES.—The culture of Ranunculuses in gardens and by florists has been confined chiefly to the Persian and Turban Ranunculus, R. Asiaticus, since the Asiatic species is far more attractive than the European. In England and in other European gardens, R. Asiaticus has been in cultivation a very long time. Parkinson mentions it in his Paradisius, published in 1629. He termed it "the double-red crown of Asia." Since his time R. Asiaticus and its varieties have been greatly improved, both in size of flowers and variety of colors. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace almost every shade of red and blue, with many intermediate and variegated. A well-grown 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, and at least not in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their introduction to 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 borders where they receive some shade during the warmer parts of the day, or a place in a rock garden with a northern aspect. The roots are tuberos, being like miniature dahlias roots.
They are not hardy, at least not in any of the northern states. The tubers should be carefully lifted after the foliage has all "ripened off" (which occurs usually toward the end of August), and stored until the follow-
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 Tur-
ban 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 Aconitifolium 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. cortusofo-
lius, R. anemonoides, R. pannatifolius 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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RANUNCULUS

KEY TO SPECIES.

A. Lvs. entire: blades of stem-lvs. amplexicaulis: fls. white. 1. amplexicaulis
AA. Lvs. somewhat lobed or divided.
B. Fls. yellow (except in some double forms of R. Asiaticus).
C. Foliage much lobed and parted into linear segments. 2. adoneus
CC. Foliage with rather broad lobes or divisions.
D. Plant spreading by runners or rootstocks. 3. repens
E. Akenes compressed, margined. 4. montanus
EE. Akenes turgescent. 5. bulbosus
FF. Plants very low and glabrous. 6. Suksdorfi
GG. Plants usually much taller and more or less hairy.
H. Fruit borne in a spike. 7. Asiaticus
HH. Fruit borne in a globose or oval head. 8. orthorhynchus
II. Beak of akenes nearly as long as the body, recurved. 9. cortusofolius
III. Beak of akenes very short.
11. Upper stem-lvs. present: petals normally only 5-11. acris

BB Fls. white (except in some double forms) 12. aconitifolius

1. amplexicaulis, Linn. Fig. 2075. Stems erect, 5-10 inches high, with 2-3 flowering branches, glabrous: lvs. entire, ovate to lanceolate, amplexicaulis, acuminate,
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. Miss. of S. E. Eu. B. M. 366 (poec.). L. B. C. 16:1593. J. H. III. 35:345. L. 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; 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 outwardly, usually exceeding the lanceolate sepals which are hairy beneath: akenes somewhat compressed, acutish; style long, straight, subulate: head globular to oblong. Summer. Rockies of Colo., altitude 10,000 ft. - Int. 1881. Procurable from dealers in Colorado plants.

3. repens, Linn. Plant more or less hairy, spreading by runners: roots 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 coarsely-toothed, bases cuneate or truncate: petals obo- vate, 5-6 lines long; sepals much shorter, spreading, hairy below: akenes compressed, margined; bead short, stout, slightly bent: head globose. May-July. Low plants from Nova Scotia and 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, 5 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 entire or entire lobes: fls. solitary, terminating the simple or once-branched stem, 1 in. across or larger; sepals concave, acute, yellowish green, slightly hairy; petals 5, large, broadly obovoid, bright yellow, with small scale and pore at base: akenet turgid, glabrous; bead strongly hooked, puberulent. May-July. Eu. B. M. 3022. 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, obovate, shining above; sepals much smaller: 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. Siskordori, Gray. Roots fibrous: stems slender, 3-6 in. high, glabrous, radical and lowest stem-lvs. small, about 6-8 lines long, subnerviform to broadly flabelliorm, with truncate base, deeply 3-5-cleft or parted; divisions cuneate, again 2-5-cleft 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, 1/2 in. long, equaling the akeny body: head of fruit globular. July, Aug. Damp places, 6,000-8,000 ft. altitude: Miss. of Wash., Oreg. 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 fleshy: lvs. petiolate, becoming sessile upwardly, ternate or biter- nate: segments toothed or deeply 3-lobed: fls. terminat- ing the stems and branches, variable in color among the cultivated forms; calyx spreading, becoming reflexed; petals large, obovate, blunt: fr. in a spike. May-June. Asia Minor. P. S. 16:1679 (fl. pl.). R. H. 16:133 (var. superhispanius). - Highly bred double fls. of many kinds are in cult. Roots are sold as "bulbs." The Persian and Turban Ranunculuses belong here.

8. orthorhynchos, Hook. Plant 10-18 in. high, erect, branched, hisulate to nearly glabrous: root thick, fibrous: lvs. oblong in outline, pinnately compound; fls. 5-7, cleft and incised, quite variable; upper lfts. often confluent and sessile or nearly so, lower ones well stalked: petals 7-16, yellow, rarely purple beneath, obovate: selp. much shorter, pubescent beneath, reflexed, decidu- ous: akenes glabrous, obliquely ovoid, compressed, margined: style of same length, straight, rigid, persist- ent: head globose. May-July. Wet places, Brit. Col. to Ore. and Mont. - Var. platyphyllus, Gray (R. max- dius, Greene). Often 3 ft. or more high: lvs. larger, 2-4 in. across; lfts. often 3 in. long, and lacinatelly cut: petals often larger than the type.

9. cortususfolius, Wild. Rose of thick, fleshy, fasci- culated fibers: plant velvety hairy, 1-3 ft. high: lower lvs. long-petiolate, rounded to reniform, incised, and with cut and toothed lobes; stem-lvs. divided into 3-5 narrow lobes; upper ones sessile: fls. several or many, terminal and axillary, rather paniculate, sepals 5, ovate to lanceolate, green with pale margins; petals 5, large, broadly obovate, glossy yellow: akenes compressed, hairy on sides, tapering into recurved styles nearly their own length: head of fruit scaly-ovoid. May. Island of Ten- eriffe, Canary group. Int. 1893. G. C. 45:944. B. M. 4625.

Not very hardy and needs protection in winter and early spring. It is well suited for pot culture. It is increased by division of the roots in autumn.

10. *Californicus*, Benth. Plant rather weak, ½-2 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 marginated, beak very short. Rather dry places, W. Calif. and adjacent Ore.

11. *Acris*, Linn. Figs. 1874, 2074, 2075, 2978. Plant hairy up to the sepal, erect, ¾-3 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-cuneate, 2-3-lobed and coarsely toothed or cut: bracts linear, lobed or entire: fls. yellow, 9-12 lines across, several, on rather short peduncles, ovate, shorter than the petals; petals 5, glabrous, obovoid, obtuse, 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*, Hort., is more common in cult. The best forms are deep, glossy, golden yellow and very double. Called Bachelor's Buttons. B. M. 215.


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2079. Dwarf Essex Rape (×1:2). is considered a cool greenhouse plant. It is a generous species and ought to succeed somewhere in North America. G. C. II. 10:724; 21:721.—*R. verticillatus*, Linn., is a white-flowered European mountain plant 6 ft. high, procurable from Dutch bulb dealers. J. H. III. 20:37. L. B. C. 3:243. B. M. 386.—*R. pedatus*, Waldst. & Kit. A, a native of the higher Alps, has yellow fls. nearly an inch across.—*R. rufulus*, Linn., a native of the higher Alps, has yellow fls.; petals 8-10; claw orange. Offered by Dutch dealers.—*R. septentrionalis*, Polr. is advertised. It is a native plant allied to *R. repens.—R. spicatus*, Desf., is figured in B. M. 4565, with showy 5-petaled yellow fls. fully 2 in. across. It is an Algerian species but is said to be perfectly hardy and of easy culture in any good garden soil.—*R. superbissimus*, Hort., is used in some catalogues for the double French Ranunculus, known also as *R. asiaticus*, var. superbissimus.—*R. verticillatus*, Hort. Van Tubergen, is a scarlet and green-flowered variety of the Turban class of *R. asiaticus*.

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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. For the season, though they are usuallyclassed with annuals. 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.

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RAPHANUS (classical name, from the Greek). Crucifer, Radish, Charlock. Annual or biennial branching herbs, of about 6 species in Europe and temperate Asia, of which one, *R. sativus*, is the Radish (which). They bear small but rather showy slender-peduncled white flowers in open flat-topped clusters in some species. Yellow, in open terminal racemes. Leaves various and variable, the radical and sometimes the calyculate lamina pinnatifid. Stamens 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 (leshy or soft-corky) siliqua, with spongy tissue between the globose seeds, indehiscent. The genus is divided into two natural groups, one (Raphanus) with the pods stipitately grooved and constricted between the seeds, the other (Raphanus proper) with the pod not grooved nor prominently constricted. To the former group belongs R. Raphanistrum, Linn., the Jointed or White Charlock (sometimes, but erroneously, called R. Raphanum). 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 tap-root and radish-like fls., growing 2-3 ft. high. fls. rather showy, purplish, turning white or purplish: siliqua 1-3 in. long, few-seeded, with a long beak. It is from this species that Carrière produced Radishes by means of plant-breeding (see Radish). To the second section belongs R. sativus, Linn., which is 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 pink-iliae 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 many shapes and colors. There are Chinese types of radish with a hard root little more than 1 in. in diameter, and sometimes becoming nearly 1 ft. long. Some forms are so clearly distinguishable from short turnips. The Madras Radish (India) is grown for its soft, tender pods, which are eaten as pickles. The Root-tailed or Serpent Radish, var. caudatus (R. caudatus, Linn.), has enormously long pods (see Fig. 2666), which are eaten either pickled, or raw as Radish roots are. 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 Rallia.

RAPHIDOPHORA. See Rhaphidophora.

RAPHILEOPSIS (Greek, raphis, needle, and lepis, scale; referring to the subulate bracts). Sometimes spelled Rhaphiolepsis. Ormamented evergreen shrubs, with alternate or obscurely whorled, usually saccate lvs., white or slightly pinkish fls., and terminal racemes or panicles and small pea-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 sandy 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 Sorbus and Photinia, but fls. in racemes or panicles, with dendroid or oxy; stamens 10-20; styles 2-3, connate below; fr. small, bluish or purplish black, gloomy, with one globular seed.

Japonica, Sieb. & Zucc. (R. ornata, Briot). Shrub, to 12 ft., with stout, upright branches: lvs. short-petioled, broadly oval or obovate, obtuse or acute, narrowed at the base, crenate-dentate and dark green, pale beneath, floccose-tomentose when young, thick, 1-4-3 in. long; fls. white, ½ in. across, fragrant, in dense, tomentose panicles or racemes; petals obovate, obtuse; fr. to ½ in. across. Var. japonica, var. var. NR. June. Japan and adjacent islands. S. Z. 1852; R. H. 1870, p. 348. Gn. 22, p. 43; 32, p. 20; 34, p. 158. — Var. integerrima. Hook. Lvs. entire or nearly so, to 3½ in. long. B. M. 5510.

Indica, Lindl. (R. rubra, Lindl. Crataegus Indica, Linn.). INDIAN HAWTHORN. Shrub, to 5 ft., with 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 ½ in. across, in glabrous or somewhat tomentose, rather loose panicles; sepals lanceolate, acute, usually red like the filaments; petals acute: fr. ¾-½ in. across. May, June. S. China. B. M. 1726. B. R. 6:468; 17:1409.

A very regular 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. oblanceolate, acuminate; panicles rather large and many-fls.; stamens white or purplish, shorter than sepals. B. R. 8:652. R. H. 1874:270. Gn. 9:26. R. rubra, advertised by the S. Calif. Acclim. Asso., in Pyracantha crenulata, which see. A hybrid between the two species is R. Delacouri, 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 REHDER.

RASPBERRY is a name applied to those brambles in which the fruit separates from the receptacle when ripe. Plate XXXII. Three species are of importance in American fruit-growing. Rubus Idaeus, 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, 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 hardness 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. 2080, 2081. 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
conditions would not warrant the growing of fruit to be sold fresh. Hybrids of *R. strigosus* and *R. occidentalis*—known as *R. neglectus*—have given the purple-cane class, of which Shafer (Fig. 2082) is a leading example. 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-wet. Much may be done to improve the drought-resisting quality of soils. If the subsoil is hard and impervious it may be improved by underdraining or subsolling. 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 and therefore resists drought better than one that is deficient in humus. Humus may be increased by the application 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 previous to planting, if the land has been improperly handled theretofore. 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 phosphorus, and potash may be obtained from wood ashes or morurate of potash. Upon the soil of the Rhode Island Experiment 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 nitrogen 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 ele-

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 been extensively used, but are likely to receive more attention. Where crimson clover will thrive it is well adapted to the purpose, although somewhat difficult to uphold in spring.

Planting may be done in fall or spring, but spring is the better time. It is to be preferred for black-caps secured from young plantations are preferable, since they possess greater vigor and are less likely to carry disease. The individuality of the parent-plant, while generally disregarded, may be a determining factor in the profitable ness of the offspring. Black-cap 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 root-set the plants (Fig. 2083) are used for planting. Red-throws up numerous suckers from the roots and these are oftentimes used in planting, though root-cuttings are available. For near-by planting the young suckers, moved in early summer, may be used. Plants are preferably set in check-rows, six or seven feet apart, with plants four to six feet apart in the row. Cross-cultivation in early spring and after fruiting will materially aid in keeping a plantation in good condition. Without it the canes will quickly form thick hedge-rows. With intensive methods hood crops may be grown between the rows the year of planting; with common farm methods they are better omitted.

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

Tender varieties may be protected in winter by laying them down and covering them with earth. To do this loosen the soil at one side of the root and bend the plant in that direction. The plants are usually best 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 pruning the bushes should be shortened to one to two feet. This spring 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 intensive the culture, the more extensively pruning should 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 fruiting 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 uninfested for many years if desired, but it is seldom profitable to do so.

The fruit demands care in picking and in handling thereafter. It should never be picked when wet. Red raspberries may be especially prone to split and are usually marketed in pint baskets rather than quarts. Red yields less than blacks and usually sell at a higher price.

Enemies are numerous. Crown- and cane-borers must be controlled by cutting out and destroying the infested canes. Red rust sometimes sweeps away plantations of black-caps. A plant once attacked can never be cured and should be removed. Rust is a disease of which there is special trouble. Only plants free from it should be set, and the plantation should be aban-
RAVENALA

1503
crown-gall, 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 Gothic, Orange county, Florida, the Rauwolfia 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.

RAVYNALA (the name of the plant in Madagascar).

Seitamia decora. A genus of 2 species, 1 from Brazil and Guiana and 1 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; petioles long, with concave bases scarcely sheathed: scapes or peduncles in the upper axils longer or shorter than the leaves: bracts spathe-like, many, boat-shaped, acuminate: fls. many, large, in a spathe or bract; petals long-exserted; sepals free: fr. a 3-valved capsule.

a. Les, shorter than pedioles.

Madagascarensis, 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. 2084. Lvs. often 30 ft. high, musa-like, very large, fibrous; fls. white, in spathes about 7 in. long. Gnc. 5:153. V. 23, p. 136. F.S. 21:2254. A.F. 12:535. R.H. 1890, p. 132. G.C. III. 2:693. A.G.

2083. "Tip" or layer of Raspberry.

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

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RAVENALA

20,870.—Cult. in Fl. and S. Calif.; also rarely under glass in the northern states.

AA. *Lvs.* as long as the petioles.

Guyanaensis, Steud. Becoming 15 ft. high; *lvs.* oval-lanceolate; *fls.* white; *spathes* 1½ ft. long. Offered 1893 in S. Fla. F. W. BARCLAY.

RAVÉNEA. See Ranevera.

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

spectabilis, Engl. (Lemonia spectabilis, Lindl.). Tender shrub: *fls.* 3; *fls.* purplish red, about 1 inch across, solitary or in open, few-flowered clusters on axillary peduncles as long as the *lvs.* Cuba. B.R. 26:59. R.H. 1844:22.—The plant offered in Fl. 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 in *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). *Stereulaceae.* A genus of 3 species of trees from tropical Asia, with coriaceous, entire leaves and terminal corymbose panicles of white *fls.* Calyx club-shaped or campanulate, 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-ovuled; *style* 5; *fruits* seeds.

thyrsoidea, Lindl. A small, glabrous tree: *lvs.* evergreen, 2-4 in. long, petiolate, ovate-lanceolate to lanceolate, entire, rounded at base: *fls.* white, in terminal, sessile corymb shorter than the *lvs. calyx* 3 lines long; petals somewhat longer; capsule oblong-pear-shaped, ½ in. long, 5-angled. China. B.M. 4199. B.R. 15:1236.—Cult. in S. Calif. F. W. BARCLAY.

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

cárnea, Kunth. *Fls.* dull flesh or pink; *bracts* rather large, tinted red: fr. red, 3-4 lines in diam. B.M. 739. —Var. *variegata* is also offered. I.H. 9:323.

REIN ORCHIS. *Habenaria.*

REINWÜRTDITA (Kaspár Georg Karl Reinwardt, 1773-1822, scientist of Leyden; traveled in East Indies 1815-1822). *Lindceae.* 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 trigynum on the second syllable instead of the first. *Reinwardtia* is distinguished from *Linum* by the yellow *fls.*, 3-4 styles and unequal or deficient glands; *Linum* has mostly blue, rosy or white *fls.*, 5 styles, and equal glands. Other generic characters: sepal 5; petals 5, contorted, fugacious; stamens 5, alternating with an apparent staminode; glands 2-3, adnate to the staminal ring: ovary 3-5-loculed. *Reinwardtia* is a showy subshrub at a foot high with bright yellow flowers. They are useful for the decoration of the conservatory in winter time, at a season when yellow is scarce. To have presentable plants, it is necessary to give them a good deal of attention. It is difficult sometimes to get suitable cuttings; the strong growths which start away from the base when the plants are cut down make the best plants. Top-shoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for 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°.

AA. *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.
RESEDA (from the Latin to calm; said to allude to supposed sedative properties). Resedaceae. 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 53 species (Muller, 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 lvs., and terminal spikes of inconspicuous perfect flowers. The flowers have 4-7 small greenish toothed petals and a cleft stigma; 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. Lutolola, Linn., the Dyer's Weed, 1-2 ft. tall, with entire lvs., 4 or 5 greenish petals of which the lowest one is entire; and R. Rutea, Linn., with pinnatifid lvs. and petals usually 6.  

A. Lvs. entire or only notched.

odorata, Linn. Common Mignonette. Figs. 1401, Vol. II, 1887. Branching annual herb, at first upright but becoming wide-spreading and more or less decumbent: lvs. spicate or oblongate, mostly obtuse or nearly entire; some coriaceous: fls. yellowish white, in spicate racemes that become loose and open with age, very fragrant. N. Africa, Syria. B.M. 29. Gn. 55, p. 498.—Much grown for its strong and agreeable fragrance. This has been greatly modified under cultivation. The following garden names seem to belong to this species: amelliorata, compacta, eziuma, gigantea, grandiflora, multiflora, pura, etc. Var. saurifoliosa, Edw., is woody at the base. B.R. 3:227. Forty to 50 named varieties of R. odorata are in the trade. See Mignonette.  

glaucia, Linn. Glabrous and somewhat glaucous perennial, less than 1 ft. tall, with many spreading stems: lvs. 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. Lvs. usually prominently lobed or pinnatifid.  

alba, Linn. (R. saurifoliosa, Loef.). White Upright Mignonette. Fig. 2088. The Straight-grown erect, gla- 

brous annual or biennial plant, 1-3 ft. High; lvs. nu-

merous, long-stalked, deeply and irregularly pinnatifid, the segments usually linear and sometimes toothed; fls. white, in a very long, slender spike. B.R. 20:46. —A good plant for growing as an ornamental sub-

ject in the flower border with other plants. It bears many spikes on tall branches, making it a conspicuous plant. Treated as a half-hardy annual. Odor not pleasing.  

crystallina, Webb. Glabrous, sparingly branched, somewhat glaucous annual: lvs. usually 3-parted, or the lowest ones entire; fla. deep yellow, in racemes. Canary Islands.—Has been offered as a garden annual.  

L. H. B.  

Notes on Reseda odorata.—In the improvement of the Mignonette less attention has been paid to the individ-

ual flower than to the spike as a whole. What the florist has desired is as large a 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 monstrities. In the more improved varieties, and especially in those plants that have been highly fed, the size of the flowers is sometimes consider-

ably 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 ob-

server. The old garden form has a sweet, pleasant odor, which is not so strong as that of the improved varieties but has a more penetrating and yet a light and agree-

able 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 im-

proved 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 flowers have been picked and brought to wilt that one recognizes the sweet violet-like scent. The modern improved varieties are likely to have very little scent when forced or red high, and in cases of excessive forcing they may nearly or quite scentless. But if we let them wilt slightly, or on sunny days after the moisture has dried up, the powerful odor becomes very apparent. The old forms seem to have the power of volatilizing the flame more readily from ordinary conditions, while the more highly bred only attain this power, to its fullest extent, when the root pressure is reduced.

Gardeners frequently assert that Mignonette if grown in certain kinds of soil will be less fragrant than when grown in 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 loams varying in proportion of sand and clay and amount of manure as follows: Soil 1. 1 part sand, 1 part loam, 1/2 dung; Soil 2. 2 sand, 1 loam, 1/2 dung; Soil 3. 1 sand, 1 loam, 1/2 dung; Soil 4. 1 sand, 1 loam, 1 dung; Soil 5. 1 loam, 1/2 dung; Soil 6. Clay loam with some dissolved bone, NaNO, 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. The amount of fragrance given off 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 is barely 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 about 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, it being a plant which loves a cool atmosphere. In order to test the effect of temperature on the fragrance of Mignonette, a number of plots 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 grown in November and December. Those in house of 75° germinated 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 13): 65° house, first; cold house, second; medium, third. But in fragrance the sequence was: 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. If the latter were forced it could 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 this did not last nearly as long as in the medium house. The cool house surpassed both in lasting power of the fragrance, due to the spike lasting longer and not volatilizing its ethereal 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 plant was blooming at the time. 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 and temperate 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, but the cool house might be replaced by new ones. From these two results it would appear that the influence of temperature is not permanent. Either as far as the flowers that came immediately under the temperature influence are concerned or those flowers that are not yet developed. But the temporary influence of temperature 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 former influence interferes with growth in the former and a cool house is probably due to the more ready volatilization of the ethereal 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 tardiness of the plants to react with the cooler temperature.

R. L. Jungmanns.

RESTREPIA (Joseph Emanuel Restrep, a student of natural history in the tropics). Orchidaceae. A genus of very interesting little plants, allied to Masdavallia and not unlike that genus in habit and appearance. The flowers are tufted on the older spikes, each bearing a single leaf and clothed below with scales. The flower-stems appear from the axil of the leaves. They are perennial, producing flowers for several years in succession. Dorsal sepal free, ending in a filament-like claw; lateral sepals united into a broad blade, bifid only at the apex; petals like the dorsal sepal, but smaller; labellum oblong or ovate, often with 2 small teeth near the base. About 12 species, few of which are cultivated for their curious flowers. They are easily grown at a temperature suited for cool Odontoglossums (40–55°). They thrive well planted in a mixture of peat and sphagnum in baskets, which are usually suspended in the greenhouse. They have no special cultivation, but do not require as large a quantity of water in winter as during their most active growth. Pot moderately firm, and rest in a cool house.

antennifera, HSB. Stems slender, clustered, 4–6 in. high, clothed with imbricated scales, and bearing one (sometimes 2) ovate to oblong, purple, rather pedunculate, from the axil of the leaf, slender, 1-fl.: dorsal sepal 1½ in. long, lanceolate, tapering into a slender claw-like tail, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antonna-like, purple at the tip. Nov.–Feb. Venezuela. B.M. 6288. I.H. 16:601. A.F. 6:631.
Dayana, Reichb. f. A small plant growing in dense tufts; lvs. roundish, acute, cordate; dorsal sepal and petals filiform, clavate, shining, violet-brown; lower sepals united into a broad, bifid blade, yellow and brown. Costa Rica.

elegans, Karst. Tufted, epiphytic, 2-3 in. high: lvs. 1-1½ in. long, elliptic; peduncles usually in pairs; fls. 1½-2 in. long, roundish, 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. 5966. F.S. 7:473.

REVERSION PLANTS are great curiosities, because they seem to "come to life" after being apparently dead. The commonest ones, shown in Figs. 2089-92, are members of the mustard family and the club moss family. Others are Asteriscus, a composite, and Mesembryanthemum, of the fig-marigold family. These are described below.

1. The Rose of Jericho is properly Anastatica Hierochuntica, Linn., which name means "Resurrection Plant from Jericho." The plant is a native of the sandy deserts from modern day eastern Algeria to Algeria. It is chocolate, white, 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 rolled 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 things 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 silice, which has 2 ear-like appendages at the top. The silice 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 Crucifera, but is exceptional in not having a long, slender silice. The growing plant has obovate lvs., the lower ones entire, upper ones

Anastatica is occasionally grown for curiosity or for botanical purposes, but the plant is anything but ornamental. The undersigned has often grown it for classes in botany, sowing the seed in February in pots and keeping the plants in pots all summer. Bottom heat is not necessary at any stage, at least in America. The

"Natural History of Plants," together with reliable accounts of the behavior of the various kinds. See also B.M. 4400. G.C. 1872:1668. 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 fronds 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 in 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. 400. F., 1871, p. 144.

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 crusaders.

2090. Rose of Jericho as it opens after being moistened.

2091. Bird's-nest Moss dried into a tight ball.

2092. Bird's Nest Moss as it opens out flat soon after being moistened.

volucere closes over the head of fruit during the dry season, and is loosened by moisture when the seeds escape. The genus is referred by Bentham and Hooker to Odontospermm. See Fig. 2093.

4. Several species of Mesembryanthemum are known to be hygroscopic. According to Kerner and Oliver, "the capular fruits of these plants remain closed in dry weather; but the moment they are moistened the valves covering the ventral sutures of the fruit-loculi open back, dehiscence takes place along the ventral sutures, and the seeds, hitherto retained in a double shroud, are washed out of the loculi by the rain." It is doubtful whether these capsules are offered in the trade.

W. M.
RESURRECTION PLANTS

2093. Another "Rose of Jericho"—Asteriscus.

The bracts roll out and make a flat, star-shaped figure.

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.

RETRIBUTING 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 produce the same thing the year round. At present the lily-of-the-valley is the only plant of the first importance which is retracted 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 "pips" may be taken from cold storage and forced into bloom in three weeks. The plants have been retarded need very little heat when they are allowed to grow; they are eager to start, and a temp. of 45° to 50° is sufficient. Littium speciosum, longitiflora and stolonifera will bloom in 10-12 weeks from cold storage; Asarum mollis in 3-4 weeks; Asarum canadense in about 5 weeks. Seedkale and illacis have also been retarded with profit. Goldenrod has been kept in an ice-house all summer and flowered for Christmas with happy results.

The art of retraining plants is making great progress at present, and with the growth of popular taste for greenhouse plants it is to be expected that the retrained seed may be greatly extended in the future. See A.F. 16:654, 655 (1900).

RETRINSOPORA. Often but not originally spelled Retinsopora. A genus of conifers founded originally by Siebold and Zuccarini on the two Japanese species of Chamaecyparis, chiefly distinguished from the American species by the resinous canals of the seeds (from Greek rhus resin), and by their being in clusters of from 2 to 5 in the clustered and ascending seed. Afterwards the genus was united with Chamaecyparis, but in horticultural nomenclature the name is applied to a number of juvenile forms of Thuya and Chamaecyparis chiefly introduced into circulation by the development of the genus, and closely resembling each other very much, indeed much more so than the two genera. These forms are distinguished by their plump, fat, and thick soft leaves, which do not, like the corresponding leaves of the genus Chamaecyparis, grow as an avulsion of the growth, but as buds in the clusters or fascicles of the branches. The peculiarities of Retinsopora have been treated in their order by the writer in "The Botanist's Magazine," 4th ed., vol. II., p. 129. The following species are described in the "Botanizer's Paran." 1899, p. 152, and 1900, pp. 152, 399,

Chamaecyparis pisifera, var. squarrosa, Belson & Hochst. (Retinsopora squarrosa, Sieb. & Zucc.). Fig. 19. A. A deciduous conifer in all respects a very small tree, with light bluish-green foliage almost silverly white when young, usually coloring violet in

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The text continues with descriptive details about the various species and varieties of conifers, focusing on their characteristics, habitats, and cultivation methods. The text provides a comprehensive overview of the genus Retinsopora and its significance in horticulture and botany.
winter: tips of branchlets holding: lvs. crowded, spreading, very soft, bluish green, silky 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 smaller, subulate and suberect lvs., and is much planted for its beauty in its golden variegated form. See Fig. 418, Vol. I.

Chamaecyparis sphaeroides, var. ericoides, Beissn. & Hochst. (Retinispora ericoides, Zucc.). Fig. 2094. Dense shrub, 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 common in cultivation than var. Angelensis. Carr. (Retinispora leptoclada, Carr.), shows also a stiff, pyramidal habit and bears chiefly small, suberect or almost scale-like lvs., and occasionally branchlets with ovate lvs. 2094.

Thuya occidentalis, var. ericoides, Beissn. & Hochst. (Retinispora ericoides, Hort. R. dabbia, Carr.). Dense broadly pyramidal or round-headed bush, with upright branches and dull green foliage, changing to brownish green in winter: lvs. bright green, linear, and usually cover the plant. 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.

Thuya orientalis, var. decussata, Beissn. & Hochst. (Retinispora juniperoides, Hort. R. decussata, Hort. R. squarrosa, Hort.). Fig. 2094. Dense, round-headed bush, with bluish green foliage changing to violet or steel color in winter: lvs. rather rigid, bluish green, scale-like, concave and with a whitish line above. But rarely cult. and not quite hardy north. The intermediate form, var. Meldensia, Laws. (Retinispora Meldensia, Hort.), has mostly suberect suberect lvs. of the same color as var. Angelensis. Carr.

Of Chamaecyparis obtusa no juvenile form seems to be in cultivation, but it is highly probable that the recently introduced Junipera Sanderi belongs here. In a list of Japanese conifers from Yokohama, the same form is called Chamaecyparis obtusa var. ericoides. It is a dwarf and dense, globose bush, with bluish green growing spreading linear, obtuse leaves. M.D.G. 1900, 1:489. Chamaecyparis obtusa, var. leptoclada, Hort., is a form of C. sphaeroides. 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 unsightly when older. They are all readily prop. by cuttings. See also Chamaecyparis and Thuya.

R. decussata, Hort.—Thuya orientalis, var. decussata.—R. dabbia, Carr.—Thuya occidentalis, var. ericoides.—R. Ellwangeriana, var. ericoides, Zucc.—Chamaecyparis sphaeroides, var. ericoides, Zucc.—Chamaecyparis sphaeroides, var. ericoides, Hort.—Thuya orientalis, var. ericoides.—R. Meldensia, Hort.—Chamaecyparis obtusa, var. breviflora.—R. filifera, Stand.—Chamaecyparis pisifera, var. filifera.—R. juniperoides, Carr.—Thuya orientalis, var. decussata.—R. leptoclada, Zucc.—Chamaecyparis pisifera, var. squarrosa.—R. obtusa, Sieb. & Zucc.—Chamaecyparis sphaeroides, var. Angelensis.—R. leucopodoides, Gord.—Chamaecyparis obtusa, var. leucopodoides.—R. Meldensia, var. obtusa, var. Meldensia.—R. obtusa, Sieb. & Zucc.—Chamaecyparis obtusa.—R. pisifera, Sieb. & Zucc.—Chamaecyparis pisifera, var. squarrosa.—R. squarrosa, Sieb. & Zucc.—Chamaecyparis pisifera, var. squarrosa.—R. squarrosa, Hort.—Thuya orientalis, var. decussata.

ALFRED REHDER

REYNOSIA (Dr. Alvaro Reynosa, 1830–1888, Cuban agricultural chemist and inventor of a machine for increasing the yield of sugarcane South as Brazil and S. Africa). Lvs. with small deciduous stipules: lvs. small, in axillary clusters, umbels or racemes, perfect, polygamous or dioecious; sepals, petals and stamens 4–5, petals sometimes wanting; style usually undivided; ovary 2–4-loculed: fr. a glabrous or oblong 2–4-seeded drupe. Several species yield yellow or green dyes and the fruits and bark of some are used medicinally. The wood of R. Frangula is made into charcoal valued for the manufacture of gunpowder.
1. cathartica, Linn. (R. Wickia, Hort.). BUCKTHORN, HART'S-THORN, WAYSIDE BUCKTHORN, RHINEBERRY. Filg. 2095. Shrub or small tree, attaining 20 ft., usually thorny; lvs. oval to elliptic or obovate, usually rounded at the base or cordate, obtuse or acute, crenate-serrate, glabrous or pubescent beneath, 1½-3 in. long; fls. in 2-5-fld. clusters, with 4 petals; fr. black, about ½ in. across. Europe, W. Asia and N. Asia; often escaped from cult. in the eastern U. S. B. B. 2:405. Gng. 9:2.

2. Dahurica, Pall. (R. cathartica, var. Dahurica, Maxim.). Large, spreading shrub, with stout thorny branches: branchlets glabrous; lvs. oblong or sometimes elliptic, narrowed at the base, acuminate, crenate-serrate, glabrous, somewhat coriaceous at maturity, 2-4 in. long; fls. and fr. similar to those of the preceding species, but fr. somewhat larger. Dahuria to Amur-land and N. China, probably also Japan. G. F. 9:429 (as R. creata). Sometimes in cult. under the name of R. crenata. See, also, supplementary list. It sometimes becomes a tree 30 ft. tall.

3. alpina, Linn. Shrub, attaining 6 ft., with stout, upright, glabrous branches: lvs. oval to elliptic-ovate, cordate or rounded at the base, abruptly acuminate, crenate-serrate, dark green above, pale green and glabrous or nearly so below, 2-3½ in. long; fls. in few-fld. clusters; petals 4: fr. globose, black, ½ in. across or less. Mountains of S. and M. Eu. L. B. C. 11:1077.—This is the following species of the handsome of the deciduous-leaved Buckthorns.


5. alpinifolia, L'Hér. Low, wide-spreading shrub, attaining 4 ft., with puberulous branchlets: lvs. ovate to oval, obtuse or acuminate, usually narrowed at the base, crenately serrate, glabrous, 1½-4 in. long; fls. in few-fld. clusters, 5-merous, without petals; fr. globose, black, with 3 nutlets. New Brunswick and N. J. to British Columbia and Calif. B. B. 2:406.

6. lanceolata, Pursh. Tall, upright shrub, with puberulous branchlets: lvs. ovate-lanceolate to oblong-lanceolate, acuminate or obtuse, finely serrulate, glabrous or somewhat pubescent beneath, 1-3½ in. long; fls. in few-fld. clusters, with 4 petals; fr. with 2 nutlets. Pa. to Ala., Tex. and Neb. B. B. 2:406.

7. crocea, Nutt. Shrub or small tree, attaining 20 ft., with pubescent young branchlets: lvs. orbicular to oblong-ovate, dentate-serrate, dark green above and beneath, changing from red to black, nearly black, about ½ in. across. Calif. S. S. 2:56.52. —A very variable species. Var. Californica, Kelln (R. Californiae, Eichb.). Usually shaggy, grey-green, and deciduous. California, D. C. (R. angustifolia, Hort.), has narrower, oblong lanceolate lvs. There are also varieties with variegated foliage.

8. Alatensis, Linn. Shrub or small tree, attaining 20 ft., with glabrous branchlets: lvs. oval or ovate to ovate-lanceolate, acute, serrate or almost entire, glossy and dark green above, pale or yellowish green beneath, glabrous, 2-4 in. long: fls. in short racemes, with 5 petals: fr. black. B. M. 2-5½, 56. —Var. angustifolia, DC. (R. angustifolia, Hort.), has narrower, oblong lanceolate lvs. There are also varieties with variegated foliage.


10. Caroliniana, Walt. INDIAN CHERRY. Shrub or small tree, attaining 30 ft.: young branches puberulous: lvs. elliptic to oblong, acute or acuminate, obscurely serrate or almost entire, lustrous and dark green above, glabrous or nearly so, somewhat leathery at length, 2-6 in. long; peduncles shorter than petioles; fr. globose, about ⅖ in. across, red changing to black, sweet, with 5 nutlets. N. Y. to Fla., west to Neb. and Tex. S. S. 3:5, B. B. 2:406.—Var. asplenifolia, Dipp. Lvs. linear, un-
Rhamnus


Alfred Rehder.

Rhaphidophora (Greek for needle-bearing; alluding to needle-like hairs). Araceae. About 20 species of the East Indies, allied to Pothos, but distinguished from the Pothos tribe by the presence of old and new leaves in the intercalary spaces and by the 2-located rather than 3-located ovary. See Pothos. It is probable that the garden plant Pothos aureus is of this genus. Rhaphidophoras are climbing aroids, to be treated like Philodendron and Pothos. It is not known that any species of Rhaphidophora are in the American trade. R. pertusa, Schott. (R. pinata, Schott. Seidnepus pertusus, Schott.), has large monster-like lvs. with long and narrow lobes and numerous spines in the blade. R.H. 1883, p. 561. R. decurvata, Schott, is a gigantic climber, with large pinate lvs., the segments or lfts. oblong-lanceolate-acuminate and strong-nerved; spathe of B.M. 7295, oblong-oblong lvs., with roundish or subcordate base; spathe yellowish.

Rhaphidophyllum (Greek, probably means Rhaphis-leaved). Palmceae. Blue Pothos. A genus of one species ranging from South Carolina to Florida. It is a dwarf fan-plant with erect or creeping trunk 2-3 ft. long, and long-stalked lvs. with about 15 segments. The genus is closely allied to Chamaerops and is distinguished by having the albumen not ruminate and by the bracts at the base of the branches of the spadix being few or none.

Rhapis (Greek, needle; alluding to the shape of the lvs., or perhaps the awns of the corolla). Palmettceae. A genus of 8 species of fan palms. Its most beautiful and elegant of our native dwarf palms. It is very local in its distribution, being found in rich, low soil both in Georgia and Florida, but it is everywhere rather rare. Its most striking characteristics are the long, sharp, black spines projecting in every direction from the dark fibers which cover the trunk. These spines, which are often a foot long, seem to possess a protective value, which before opening resembles a large white egg and which is imbedded among the spines. This palm bears staminate and staminate flowers in the axils of the leaves. The woody clusters of fruit or seeds are borne on short stems also surrounded by the sharp spines. This pamelto is easily transplanted. The lvs. are dark shiny green, relieved by a pale silver-gray on the under surface. It is a very beautiful plant, and groups of it are striking. The stem is 2 to 3 feet high and the leaves rise to a height of 3 to 4 feet.

H. Nehrling.

Rhaphiolepis. See Raphiolepis.

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Rhaphiolepis. See Raphiolepis.
RHEUM (Rha was the old Greek name for rhubarb). RhEUMa. Twenty species of robust perennial herbs, according to Meissner (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 akeue.

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 fine 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 official 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., Pontic Rha, "Rhubarb of Pontus," a province of Asia Minor). RhuBarB. PIne-PlAnt (in the U. S.). Wine-Plant. Fig. 2068. Strong perennial, with thick clustered roots: petioles semi-cylindric, plane above: fl.-blades suborbicular, deeply cordate at base, undulate, about 5-ribbed, glabrous and shining above, pubescent on the veins beneath: panicles tall and narrow, somewhat leafy, densely flowered, the pedicels jointed below the midrib, the fls. whitish, the akeue oblong-oval. In deserts and subalpine parts of southern Siberia.—Nearly everywhere 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-serrete, lightly channelled 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; akeue ovate or oval. Siberia.—Small plant, earlier than R. Rhaponticum.

bb. Lvs. oblong-ovate.

Emodi, Wall. Stem tall and leafy; petioles semi-serrete, somewhat concave above, the margins obtuse: leaf-blades large, ovate, cordate, obtuse, somewhat undulate, 5-7-ribbed, the under surface and the margin pubescent: petals fastigiately branched, the fls. dark purple, pedicels jointed below the middle: akeue large, ovate or oblong-oval. 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 sulate, plane above: leaf-blades thickish, broad-ovate, cordate, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin strongly toothed, the veins very prominent: panicle with drooping branches: akeue large, dark-colored. Siberia to China.

bb. Lvs. deeply lobed or divided evergreen.

palmatum, Linn. (R. sanguineum, Hort.). Stem tall and leafy: petioles subhyaline, the margin rounded: leaf-blades broad, suborbicular and cordate, 3-5-ribbed, scabrous, deeply pinnatifid: the lobes ovate-oblong or lanceolate, acute, entire, dentate or pinnatifid: panicle leafy, with pubescent branches, the pedicels scarcely longer than the fls.: akeue oblong-oval and subcorbin. Northeastern Asia.

Var. Tangdiaticum, Hort. (R. Tangdiaticum, 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, incised-cordate, puberulent beneath: panicle lax, leafy: akeue large, ovate.—Seems to be unknown wild. Perhaps a hybrid series between R. palmatum 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.

Collinianum, Ball. Probably one of the R. hybridum series, with much-cut branches: the exstensile half the depth of the leaf-blade: fls. red. China.

officinale, Ball. Figs. 1045, 2099. Robust, with a short branching stem or crown 4-10 in. high: lvs. very large, 1-3 ft. across, round-oval, more or less pointed or acuminate, hairy, 3-7-lobed, the lobes extending one-third or one-half the depth of the blade and sharply angled-notched: flower-stems 3-5 ft. much branched,
bearing numerous greenish fls. that give a feathery effect to the plant: scaly red, winged. Tublet and W. China, on high table-lands. B.M. 6155. R.H. 1874, p. 92. On 35, p. 243; 48, pp. 199, 206. — Probably the best plant of the genus for general cultivation, making a most striking foliage plant. It is the short, thick, branching stem or caudex of that plant which most of the true official Rubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1872. Fig. 2099 is adapted from The Garden.

R. acuminatum, Hook. f. & Thom. "Probably only a small form of R. Emei, with acuminate lvs., but the fls. are considerably larger, and though long under cultivation it does not attain half the size of that plant, or vary in its character."—Hooker. Himalayas. B.M. 4877.—R. nobilis, Hook. f. & Thom. Stem simple and densely clothed with imbricated downward-pointing bracts that conceal the short axillary peduncles: lvs. ovate-oblong or rounded, entire. When the fruit is ripe, the shingled bracts are torn away by the winds, leaving the long-paulexposed. 3 ft. Himalayas. R.H. 1876, p. 260. I.H. 22: 209. G.C. H. 15: 786. A remarkable alpine plant.—R. Ribes, Linn. 3-5 ft.: lvs. 1 ft. across, cordate to reniform, the margins crisped or undulate, the blade puckered or blistered: fls. green, drooping: frs. about 1 in. long, oblong-cordate, narrow-winged, blue. Fls. showy. Asia Minor to Thess. B.M. 7301. "Rivas" or "Ribes" is its Arabic name.—R. spiciforme, Royle. Dwarf: lvs. thick, orbicular or broadly ovate; fls. white, in a dense spike rising about 2 ft. Western Himalaya.

L. H. B.

RHHEMATISMA ROOT. Jeffersonia binata.

RHEXIA (Greek, rupture; referring to its supposed properties of healing). Melastomaceae. MEADOW BEAUTY. A genus of about 10 species of N. American perinormal herbs, with opposite or opposite 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, ovate; stamens 8, equal, the connective being thickened at the base, with or without a spur at the back. Rhexia Virginica is found wild in company with side-saddle plants (Sarracenia purpurea) and cranberries in the low meadows of Massachusetts. It is what we should call a bog plant. It is a pretty, low-growing, tuberosous-rooted plant blooming in summer and chiefly interesting as being one of few species of a genus belonging to a family almost wholly composed of shrubby plants from tropical countries, such as Central and South America. It increases by means of tubers and seeds, and under suitable condi-
tions soon makes large clumps. Tubers painted in the autumn and kept in a coldframe force nicely in spring-time.


2099. Rheum officinale.
RHIPSALIS

RHIPSALIS

4. grandiflora
5. Cassytha
6. virgata

Branches angular; fls. and fr. not immersed.

Branches angular, often nearly covered with roots: areole hollowed, the fl. and fr. immersed, with copious bristles.

Branches flat, rarely triangular, crenate or serrate, with middle- and usually side-ribs; rarely setulose: fls. yellow or yellowish.

1. salicornioides, Haw. (Hariotia salicornioides, DC.). Plant upright, reaching a height of 18 in., richly branched; areoles hardly setulose or lanate: stems cereiform, with cylindric or oblong-elliptic joints: mature or fruiting branches with verticillate, club- or flask-shaped joints, with slender base, all apparently, as well as the fls. and fr. growing from the tops of joints: fls. yellow, funneliform, ¼ in. long: berry small, whitish. Brazil. B.M. 2461.

2. Saglioniis, Otto (B. brachiata, Hook. Hariotia Saglioniis, Lem.). Fig. 2101. Reaching a height of 2 ft., richly branched: long or cereiform branches ½–1 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 ¼ 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, ¼ in. in diam., with 12 white leaves with yellowish midstripe: berry white. Uruguay and Argentina. B.M. 4039 (B. brachiata).

3. mesembranthesoides, Haw. (Hariotia mesembranthesoides, 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 joints, about 5 lines in diam., formed of 10 white with yellow midstriped leaves: berry white. Brazil. B.M. 3078.—Hardly more than a slender variety of the preceding.

4. grandiflora, Haw. (R. grandiflora, Salm.). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diameter of more than ¼ in.; ultimate branchlets short, often verticillate: areole depressed, bordered by a red line, sometimes in old branches bearing a bristle: fls. wheel-shaped, later on the branches, nearly 1 in. in diam. Brazil. B.M. 2740.

5. Cassytha, Gaertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1–1½ lines in diam., pale green; ultimate branchlets spirally attached: areole 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 mistletoe, 1–2 lines in diam. Widely dispersed in Central and S. America, West Indies, Mexico, Mauritius, Ceylon and Africa. B.M. 3060.

6. virgata, Web. Richly branching, pendulous, becoming a yard long; terminal branchlets hardly more than a line thick, spirally attached: areole bearing sparse woolly hairs, with an occasional bristle: fls. lateral, 3–4 lines in diam.: berry only 1¼ lines in diam. Brazil.—Very much like the preceding.

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

8. trîgôna, Pfeiff. Richly branched, becoming a yard long: branches ½ to nearly 1 in. in diam., 3-angled: areoles sparingly woolly and bristly, the blooming areole much more copiously so: fls. greenish outside, white within, 4 or 5 lines long. Brazil.

9. paradôxa, Salm. Sparingly branched, 1–2 ft. long; branchlets 1–2 in. long and ¼–1 in. in diam., twisted at the joints, so that the angles alternate with the sides: fls. ¾ in. long, white. Brazil.


12. **myosurus**, Schum. (*Leptospermum myosurus*, Pfeiff.). Somewhat branched, 1 ft. long; branches 3-6 lines thick, 3-4-angled, the angles not winged, the terminal branches generally acuminate, often tipped by a pencil of bristles; fls. solitary in the deep areole, 4-5 lines long, rose. B.M. 3775.

13. **rhombae**, Pfeiff. (*R. Swaytinskina* (1), Pfeiff.). Branching, reaching a yard in length; joints green, leaf-like, crenate, oblong or rhombic, 1-5 in. long, ¼-2 in. broad: fls. yellow, about 5 lines long. Brazil.

14. **pachyptera**, Pfeiff. (*R. alvida*, 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. 3820 (*Cecropia alvida*).

15. **Houletiana**, Lem. (*R. Houletti*, Lem.). Stem richly branched, becoming 3 ft. or more long, 1-1⅓ in. broad, often tapering to the round midrib for a considerable distance, then becoming again broad and leaflike: fls. 8-9 lines long, yellowish white to yellow: berry red. Brazil. B.M. 8069.

**Katharine Brandegee.**

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

**RHODANTHE.** See Hellertum.

**RHODEA.** See Rohdea.

**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, 1,138,083 doz.; tomatoes, 186,259 bushels; cucumbers, 66,238 bushels; lettuce, 1,622,294 heads; beans, string, 40,706 bushels; peas, green, 53,458 bushels; celery, 57,016 heads; melons, 624,980.

The greater proportion 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 production is consumed in the villages near 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 early varieties used for the crop are of the small green type, and do 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 which they grow. In these villages are good buyers who consume large quantities of vegetables when they have work.

**RHODE.** See Rhodea.

**RHODE ISLAND, 1515.** During the past decade the floriculture of the state has been developing rapidly, not so much, however, in the number of establishments as in the improvement in the work. There were 2,000 nurseries in 1895, eleven more than in the census of 1880, and the number has since increased to 2,000. The census of 1895 gives the number of nurseries at 2,000, and the number has since increased to 2,000.

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**2102. County map of Rhode Island.**

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 dessert farms. Among the enemies of fruit, the following are the most troublesome: apple scab, codlin-moth, currulio, 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.

Beaches 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.
having curious, distinct purplish red fls, over 2 in. long on red peduncles: lvs. about 3 in. long. B. M. 3367. B. R. 31:1766. L. H. 4:231. - 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). The flowers are highly ornamental, the large, showy and graceful, and have as many as 100 red, purple, white, pink, or yellow and variegated flowers per stem. The leaves are large, leathery and evergreen. This genus belongs to the family Ericaceæ, the Ericaceæ, or Heath Family, and is allied to the Heather. The flowers are in striking contrast to the dark green foliage, and are often so numerous as to make the plant the pride of gardeners in many parts of the world. The large clusters of snow-white, rose-pink, purple, and scarlet flowers of the rose-like flowers of this shrub are the opening taste of Spring. The shrubs or small trees, with alternate pedioted, entire lvs. and terminal clusters of large, showy fls., varying in all shades of purple, scarlet, pink orange, yellow and white. None of the evergreen shrubs suitable for culture in colder climates are more effective in bloom than the Rhododendrons. The large clusters of showy flowers often nearly cover the entire plant, while the handsome foliage is equally attractive at every season.

Hardiness of the Various Species. - Although most of the species are hardly only in warm temperate regions, there are many which are hardly at least as far north as Massachusetts. They are R. maximum, Cataleena, Caucoisum, brachycarpum, Metterniχ; Szmówni, macromolatum, Dahuricum, Laponicum, ferrugineum, hisrutum, punctatum, and probably also chrysanthum, Frewalski, camposanulatum, Californicum, Ulgiensis, and Kalmii. Somewhat more tender are R. Ponticum, nitenum, Hodgsoni, Thomsonii, and Angelou. South of Philadelphia such species as R. cinnaaria, glaucescens, ellițatum, Fornicari, lepidotum, Colletani, and the Japanese species, as R. delavayi, are hard. R. lepidotum and punctatum are probably hardy; also R. arboreum, barbatum, Falconerii, Keysi, trilorum and Wightii in very sheltered positions. Species like R. Dahnusia, Edgecombe, and the Javanese, as R. falconeri, ballotii, and pendulum stand only a few degrees of frost. The Javanese species, as R. Javanicum, jasminiflorum, Brookeorum and Lobbi grow and bloom continually and stand no frost at all.

Variation in Height. - Most of the species are shrubs; a few only, and these mostly Himalayan species, grow into small or medium-sized trees, attaining 60 ft. in the case of R. barbatum, 40 ft. in R. grande and arboratum, 30 ft. in Falconeri and maritimum. A number of northern and alpine species always remain dwarf, as R. ferrugineum, hisrutum, Laponicum, virgatum, lepidotum, racemosum, and others. A few Himalayan and Malayan species are often epiphytal and grow on branches of large trees like orchids; e.g., R. Dahousia, pendulum, Nuttallii and most of the Malayan species.

Their Place in Ornamental Planting. - Rhododendrons are equally effective and desirable for single specimens on the lawn or when massed in large groups, and are especially showy when backed by the dark green foliage of coniferous trees, which afford a 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 middle and southern parts of the United States as in England, if the right situation were selected. Formerly it was considered impossible to grow the beautiful hardy hybrids in the New England states, but now it has been shown by such splendid collections as those of Mr. H. H. Howes at Wellesley, Mass. (see A. F. 13:24-31 and Gug. 5:375-377), that, even in a trying climate, they can be grown to perfection if the right situations are selected and the right way of cultivation is followed. A suitable situation is of foremost importance. If possible the beds should be sheltered against drying winds and the burning sun by tall conifers, but the shelter should be always natural and natural, as brick or stone and hedges or walls close to the plants is worse than no shelter at all. Any open, well-drained soil which does
RHODODENDRON

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 fine loam should be used. Drainage is essential, 2 to 3 ft. deep, or deeper where the subsoil is not porous, and in this case the bottom should be filled in about 1-2 ft. high with gravel or broken stone for drainage. A mixture of leaf-mold, leaf mould and sand or loam will make a fine medium, but water-logging must be guarded against. In watering is necessary if the subsoil is not very moist; it is most essential that the soil never become really dry. In the fall the ground should be covered with leaves and other material to keep it in a state of cold until spring. If this mulch should be allowed to remain during the winter, especially where the plants are not large enough to shade the ground. An occasional top-dressing of fresh manure will also prove of much advantage. The ground should never be disturbed, as the roots are very near the surface. After flowering, the young seed-vessels should be removed. The Rhododendrons are easily transplanted either in spring or in fall, especially if they grow in peaty or loam, and a good ball of earth can be preserved in moving. They should be planted firmly, especially in porous peaty soil, and thoroughly watered after planting. If they are carefully handled they are not much affected by transplanting, and tender kinds may be dug in fall, heeled-in in a frost-proof shelter, and planted out again in spring. Potted and well-budded plants transplant freely in hot and cold weather, and will live in the shrubbery for a long time. Varieties will develop in about six to eight weeks into very attractive and showy specimens for decoration.

Hardy Varieties.—The following varieties have proved hardy in this region and may be recommended for planting in similar climates and for experimental trial farther north. They are mostly hybrids of R. Ca
taubienne with R. maximum, Ponticum, Caucasium and with some infusion of R. arboreum and perhaps a few other species. As a rule, most of R. Ca
taubienne is the most predominant, they are usually called "Cataubienne Hybrids." Choice kinds are: Album elegans, blush, changing to white; Album grandiflorum, blush, changing to white; fls. larger, less spotted; Alexander Dancer, bright rose, paler in center; A.rosaevineum, rich blood-red; August Van Geert, bright carmine, spotted dark purple; Bacchus, crimson, large fls.; Bicolor, purplish pink, spotted; Blandianum, rosy crimson; Caractacus, deep crimson; Charles Bag
tey, cherry-red; Charles Dickens, dark red, deeply spotted brown, one of the most striking red ones; Cerasulescens, pale lilac; Coronium, white, spotted yellow, dwarf and free-blooming; Crown Prince, crimson spotted greenish yellow; Delicatissimum, bluish, edged pink, changing to almost white, late; Everestianum, rosy lilac with crisped edges, excellent habit and very free-flowering; F. A. Amea, white center, edged pink; Giganteum, bright rose, large clusters; Grandiflorum, clear rose; Hannibat, rosy carmine; Henry W. Sargent, crimson, large clusters; H. H. Hunnewell, rich crimson; John Wetter, dark crimson; J. D. Godman, carmine, distinctly spotted; Kettledrum, rich crimson; King of Purples, purple, spotted dark brown; Lady Armstrong, rose-red, paler in center, distinctly spotted; Lady Gray Horton, delicately spotted greenish brown; Mrs. C. S. Stoddard, similar to Everestianum, but pink; Mrs. Milner, rich crimson; Old Port, plum-color; Purpureum crispanum, lilac-purple, spotted greenish; Purpureum grandiflorum, purple, large clusters; Roseum elegans, rose, lilac, dwarf; Saffron, deep maroon, large clusters; Wellesianum, bluish, changing to white.

Greenhouse Culture.—The most successful way, espe
cially with the taller-growing species, like R. arboreum, Griffthianum, barbatum and P. olearia, is to plant them out in peaty soil provided with good drainage. If grown in pots a sandy compost of leaf-soil and peat, with an addition of some fibrous loam, will suit them. The pots, which should never be too large, must be drained and stood freely, allowing the water to drain off during the summer, while during the winter water must be carefully applied. The Himalayan species and their hybrids will do well in a cool greenhouse, where the temperature is 50° during the winter. The Javanese species and hybrids, however, on account of their continual growing and blooming, require a warmer greenhouse and must have a minimum temperature of 50° during the winter. They like a moist atmosphere and should be freely syringed in warm weather. In potting them, their epiphytal habit must be borne in mind, 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 large number of beautiful hybrids have been raised; the following are a small selection of them: Balsamina
torum, with double white, yellow, or pink fls. G. 37, p. 208, H. C. H. 18, 19:289; II. 12:269; Drifta, brilliant scarlet; Ceres, tawny yellow. G. 41:845; Diadem, 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; Ex
quiste, large light fawn-yellow fls. G. 66:1229; Fau
vorite, satiny rose; Jasminiflorum carminatum, deep carmine. G. 41:832; Little Beauty, fls. small, but bright carmine-scarlet. G. 56:2341; Lord Woseley, bright orange-yellow, tinted with rose at the margins; Maiden's Blush, bluish with yellowish eye. G. 16:204; Princess Alexandrina, white, faintly blushed; Princess Frederica, yellow, faintly edged rose; Princess Royal, pink; Rosey Moon, bright pink. G. 42:281; Taylori, bright pink with white tube. F. M. 1877:242; Triumpha, crimson-scarlet.

Propagation.—All Rhododendrons are easily prop. 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

2104. A good plant of Garden Rhododendron in bloom. until the following spring. The seedlings of hardy Rhododendrons should be placed in coolframes and gradu
dually hardened off; those of greenhouse species re

mian under glass.

Rhododendrons are also sometimes increased under glass by cuttings of half-ripe wood taken with a heel,
2105. Azalea Sinensis, to contrast with Rhododendron.

ing 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 cleft-and 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 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 Malay 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.—Leaves leathery, sometime lepidote and pilose, or quite glabrous or tomentose beneath: fls. pedicelled, in terminal umbell-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 5-10, the ovary glabrous, glabrous or pubescent within; ovary 3-dotted, 5-10-loculed; capsule separating into 5 valves containing numerous minute seeds. The Rhododendrons possess but few economic properties. The hardy close-grafted plants may be used as ornamentals, to be used for medicinal purposes; 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 unite 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 Sinensis, 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 1800, in the nursery of Mr. Thompson, at Mile- end, near London, and was first described and figured as *R. Ponticum*, var. deciduum (Andrews, Bot. Rep. 2104). Many hybrids of similar origin were afterwards raised. The first hybrid between true Rhododendrons was probably a cross between *R. Catawbiense* and *R. Ponticum*, but it seems not to have attracted much attention. It was, however, one of the products of the greenhouse at G.H. with the Himalayan *R. arboreum* introduced about 1829 that the first plant was raised which became the fore-runner of a countless number of beautiful hybrids. From the appearance of this cross obtained about 1828, at Highclere, in England, and therefore called *R. catawbiense*, 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 Sikhim Rhododendrons about 1850 and of 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 1; in soil one-half sand and peat well mixed with good drainage. The seeds are small and require no covering, the usual watering after sowing being quite sufficient. A thin layer of sphagnum over the surface of the seedling 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-pans or flats of convenient size are used and they should be plunged in sphagnum still further to insure even moisture; the temperature of the greenhouse should be 45°-50° F. Seedlings are used to damp-off and should be pricked-off into fresh soil as soon as they are big enough to handle; wooden plinches, 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 earth is settling. Frames with lath screens make good summer quarters. Winter in pits and plant out in frames in peaty soil when large enough. Never let them suffer from dryness. It has been suggested that the seed of *R. maximum* might be planted on living moss under high-branched trees in swamps where the water does not collect in winter. See Jackson Dawson, on the "Propagation of Trees and Shrub from Seeds," Trans. Mass. Hort. Soc., 1885, p. 142.

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 (1893) 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. manchuricum**, 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 **Gratian**, p. 604, 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. 5:201 (1890). To effect this: (1) make the soil deep and fine, using materials like peat, leaf-mold, well-rotted manure and yellow loam, all of which

![2107. Grafting of Rhododendron.](image)

Saddle-graft at A; veneer-graft at B.

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, etc., 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 conifers, particularly the hemlock, in preference to deciduous trees. Good positions for beds may be found along the edges of ponds and streams, and in reclaimed meadows, with their cool moist soil, but keep 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-
dendrons and many deciduous shrubs, among which are the Azaleas, their near relatives. A background of dark green conifers seems most appropriate. Mountain Laurels, Pieris japonica, Leucothoe coccinea, and Daphne mezereum 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 dribbles, 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, Knap 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. Dance, bright rose; Arosaunicum, intense blood-red; Bicolor; Bluell; Cataracta, purple-crimson; Catawbiense album, white; Chas. Bagley, cherry-red; Chas. Dickson, dark scarlet; C. S. Sargent, bright scarlet, fine truss; C. W. Handley, white; C. W. Handley, dark crimson; C. W. Handley, deep crimson; C. W. Rand, scarlet; Everestianum, rosy lilac, fringed, one of the best; F. D. Godman, crimson, fine truss; F. L. Ames, Glenianum; Giganteum, bright crimson; Godman, rose, late; Henrietta Sargent, pink; H. H. Hunnewell, dark crimson, fine truss; H. W. Sargent, crimson; Jas. Bateman, rosy scarlet; J. A. Bissel, rose; King of the Mountains, purple crimson; King of the Purples, fine habit; Lady Aristartra, pale rose, beautiful; Lady Grey Egerton, silver bluish, splendid truss; M. extra; M. extra; Maximum Wellianum, blush, late; M. T. Masters, rosy crimson; Merton, rich purple; Miss Ames Marie, fine habit, crimson; Mrs. A. Hunnewell, rosy lilac; Mrs. C. W. Salmon, crimson; Mrs. H. Ingersoll, rosy lilac; Mrs. Miller, crimson; Norma; Purpurum elegans, Purpurum grandiflorum; Ralph Sanders, purple-crimson; Roseum elegans; R. S. F. Armstrong, 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 experiments, whereby a 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 thus 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 climatic conditions peculiar to this vicinity: Album elegans, Album grandiflorum, Arrosoaunicum, Caratacaus, Charles Bagley, Charles Dickens, Delicatissimum, Everestianum, Giganteum, Hannibal, H. H. Hunnewell, James Bateman, Lady Armstrong, 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 prudishly 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 satisfaction. In growth and form, 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. It is desirable to add 25 per cent of well-rooted 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 large a percentage of 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 thus made possible 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, they will grow vigorously and healthily. 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 be left on the surface of the soil, and it has been found that thorough watering by being first applied as a mulch on the surface of the ground. Here, again, it is essential that care be taken in working in such fertilizer that it is not disturbed until it has been well watered. The surface of the Rhododendron which are 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 into the soil, for the surface of the soil the second month a raking of 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 under conditions of southern or western exposure. A southerly exposure necessitates careful shading of the plants through the hot months of winter in order to prevent injury from alternate freezing and thawing in the late 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 has a decided advantage, but with the use of the taller-growing varieties they make tall, showy balloons 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 northern Europe and Asia Minor, cannot be depended on for best success, 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 its various forms have constituted the main part of the plants that have been imported, while the R. maximum has until lately been practically unknown. While the facts remain 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 in general beauty, 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 the elder flower of Francis B. Hayes, of Lexington, for which 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 wait for the smaller plants to make satisfactory height for producing landscape effects. Consequently, the landscape architects of recent years have sought a variety of Rhododendron that would combine vigor of growth, blooming quality and compact hardiness. Experiments made with collected plants of R. maximum taken from various localities have proved that this plant is practical for such purposes; and the outcome of such experiments has been the supply of private estates as those of William Rockefeller, W. L. 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 bushyspecimens down to small plants that could be grown on small flower-beds. These plants are taken 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 growth in soil of sufficient richness to assure their digging with a large amount of clinging earth. With proper care in transportation and after-cultivation the results show a surprising small size of plants collected under these ideal conditions give entirely satisfactory results, but so far as these conditions of careful digging, packing, transportation and after-culture are observed, the result 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 many in diameter are frequently moved and show practically no set-back in the transplanting.

J. WOODWARD MANNING.

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RHODODENDRON

AA. Foliage lepidote or glandular, rarely more than 3 in. long; ovary glandular. Lepidodendron.

BB. Corolla with cylindrical tube, thence as long as lobes........11. jasminiflorum

C. Lvs. persistent; corolla lepidote outside.

D. Style hardly twice as long as ovary, shorter than stamens: lvs. often slightly crenulate.

E. The lvs. without hairs.

F. The lvs. ciliate.............13.

DD. Style at least thrice as long as ovary.

EE. Lvs. pale yellow........17.

CC. Lvs. deciduous or semi-persistent; corolla not lepidote outside: lvs. very early in spring from lateral leaflets. buds at the ends of branches.............18. mucronulatum

19. Dahuricum

20. precox

1. Californicum, Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous: lvs. oblong, shortly acuminate, pale green beneath, 3-6 in. long, sometimes crowded beneath the fls.; clusters many-fld., calyx minute; corolla broadly campanulate, with ovular crisp red lobes, rosy purple or pink, paler 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. 4863.14. punctatum

15. arbutifolium

16. myrtifolium

17. Keiskei


3. maximum, Linn. Great Laurel. Fig. 2111. Shrub or small tree, attaining 35 ft.: lvs. mostly acute at base, narrow-oblong or lanceolate-oblong, acute or shortly acuminate, whitish beneath, 4-10 in. long: clusters many-fld.; pedicels viscid: calyx-lobes oval, as long as ovary; corolla campanulate, deep purple, not spotted, with roundish lobes, usually rose-colored, spotted greenish within, about 1½ in. across: ovary glandular. June. July. N. S. and Ont. to Ga. B.M. 951. Em. 2:435. Ms. 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 varieties have been distinguished: var. album, Pursh (R. Purshii, Don), with white lvs.; var. purpureum, Pursh (J. purpuraceum, Don), with purple lvs.; and var. roseum, Pursh, with pink flowers. This species and the former are now often extensively used in park-planting and taken by the hundreds from the woods. If properly handled and taken from a turfy soil with a sufficient ball of earth around the roots, they are usually successfully transplanted.

4. Ponticum, Linn. Shrub, 10 ft. high: lvs. elliptic to oblong, acute, pale green beneath, 3-5 in. long: clusters many-fld.; pedicels longer than fls.: calyx-lobes as long as ovary, the lower ones half as long; corolla campanulate with oval lobes, purple, spotted brownish within, about 2 in. across; ovary glandular. 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. There are also vars. with variegated and one with purple leaves.

5. azaleoides, Desf. (R. frigida, Hort. R. odoratum, Hort.). Hybrid between R. Ponticum and Azalea nipponica. Shrub, a few ft. high: lvs. leathery but thin, elliptic to oblong, acute at both ends, dark green above, paler beneath, somewhat pubescent when young: fls. funnel-form-campanulate, pinkish or whitish, 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 Azaleoides has been proposed as a generic name for the hybrids between Azalea and Rhododendron.


7. Caucasicum, Pall. Dense low shrub, 2 ft. high, often with procumbent branches: lvs. oblong-oblong or narrow-elliptic, acute, dark green above, ferrugineous-tomentose beneath, 2-4 in. long; clusters 7-10-fld.; pedicels short: calyx minute; corolla funnel-form-campanulate, with emarginate rounded lobes, pink to yellowish white, spotted greenish within 1½ in. across. June, July. Caucasus. B.M. 1145. -A dwarf, quite hardy species; late-flowering. Var. flavidum, Regel. Fls. straw-col-
RHODODENDRON

ored, spotted greenish within. Gt. 16:560. Var. stramin-
emum, Hook., is similar, but with fulvous spots. B.M. 3.422.
Var. roseo-album, Briot, with bluish fls., changing to white, and var. splendens, Briot, with deep pink fls., are said to bloom very early and may be hybrids. R.H. 1873:311.

8. brachycarpum, Don. Shrub, 4 ft. high, sometimes 10 ft.; lvs. oval to oblong, rounded at both ends, mucronulate at the apex, bright green above, whitish or ferrugineous-tomentose beneath, 2½-6 in. long; fls. in dense clusters, short-pedicelled; calyx-lobes short; corolla campanulate, creamy white, spotted greenish within, 1½-2 in. across. June. Japan. G.F. 1:293.—Has proved quite hardy, but is yet rare in cultivation.

9. Metternerich, Sleb. & Zucc. Shrub, 4 ft. high; lvs. oblong or oblong-lanceolate, narrowed at base, acute or obtuse, ferrugineous-tomentose beneath, 3-6 in. long; clusters 8-15-fld.; calyx minute; corolla campanulate, 5-7-lobed, rose-colored, spotted purple within, 1½-2 in. across; stems 10-14. May, June. Japan. S.Z. 1:9.—Like the preceding hardy, but rare in cultivation.


11. jasminiflorum, Hook. Small shrub: lvs. subver-
scence; calyx acute, glabrous, lepidote beneath, 1½-3 in. long; clusters many-fl.; pedicels short; calyx minute; corolla almost saucer-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. 4324. I.H. 6:203.—A distinct spe-
cies, very unlike other Rhododendrons; it requires a warm greenhouse.

12. ruginerve, Linn. Shrub, 2 ft. high, glabrous; lvs. elliptic to oblong-lanceolate, acute, densely lepidote beneath, 1-2 in. long; clusters many-fl.; calyx-lobes short; corolla funnelform-campanulate, with the tube about twice as long as limb, pink or carmine. B.M. 4890. June-Aug. Mt. of middle Eu. B.M. 1:65. Gn. 29, p. 338.—Dwarf, hardy shrub, handsome for rockeries. Var. album, Sweet, has white flowers. S.B.F.G. II. 3:258.

13. hirsutum, Linn. Shrub, 3 ft. high, with hirsute branches; lvs. oval to oblong, ciliolate, light green and glandular-lepidote beneath, 1½-3 in. long; clusters many-fl.; calyx-lobes as long as ovary; corolla similar to that of the preceding, lobes shorter. June, July. Alps. L.B.C. 5:478. B.M. 1853.—Much like the preceding, but usually thrives better in cultivation and does not like limestone soil.

14. punctatum, Andr. (R. minus, Michx.). Shrub, 6 ft. high, with slender spreading or recurving branches; lvs. oval or ovate-lanceolate, acute at the ends; buds broad above, glandular-lepidote beneath, 2½-5 in. long; clusters rather few-fl.; calyx short; corolla broadly funnelform, with obovate rounded and slightly undulate lobes, usually pale rose and spotted with yellow, both in, and out. 7 in. across. B.M. 2285. B.R. 1:37. Hardy.—Var. album, Hort. Fls. white.

15. arbutifolium, Hort. (R. daphnoides, Hámmann, and Olearioides, Hort. R. Wilsonii, Hort., not Nutt.). A hybrid of R. ferrugineum and punctatum. Dwarf 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. Wilsonii; this name, however, had been given previously to another hybrid between two Himalayan species and should not be used for this form.

16. myrtifolium, Lodde. (R. ovatifolium, Hort. R. ovatum, Hort., not Hook.). Hybrid between R. puncta-
tum and hirsutum, much like the preceding; but lvs. generally smaller and broader, less densely lepidote beneath, 1½-2 in. long, sometimes sparingly ciliate when young; fls. longer pedicelled and calyx-lobes narrower and longer. June, July. L.B.C. 10:906.—Originated in the nursery of Leddiges.

2110. Rhododendron Catawbiense (X ½).

17. Keliskei, Miq. Low, sometimes procumbent shrub; lvs. elliptic to lanceolate, acute, dull green above, lepi-
dote beneath, 1½-3 in. long; clusters 2-6-fl.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes, pale yellow, 1½ in. across; stamens much exerted. May, Japan.—Hardiness not yet determined.

18. mucronulatum, Turcz. (R. Dahuricum, var. mu-
cronulatum, Maxim.). Upright shrub attaining 6 ft.; lvs. elliptic to oblong, acute at both ends, slightly cren-
ate, sparingly lepidote on both sides, bright green above, pale beneath; fls. 3-6, short-pedicelled; corolla funnelform, almost without tube, divided to the middle into oval rounded lobes, rose-colored, 1½ in. across. March, April. Dahuria, N. China, Japan. G.F. 9:65.—Hardy shrub valuable for its very early fls. (it is the earliest of all hardy Rhododendrons), and for its handsome scarlet fall coloring.


Great numbers of names of Rhododendrons are to be found in recent literature but are unknown in the American trade. The following list will explain most of these names. Some of them belong to Azalea, although they may not be accounted for under that genus in this work. R. Aphanheim, Hort., not Aitch. = R. Collettianum.—R. albiflorum, Hook. = Azalea albiflora.—R. album, Blume. Small shrub; lvs. oblong-lanceolate, ferrugineous-lepidote beneath, 3-4 in. long; fls. rather small, campanulate, yellowish white. Java. B.M. 4972. Tender.—R. Attenboroughi, Lindl. Hybrid of R. aureum with R. Catawbiense X Ponticum. Fls.
2111. Rhododendron maximum (× 54).

Rhododendron


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.

berries. 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, Malaya 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-lodes persistent; petals 5, rarely 4; stamens numerous, free; berry globose or ovoid, with few or many seeds.

tomentosa, Wight (Myrtus tomentosa, Al.t.). Downy Myrtle. Branches downy above: lvs. elliptic or obovate, short-stalked, hoary below: peduncles shorter than the lvs., 1-3-fl.d.: berry 3-celled: seeds compressed, forming 2 rows in each cell. B.M. 250.

E. N. Reasoner and W. M.

RHODORA. See Azalea Canadensis.

RHODORHIZA (Greek, rose-root; the root and wood furnish the fragrant powder known as bois de rose). Convolvulaceae. R. florida 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, paniced inflorescence. These panicles are often a foot high, 10 inches wide at the base and contain as many as 20 full-blown flowers and 100 buds. It is a native of Teneriffe, and has been introduced into southern California in 1901.

Rhodorhiza is a group of about 7 species, all from the Canary Islands, which Bentham and Hooker regard as a section of the genus Convolvulus. They all 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 subshrubbs at times spinescent: lvs. entire, dentate, undulate or lobed: corolla broadly or narrowly bell-shaped; limb 5-angled or 5-lobed: ovary 2-loculed, 4-ovuled.


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 north, but 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 layers, also by cuttings of ripened wood under glass. Monotypic genus, Myrtus, having only this species, which resembles Kalmia, but anthers not in pouches: lvs. alternate: sepals 5, half as long as corolla: corolla rotate, deeply 5-lobed: stamens 10, slightly longer than corolla: fr. a 5-celled, many-seeded dehiscent capsule.


ALFRED REEDER.

RHODOTYPUS (Greek, rhodon, rose, and, typos, type; alluding to the resemblance of the flowers to those of a single rose.). Roákæae. Very small herbs, with opposite serrate lvs. and large white fls. solitary at the end of branchlets, followed by black and shining berry-like drupes persistent during the winter. A handsome and distinct shrub, hardy as far north as Mass., with bright green foliage, consisting of small, oval lvs. 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, alluded to Kerria: lvs. stipulate, opposite: fls. solitary, short-pedicelled: sepals large, half as long as petals, outside with 4 small alternate bracts; petals 4, orbicu- lar: stamens numerous: carpels usually 4, developing into black, dry, one-seeded drupes, surrounded by the large persistent calyx.


ALFRED REEDER.

RHÉGO (name unexplained). Commelinideae. One species, from Mexico and the West Indies, R. discolor, Hance, known also as Tradescantia discolor, L.Her., T. spathacea, Swartz, and Ephemerum bicolor, Moench. B.M. 1192. Eerola. This genus is distinguished by having 1 ovule (rather than 2) in each locale.
RHUBARB or Pie-plant (see Rheum), is commonly forced in this country, 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 if 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 many garden-plants, especially in the north or north-east. A large number of home gardeners are still without on their premises, although everybody seems to want Rhubarb pie as soon as spring opens, this plant grows well, and with a little care, will produce a good crop even in a small garden. Rhubarb delights in extremely rich soil. Very large and brittle leaf-stalks cannot be secured except from soil that is really "filled with manure to overflowing." The seedlings, however, may be started in any good clean garden soil. Start them early apart, leaving a foot apart and not over an inch deep. Thin the plants promptly to stand a few inches apart in the rows, and give the same thorough cultivation allowed to other garden crops. In the following fall or spring, take the seedlings up, and set them in the well-prepared permanent patch, not less than four feet apart each way, and cultivate frequently during the entire season. Ten to twenty plants will supply the demands of one house-hold, possibly with some to spare for the neighbors. In spring of the next year the stalks may be pulled freely. When soil fertility feeds a rampant growth, the stalks will be large and brittle enough without the aid of boxes or kegs (bottomless and coverless) placed over the plants, and the stalk will be removed every 4 or 5 years at the least, as the clumps of roots grow so large, and have so many eyes, that the stalks soon become more numerous than desirable, and run down in size. Take up the entire roots and cut them to pieces, leaving only one strong eye to the piece, and plant the pieces in a newly-prepared bed (or even in the old one if properly enriched and prepared) four feet apart each way as before. The seedlings should be renewed every 4-5 years. These should be promptly pulled up, unless seed is wanted. A few may be left to mature the seed crop.

Rhubarb can be forced in coldframes, under the greenhouse benches, or even in an ordinary house. The plants need warmth (even that of a lantern set among them will do), but require no light. Take up good young roots (2-year seedlings being best) in autumn; leave them out until after exposure to freezing, then crowd them together in boxes with a little soil between and under them, and set them under the greenhouse bench, or wherever wanted, or plant them out on the circularbottomed frame. The plant will require a southern exposure, with sufficient slope to the south to give good drainage. Plow the ground 6-8 in. deep, draw furrows 5 ft. apart, set the plants 3 ft. apart, with the bud one level with the surface of the soil. An inch of manure is laid over the soil and worked with them; the stalks should be set 6 in. deep, with the bud 1 in. below the surface. The soil lacks in fertility mix compost with the dirt that is placed about the roots; never put fresh manure next to the roots. As soon after planting as possible start the cultivator, and give a thorough stirring at intervals of 6-8 days up to the middle of last August. After the ground is frozen over the rows 3-4 in. deep with manure that is as free as possible from weed and grass seed. As early in the spring as the ground can be worked to advantage, start the cultivator and work the manure into the soil. Each alternate season the surface of the soil should have a good dressing of manure. The third or fourth year after planting the hills should be widened. By this time the roots will be large and with a sharp spade cut through the crown, leaving 4-5 buds in the hill undisturbed. This work should be done in the fall or early in the spring.

Rhubarb has been growing in popularity. The plant has no choice as to whether it is grown in light or darkness. Blanching improves the flavor and reduces the acid, lessening the quantity of sugar needed in cooking. Divided roots, with 1-3 buds, which have been grown in highly fertilized, well-tilled soil will give the best results. Plow out the plants any time after killing frosts, divide the roots and place them in single layers on top of the ground, and cover them with a thin dressing of soil from the air. Leave them in this condition until the roots have been slightly frozen, and then place the roots either in a root cellar, a frame heated by pipes, a frame heated from a wood-burning stove, or in a coldhouse. Pack the roots close together, filling in and packing closely with good rich soil. The crowns should be covered 4-6 in. Keep the soil moist and maintain a temperate temperature of 50-55°. The roots may be packed in a family cellar without any bad effect to other things, as there is no odor from the plants. Judgment must be exercised in pulling the stems. The work should always be done by an experienced person.

The writer has grown seedlings for ten successive years. Fully 75 per cent of all the seedlings showed a tendency to degenerate, and 25 per cent were almost as coarse as burdock in appearance. Half of one seed-
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 they seed less than one percent. The seed was selected from ideal plants that had been propagated by division. As to varieties, the writer has had best results with Linneaus and Victoria.

S. H. LINTON.

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 green-house 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 dressing, 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 with liberal dressing of compost, that made from cow and hog manure being sufficient to pay for all cost of labor and maintenance.

2113. Stalks of forced Rhubarb.
The leaf-blades do not develop 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 to give 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 or three feet apart and should be fertilized annually with liberal dressing 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 with liberal dressing of compost, that made from cow and hog manure being sufficient to pay for all cost of labor and maintenance.

2114. House for the forcing of Rhubarb, covered with movable sash.

Roots for forcing under greenhouse benches and in hotbeds should be from beds at least three or four years old, as the larger and more vigorous the roots the better the results. Satisfactory results cannot be obtained from inferior roots. The roots should be dug early in the fall before the ground freezes and allowed to remain exposed to the weather until they are frozen solid, when it is best either to remove them to a shed or cover them with litter in the field to prevent alternate freezing and thawing. Care should be taken to leave as much dirt upon the roots as possible when they are dug.

As soon as the roots are placed in position under the benches, all spaces between them should be filled with soil to prevent evaporation. When the plants start to grow, they should be given an abundance of moisture. When forced in this manner light is not necessary; therefore any convenient place may be used, provided the proper amount of heat and moisture is supplied. If grown in the dark the development of leaf is much less than in light, while the color, instead of being green, is usually a dark cherry-red, which gives to the product a very attractive appearance. The temperature may range from 45° to 75°, although the lower the temperature the larger the yield and higher the quality of the product. The time required for bringing a crop to maturity under the benches is about the same as that required for forcing in the field.

The method which is to be followed in the growing of this crop for the winter market will depend largely upon local conditions. When grown by any method which requires the lifting of the roots, it must be remembered that they are worthless after having produced a crop; therefore this method cannot be practiced with economy except where land and labor are cheap, so that the roots may be produced at a slight expense, or where roots may be secured which would otherwise be destroyed. Be the method what it may, the roots to be forced should be well developed and allowed to freeze before forcing is attempted, otherwise failure to secure a profitable crop is certain. G. E. ADAMS.

RHUS (ancient Greek name). Anthocleitia. Su-
mach. Trees or shrubs with alternate, usually odd-
ompinate lvs. and no stipules; fls. in axillary or terminal
pancees, small, whitish, 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 Su-machs covering rocky billides or bare
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 orna-
mental planting. Some species, too, retain their crim-
son 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
ever native Su-machs covering rocky billides or bare
roots give the most ample foliage. Some are admirable as
single specimens, having a picturesque character that
is quite refreshing. When grown as standards, how-
ever, they are likely to be short-lived, and so the suc-
cussion must be provided for. The laciniate varieties
of two of our native species seem to give more leaf-
age than the types and are very useful in mass-plant-
ing. All the species are strong growers, the larger
roots they give 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.

Over one hundred known species only about six-
teen 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.

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A. Foliage simple.


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

3. Cotinus, Linn. Smoke Bush. Venic Sumach. 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 plumose, 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 borers or other causes, it has not been replaced. Gng. 5:116. G. 34, p. 162; 54, p. 695.


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, sparsely hairy, and comparatively large. Flowers in spring before the lvs. appear. Rocky woods, eastern N. Amer. Var. triloba, 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. Toxicodendron, Linn. Poison Oak. Poison Ivy A scandent or climbing plant: lvs. smooth or often pubescent on veins, veins, stipules, 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, glaucescent, 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 pediole and midrib, smooth, shining green above, pale beneath; fls. in a narrow panicle, drooping: fr. small, flattened, white. June. Moist ground, eastern N. Amer. —One of the most beautiful, but unfortunately

2115. Rhus glabra (X ½).

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


11. \textit{symplocos}, Linn. \textit{STAGHORN SUMACH}. A densely velvety-hairy species growing to a height of 30 ft. in favorable situations. Lfts. many, oblong-lanceolate, serrate; fls. in a dense, terminal panicle; fr. red, with crimson hairs. June, July. \textit{Eastern N. Amer.} S. S. 3: 102–3. — Var. \textit{laciniata}, Hort., in which the lfts. are deeply cut, is the most distinct form. Fig. 2116. Trained in tree form this species is decidedly picturesque. In mass planting where dense foliage is required it should be cut over occasionally to provide young vigorous shoots, which produce the largest leaves. Its brilliant fall coloring and the persistence of its crimson fruit-clusters render this plant of great value where a warm color effect is desired. It will grow in the driest soils. G. N. 54, p. 565.


13. \textit{vernicifera}, DC. \textit{VARISCH TREE}. \textit{LACER TREE}. Tree-like, 20–30 ft. high; lvs. ample; lfts. 11–15, smooth above, pubescent beneath, midrib more or less broadly margined; young growth also pubescent. This is the plant from which the Japanese obtain the lacquer for the finely polished ware. It is poisonous, and it is said that people have been poisoned by handling the articles coated with the lacquer. G. N. 34, p. 158. — Cult. in S. Calif.


15. \textit{copallina}, Linn. \textit{BLACK SUMACH}. \textit{SHINING SUMACH}. A shrub or small tree, sometimes growing to the height of 25 or 30 ft.; lfts. numerous, entire or sometimes indented or cut near the apex, smooth above, usually pubescent beneath; shoots also tomentose; midrib whitish, in a large, loose, terminal panicle; fr. red. July. S. Eu. — This is the Specimen to which. It makes a fine specimen plant and is also useful in masses.


\textbf{RHYNCHOSPERMUM} \textit{jasminodes}, a fine shrub of the dogbane family, is referred to \textit{Trachelospermum}. There is, however, a good botanical genus named \textit{Rhynchospermum}, but it belongs to the composite family. It has only one species, \textit{R. verticillatum}, a plant not in cultivation.

\textbf{RHYNCHOSTYLIS} \textit{(Greek, beaked column). Orchids.} This genus includes a few species closely related to \textit{Saccocaulum} 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 axils of the lvs., medium-sized; dorsal sepals and petals similar, lateral sepals broader, decurrent on the foot of the column; labellum firmly joined to the base of the column, obvolute, indexed at the apex, not lobed, spurred, the spur straight or curved backwards. For culture, see \textit{Saccocaulum}.


\textit{violaeca}, Reichb. f. (\textit{Saccocaulum violacea}, Reichb. f.). Lvs. 10–12 in. long; racemes 1 ft. or more; fr. 1 in. across, white, spotted with pale mauve; labellum dark violet. Jan. \textit{Philippines}. B. R. 33:30. — The blossoms are said to have a disagreeable odor. Var. \textit{Harriisoniana}, Hort. (\textit{Saccocaulum Harrisoniana}, Hook.). Lvs. distichous, oblong, obliquely bifid at the apex; racemes dense, cylindrical, pendulous: fls. white, fragrant; sepals ovate-oblong, somewhat incurved; petals narrower, oblong-spatulate; labellum oblong-obovate, with a thick blint apiculum, saccate toward the apex; spur blunt; disk with a single thickened line. Malay Islands. B. M. 5433. F. S. 23:2412. The racemes grow to a length of 2 feet.

\textbf{RIBBON GRASS}. \textit{Phalaris arundinacea}, var. variegata.

\textbf{RIBBON TREE}. \textit{Plagianthus}.

\textbf{RIBES} (said to have come from the German \textit{rieb}, a vernacular name for currant). \textit{Saxifragaceae, Currant} and \textit{Gooseberry}. Shrubs, often spiny and prickly, with simple, alternate, pellately veined lvs.; fls. 5–4 parted, borne singly or in racemes; calyx-tube cleft herent with ovary; lobes commonly colored petals; usually small, borne on throat of calyx, alternating with stamens: fr. a berry, tipped with remains of calyx. \textit{Fig. 2118}. Larger and better 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 Grosseliller; Card, "Bush-Fruits." (from which Figs. 2119, 2122, 2124-6 are taken). Aside from domestic Currants and Gooseberries (which see in Vols. I and II), 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 productive everywhere. The hybrid *R. Gordonianum* is also popular for its clusters of bright pink flowers, its vigorous habit and its hardiness. *R. sanguineum* 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.

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A. Stems bearing thorns below the leaf-clusters: branches often with numerous scattered prickles: berry sometimes pricky. (*Gooseberries*).

B. Fls. red and showy, 4-petalled: stems long, exerted.

1. speciösum, Pursh. *Fuchsia-flowered Gooseberry*. Fig. 2119. Branches covered with fine reddish prickles and glandular-tipped hairs; thorns long, slender, common in *R.*; lvs. small, thick, shining, partially evergreen; peduncules slender, drooping, 2-4-flowered: fls. showy: calyx cylindrical, ½-¾ in. long; stems exerted ¾ in. or more beyond calyx, bright red; berry small, pricky, dry, few-seeded. California. B.M. 3530. B.R. 18:1557. Gn. 31, p. 333; 34, p. 230.—The most showy member of the genus, but not hardy in the northern states.

2119. Ribes speciosum, the Fuchsia-flowered Gooseberry (*X 3/4*).

2. rotundifolium, Michx. long clusters 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. trilobatum*).—Sometimes offered by dealers in native plants.

3. oxyacanthoides, Linn. Fig. 2120: also 926-9, Vol. II. Branches slender, reclined, but often crooked: thorns single or triple, slender, very finely pointed, ¼-¾ in. long, sometimes nearly wanting: lvs. thin, roundish, cuneate to cordate, finely pubescent, glossy when growing: calyx greenish white, smooth or pubescent without; lobes oblong or obovate, thin and petal-like, equaling or exceeding the stamens; petals broadly ovate or spatulate, reaching half way to the anthers: ovary glabrous: berry round, perfectly smooth, but with delicate bloom, small or medium, red. Swamps and low grounds, eastern United States. B.M. 6892. B.R. 15:1237 (as *R. setosum*).—Parent of the representative American Gooseberries of gardens.

cc. Berry rough-hairy or pricky.

4. Grossularia, Linn. (R. *Uva-crispa*, Linn.). *European Gooseberry*. Figs. 292-5, Vol. II. Bush stocky, rigid: branches thick: thorns mostly triple, heavy and thick at base, the central one ½-¾ in. long: lvs. thick, very glossy, pubescent: calyx strongly pubescent; lobes broadly ovate, thickish, leaf-like, longer than the stamens; petals obovate, reaching to base of anthers: ovary pubescent or glandular: berry generally oval, large, green, yellowish green or red, minutely but roughly pubescent, often with glandular hairs or prickles. Eu., northern Africa and western Asia.

5. Cynosbati, Linn. Fig. 2121. Thorns commonly single, slender, fine-pointed: pedicels and peduncles pubescent and glandular; peduncles long, filiform: calyx-lobes narrow, oblong, acute, half as long as tube: ovary glandular: hispid: berry large, prickly or rarely smooth, reddish or purple. *Eastern North America*.—Fruit edible, variable; sometimes cult. for its fruit, and worthy the attention of the plant-breeders.

6. lacustris, Pol. *Swamp Gooseberry*. Upright shrub, with many slender and straight prickles, and weak solitary or whorled thorns: lvs. cordate, with 3-5

Ribes 1531
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. 4931. L.B.C. 9:884.—Offered by dealers as a bog shrub. Intermediate between Currants and Gooseberries. Fls. in short racemes.

7. **Lobii**, 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, 3-5-lobed and notched, glandular on both surfaces: peduncles drooping, 1-2-ft.: fls. showy, with purple tube and reflexed lobes, the small, erect petals white, the anthers exerted: berry glandular-hairy. N. Calif. to B.C. B.M. 4931 (as *R. vestitum*). 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.: 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. sweet, 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. **fuscifolium**, 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 younger ones pubescent below and on the nerves but becoming glabrate: fr. sweetish mucous, scarlet. Japan.—Var. **Chinense**, Maxim. From N. China, with lvs. soft pubescent, is offered by Franceschi. S. Calif. M.D.G. 1899:571.

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

13. **bracteatum**, Doug. California Black Currant. Strong, erect bush, often several feet high, glabrous or nearly so, the young growths resinosous-dotted: lvs. large (sometimes 9 in. across), 5-7-lobed, coarsely and doubly serrate, hairy and resinosous: racemes erect or ascending, 4-8 in. long, many-ft.: fls. small, greenish or purplish; berry 1/2 in. in diam., black and resinosous-dotted, edible. N. Calif. to Alaska. B.M. 7419.


15. **Americana**, Mill. (R. fruticosum, L’Her.) American Black Currant. Fig. 612, Vol. I. Bush spreading; branches slightly angular: lvs. bearing bright yellow resinosous dots, few above, many below: racemes long, pendulous, many-ft.: fls. greenish white or yellow, 1/4-1/2 in. long; calyx-tube bell-shaped, not resinosous-dotted; lobes large, petal-like: ovary smooth: fr. black, resembling **R. nigrum** in flavor. Nova Scotia to Virginia, westward to Colorado and Manitoba.
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.R. 16:1349. Gn. 51:1110.


Var. *albidum*, Hort. (*R. albidum*, Hort.), is a form with whitish, dirty yellow or yellowish red flowers and light-colored fruit. R.H. 1845:419. Gn. 51:1110 (as *R. album*). Var. *atrorubens*, Hort., one with dark, blood-red flowers. Var. *flore pleno*, Hort., has dark, clear double flowers. R.H. 1845:245. G.C. II. 14:144. All the forms of this species are worthy ornamental plants.


18. *aureum*, Pursh. MISSOURI, FLOWERING, GOLDEN or BUFFALO CURRANT. Fig. 2125; also Fig. 613, Vol. I. Plant free-growing, sprouting from root: lvs. cuneate or truncate, smooth, shining, when young densely covered with brown or yellow resinous beads, which disappear with age: peduncles short, few-fl.; bracts large, leaf-like: fls. spicy-scented, yellow and showy; calyx-tube 3/4-1/2 in. long; petals red: fr. dark brown or black, with high bloom. Mississippi valley to Rocky Mts. B.R. 2:123.—Much grown for its yellow fragrant flowers. It has given rise to the Crandall and some other fruit-bearing sorts.


19. *céreum*, Dougl. Fig. 2126. Upright branching shrub, reaching 3-4 ft., the young parts minutely pubescent and more or less glutinous: 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. 3/4 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. 3008. B.R. 15:1333; 17:1471 (as *R. inebriana*).—Sometimes grown for ornament.

20. *viscossissimum*, Pursh. Branchy, upright, to 6 ft., the young growths viscid: lvs. round-cordate, 3 in. or less wide, 3-5-lobed with obtuse doubly crenate somewhat cut divisions: racemes erect, viscid: fls. large, fragrant, yellowish or whitish green, the calyx-lobes not reflexed, the petals small and white: berry black, mostly glandular-hairy, scarcely edible. Rocky Mts. and west.

**RHEUM**


**FRED W. CARD.**

**RICCIA** (F. R. Ricci, Italian nobleman, patron of the botanist Micheli). *Ricciaesce*. *Riccia fluitans*, Linn., is one of the few flowerless or cryptogamous plants in cultivation aside from the ferns, mushrooms and selaginellas. It is cultivated by one specialist in aquatics presumably for the benefit of students of botany. It is not generally advertised among aquatic plants. In this family of plants the plant-body is a thallus (i.e., a green, flattish 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. fluitans* 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 *Pattia Japonica*, which see.

**RICHAIRDIA** (L. C. Richard, 1734-1821, French botanist). *Arbleae*. *Calla Lili*. 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 excurrent; peduncle as long or longer than the leaves; spathe large, open, with a flaring, pointed, recurved tip; spadix stamine above and pistillate below (Fig. 2127). Differs from *Peltandra* in floral characters. So. Africa. Species 10-12. See Gn. 46:146; R.B. 23:13. Engler, DC. Monogr. Phaner, vol. 2. The true *Calla* is not of this genus; see *Calla*. For the Black *Calla*, see *Arum*.

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 flowers having yellow and pink spathes seem to do best when grown without a resting period.

**A. Leaves lanceolate.**

*Rhémannii*, Engler. Pink or Rose *Calla*. Dwarf perennial; lvs. lanceolate: spathes about 4 in. long, erect, trumpet-shaped, with a candiate tip 1 inch long. B.M. 7436. In Natal the spathes are said to be dull rose without, rose-purple within, with a dark crimson blotch at the base inside. In cultivation the spathes are white, with a faint rose tinge to the back and margins.

2127. Common *Calla* Lily—*Richardia Africana* (X ¾). Left-hand specimen shows the spadix, the spathe being removed.
237. Blade about twice as long as wide, cupulatate 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 cupulatate tip. S. Africa. B.M. 332. Gn. 33:554. —R. devoniensis, Hort. (R. nana compacta, Hort.). Dwarf; frerer 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, spathe large. Some were hybrids of this and R. Elliottiana. —R. angustiloba, 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 14 in. long. R. Elliottiana, Hort., said to be a hybrid of hastata and albo-maculata, but better regarded as a variety of hastata: leaves spotted; spathe large, yellow. Said to be a hybrid of R. albo-maculata and R. hastata. —R. suffruticos. A distinct dwarf-habitat plant with a creamy white spathe, the base in the inside of a rich violet-purple shade. It is apparently a plant of good constitution."

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-ripening 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 loam and plenty of root-room, with a liberal allowance of liquid fertilizer when well established. They thrive best under good light, and in a minimum temperature of 55°.

There are several varieties, all differing only in size, from those which grow 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 "dog" gardens, and on the margins of ponds, to give subropical effects.

R. Elliottiana, 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 kill it. For what rootball of plants may 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 P. 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 on him as his investment.

The bulbs (corns or roots) were expensive,—a guinea

239. Calla with double spathe (X ¾).
or thereabouts—and about as big as marbles. Mr. Tailby now has bushes of them, and some as large as turnips,—anyway, four inches in diameter. Tailby’s experience is interesting and it may be valuable to the reader. He came near losing his whole stock by cutting out the eyes, with the object of getting out the thrips for it. There had been no sign of natural division, nor has there since; though Mr. Tailby is still of the opinion that by proper manipulation they may be increased by division, as we now do potatoes, but the roots must be given time to heal over. The roots are kept over in a cellar at a temperature of 45° F., or thereabouts, until April, when they will show signs of starting. They should be potted then, but kept rather dry. They 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 roots 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 flower-stems appear. The blooms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully; and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thor- oughly ripe until after the beginning of 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, must be covered up strong, but the plantlets are difficult to handle and liable to go off when very young. It is the safest way to let them stay in the seed-boxes, ripe there, and plant them farther apart next season. This is what we have been doing and we cannot complain of the results. Tailby has sown seeds with the most gratifying results. Almost a year is gained in this way, as the roots (or bulbs) are considerably larger than box-grown seedlings. Older roots held over until settled were planted in September and October, and potatoes, bloomed freely all summer, making fine roots; they were green when cut by frost in October, but hardly ripening seeds. To do this takes a longer season, and the plants must be started indoors.

T. D. HATFIELD.

The Richardia in California.—In considering the Calia 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, are the uses to which it is put. It is, perhaps, most commonly used in a belt along fences, and not infrequently as a hedge between two properties; or nearly as often is found along one side of a house in a long, narrow bed. For effective planting it is much in demand for grouping around hydrants and unsightly objects in dump places, at watertides; sometimes in the middle of a fish or lilly pond, oftentimes growing in luxurces 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 effectively, is it used in the lower tiers of basins around a large fountain with Myriophyllum hanging down from the base of the Calia. For all of these purposes the foliage is of even more importance than the flowers. As it grows luxu- riantly 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 doing fairly well in the full sun, our summer climate is quite sufficient to ripen them off, but it is an indifferent one. The spathes are subject to many variations in form, both in size and shape, some being long, rather narrow, and pointed, ending in a decidedly recurved awn, while others are straight or even the roots developed in the winter, being wide and spreading upright the same as the balance of the spathe. It frequently happens that the spathes are 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 frostless belt, the blooms will have a better market in the winter field, as in that season of the year flowers of all kinds are scarce. The average retail price for good blooms in midwinter is 50 cents per dozen; the whole sale price about $1 per 100. Bulbs of small size are kept about one-half, or even less, what they do in the East. Our commercial growers get at present (January, 1901), 825 to 830 per 1,000, according to size, the market calling for tubers three or four inches long. Largest 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 alkali to prevent the growth of many common crops will produce good Callas if other requirements are present. In field plant- ing it is much better to put in small bulbs about 4 inches apart than to sow the offsets promiscuously in the row; when the sets are thus sown, they should be taken up the following year. Small bulbs properly planted. Offsets sown 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 bulbs, but the small bulb tubers are devoured by the sow-bug into the tubers very seriously and receive considerable assistance from millipedes. Both these pests are quite a nuisance to the California nurseryman and gardener. The much-photographed “Acre 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 the above article relating to the culture of the Calia for the general market.

ERNST BRAUNTON.

RICINUS (Latin name, from the resemblance of the seeds to certain insects). Euphorbiaceae. Herbaceous or becoming tree-like in the border around a large, alternate, peatite, palmate-ly 7- to many-lobed, the lobes serrate, monocotylous: leaflets, without petals or stamens in terminal and ap- proximately lateral racemes, opposite the order: the upper short, pedicelled or sessile and stami- nate; calyx 3-5-parted, valvate; stamens many, erect in the bud.

2131. Fruit of Castor Bean, showing the seeds inside. Natural size.
flaments much branched, each with many anthers; rudiment of pistil none: the lower fls. longer pedicelled, pistillate; sepals very deciduous; styles 3, plumose; capsule 3-loculed, 3-seeded, explosively separating into 2-valved cocce when ripe: seeds ovold, with a large caud.

Ricinus communis, Linn. CASTOR BEAN. CASTOR OIL PLANT. PALMA CHRISTI. Figs. 2131—3. Half-hardy annual, 3-15 ft. high in the central United States, 30-40 ft. in the tropics. The large handsomc leaves (6 in.-2½ ft.) and stems bright green to dark red: capsules prickly or smooth. July to frost. Probably originally from Africa or India, now scattered widely and naturalized in all tropical lands. B.M. 2299.—Cultivated in most tropical and temperate countries from the earliest times for the oil of the seeds (castor oil, Otten Riciin) used in medicine and in the arts, and in some places as a food-cressing oil. The seeds contain a poisonous principle. Also much used as a decorative plant singly or in bed centers, giving a rich tropical effect. Of rapid growth in any rich soil. The seeds may be planted in May where they are to grow, or sown singly in pots in early spring and afterwards transplanted. The species varies greatly in size and in the form and size of the capsule, the form, size and color of the seeds and color and glaucosity of the stem and leaves. The following are some of the principal varieties: Var. Cambodgensis, Hort. Lvs. dark colored; stems nearly black. Var. Giboshi, Hort. Dwarf, 5 ft., lvs. bronze purplish. Var. lividas, Jacq. (R. sanguineus, Hort. K. Obermanni, Hort.) Slender; stem and fruit blood-red, 8 ft. B.H. 7:182, 183. Var. Borboniencis, Hort. Fifteen feet, lvs. large, shrinking, green or reddish. Var. Zanzibarensis, Hort. A recent introduction of large size with enormous various colored lvs. and very large flat seeds. A.G. 16:363. I.H. 4:1:12.

RIGIDELLA (Latin, somewhat rigid; referring to the pedicils, which after the petals fall become erect and stiff). Iridaceae. A genus of 3 species of Mexican half-hardy bulbous plants allied to the well-known Tigridias and distinguished by the inner perianth segments; these are inconspicuous in Rigidella, being very small, ovate and erect, while in Tigridia they are larger, fiddle-shaped and spreading. Lvs. broad, plicate, with channelled pedicel; fls. fugitive, bright red, pedicelled; perianth-tube none; segments very unequal, outer oblong, convoluted in a cup in the lower third, then spreading or reflexed; inner very small, erect, ovate, with a narrow claw. Baker's Iridèa, Baker, p. 70.


RIVINA (A. Q. Rivinus, professor of botany, etc., at Liezping, 1691-1725). Phytolaccaceae. 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 cordate-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. ROUGE 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. 5:75. S.H. 2:111. Gn. 22, p. 68 (as R. liviis).

BOAN or ROWAN. Sorbus Aucuparia.

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

beauty of *R. Pseudacacia* was early recognized and it was extensively planted, but the attacks of the borer have caused great loss and checked the planting of a beautiful tree.

3134. *Rivina humilis* (× ½). (See page 1337.)

**Pseudacacia**, *Linn. Locust. False Acacia. Black Locust.* Fig. 2133. This species is the largest of the genus, growing to a height of 80 ft. Lfts. 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: *aurora*, Hort., has pale yellow lvs.; *bell-bella-rosea*, R., rose-colored fls., and is probably a hybrid of *R. Pseudacacia* and *R. viscosa*; var. *inermis*, DC., is a thornless variety, with large dark foliage; *bulata*, Hort., is much like Bessoniana (below), but more compact; *Decaisneana*, Carr., is a form with handsome rose-tinted lfts. R.H. 1863:151. F.S. 19:2027. I.H. 12:427. Gt. 34, p. 174; spectabilis, Du Mont Cour., is a strong-growing thornless var.; *monophylla*, Peitz. & 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; *semperflorens*, Hort., is said to flower throughout the summer; vars. *glabra*, stricta and *mimosifolia* are horticultural forms, which are sufficiently described by their names; *pyramidalis*, Peitz. & Kirchn., is a distinct narrow-growing form; *umbrellifera*, DC. Umbrella Locust. Thornless, the glabrous branches densely crowded; lfts. ovate. Vars. *rubra*, *stricta* and *Bessoniana* are forms of this. Very distinct.

**hiapida**, Linn. Rose Acacia. Fig. 2136. A shrub 2-8 ft. high, all parts of the plant except the fls. bristly or hairy: lfts. 9-13; racemes loose; fls. 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.


**ROCHEA**

**ROBIN’S PLANTAIN, Erigeron bellidifolius.**

**ROCAMBOLE** (*Allium Scorodoprasum*, Linn.), is a humble member of the onion tribe, the underground bulbs of which are used abroad like garlic, known in America amongst the Canadian French. The plant is a hardy perennial, with a stem that is twisted spirally above and bears at the top an umbel of flowers, some or all of which are changed to bulblets. The presence of these bulblets distinguishes the plant from garlic. The species can be propagated by the bulblets, but quicker results are secured from the cloves of the underground bulbs. In mild climates, the bulbs should be planted in autumn or not later than February; in cold climates, plant in spring. In the autumn when the leaves decay, the bulbs are lifted, dried in the sun, and stored.

Rocambole is a native of Europe, the Caucasus region and Syria. It has flat or keeled leaves, short spathe, bell-shaped, 6-parted perianth, and the 3 inner stamens broader than the rest, 3-cleft, and not longer than the perianth. It is a perennial plant. Good seeds are rarely produced.

**ROCCARDIA.** Consult *Helipterum.*

**ROCHEA** (de la Roche, French botanist), *Crassula*. A genus of 4 species of succulent plants from S. Africa, with opposite, oblong-ovate or lanceolate lvs. and fls. in terminal, few-to-many-fld. heads. For generic characters, see *Crassula*. The best species is *R. coccinea*. The following points concerning its culture are condensed from Gt. 46, p. 360: This species enjoys an abundance of light and sun, and needs to have its wood thoroughly ripened in the autumn to insure a display of bloom. If small plants can be procured they should be nipped about February 1. If a few leaves are removed, after the top is pinched out, shoots will start more evenly. After pinching, the plants are put into considerably larger pots, a peaty soil being generally used and good drainage given. They should be given a night temperature of 50°, day temperature of 75-90° in sunshine, with plenty of atmospheric moisture until the new growths are freely produced, when they should


be imured to more air. A shading of the glass may be necessary in summer, or the plants may be placed in a shaded position outside. About August, when the plants have made as much growth as can be ripened that season, they may be placed in a warm, dry, sunny
ROCHEA

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.

jasminae, DC. (Crassula jasminae, Ker-Gawl.) Stem herbaceous, 4-12 in. high, decumbent, branched, flowering part erect: lvs. Resby, obovate-long, ¼-5¼ in. long, 1-2 lines wide: fls. white, tinted with crimson, sessile, not fragrant, ¾ in. long. B.M. 2178. - Hybrids with C. coccineae are figured in A.F. 5:143.

B. Clusters many-flowered.

coccinea, DC. (Kalopsanthus coccinea, Haw. Crassula coccinea, Linn.) Plant robust, shrubby, 1-5 ft. high: lvs. very closely imbricated, 1-1½ in. x ½-¾ in.: fls. bright scarlet, 1½-2 in. long, fragrant, borne in summer. Cape. Gd. 46, p. 360. B.M. 496.

R. falcata, DC. See Crassula falcata. F. W. BARCLAY.

ROCK-BRAKE. See Cryptogramma.

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 as unique a place in the vegetable kingdom as they have in the plan of nature. Surely there are men and women who, if they knew these plants well, would be fired with an ambition to excel in their cultivation; and in so doing they may enter a comparatively untrodden 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 Arctostaphylos alpina, Vaccinium cassinum, Saxifraga rivularis, Veronica alpina, Geum radiatum, var. Pickii, Sibbaldia procumbens, Rhododendron Lapponicum, Bryanthus laxifolia, Primula farinosa, Saxifraga oppositifolia, Aisoon and aizoideas, Aster palustris and Woodsia ilvensis; and in the Rocky Mountains and Pacific Coast Ranges by Erigeron uniflorus, Ianluxus and ursinus, Actinella Brandegei and grandiflora, Artemisia borealis, scabulorum and alpina, Senecio Soldanello, Fremontii, petraeae, uniflorus and cernerioidae, Crepis numa, Campanula uniflora, Primula Purpuri and sulphurificus, Androsace Chamise and septemtrionalis, Gentiana prostrata, frigida, Newberryi, Purpuri and simplices, Pheoz broyides and cespitosa, Polemonium contortum, Cassiope Mertensiana, Bryanthus Breveri, Draba streptocarpa, Parryi and nudicaulis, Arabis Lyallii and platysperma, Smenosiphon callycena, Lychins montanus and Kingii, Catandrinia pygmea, Claytonia megaarhiza, Spraguea umbellata, Dryas octopetala, Geum Rosei, Saxifraga chrysanth and bryophora, Cystopteris alpina, Aplopappus pygmea, Loiseleuria and acutilis, Omphalodes numa, var. aretioides, Chionophila Jamesii, etc. (Not all of these names are accounted for in this work, but they are to be found in the Current Manuals of North American Plants.)

The uncultivated 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 Aubrietia deltoides, Achillea tomentosa, Campanula Carpathica and Arabis albida, are offered by American nurseriesmen 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 botanical 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.
ROCK GARDENS

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 lead planter does not allow the period of rest that such plants require. This condition must be met by devices, methods and locations that will retard the growth in spring, check it at an early period in autumn, and keep the plants fully dormant in winter, such as shade, mulching, and, in the case of particularly difficult plants, the protection of frames. It is essential that conditions be provided that will enable the roots to extend for a long distance, of from six to ten 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 cavi-
ties should be filled with such loose material as frag-
ments 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 recom-
pended. A small collection comprising a few easily cul-
tivated 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 col-
lection 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 re-
gions, 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 can be diverted to supply a constant flow of water, underground pipes can be carried from an artificial source of supply to various points where conditions require them. However favorable the condi-
tions are, it will be found that much can be done to advantage in different localities to meet the special re-
quirements of different groups of plants. In such work, however, it should be kept constantly in mind that there are plants that will grow in all sorts of surroundings, and that it will often be much better to seek such as are

adapted to existing conditions than to go to the ex-
 pense 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 dis-
playing a collection of curious rocks fantastically ar-
 ranged, but to provide a place 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 on the conditions as they are, but to use, 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 and water supply, and whether it be permanent or fluctuating in character. Selecting 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 decid-
edly downward direction from the exposed surface and not be shuttered by over-

ing rock. That this does not apply in all cases, those who are familiar with the habitats of rock-plants know full well. The Penila grac-
"ilis in the upper Mississippi bluffs is in horizontal crevices well back from the edge of the overhanging rock, where it is absolutely protected from surface water. It finds sufficient moisture in the horizontal seams. Penila atrorumvarea will grow in narrow cracks and small pockets on the face of dark limestone boulders where there can be no possible internal supply of moisture. These in-
stances go to show that the general prin-
ciples that will apply to such plants as a class will not apply to each of them. It simply gives emphasis to the importance of trying a plant under all sorts of condi-
tions before assuming that it can not be grown. The gardens here described are an at-
tempt to grow that 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 by over-

hanging rock. This that was not done in the same, and finally a situation was secured, where, instead of barely holding its own, it increased and produced a number of its giant deep in the rock. 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 varietas rather than materials not to make a screen. While shelters of this character are of 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 ever-

greens with a restricted root range are best. This would include the Yuccas, a few of the dwarf forms of Thuya, Juniperas, Picea. Retinispors and practically all the broad-leaved evergreens, especially the Rhododendrons (of which Rhododendron maximum can be secured in large plants at low cost), are particularly useful owing to their habit of growth, restricted root area, and the facility with which they can be moved from place to place as desired. As these shelter-

its 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 use of the very tall form of the background, and in the planting of the rock garden as well, a decided character should be given to the whole and to each distinct compartment by using some few evergreens in large quantities, or a number of varieties in small quantities. Variegated and dis-

2133. A pocket in the rocks.
ROCK GARDENS

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 Her- baceous 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 tree and shrub line. They are the ones that will test the skill of the cultivator. There are, however, many rock-plants; that is, plants that grow naturally on rocks, or plants having a tufted, matted and more or less persistent and evergreen foliage similar to alpines that can be used with them in less favorable positions in the rock garden or in the open border. Many of such plants can be readily procured from American nurserymen and collectors. They are easy of cultivation and attractive in habit and flower. The writer would include also low-growing bulbous plants, especially such as have inconspicuous foliage. They can be planted with the low ground-covering plants to push up through them. From this list are omitted such plants as belong more properly in the wild garden, especially such as spread rapidly by underground shoots and are likely to become a pest. (In a rockery conditions are such that it is almost impossible to eradicate deep-rooting weeds, and they above all others should be rigidly excluded.) Among desirable rock-plants the writer would include Geranium sanguineum, Andrewsii and Robert- tianum, Gypsophila muralis, Helianthemum vulgare, Helleborus niger, Leontopodium alpinum, Linaria Cymbalaria, Lotus corniculatus, Lychnis vincaria, Papaver alpinum and nudicaule, Cerastium Larenti, Saponaria ocymoides, Veronica Teucrium and rupestris, Arabis alpina, Cneorum fragarioides, Daphne Cneorum, species of Alyssum, Bellis, Cerastium, Arenaria, Draba, Epimedium, Iberis, Thymus, Arabis, Armeria, Ajuga, Dianthus, Sedum, Sagina, Primula, Aquilegia, Saxi- fraga, Corydalis, Myosotis, Sempervivum, Parnassia, Viola, Hepatica, Opuntia, Houstonia, Anemone patens, var. Nuttalliana, dwarf and creeping Campanulas, Cornus Canadensis, Dicentra eximia, Calluna vulgaris, Iris cristata, verna and pumila, Leptosiphum bazzanil, Phlox subulata, Parnassia fragarioides, Daphne Cneorum, Saxi- fraga Virginica, Silene Pensylvanica and Virginica, Anemone thalicroides, Waldsteinia fragarioides, Galax aphylla, Asperula odorata, low-growing ferns, mosses, etc.

WARREN H. MANNING.

A rock garden or rockery is, or should be, an imitation (though not in its limits and manner of placing) of a natural rocky slope such as is often seen on mountain sides, but made more interesting and at-
ROCKY MOUNTAIN BEE PLANT. *Gentianella virginica.*

RODRIGUEZIA (Commodore Rodgers, U. S. Navy; Saxifragaceae.) A genus of one species, a hardy herbaceous perennial for which the following names have been proposed: Rodgers' Bronze Leave, Bronze Leaf of Japan and Stately Five-Leaf. It grows 3–4 ft. high, and has comparatively large finger-shaped leaves. As a flowering plant it has been said by enthusiasts to be superior to Astilbe, but the bloom is scantier, rather greenish at first, and perhaps does not last as long. It may not be so amenable to forcing. Rodoriguezia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardens. Although any deep, 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.

Botanically Rodoriguezia is closely related to the subsalpine region of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardens. Although any deep, 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.

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RODRIGUEZIA
tufs, while others, like *R. decorum*, have long, strag- 
gling rhizomes difficult to keep within the limits of a 
block or a basket. Pseudobulbs small, compressed, 1-2- 
ivd. and bearing sheathing lvs. at the base; racemes 
erect or pendulous: dorsal sepals and petals similar, 
free, erect; lateral sepals united, concave, but scarcely 
saccate; labellum spurred or saccate, with a long claw 
parallel to the column, and a spreading blade not 
exceeding the sepal: column slender. Robert Brown's 
genus Gomesa (sometimes written Gomeza), found on 
g. G. in. is now referred to Rodriguezia. *G. recurva* 
is *R. planifolia*.

Grow Rodriguezias in very shallow pots filled with 
tough peat, and well drained. 'Rest them in a tempera- 
ture of 50°, giving little water. The growing tempera- 
ture should be from 65-75°. Give plenty of moisture 
and shade from direct sunshine. The stronger-growing 
kinds will need thicker potting material in baskets; 
they do well wired on tree-fern stocks. During season 
of growth, syringing is necessary.

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

1. fragrans, Reichb. f. (Burlingtonia fragrans, Lindl.). 
Lvs. tufted; racemes erect; lvs. pure white, except the 
middle of the label, which is stained with yellow, 
very fragrant; lower sepals united, entire: dorsal se- 
pal acute; labellum saccate, with a 2-parted, pubescent 
appendage on the disk. April, May. Brazil. 
B.C. II. 3: 767—Var. piecta, Hort. (Burlingtonia 
decora, var. piecta, Hook.). Pseudo- 
bulbs orbicular, compressed: lvs. short, acute; se- 
pals and petals spotted with deep purple-red. B.M. 5419.

2. venusta, Reichb. f. (Burlingtonia venusta, Lindl.). 
Lvs. linear-oblong, forming compact masses: lvs. 
in drooping racemes, large, white or tinged with pink 
and having a yellow stain on the lip; dorsal sepal 
acute, the lateral pair entire; labellum transversely 
plaited near the middle. Flowers at various seasons. Brazil. 
May. 1 H. 5: 138.—Very near *R. candida*.

3. candida, Batem. (Burlingtonia candida, Lindl.). 
Lvs. oblong, firm: racemes pendulous, 4-6-fl.: lvs. white, 
with a light stain of yellow on the labelum, 2 in. long; 
dorsal sepal obovate, emarginate, the lower pair united 
into a concave, bifid blade, saccate at base; petals obo- 
vate, with the apex recurved; labellum with a broadly 
concave, bifid middle lobe, longer than the 2 lateral 
petals; base and lateral lobes parallel to the column, 
throat with many lamellae. April, May. Guiana. B. 

4. pubescens, Reichb. f. (Burlingtonia pubescens, Lindl.). 
Lvs. tufted, dark green, keeled, racemes many, 
pendulous, from the tuft of lvs.: lvs. pure white; labellum 
2-lobed, hastate; lateral lobes erect, furnished with 
lamellae; column pubescent, in which it differs from 
the other species.

5. secunda, HBK. Fig. 2141. Pseudobulbs bearing sev- 
eral linear-oblong lvs.; raceme erect, second, 6 in. high: lvs. deep rose; sepal erect, ovate, convex, the 
lower pair keeled and gibbous; petals like the dorsal 
sepal; labellum obovate-oblong, emarginate, undulate, 
scarce; longer than the sepals. Aug. Trinidad, Guia- 
ana. B.M. 5242. B.R. 11: 930. L.B.C. 7: 676 (as *R. lan- 
ceolate*).

ROLLINIA

1543

crispa, Lindl. Pseudobulbs elongate-ovate: lvs. ob- 
long-lanceolate, spreading, undulate: raceme pendulous, 
rather dense: lvs. green, with yellowish borders; sepals 
albino, undulate-crisp; petals similar; labellum lanceo- 

planifolia, Lindl. Pseudobulbs clustered, compressed: 
lvs. lanceolate: raceme long, drooping: lvs. greenish 
yellow, fragrant; sepals oblong, waved, acute, the 
lower pair united except at the end; petals like the dor- 
sal sepal: labellum broadly oblong, acute, reflexed, 
shorter than the lower sepals. Feb. Brazil. B.M. 5748, 
3504. L.B.C. 7: 690 (as Gomesa recurva).

HEINRICH HASSELBRING AND WM. MATHEWS.

RÖDEA. See Rondeletia.

ROHDEA (Mich. Rohde, physician and botanist of 
Bremen). *Litiaeeae.* A monotypic genus from Japan, 
especially 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-ball-shaped; anthers sessile; stigma petals; 
style nearly wanting: fr. a globular, usually 1-seeded 
berry. Rohdea 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 root-
stock with fleshy fibers: lvs. typically green, 9-12 in. 
a rosette, erect, oblong-lanceolate: berry about the size of 
a small olive, with a red pulp. B.M. 589. Gr. 36. p. 541.

The following varieties, which differ in shape and 
color of the lvs., are offered by Dutch bulb growers: 
Var. aureo-stríata, falcata, falcata var., natimaculata 
macrophylla, margiáta minor, pygmea, zebrina.

G. W. OLIVER AND F. W. BARCLAY.

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

Siéberi, A. DC. (Anona muscáceoa, Jacq.). Long tree, 
the young growth nearly or quite smooth: lvs. oblong, 
taper-pointed, smooth; exterior petals oblong and blunt 
¾-1 in. long. greenish, the interior smaller but promi- 
nent, reddish: fr. about 4 in. in diameter, greenish, 
somewhat globose, the surface bearing tuberules. 
Native in the islands of Guadeloupe 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. 2142) 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 borne on 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. Generie characters: sepal 3, with a broad, membranous, dorsal wing; petals 6, all alike; stamens very numerous, free; filaments dilute but thickened above; stigmas free: capsule 7-11-loculed, dehiscing to the middle, the valves separating by their margins from the firm persistent placenta.


—Ever since 1880 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 Papaver orientale. Though not considered hardy in the eastern states, it has been successfully grown in the open in northern New Jersey. Romney 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 Brauntoun 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 divisions."

W. M.

ROMNEYA

RONDELETTIA

RONDELETTIA (Rondelet, 1567-1566, 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 corymbs. The whole family is noted as furnishing numerous decorative stove 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. olivacea) the flowers number 10-30 in a cluster, each flower being full an inch across; in the other species the flowers may number 150-200 to a cluster, each flower being less as 1 in. across. Known also as Rondeletia characters: calyx-lobes short or long, equal; corolla-tube usually slender, swollen 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 or ovary; 2-styled; capsule loculicidal.

R. anomala 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 because of typographical errors.

W. M.

Rondeletia anomala is a half-shrubby plant, growing 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 purple flowers. It is not a hardy plant, but continues in bloom for two or three months. An additional good feature is handsome foliage, so that it is always presentable. Cuttings root
RONDELETIA

easily at any time, and these may be grown in pots for a season. Barring the tendency to stoozing, 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.

dorata, Jacq. (Rondeletia speciosa, Lodde.). Lvs. ovate, nearly sessile: clusters 10-30-flld.: fls. crimson to brick-red, with a conspicuous yellow throat; lobes


BB. Leaves in 3's.

anomala, Hort. Figured in J.H. III. 35:251 with 8 fls. in a cluster, the fls. 3½ in. across, with roundish lobes. The color is said to be coral-red or deep scarlet and the throat is presumably yellow. Habitat (1). Imperfectly known.

AA. Fls. pink to white.

BB. Base of lvs. more or less cordate.

cordata, Benth. (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 12), but in R.H. 1873:230 they are shown as pure white. Guatemala. Franceschi says it is native to Mexico.

BB. Base of lvs. not cordate.

C. Corolla-lobes ovate: stipules broadly ovate.


cc. Corolla-lobes obcordate: stipules subulate.

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

The following species would probably be desirable additions, as they represent other colors than the above: R. Americana, Linn. White-flld. West Indies and S. Amer.—R. Blackhousi, Hook., a pink-flld. species from trop. Amer. is easily distinguished from those mentioned above by the much longer calyx-

lobes, which are pink. B.M. 6290.—R. Purpurea, Hook., a beautiful pale yellow-flld. species from Colombia, has a great pyramidal cluster 5 in. across and 4 in. deep, with an astonishing number of fls., perhaps 150–200 in B.M. 5909.—R. versicolor, Hook., is referred to R. amera 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 bud deep rose-color, 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. 4579.

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 nodules 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. 2144); the enlargement on the roots of cabbage and related plants by the myxymyces (Plasmophora 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. 2144), the galls formed on the roots of the grape by the phlyotoxera, 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-burn, 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.

2143. Rondeletia cordata (X ¼).

2144. Root-galls due to nematodes—Tomato roots.
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 gall-like root-growths in some instances to the hypertrophy of adventitious buds.

The root-galls caused by the nema-to-tode (Heteroder-a radi-ciola) may usually be readily recognized by the numerous knotty enlargements on the smaller roots infested by the worms. By careful search, in most instances, the distended female worms may be found in the infested tissue, where they appear as small, nearly spherical, pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called cel-worm, feeds upon 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 the 'ash' that would harbor the worms during the winter. In greenhouses steam can be forced through the infested soil. When possible, the plants should be destroyed and replaced by others that may be severely root-pruned and re-potted in soil free from worms. They are not troublesome in soil that has been plowed since an infested crop was grown in it.

The root-swellings caused by the grape vine gall-louse (Phyll-tozer-a vast-altrayz) may be readily recognized from other root-galls by the presence of the insects. The young insects, by puncturing the epidermis of the roots and depositing 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 most popular varieties on roots of those that are stronger and better able to resist the attack of the insect. Blast of grapevine in some instances has proved effective in killing the lice.

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, as 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 Southwest are not the same as the leaves on the roots of the peach, apricot and allied plants, known under the name of the weed, varisal. These are caused by a slime-fungus (Dendrophagus globosus), which is parasitic in the infected roots.

Seedlings from one to six months old appear to be most susceptible to this disease. Lenticels 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 older root. Younger galls are commoner than old ones. 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.

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

J. W. Tumey.

ROQUETTE or ROCKET-SALAD (Ericea sativa, Mill.), a low-growing hardy annual from southern Europe, whose leaves resemble those of radish and turnip, is much used by the French as a spring and autumn salad and pot-herb. The flavor of the young, tender leaves, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown. The first sowing may be made in early spring, the seed being dropped thinly in shallow drills a foot apart, with successional plantings each second or third week through the season. The soil must be rich and well supplied with moisture, else the leaves will probably be injured by the summer heat. Inter-culture is the same as for lettuce and similar crops. Frequent watering and tillage in hot, dry weather to insure rapid, vigorous growth should result in succulent, mild-flavored leaves. In hot weather the plants run to seed in a few weeks and autumn they will produce abundantly after being cut. The pale citron-yellow flowers emit a perfume resembling that of orange blossoms. M. G. Kains.

ROSA (ancient Latin name). Rose. Rose. Ornamental deciduous shrubs, upright or climbing or creeping, usually with prickly stems, alternate, stipulate, odd-pinnate, rarely simple leaves, showy purplish, carmine, pink or white flowers, and conspicuous, often ornamental, usually scarlet fruits. There is probably a flower more popular and better known than the Rose. From time immemorial poets have sung its praise, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarked to note, however, that the Rose has played a far inferior part in the horticulture of the Chinese and Japanese. It is probably the first flower known and cultivated in a double state, and it is the double-flowered Rose that is so familiar to us. It is the Rose that variably brings to our mind, while the wild single-flowered Roses much less attention has been given. The ornamental value of single Roses is rarely fully appreciated. A simple flower in some instances has proved effective in killing the lice.

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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*, *setigera*, *Corylopsis*, *Virginiaea*, *Lucida*, *Humiltis*, *Canina*, *rubiginosa*, *spinosisima*, *Alpina*, *Arvenis* and multiformis. Some species, as *R. Wichuriana*, *Sempervirens*, *Sericea*, *Microphylla*, *Chinensis* and *Engelhardia*, require protection north. Others, as *R. Banksis*, *Bracteata*, *Hortigata* and *Gigantea*, are hardy 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; long and vigorous shoots should not be shortened, especially 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 cuttings taken in fall and planted north. Some species are less often practiced, except with a few species, like *R. Lutea* and *R. Hemispharica*, which do not grow readily from cuttings. Some species, especially those of the groups of Carolina and Callowia, 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 shrubbery where the individual plants cannot be carefully watched; the stock usually throws up suckers and outgrows the clone, often in a short time.

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,

the French botanist Gandoger actually describes from Europe and western Asia alone 4,206 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 Abyssinia, and in Asia to India. They are all shrubs of upright habit, or climbing or sarmentose, with usually prickly stems; lvs. stipulate, alternate, odd-pinnate, with 3 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, enclosed 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 immemorial. These innumerable garden forms, increasing every year, are almost exclusively of hybrid origin and are therefore omitted in the botanical classification of the genus.

Many attempts have been made to subdivide the genus with more or less satisfactory results; the more important are those by A. De Candolle, Lindley, Regel and Baker. Nowadays the arrangement proposed by Crépin Is considered the most natural and satisfactory and has been followed by almost all the writers given below. No good general monograph has been published since Lindley's Monographia Rosarum (1820), except a rather short one by Regel in 1877. Of the more recent publications the most important are those of Crépin, especially his *Primo Monographie Rosarum*. In compiling his publications he takes a broader view in regard to the specific value of the Rose forms and unites under one species many forms which he formerly considered as distinct species. An illustrated monograph valuable for the knowledge of the older garden forms and species is Thory and Redouté's *Les
Roses," with 100 colored plates (1817-1820). 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 pagination nor plates being numbered continuously in this edition.

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

For general notes on culture, see *Rose*.  

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**KEY TO THE GROUPS.**

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

**A.** Lvs. simple, without stipules: Lvs. yellow ....

**Subgenus Hulteniana** (Species No. 1)

**AA.** Lvs. pinnate, stipulate ....

**Subgenus Euroas** (Species Nos. 2-50)

**b.** Styles exerted beyond the mouth of the receptacle ....

**c.** Everted styles connate beyond the mouth of the receptacle.

**Climbing or creeping: style about as long as stamens.**

**SECTION I. SYSTILE** (Species Nos. 2-8)

**Upright, with arching branches: styles shorter than stamens.**

**SECTION II. STYLOLE** (Species No. 9)
**SUBGENUS EURUSA.** A group of about 12 species (one of them American), well marked by the styles being conuate into a slender exserted column. Stems axillary, or climbing, with hooked prickles: fls. in corymbs, few or many; outer sepals pinnate, rarely entire, reflexed after flowering, caducous.

**KEY TO SPECIES OF SECTION I.**

A. Stipules entire; prickles usually in pairs: corymb usually 9-foliate.

B. Stipules entire or denticulate; prickles scattered.

BB. Lvs. of flowering branches 5-7-foliate.

CCC. Sepals lanceolate, gradually acuminate: fl. buds elongated: corymbs usually many-fld.


**2150. Section of Rose flowers (X 3/4).** To show two forms of styles.

**name for hybrids with R. Chinensis.** Gn. 29:530. The Dawson Rose, or R. Dawsoniana, is a hybrid with General Jacqueminot. A very beautiful hybrid and one of the best climbing Roses is Climson Rambler (Plg. 2151), a vigorous grower, with large corymbs of bright
crimson fls. A.G. 10:233. Hybrids with R. setigera and R. Wichuraiana have also been raised.

3. **Watsoniána**, Crép. Deciduous shrub, with sermentose or recurving branches: flts. 3–5, linear-lanceolate, with entire wavy margin, pubescent beneath, 1–2½ in. long; fls. in many-flld. pyramidal corymbs, 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.


6. **semprevírense**, Linn. Evergreen shrub with long and slender sermentose, somewhat reddish branches:


8. **moscháta**, Mill. (R. Brunní, Lindl.). **MUSK ROSE.** Deciduous shrub with sermentose or climbing branches: flts. 5–7, oval or oblong, mostly acuminate, serrulate, 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. ovoid, small. July. S. Asia, Abyssinia. B.R. 10:829. F.S. 4:360–362. B.M. 4090.—Naturalized in some localities in Ala. in a form with rather broad, acute or obtuse lvs. Var. **Abyssínea**, Crèpin (R. Abyssínea, Lindl.). More prickly: flowering branchlets shorter; inflorescence more compact; sepals with smaller lobes. Var. **Leschenáutíti**, Crèpin. (R. Leschenáutíti, Wight & Arn.). Fls. larger, in few-flld. corymbs: pedicels and receptacle glandular-hispid. R. Pissárdii, Carr., a vigorous-growing Rose with numerous white fls., figured in R.H. 1890, p. 314, 315, 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.
Rosa

Section II. Stylosa. Contains only one European species, with the appearance of a hybrid between R. angustifolia and R. canina.


Section III. Indice. Few Asiatic species with upright or procumbent stems; prickles scattered, hooked: fls. 3–5, rarely 7: inflorescence 1-many-fld.; sepals entire or the outer ones sparingly pinnate, reflexed after flowering: bracts and stipules narrow, the latter with small, divergent auricles.

10. gigantea. Collett. Procumbent: flowering branches usually unarmed: fls. usually 5, oval to broadly elliptic, serrate, glabrous, firm, 1½–3 in. long: fls. solitary, usually without bracts, white, 5–6 in. across; pedicels and receptacle smooth; sepals long, acuminate. Burma. G.C. III. 6:13.—Hardy only south. It is possible that Fortune’s Double Yellow (Beauty of Glazenwood), with large, double, salmon-yellow fls., figured in B.M. 473, 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: fls. 3–5, sometimes 7, ovate to oblong, acute, finely serrate, coriaceous, shining and dark green above, pale beneath, glabrous, 1½¾ in. long: fls. usually few or solitary, crimson, pink, white or yellowish, sometimes 3 in. across, fragrant: fr. usually obovate. Blooming all summer and fall. China. From this species and R. Gallica and its forms most of the Garden Roses have originated. Several variants are known.

Var. Devoniensis, Hort., is probably a hybrid: it is of vigorous growth, almost climbing, and has large, yellowish white, double flowers. P. M. 8:169.

Var. fragrans, Thory (R. indica, var. odoratissima, Lindl.). Tea-scented or Tea Rose. Similar to the following but fls. more fragrant, salmon-pink or light rose: fr. ovate. B. R. 10:804. More tender than the other vars.

Var. indica, Koehne (R. indica, var. vulgaris, Lindl.). MOSTLY ROSES. Stems rather stout, 3–5 ft. high, glabrous green, with brownish red prickles: fls. pink to whitish, with glandular pedicels: fr. obovate.


Var. minima, Curt. (R. Lawrenceana, Hort. R. indica, var. minima, Thory.). Dwarf shrub, usually not over 1 ft. high, with small rose-red fls. about 1½ in. across; petals often pointed. There are single- and double-flowered forms. The Hybrid Roses belong to this variety. B. M. 1762. Red. Ros. (3:25, 6, 7).

Var. semperflorens, Nichols. (R. semperflorens, Curt. R. Benghalensis, Pers.). CRIMSON CHINESE ROSE. Low shrub, with slender, prickly or almost unarmed, dark green branches: flts. rather thin, mostly stained with purple; fls. usually solitary on slender pedicels, crimson or deep pink. B. M. 284.

Var. viridiflora, Dipp. GREEN ROSE. With monstrous green fls.; the petals are transformed into small, narrow green brs. F. S. 11:1136.

Var. Manetti, Dipp. (R. Manetti, Hort.). Fig. 2156. Of vigorous growth, upright; pedicels hirsut-pediglansular: 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. NOISSETTE ROSE. CHAMPNEY ROSE. Supposed hybrid of R. Chinensis and R. muschata. Stems upright to 6 ft., with hooked reddish prickles: flts. 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 bush China Rose. From the seed of this hybrid Phillips 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; lvs. usually 7, 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. BANKSIE. Contains one Chinese species with climbing, sparingly prickly or unarmed stems: stipules quite free, subulate, caducous: sepals entire, reflexed after flowering, caducous.


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

a. Lfts. doubly and glandular serrate.16. GALICIA
aa. Lfts. simply serrate, not glandular.

Supposed hybrids of R. Gallica...17. DAMASCENA
18. alba
19. turbinate


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:
20. **villosa**
Linn. (R. pontica, Herrm.). Upright shrub, attaining 6 ft., with almost straight spines: lfts. 5-7, oval to ovate-oblong, acute or obtuse, doubly glandular-serrate, grayish green, pubescent above, tomentose beneath, 2-2 ½ in. long; fls. 1-3, pink, 1 ½-2 in. across on prickly pedicels; fr. scarlet, orovoid or subglobose, to 1 inch across, hispid, with persistent erect sepals. June. July. Europe, W. Asia.—Hardy Rose, with large ornamental fruit. Var. mollissima, Roth (R. mollis, Sm.). Lower, with shorter prickles, smaller, silky-pubescent lfts.: fr. smaller, less hispid.

21. **rubiginosa**
Linn. (R. Eglantina, Mill., not Linn.). SWEETBRIER. EGLANTINE. Dense shrub, attaining 6 ft., with hooked prickles often mixed with bristles: lfts. 5-7, ovate to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, 2 ½-1 in. long; fls. 1-3, on hispid short pedicels, bright pink, 1 ½-2 in. across; receptacle usually glandular-hispid: fr. subglobose or ovate, orange-red to scarlet, with upright-spreading, usually caducous sepals. June. Europe; naturalized in some localities in the East. B.B. 2:232. — 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: lfts. 5-7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, 3½-1 ½ in. long; fls. 1-3, light pink, on usually glabrous pedicels; sepals reflexed, caduceous: 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. rubriflora, Vill.). Upright shrub, attaining 6 ft., with slender, purplish branches covered with glaucous bloom: prickles few, hooked or straight; lfts. 7-9, elliptic to ovate-lanceolate, simply serrate, bluish green and more or less tinged with red, 3½-1 ½ in. long; fls. 1-3 or more, pink, 1 ½ in. across, on usually hispid-glandular pedicels; sepals long, with dilated apex, upright spreading, tardily caduceous: fr. subglobose, scarlet. June. Mountains of M. and S. Eu. B.B. 5:490.—Effective by its reddish foliage: fls. less conspicuous. Hardy.

**SECTION VII. CAROLINIA.** Contains only American species. Upright, mostly low shrubs: stems slender, mostly straight prickles, placed in pairs and often mixed with bristles: upper stipules usually narrow: corymb generally few-flowered; sepals spreading after flowering, caduceous, the outer ones entire or with few erect lobes: achenes inserted exclusively at the bottom of the usually depressed-globose receptacle.

A. Pedicels rather long: lfts. 5-9
B. Lfts. finely many-toothed: prickles usually hooked: stipules conuplicate. 24. **Carolina**
BB. Lfts. coarsely toothed: prickles usually straight and slender: stipules flat

25. **lucida**
26. **bunilla**
27. **nitida**

AA. Pedicels very short: lfts. 7-11, small and narrow...

28. **foliolaris**


**2156. The Manetti Rose (× ½).** Much used as a stock. See No. 11.

22. **canina**, Linn. Dog Rose. Upright shrub, attaining 10 ft., with often recurving branches; prickles stout, hooked: lfts. 5-7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, 3½-1 ½ in. long; fls. 1-3, light pink, on usually glabrous pedicels; sepals reflexed, caduceous: fr. ovate, orange-red or scarlet, glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities.—Much used as a stock for grafting.
25. *lactea*, Ehrh. (*R. helenium*, var. *lactea*, Best). Shrub, 6 ft. high, with few or no suckers: prickles sometimes hooked: fls. 7–9, elliptic to obovate-elliptic, dark green and shining above, thickish, often slightly pubescent beneath, ½–¾ 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. Go. 55, p. 428.—Well adapted for borders of shrubbery, 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. 12:1088. Gng. 5:306. Var. *pleana*, Hort. With double fls. *R. Hêpâtre*, Bose, is also supposed to be a double-fl. var. or perhaps hybrid of this species.

26. *humble*, Marsh. (*R. parviflora*, Ehrh. *R. Ljôni*, Parsh). Fig. 2148c. 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. Lvs. villous-pubescent beneath, thickish.


28. *foiôlosa*, Nutt. Low shrub, 1½ ft. high: stems with rather few slender prickles, sometimes almost unarmed: fls. 7–9, narrow or linear-oblong, bright green and shining above, glabrous, adpressed, green on the midrib beneath, ¾–1½ in. long: fls. solitary or few, pink, about ½ in. across; pedicels and receptacle smooth or sparsely glandular-hispid: fr. globose, with rather few axillary stipules. Mo. in Ark. and Ind. Terr. to Tex. G. F. 3:101.—Like the 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, with dilated bracts: sepals generally entire, upright after flowering and persistent, rarely deciduous; receptacle usually smooth.**


32. *Woodsi*, Lindl. Stems 3 ft. high, with slender, straight or recurved prickles, often bristly: fls. 5–7, obovate to oblong, simply or doubly glandular-serrate, pubescent or glabrous beneath, ½–1¾ in. long; fls. often solitary, pink, 1½–2 ft. across, on very short smooth pedicels; fr. globose, with short neck. June, July. Saskatchewan to Colo. and Mo. B. R. 12:976.—The two preceding species may be only variants of R. *Woodsi*.

33. *Californica*, Cham. & Schlecht. Stems 8 ft. high, with stout, hooked or straight prickles, often bristly: fls. 5–7, broadly elliptic to oblong-ovate, simply or
doubly glandular-serrate, pubescent beneath or on both sides, often glandular, rarely glabrous, ¾-1½ in. long: fls. on slender, usually smooth pedicles, over 1 in. across. June-Aug. Brit. Col. to Calif. Fls. pink.

2159. Rosa cinnamonae (X ¾). One of the old-fashioned hardy Roses. No. 35.

34. Nutkana, Presl. Stems stout, 5 ft. high, with usually straight prickles and sometimes bristly: flts. 5-7, broadly elliptic to oblong-lanceolate, generally rounded at the base, usually doubly glandular-serrate, almost glabrous, often glandular beneath, ¾-2 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. 2148b. Stems slender, 3 ft. high: flts. 7-9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ¾-1¼ 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-flowering shrub. Var. Pyrenáica, W. D. Koch (R. Pyrenáica, Gouan.). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gn. 27:496.

37. reclinatu, Thr. (R. Boursaulti, Hort.). Supposed hybrid of R. pendulina and R. Chinensis. Climbing to 12 ft. high, with slender, sparingly prickly branches: flts. 3-7, oblong-ovate, glabrous: fls. in corymbs, purple, double or semi-double, nodding: fr. subglobose, smooth. Red. Ros. (3:26, 3). —Varies with lighter and deeper colored and more or less double fls.

38. Virginiana, Mill. (R. blanda, Ait. R. traxinifolia, Bor. A.). Stems slender, 5 ft. high, with few slender prickles or unarmed: flts. 5-7, elliptic to obovate-oblong, usually acute, simply serrate, glabrous or pubescent beneath, ¾-2½ in. long; stipules dilated: fls. usually several, pink, 2-2½ in. across, on smooth peduncles: fr. globular, sometimes elongated. May, June. Newfoundland to N. Y., west to Wis. and Ill. B.B. 2:229.

39. Arkanassana, Porter (R. blanda, var. setigera, Crép., and var. Arkanassana, Best). Stems low, sometimes 6 ft. high; flts. 7-9, broadly elliptic to obovate, usually cuneate at the base, simply serrate, more or less pubescent beneath, ¾-2 in. long; stipules usually entire: fls. corymbose, rarely solitary, pink, sometimes white, ¾-2 in. across; outer sepals with one or few lobes. June, July. Minn. and Brit. Col. to New Mexico. B.B. 2:239. Mn 3:116. —Adapted for covering dry slopes and barren places. According to E. L. Greene, the true R. Arkanassana 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. pratitocola; this form is described above. The true R. Arkanassana, Porter, differs by its glabrous foliage, glandular and bristly stipules and reflexed sepals. At the same place (Pittonia, 4:10-14) Greene describes four other new species belonging to this section.

40. acicularis, Lindl. Stems low, densely prickly: flts. 3-7, broadly elliptic to narrowly oblong, rounded at base, simply or doubly serrate, pubescent beneath, ¾-2 in. long: fls. solitary, deep rose, ¾-2 in. across, fragrant; sepals entire and nearly glabrous: fr. globular to oblong, ¾-1 in. long. May, June. Alaska to Ontario and Colo., N. Eu., N. Asia, Japan.—A very variable species.


2160. Rosa cinnamonae. See No. 35.

41. rugosa, Thunb. Figs. 2148a, 2162-4. Upright shrub, attaining 6 ft., with stout stems densely beset with prickles and bristles: flts. 5-9, oval to obovate-oval, rugose, shining and dark green above, glaucous and
pubescent beneath, thick and firm, ¾–2 in. long; petals tomentose and bristly; stipules dilated; fls. solitary or few, purple or white, 2½–3⅓ in. across; bracts large; pedicels prickly; receptacle smooth; fr. depressed-globose, brick-red, to 1 in. across. May–Sept. N. China, Corea, Japan.—Very variable species. Vars. férox, C. A. Mey. (var. Thunbergiana, C. A. Mey. K. férox, Lawr. R. Regelianus, André & Lind. R. Andreea, Lange). Stout and densely armed; lvs. thick, very rugose and shining; fls. large, 3¼ in. across; fr. 1 in. across. S.Z. 1:23. B.R. 5:420. Gn. 30:1049; 42, p. 537. G.C. H. 14:372. Gn. 46, p. 324; 52:1144; 55, p. 434. I.H. 18:47. (Aug. 1:7; 5:339. A.½ 13:342, 344; 18:567. Var. Kameshática, Regel (R. Kameschática, Vent.). Less densely armed: lvs. thinner, less rugose: fls. and fr. smaller. B.K. 5:419. B.M. 3149. Besides these the following forms are often cultivated: Var. alba, with large white fls. Gn. 9:20; var. alba pléna, with double white fls.; var. rosea, with pink fls.; var. rúbra, with purple fls.; var. rúbra pléna, with double purple fls. Gn. 24:846. R. rugosa is one of the most ornamental Single Roses, especially for shrubberies; 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-flowered 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. 446, 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, scabrous, usually numerous and mixed with bristles: lfts. very small, usually 9; stipules narrow, with divergent and dilated auricles; fls. solitary, without bracts; sepals entire, erect and persistent.

42. spinosissima, Lind. (R. pimpinellifolia, Lind.). SCOTCH ROSE. Low shrub, with upright recurving or
spreading branches, 3 or 4 ft. high, usually densely beset with slender prickles and bristles: lfts. 5-11, usually 9, orbicular or oblong-ovate, simply or doubly serrate, glabrous, sometimes glandular-serrate, 5 ½-9 in. long; fls. solitary, but usually very numerous along the stems, pink, white or yellowish, 1 ½-2 in. across; pedicels smooth or glandular-hispid: fr. globular, black. May, June. Eu., W. Asia to China. Gn. 55, p. 425. — Very variable. Var. altissima, Thory (R. Althea, Wildl. R. grandiflora, Lindl.). More vigorous: fls. large; white; pedicels smooth. B.R. 11:888. Gn. 53:1599. A.F. 12:1099. 


Var. myriaacantha, W. D. Koch (R. myriaacantha, DC.). Branches very prickly: lvs. doubly glandular-serrate, very small: fls. small, white, blushed. Red. Ros. (1:6,7). There are also vars. with double or semi-double, pink, white or yellow fls. (Gn. 29:544). Several hybrids are known. R. Híbríndica, Smith, a low shrub with glaucous green foliage and small pale pink fls., is a hybrid with R. canina, R. rubétia, Smith, with dark green foliage, red fls. and scarlet, pendulous ovate-oblong fruits, is a hybrid with R. pendulina. R. revés, Waldst. & Kit., is similar and probably of the same parentage.

SECTION X. LUTEA. Two Asiatic species. Upright or somewhat sarmentose shrubs, with scattered, straight or hooked prickles; stipules usually narrow, with divergent and dilated auricules: fls. yellow, without bracts; sepals entire, persistent, upright.

43. Eglantería, Linn., not Mill. (R. lutea, Mill.). Shrub with long, slender often sarmentose or climbing stems,

2 63. Fruits of Rosa rugosa (× 3/4).
No. 41.


Var. Härisoni, Hort., Harrison's Yellow Rose, is of paler color and a little less double than Persian Yellow, but it blooms more freely, is more vigorous, harder and easier to grow. It is of American origin and may be a hybrid of Persian Yellow with Rosa spinosissima.

SECTION XII. SERICEA. One Asiatic species. Erect shrub, with the prickles in pairs; stipules narrow, with erect dilated auricles: fls. solitary, without bracts; sepals entire, persistent and upright.

45. sericea, Lindl. (R. tetrapetala, Royle). Attaining 12 ft., with prickly and often bristly branches: lfts. 7-9, oval or obovate, serrate, glandular or silky pubescent beneath, ¾-¾ in. long; fls. white, 1½-2 in. across; petals usually 4, sometimes 5: fr. globose or turbinate. May, June. Himal. B.M. 5209, R.H. 1897, p. 444, 445.

SECTION XII. MINUTIFOLLE. Two American species. Low shrubs with slender, scattered prickles: lfts. small, incised-serrate; stipules with dilated and divergent auricles: fls. solitary, without bracts; sepals erect, persistent, the outer ones pinnate.

46. minutifólia, Engelm. Dense spreading shrub, 4 ft. high: lfts. 5-7, ovate to oblong, incisely dentate, puberulous, ¾-¾ in. long; fls. short-pedicelled, pink or white, about 1 in. across; fr. hispid. April, May. Calif. G.F. 1:102.
47. stellata, Wooton. Similar to the preceding: lfts. 3-5, broadly obovate-obovate: fls. 1½-2¼ in. across, deep rose-purple. New Mex. Bull, Torrey Bot. Club 25:335.—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. BRACÉATE. Two Asiatic species. Shrubs with erect or sarmentose and tomentose or pubescent stems; prickles in pairs; stipules slightly adnate and pedicinate; inflorescence with large bracts; sepals reflexed after flowering, entire; receptacle tomentose.

48. bracteata, Wendl. (R. Macdoum, Dum.). MACARTNEY ROSE. Stems usually procumbent or sarmentose, villous-tomentose, with stout hooked prickles: lfts. 5-9, oval to obovate, crenately serrulate, bright green above and somewhat shining, almost glabrous beneath, ¾-2 in. long: fls. one or few, short-stalked, white, 2-2½ in. across; sepals and receptacle densely tomentose. June-Oct. S. China, Formosa; naturalized in Fla. and La. B.M. 1877.—Handsome half-evergreen climber, not hardy north.

SECTION XIV. LÉVIGATA. One Asiatic species. Climbing shrub, with scattered hooked prickles; lfts. generally 3; stipules almost free: fls. solitary, without bracts, large, white: sepals erect, entire, persistent.


SECTION XV. MICRÖPHYLLA. One Asiatic species. Upright spreading shrub, with the straight prickles in pairs: fls. 1½-2 in.; 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: lfts. 11-15, 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, ½-2 in. across, very prickly. June, July. China, Japan. B.M. 6548.—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.
ROSCOEA

**Supplementary List.**

(The Roman figure indicates the group to which the species belongs.)


**Alfred Rehder.**

ROSA

**ROSCOEIA**

See *Sinningia*.

**ROSCHEIRIA** (name unexplained). *Palimdacea*. A genus of one species, a palm from Seychelles allied to *Hyphorbe*, which see for differences. It is slender, erect, spiny at the nodes: lvs. terminal, long-petioled, at first 2-3 ft., later unequally pinnaless; segments numerous, linear-lanceolate, 2 ft. at the apex, the numerous nerves scaly beneath; petioles spineless, somewhat 3-sided, concave above; sheath long, prickly; spadix 2-6 ft. long: peduncle long, slender, compressed; branches slender, rather simple, divaricate; spathes many, entire, narrowed, lengthened, and reflexed, fls. lower ones persistent, the upper deciduous: fls. pale: fr. fusi-form, small, black.

**melanochôtes**, Wendl. (*Verschaffeltia melanochôtes*, Wendl.). Trunk 15-25 ft. high, 2-3 in. in diam., with many serral roots, and when young with a ring of spines below each leaf-scar: lvs. 4½-7 ft. long; petiole 1½-2½ ft. long, smooth, with a pale band running from the top of the sheath down the back of the petiole; sheath 14½-5½ ft. long, with a few fine black spines; leaf-blade pale green, 7½-5½ ft. long, 2½ ft. broad, entire when young, unequally pinnate; segments 1¼-1½ ft. long, 2½ ft. at the apex, clothed beneath with peltate scales. Seychelles. 1.H. 18:54.

**Jared G. Smith.**

**ROSOCEA** (Wm. Roseco, founder of the Liverpool Botanic Garden). *Scitamindaeae*. A genus of 6 species of half-hardy perennial herbs from the Himalayas, with...
purple, blue or yellow fls. terminating the leafy stems. Lvs. lanceolate or oblong; fls. terminal, usually few-flowered; spikes: bracts persistent, 1-fld.; calyx long-tubular, slit down one side; corolla-tube slender, as long as calyx or longer; lateral staminodes spreading; lateral staminal ollanceolate, petaloid; lip large, cuneate, deflexed, 2-ecleft or emarginate.

**purpurea.** Sm. Stem ½-1 ft. high, with 5-6 sessile, lanceolate, sheathing lvs, about 6 in. long; fls. few, purple, rarely white or pink, in a sessile spike, appearing once at a time in midsummer. B.R. 27:61. B.M. 4630. Le.B.C. 15:1404. G.C. III. 8:191.—*The most hardy species of the genus.* Var. **Sikkimensis,** Hort. Elwes (R. Sikkimensis, Van Tubergen), is said to differ in having the epiphyllous habit and more numerous fls. of a different shade. Consult G.C. III. 8:221. F. W. Barclay.

**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 pains 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, II. 24, p. 199 (1885).


Following are the names of some of the common names of Roses:

**Ayrshire** .......................... R. arvensis, var. capreolata
**Banks Rose** ........................ R. Banksi
**Bengal** ............................... *R. Chinensis*
**Bourbon** ............................. *R. Borbonica*
**Champagne** .......................... *R. Noisettiana*
**Cherokee** ............................. *R. laviyiata*
**Cinnamon** ........................... *R. cinnamomea*
**Damask** .............................. *R. Damascena*
**Dog** ................................. *R. canina*
**Eglantine** ........................... *R. rubiginosa*
**Memorial** ............................ *R. Wichurana*
**Moss** ................................. *R. Gallica, var. mucosa*
**Musk** ................................. *R. moschata*
**Noisette** ............................ *R. Noisettiana*
**Prairie** .............................. *R. setigera*
**Provençal** ........................... *R. Gallica*
**Scotch** ............................... *R. spinosissima*
**Sweetbrier** .......................... *R. rubiginosa*
**Tea** ................................. *R. Chinensis, var. fragrans.*

Horticultural Classification of Roses.—The garden classification of Roses presents considerable difficulty, as the several groups have been so much mixed that the original characteristics of each overlap at nearly all points. This is particularly true of the Perpetuals, of which any close classification is impossible. The difficulties increase as one advances. Certain clear-cut characters may be taken to mark certain distinct groups in the summer Roses, with which the horticulturist has not busied himself so much. Nearly all of these char-

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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 Rose beauty of Europe. The Wichuranae, Rugosa, 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)
   a. Growth branching or pendulous: leaf wrinkled
      1. Providence
   b. Growth climbing: fls. produced singly
      4. Ayrahite
   BB. Growth short-jointed, generally, except in Alpine
      5. Niviera
      BB. Growth climbing: fls. in clusters
      6. Multiflora
      BB. Growth free: foliage persistent (more or less)
      7. Evergreen
      BB. Growth free: foliage wrinkled
      8. Pompon

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**Class II. Summer- and autumn-Flowering Roses, blooming more or less continuously.**

A. Large-flowered.
   B. Foliage very rough
   9. Hybrid Perpetual
   10. Hybrid Tea
   BB. Foliage rough
   12. Bourbon Perpetual
   13. Bourbon Perpetual
   BB. Foliage smooth
   14. China
   BB. Foliage smooth
   15. Lawrenceana (Fairy)
Plate XXXV. A Tea Rose.—Bridesmaid
ROSE

AA. Smaller flowered.
   b. Foliage deciduous.
   c. Habit climbing ....15. Musk
   16. Ayrshire
   17. Polyantha
   Wichurana Hybrids
   c. Habit dwarf, bushy.18. Perpetual Briers
   Rugosa
   Lucida
   Microphylla
   Berberidifolia
   Scotch
BB. Foliage more or less persistent ..........19. Evergreen
   Macartney
   Wichurana

   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: Iv's. 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 gener-
   ally light-colored flowers. Type Princess Clementine.
   Other subdivisions include hybrids with nearly all of
   the Perpetual group. Madame Plantier is a Hybrid
   Noisette. Coupé d'Hebe is a Hybrid Bourbon.

Hybrid China (China x French and Provence, par-
   taking more of those parents). Growth more diffuse
   than the French Rose; foliage smooth, shining and
   remains on the bush late in the year; thorns num-
   erous 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

2168. American Beauty Rose (X 14).
   Probably the most famous Rose now cultivated in America.
   One of the Hybrid Perpetual class.
size: leaf whitish above, deep green below: spineless
   (some hybrids with other groups are very thorny), of
   free growth; prune closely. Type, Felicite Parmentier
   and Maiden's Blush.

ROSE

2169. Paul Neyron (X 34).
   A popular rose-colored variety of the Hybrid Perpetual type.
   deep crimson. Type, Queen of the Belgians, Dundee
   Rambler. Ruga is a hybrid between this group and one of
   the Teas; fragrant.

Garden-group 5. Briers. Under this heading may be
   grouped most of the well-defined types of garden Roses,
   mostly small-flowered and which do not readily respond
   to high cultivation. They are more useful as flowering
   shrubs in the garden than for cut-flowers. The blooms
   are generally short-lived.

Austrian or Yellow Briers. Small leaflets: solitary
   flowers: bark chocolate-brown. Very hardy, but re-
   quire pure air and dry soil; will stand very little
   pruning, producing flowers from the upper ends of
   the old wood. Types, Harisoni, Austrian Copper and
   Persian Yellow.

Scotch or Spiny. This group is well recognized by
   its excessive spininess; the spines are also very
   sharp: compact, low bushes, flowering abundantly and
early: flowers small, double. Multiply by under-
ground suckers; fragrant. One hybrid of this group,
   Stanwell, is a Perpetual.

Sweetbrier. Distinguished by the fragrance of its
   leaves: the fruits are also decorative: foliage small:
   flowers light-colored generally and not held of much
   account.

Lord Penzance Briers. This is a group of hybrids
   of R. rubiginosa (the Sweetbrier), and the older large-
   flowered varieties, especially Bourbon and Damask.
The results are hardly distributed in America as yet;
a few are to be found in select collections. Generally
speaking they may be described as very greatly im-
proved Sweetbriers. Brenda is particularly desirable
for its fruit.

Prairie Rose (R. sedigera). A native species; prom-
ises under cultivation to develop some valuable ac-
quires, 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 Amadis. Pro-
duced by crossing Tea and R. alpina.
Garden-group 6. Multiflora. The Multiflora group
divides itself naturally into the Multiflora true and
Polyantha. R. multiflora, the parent type, is character-
estic of the varieties here, the flowers being produced
in large corymba and continuing over a comparatively
long time. This group is particularly well adapted to
the wild garden. There are many hybrids, which are

2170. La France, a famous Hybrid Tea Rose (X 1/2). known in cultivation under the general term of Rambler Roses.
The Polyantha section has given a fairly hardy variation 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 year. 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.


Weichsiana (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-

bids have been raised from Hybrid Perpetual and Tea varieties giving large flowers, scented; such are Gardenia and Jersey Beauty. Several hybridists are now working on this species and in the next few years promise remarkable developments. W. J. Shauid in New Jersey, M. H. Walsh in Massachusetts and M. Horvath in Ohio are thus engaged.

Cherokee (R. brevifolia) of the southern states can be grown satisfactorily way from its native regions only in a greenhouse. Figs. 2152-54.

The Banksian (R. Banksi). Two varieties of this are known, the yellow and the white. Requires greenhouse treatment: very free flowering; long, thinning, merely shortening the shoots that have bloomed. This variety is suitable for the white varieties possessing the odor of violets: flowers are produced in graceful drooping clusters.


Garden-group 9. Hybrid Perpetua, or Hybrid Re-
monant. A large and comprehensive group of much 
mixed origin. The mixture with other groups has be-
come so involved as to render separation practically
impossible. The characteristics may be described as
stiff, upright growth, sometimes inclined to pendulous:
ds, all fully: foliage dull green, wrinkled, not
embracing generally the characteristics of the Provence, 
Damask, French and the Chinese groups: d's, large, in-
clined to flat, generally of dark colors. By far the
largest and most comprehensive division. Figs. 2155-57.

Garden-group 10. Hybrid Teas form a section of the Hybrid Perpetual group crossed back on to the Te-

2171. The Tea-scented China. The Tea-scented China, gradually losing all identity. They dif-
fer from the pure Hybrid Perpetuals by having foliage
of a deeper 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 Mon-
erville de Lyon, H. P., and Belle Siebrecht Hybrid Tea.
The La France type belongs here. Fig. 2170.

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 leaves:
very floriferous; brilliant colors; good outline; in per-
fecion late in the season; requires close pruning. Type, 
Hermosa (or Armosa).

Garden-group 13. Bourbon Perpetual. Very flor-
iferous; flowers moderate-sized, well formed, in clus-
ters, Madame Isaac Pereire.

Garden-group 14. China. The China or Monthly
Rose is characterized by its positively perpetual man-
er of flower. Its blooms become much darkened in
color from the action of the sun's rays: d's 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 yel-
low: growth free; the best for forcing. The group has been hybridized with all other sections and the Tea influence is seen throughout the Rose family. Some of the varieties are climbing. Type, Bon Silene and Homer.

Lawrenciana. 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: d's, of pale color.
This group has been much hybridized with others, and its
identity is lost as a garden plant in that of its deriv-
atives; especially the Noisette. The flower buds are elongated and the flowers produced in clusters.

Noisette. Fig. 2172. Larger flowering than the true Musk Roses; flowering very late: free growth: more
hardy. The group bears a certain superficial resem-
blance to the Teas and requires moderate pruning;
but will grow in any soil. This sub-group has been
largely blended with the Teas and with a loss of hard-
ine. In consequence it has fallen into disuse.

Garden-group 16. Ayrshire. Perpetual forms of the
Ayrshire. For characters, See Summer Roses.
ROSE

Garden-group 17. *Polyantha.* Perpetual-flowering varieties of the Multiflora group. The term in gardens is taken to include a large number of small cluster-flowered clones especially by American Rose culture, as the basis of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichuraiana and Teas. M. H. Walsh in *Massachusetts Horticulturist* (Mass. Hort. Soc. Proc., 1859) says: "Dawson in Massachusetts have accomplished important work in this field. Some of Walsh's recent introductions, as Debutante and Sweetheart, not as yet fairly tried, and the Dawson Rose may be classed here. They are reliable as trolls and pillar Roses for garden decoration."

Garden-group 18. *Perpetual Briers.* Of this group there are about five important types.

The Rugosa Japan Rose, a low-growing bush: hardy, useful as a hedge plant, and specially adapted for exposed situations near the seaside. Figs. 2162-4. Hybrids have been made with other Perpetual groups, especially Teas and H. 1st's. Mme. Georges Braun is a type. The Rugosa blood is strongly seen in all cases.

Lucilia, 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. hortensis.*

Wichuraiana. The Wichuraiana hybrids already referred to in the Polyantha group may dubious 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 Bourbon, Bengal 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 bushes so that they do not shade them or rob them of ventilation. 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 roots may roil the Rose." A hillside is in the sun and away from the 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 shovel away several inches of snow and break up the frozen earth of the earth with crow-bar and pick-ax 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, hardy and half-hardy 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 and width. Budded plants should be set so that the joints will be three inches under the surface of the ground. This is the only way to secure immunity from suckers growing from the root into which the bush has been budded. The best fertilizer for roses is rotted cow manure. The next in value is the manure from the pig-sty.

Nearly all of the Hybrid Perpetuals and Mosses will stand the severe winters in the northern states without protection, but it is best to protect them. Al. Bourbon, Hybrid Noisette, Hybrid China and Hybrid Teas in the northern, and in some of the middle states, must be protected; "excelsior" tied around the bushes to the height of 12 or 15 inches gives sufficient protection.

When the leaves are out and the buds well formed a mixture composed of three parts of wheat flour and one of white helobble sprinkled on the foliage when wet after a rain or dew disposed of the most dangerous foes of the Hybrid Perpetual. The dew and flour make a paste that holds the helobble on till its work is done. A tea made of tobacco stems will destroy the insects most troublesome in July and August. Trimming should be done in the spring before the sap begins to flow.

The following embrace the best of the Hybrid Perpetuals: Alfred Colomb, Anne de Diesbach, Baron de Bonetten, Baroness Rothschild, Chio, Earl of Dufferin,

**ROSE**

2171. Yellow Tea Rose, Madame Honoré Defrane, popular in the South (X 35).


The Moss Rose (*Rosa Gallica, var. muscosa*): These are like the Moss Roses except that they are autumnal bearers. Mme. Edward Dry, Salet and Soupert-et-Notting are the best of this class. The best results 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, is praised 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
leaflets and single flowers of a coppery yellow color. It is so hardy that it can brave the most rigorous climate where man till the soil. Persian Yellow, Harisonii and Copper are the most valuable varieties. They should be pruned sparingly.

Hybrid Climbing Roses. These are especially useful as pillar Roses. The most valuable are Climbing Jules Margottin (See Fig. 2179, page 1567) and Glory of Ches-terfield.

The Prairie Rose (Rosa setigera) is the hardiest of climbers. This quality, with the rapidity and vigor of growth, has given them a wider popularity than any other climber. 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 Trium-phant. The pruning knife should be used sparingly.

Hybrid China Rose (Rosa Chinensis forms): Many Roses classified as Hybrid Perpetuals properly belong here. If Ellwanger's suggestion that all French, Provence, Damask and Hybrid Bourbon be grouped under the Hybrid Chinas is adopted, Rose classification will be much simplified and little will be lost in accuracy. Madame Plantier is the best known and most valuable of all the group.

Half-hardy Roses: Bourbon Rose (Rosa Bourbon- ica): This group for the most part is composed of au- tumnal bloomers. They are popular as garden Roses. Hippomos is the freest bloomer. Appoline is the most beautiful. George Peabody and Malmaison are also deservedly popular. The moderate growers of this group should be closely pruned.

The Hybrid Noisette (Rosa Noisettiana, var. hybrida) has made several contributions to the rosarian. The least hardy but the most beautiful members of this group are Madame Noman, Mlle. Bonnaire and Eliza Bode. Rivals in beauty and more hardy are Co-quette des Alpes, Coquette des Blanches. The pruning knife should not be spared with this class.

The Hybrid Tea Rose (Rosa Chinensis, 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 Au-guste 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-growing bush, blooming from near the ground (Fig. 2174).

EDMUND M. MILLS.

Another View of Gar- den Rose - Growing. Roses may be success- fully 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 outskirts 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 accom- plished 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 composting of the soil and the bedding on the class of Roses to be grown, for the Hybrid 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 satisfac- tory, as a double row can be planted at intervals of 2 1/2 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 tramp- ing on the soil. Space may be economized by planting as in the following diagram:

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 the bed on a lawn, the sod and soil should first be entirely removed and placed apart; then the best 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 soil and sand is mixed and with a generous dress- ing of well-decomposed stable manure; lastly the surface soil and sod well broken up and a so thoroughly enriched with manure, and the bed filled to the level of the ad-joining 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 neighboring sod, in order that all the rain fall be re- tained. The writer be- lieves 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 Remontant class, it should contain a fair proportion of clay well mixed with the soil. A suf- ficient 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 bed is intended for Hybrid Teas, Teas, Bourbours 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. 2156, 2175. 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 Polkestone, both charming Roses when well grown. The budded plants are mostly grown in Europe, taken up as soon as the wood is ripened in the autumn, and shipped to us in the dormant state in time for planting in the latitude of Philadelphia before the ground is frozen. They are usually received in such excellent condition that rarely one in a hundred of the hardy sorts fails to make a 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 of the inability of the plants to endure the rigors of our winters before becoming established. Consequently they need 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.)

Plating 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 from which the new growth starts placed 2 in. below 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. 2176. Manure should never be placed in actual contact with the roots, but near hand, where the new feeding roots can easily reach when growth begins.

2174. A Rose bush for the corner of the garden.

The remaining soil should then be packed in firmly, the surface leveled and covered with about 3 inches of coarse litter and manure, and the long wood cut back to about 15 inches to prevent the plant being whipped and loosened by high winds. This extra wood is left to encourage root action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to strong outside bud, without injuring it, to develop an open and free head, thus 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 speedily choke and kill the less vigorous wood which we are endeavoring to develop. From the writer's point of view the objection to budded plants is this danger of sucking 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 to prevent its starting again. 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 few inches outside of the regular growth, rarely inside; 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, so 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 placed 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. Pot-
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 sectional frame made from tongued and grooved white pine fencing, 2½ ft. in height at the back and 1 ft. in front, facing east or southeast and fastened together with hooks and eyes or screws, the whole covered with ordinary coldframe sash (6 x 3 ft.), will preserve the tender varieties through a severe winter. The cold frame should be freely opened while the temperature is above 30°F, and air admitted during the day when it is 10 or 15°F 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°F will destroy most of the buds for the coming June, as they will become too strong for the heat to out, and one cold night will kill them. **Protect from rains or 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 are hundreds of fine blooms from May until November and remain so vigorous that many of the new shoots 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 or 9 ft. high. They also look well trained on the house porch, but are much more likely to be 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, so Roses 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 wanted 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 they 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 cared for with glass. Lamarque, Bouquet d’Or, Cloth of Gold, Triomphe de Rennes, Marchéal Niel and Rêve d’Or, have, in the writer's experience, all perished in the first winter. Reine Marie Henriette, Glore de Dijon, William Allen Richardson and Cellier Breestier will do well and yield satisfactory results. The finest climbing Tea for this latitude is Reine Marie Henriette. It blooms abundantly 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, dividing the space 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 Roses may be gathered throughout the summer and autumn. With the hardly June-flowering varieties the writer has not had much experience and can only recommend Crimson Rambler and Cheshunt Hybrid from actual observation. 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 satisfactory varieties were cultivated, and such kinds as Baltimore Belle and Prairie Queen do not compare favorably 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 for cutting; but with short canes it only stales 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 yearly, 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 in most varieties to hold up the largest flowers and to give magnificent specimen flowers for cutting. Roses grown in this way do not
need stakes. They are sufficiently strong and vigorous to hold erect any weight they may be called upon to bear; but late in the autumn, before the high gales of November arrive, they should be cut back to about 2 ft. to leave their limbs whipped by the winds, for 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 ends will surely be frozen out and the promised blooms for the ensuing season destroyed; so in pruning for protection from November blasts, enough wood should be left to avoid all danger of the lower buds being forced out. The upper buds always develop earliest. Some varieties will not produce flowers on footstalks under any method of treatment, notably Prince Camille de Rohan, La Rosarie and Rosieriste 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 branch cut back to 1 or 2 eyes, and after each period of bloom the longest shoots should be cut back and thinned sparingly. Below the shoots need even less trimming. Souvenir de la Masion, 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 trampled upon and this should be done with the spaded 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 garden trowel around each plant, the next follow and fill with the liquid manure, being careful to avoid bruising the leaves; afterwards the bed can be raked over level and the rain will wash the dainty food to the eager roots, and thirst and glory will result. This may be repeated with benefit every week 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 winter 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 Roses 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 potash to the soil and materially 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 macerated, 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. R. 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 infected shoots dipped into it. Pure water should follow the next day to cleanse the shoots.” If, at the first appearance of these ants, 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 from the left hand and, with the brush dipped in the solution, throw the drug up and against the leaves. One thorough application will usually suffice, but if the slug has appeared in previous years, anticipate his coming.
ing and apply the hellebore 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 loose, 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, willspeedily 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, Clio, Countess of Oxford, Dinsmore, Dr. Andry, Duke of Edinburgh, Duke of Teck, Etienne Levet, Eugenie Verdier, Fisher Holmes, Francois Michelon, General Jacqueminot, Giant of Battles, Heinrich Schultheis, Her Majesty, James Brownlow, Jeannie Dickson, John Hopper, James D. Paul, Lady Helen Stewart, Mabel Morrison, Madame Gabriel Luizet, Magna Charts, Marchioness of Lorne, Margaret Dickson, Marie Baumann, Marie Verdier, Merville de Lyon, Mrs. John Lang, Mrs. R. G. Sharman Crawford, Paul Neyron (Fig. 2169), Pride of Waltham, Prince Arthur, Prince Camille de Rohan, Rosslyn, Rev. J. B. M. Camm, Suzanne Marie Roodecamachii, Ulrich Brunner, Xavier Olibo.

Hybrid Tea.—Augustine Guinoisian, Captain Christy, Caroline Testout, Giroire Lyonnaise, Kaiserin Augusta Victoria, Madame Joseph Combet, Miss Ethel Richardon, Souvenir du President Carnot, Souvenir de Madame Eugenie Verdier, Viscountess Folkestone.

Mr. Alexander B. Scott recommends the following additional H. T. varieties: Antoine Rivoire, Baldwin, Bossie Brown, Gruze an Teplitz, Killarney, Lady Clamorough, Madame Joseph Combet, Miss Ethel Richardson, Souvenir du President Carnot, Souvenir de Madame Eugenie Verdier, Viscountess Folkestone.

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Tea-scented Roses.—Alphonse Karr, Comtesse Riza du Parc, Duchesse de Brabant, Etoile de Lyon, Francesca Kruger, Innocente Pirola, Isabella Sprunt, Madame Lambard, Madame Mathias, Maman Cochet, Madame Joseph Schwartz, Marie van Houtte, Papa Gontier, Sarfran, Souvenir d’un Ami, The Queen, White Maman Cochet.

Most Roses.—Comtesse de Martinis, Blanche Moreau, Crimson Gloire, Lanei, Princess Adelaide.

Climbing Roses.—Climbing Rambler, Cheshunt Hybrid, Gloire de Dijon, Celine Forestier, Reine Marie

Lady Penzance, Lord Penzance, Lucy Ashton, Lucy Bertram, Meg Merrilies, Minna, Rose Bradwardine.

The Hybrid Wichuraianas 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,
Plate XXXVI. Rose, American Beauty
sod 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-in, which is delayed as late as possible in order not to invite 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 1896-97 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 Hybrid 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 Camille de Rohan, H. R.; Magna Charta, H. Ch.; Mrs. R. G. Shamar Crawford, H. R.; General Jacqueminot (Rousselet), H. R.; Captain Christy, H. T. (Hybrid Tea); La Rosière, H. R.; Captain Hayward, H. R.; Mrs. Paul Bour.; Garden Favorite, H. R.; Louis Van Houtte, H. R.; Paul Nevrom, H. R. (Fig. 2109); John Hopper, H. R.

The following dozen were in fair condition after the winter and recovered their form during the season: Mme. Victor Verdie, H. R.; Pierre Notting, H. R.; Anne de Diesbach, H. R.; Ulrich Brunner, H. R.; Baronne Fresot, H. R.; Eugene Furst, H. R.; Prince of Wales, H. R.; Alfred Colomb, H. R.; Lyonnaise, H. R.; Mme. Gabriel Luizet, H. R.; Countess of Oxford, 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 Greville (Seven Sisters), Crimson Rambler, Thalia, Paul’s Carmine Pillar, Multiflora and the Dawson Rose were in fairly good condition when wintered under protection. The failures even when protected were Aglaia, Alister Stella Gray, Euphrasynae, Russell’s Cottage, Baltimore Belle, Tennessee Belle. The typical Sweetbriers proved hardly unprotected, but the hybrids of them were killed. Protected R. Wichuraina and its hybrids killed back to the roots; H. rugosa and most of its hybrids, especially those of Jackson Dawson 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 hedders for permanent planting when protected, and the so-called Fairy Roses stand fairly well, especially Mlle. Cecile Brunner. Papa Goutier and Kaiserin Augusta Victories 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 browns in the bud under our sun, and, strange to relate, the writer cannot grow them. Mme. Mrs. John Laing successfully, either on its own roots or budded. R. rubrifolia (or terruginea), R. spinosissima, var. Alitana, R. nudita, R. lucida and R. humilis were hardy without protection.

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 44th parallel, and still farther north the East European R. rugosa and such of its hybrids as Snowlight, Empress of the North and Rosa majalis l. p., 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 Russian. 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. Regelian a (p. 1556), and which we know as the Russian Rose rugosa. The first two named came from seeds of Rosa Regelian a introduced by the writer in 1883 crossed with pollen of General Jacqueminot, and the last three were developed from seeds of R. Regelian a in Germany as stated by L. Späth, of Rixdorf near Berlin. They are all fine double Roses of one class and very distinct classes. The one from the Amur valley in

2182. Russian form of Rosa rugosa (X 3¼).

2183. The I. A. C. Rose (X ¾).

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 rugosa leaves, and larger flowers than the Japan type, but its hips are smaller. 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 folded petals shades of rich red and crimson. Its clusters of flowers differ, as it forms large 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.

As the same we pollinated the blossoms of our native species Rosa blanda and Rosa Arkansana with pollen of General Jacquemontin and other Hybrid Perpetuals, but wholly without valuable results, as the crosses were not at all vigorous. Most of the hybrids showed a modified foliage and habit of growth, but all except three bore single flowers. The three double varieties developed blossom-buds freely, but in no cases have the blossoms expanded into perfect flowers. When appearing entirely 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. Rugeliana, does produce markably vigorous hybrids which yield clusters of promising buds, but up to the present not a single flower-bud has fully expanded. The late E. S. Carman, however, reported better results with this cross of Harison’s Yellow rugosa (A. G. 1896, p. 660). It is apparent that the future of these hybrids is shown in Fig. 2186. As in Europe, our marked success has been with the pollen of General Jacquemontin, 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 perfectly 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 Northwest. We already have fine double varieties with 60 petals to the flower, with the rich color of the General Jacquemontin and the fine leaves of R. rugosa. The main trouble at present is in propagation. As with the type, the best hybrids of R. rugosa are difficult to grow from cuttings. We find that the buds 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 advised, as the vigor of some of the hybrids is remarkable. A writer’s lawn is a patch of this hybrid variety three years old that stands 7 ft. high, with several stems three-fourths of an inch in diameter.

J. L. BUDD

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 partially owing to adverse conditions, such as great range of temperature, frequent twenty-four hour 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 accessibility of the majority of localities. 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 being several hundred feet higher than Los Angeles, is therefore less subject to fog or great range in daily temperature. In some places a certain few Roses will produce an astonishingly fine crop of bloom, while but a few feet distant, with but a slight difference in altitude, they will be utterly worthless; while a like number of other varieties will give as good returns as those first mentioned. Consequently the Rose grower must select the best of the variety he can, and the best dozen Roses I can grow?” is usually met by the equally pertinent query: “In what part of the city do you live?”

Roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a continuous crop of blossoms than any other. For this reason it stands in a class by itself and is not considered in the appended list of the best dozen Roses for southern California, though every one should grow at least one bush of this variety. Along with the Duchesse might well be placed the Polyantha Madame Ceci Brunner, and the climbers Cherokee, Bankhead’s Ophir (or Gold of Ophir), Beauty of Glazenwood or Fortune’s Double Yellow. All these produce most wonderful crops, but none more so than the last mentioned, which in favored regions produces a wealth of flowers simply due to favorable conditions. The same writers assert that Gold of Ophir and Beauty of Glazenwood are one and the same Rose, but this is by no means the case and the writer can furnish satisfactory proof for the separate identity of these two varieties. Gold of Ophir was here for many years before the other made its appearance, and some of the original plants are still growing on many of the old frontyards of Los Angeles and within the writer’s knowledge, and are at least as good as the most rare and valuable varieties. The writer is disposed to believe that this variety and the Duchesse de Brabant are the two varieties that will prove most reliable and sure to produce a fine bloom in any localities where the winter season leaves the grower no alternative. But the same amount of rest may here be given semi-annually, with equally as good and perhaps better results than is possible with one long annual period of inactivity.

The writer firmly believes that with a proper exercise of intelligence in the selection of varieties and subsequent care of plants, better results can be obtained in California than in any other state in the Union. Though some few localities must be excepted, they form but a very small area and may be passed with a mere mention of their existence. Climate is the all-important feature of Rose culture in this section, and if that be satisfactory the character of the soil makes little difference. Our dry summer air is a serious drawback to the growth of many Roses, there being few places where Roses thrive, and these must be grown in white or partial shade. Niphets and Merechals Nell are good examples of Roses requiring partial shade if good results are desired. Many localities cannot grow the two above named, and care must be taken to choose varieties where the writer can be better than any other agency. Laurette is a Rose which often produces the only perfect flowers to be
found among a hundred varieties, and this is particularly the case in places visited by heavy frosts, Lau-
rette 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 Maréchal 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 peo-
ple maintain that all Roses are best on their own roots, but such
opinions are easily refuted by consulting any of our veteran ro-
sarains. 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 nurseriesman,
and the bulk of our local

2184. Full-blown flower of Madame
Georges Bruant Rose. Natural size.
stock is budded on Manetti or Maiden’s Blush, though
the Dog Rose (Rosa canina) and even the Banksia
are often used. These Roses grown on their own roots
are usually propagated from hardwood cuttings, grown
out of doors, and December is usually the best month,
The writer has successfully rooted them from
October to March, 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. Puller’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 “the back” (an-
thracose), 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 Cal-
ifornia, 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:
Bush Roses.—Marie Van Houtte, Madame Lambard,
Maman Cochet, Papa Gontier, Kaiserin Augusta Vic-
toria, Laurette, The Bride, Carmelina Mernet, Meteor,
Perle des Jardins, Caroline Testout, Elise Sauvage.
Climbers.—Lamarque, Maréchal Niel, Climbing Sou-
venir de Wootton, R’-ve d’ Or, Reine Marie Henriette,
Glorie de Dijon. This list will be found to be the best
for Los Angeles and vicinity in general. The intelli-
gent nurseryman or careful purchaser should be able
to make the slight changes required by peculiar condi-
tions.
To Mr. Frank Huston, nurseryman of Los Angeles,
the writer is indebted for many valuable points con-
tained 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.

Ernest Branton.
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

**R. multiflora** (the Japanese type), **R. rugosa** and **R. Wichuraiana**. The earliest experiments were made with **R. multiflora**, the object being first to obtain colored flowers and afterwards to get double ones, but always to keep the hardiness and habits of growth of **R. multiflora**. There are few pillar or half-pillar Roses that will stand our New England climate without protection, and therefore this type was chosen as the hardest, and effort was made to retain its strong constitution and later to get other improvements. How far the writer has been successful may be judged by his exhibits at the Massachusetts Horticultural shows and by a visit to the Arboretum. This work, started by some others as well as the undersigned, has been the means of having these new types of Roses taken up by the growers, and there are many possibilities for improvement. There seems to be no reason why they should not be as fine for use in the garden as the Hybrid Perpetuals are for flowers.

The first cross made by the writer was with General Jacqueminot, **R. multiflora** being the female parent, and the result was anything but satisfactory. At last a break was made. All sorts of forms were secured, some resembling both parents in flower and foliage, but most of them were worthless. Two were saved, one with large clusters of double purplish Roses, fully as large as Jacqueminot, with a big stem closely set with heavy spines, a long, rampant growth unlike either parent, the foliage of a Hybrid Perpetual and flowers in clusters of 10 to 20. The other, the widely known Dawson Rose (silver medal Mass. Hort. Soc. 1894) has large clusters of bright rose flowers, 20 to 40 on a stem, bright shiny foliage and a strong growth, sometimes running up 15 feet or more in height. The writer again crossed **R. multiflora** with Madame G. Luizet and obtained a half-climbing plant with large, single white flowers in clusters. An attempt was then made to cross these three crosses with other choice Roses for still further improvement, but no perfect seeds were made except on the Dawson. By crossing the Dawson with other Roses several fine forms have been secured, beautiful types of cluster Roses, single, semi-double and double, all more or less with the habit of **R. multiflora** in the trunk and with white, peach, 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 fine race 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 one was 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 com- pletely 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,
but the habit was half-scamdent 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; foliage fine, somewhat resembling the Bourbons, but also retaining the gloss of R. Wichuraiana. So far it has produced no seeds. Another was of medium growth, with bright shiny leaves and clusters of double purplish pink flowers, fading to lime. The best of the lot was a hybrid, 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, of a delicate pink color, resembling Souvenir de la Malmaison almost exactly but somewhat smaller; the foliage is also like Malmaison but brighter. It is perfectly hardy in the nursery and without protection.

Next R. Wichuraiana was fertilized with pollen from R. setigera, and while decided crosses were obtained the results were not altogether satisfactory. One of the best was saved for future use. The flowers are in color near R. setigera, and the growth prostrate as in R. Wichuraiana, but shorter jointed. The plant is very hardy. R. Wichuraiana was next crossed with R. rugosa, with more pleasant results; Lady Duncan is named from the Massachusetts Horticultural Society in 1900, having the prostrate, long, rampant growth of the mother, while the Rugosa blood shows in the foliage and flowers, these last being a warm, lively pink. The flowers are delightful contrast to the soft, pale pink blooms of the first. Another is somewhat deeper in color but of less vigorous growth. A curious fact concerning these extreme crosses is that not one of the Wichuraianas have been described above will seed, no matter how treated. From R. Wichuraiana impregnated by Cassone 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. Wich-
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. Wichuraiana, Madame Plantier and doubtless many others. Rosa Indica, in all its forms, all tender species and many Hybrid Perpetual Roses are propagated by cuttings of hardened wood grown under glass; Peter Henderson says the wood is in the best condition when the bud is "just open enough to show color." Blind eyes can also be used, and the shoots will then be planted in the open air the following June. They grow very rapidly. This is the strongest 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 eye shoots are preferred. 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.

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 thickly in good soil, allow them to grow from three to four years, then lift and divide apart. It will be found that the increase is large and that plants so obtained are salable after one year's growth in the nursery. The year in the nursery may be omitted with the quicker-growing kinds which are to form new plantations on the same estate.

Budding 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, some0me varieties familiar not to be readily noticed even by those familiar with Rose-growing. In consequence many purchasers of budded Roses allow these suckers or sprouts from the stock to grow up and, being usually of much more vigorous habit than the variety budded in, they run 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 florists, nurseries, forcing and for the most part, budded Roses 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. The forms and terms and technique used for forcing the florist's Rose at the West are almost identical with those used in the western New York for budding Roses is Rose Manetti, and that seems to be the best adapted for the purpose. Rose multiflora de la Grillerie is also used more or less, but is generally considered not so desir
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 Manetti is bad enough. *Rosa canina* (Dog Rose) and *Rosa polyantha* are largely used in Europe as stocks upon which to graft *Rosa multiflora* de la Griliatte are grown from cuttings in France, and are shipped from there at the end of the first season; when received here they are trimmed back to the root 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 50°-90° Fahrenheit and a sharp fall in it. An application of Bordeaux mixture is of value in checking mildew.

The greater proportion of Roses handled are propagated from cuttings, and consequently are on 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 cultivation. 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 more than 1 part thousands 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 size of the greenhouses 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 details or small items, as many are pleased to term them, are constantly being improved. In the method of successful culture as 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.

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, spread it evenly all over the bench, then beat 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 of 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 spraying 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 nicely 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 2¼-inch pots, using a good fresh soil 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
greenhouse having a temperature of about 56° 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 greenfly 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,—3-inch size will be large enough. The same class of soil can be used as for the first potting, be ready for benching out, or, in other words, to be put into their winter quarters. The benches should hold 5 inches of soil and the bottoms of the boxes should be placed not less than 3%-% in. apart to allow for ample drainage. If plants have been grown in these benches previously, the benches should be thoroughly cleaned and scrambled out. To get all insects, eggs, larvae, etc., away, all the soil or surface of the house underneath should be scraped very carefully and swept out clean, and practically all the inside of the house thoroughly cleaned. When this is done, take two or three layers of cheesecloth or 1/2 by 2 pieces of stone sulfur and put them around the house, preferably in the afternoon while the sun is still hot. As soon as the sulfur is set on fire and burning sufficiently, shut up the house as tight as possible and leave it until the next morning. This will be found to have a most beneficial effect. As the outdoor temperature drops, the fumigating 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 fined 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 treading or pressing in any form; then start to fill the house with plants. For the better varieties such as Bride, Devonia, etc., 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 roots of each individual plant and then syringe the whole; this will moisten the other soil on the surface without making it unduly 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 be thoroughly settled and firm. After this, rake the whole soil down with a hand-raked rake so as 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 mulch the soil with a little manure, 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 little night ventilation as long as possible, even if it is necessary to use a little fire heat to expel the damp. 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 this season of the year, or black-spot and various other diseases may appear.

To obtain the best class of flowers during the entire winter, the greenhouse should have a temperature of 55°-60° or even 70°, provided the days are not too cloudy. As a rule, an abundance of air on, the temperature can be allowed to run up to 75°, 80° or even 90° on some very bright winter 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

2189. American Beauty, now the most popular florist's Rose in America (×½).
make its appearance, sulfur on the heating pipes is the best remedy that can be applied. Red spider also will become troublesome if the plants are allowed to get 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. Helianthus niger.
ROSE, JAPANESE. Kerria 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 WEADE. Silphium laciniatum.

2190. A forcing Tea Rose—Mrs. W. C. Whitney (X ½).

ROSMARINUS (Latin, sea-dew; 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 con- cave, minutely 3-toothed; anterior 2-cut; corolla with posterior lip erect, emarginate, anterior lip spreading, 5-cut, the middle lobe longest, conave, declined; 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 fila- ment 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 Wheelers U. S. geological surveys of the region in which the plant was discovered). Asclepiadaceæ. A genus of a single species, a perennial herb, with some- what woody stems, spreading and twining: lvs. woolly; fls. in loose racemes, in axils of the lvs.: foliules 4-5 in. long, glabrous, fusiform, often used as a vegetable where native: corolla rotate, deeply 5-cleft; crown sim- ple, inserted at the junction of corolla and stamen-tube,
ROTHROCKIA

cordifolia, A. Gray. Lvs. opposite, slender-peduled, coriaceous, acutely acuminate; fls. white or white and yellowish in racemes; corolla lobes 5-6 ft. long. Along waters-courses near the borders of Arizona. Cult. in S. Calif.

F. W. BARCLAY.

ROUGHE PLANT. Rivina humilis.

ROUPALA (probably a native name in Guiana). Also spelled Rupala, Raphala, 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: fls. usually inconspicuous, in axillary or lateral racemes, pedicellated in pairs, hermaphrodite, 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.

Fбелок, Meisn. (R. Corovadensis, Hort.). A tree, with branches clothed with rusty colored woolly tomentum; 5-7 ft. more, or 5-8 pairs of lfts. which are 3-5 in. long, on stout petioles 1 in. or less, ovate or oblong, acute or obtuse, or 2/5 in. long, white or yellowish, in nearly sessile axillary racemes 3-5 in. long. B.M. 6995.

AA. Hairs golden.

Rubia, Lind. According to Belg. Hort. 1866:202, this species was named for the golden hairs covering the upper parts of the stem and petioles. Fzelii.—Rarely found in America.

F. W. BARCLAY.

ROWAN. Sorbus Aucuparia.

ROYAL CROWN. Eucomis.

ROYAL FERN. Osmunda regalis.

ROYAL PALM. Oreodoxa regia.

ROYAL PEACOCK FLOWER. Poinciana regia.

ROYENA (Adria van Royen, professor of botany in Univ. of Leyden; died 1779). Ebeneeae. 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 fls. about 1/4 in. across, with 5 more or less petals, or 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 other genera of the same 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 accrescent in fruits; lobes 5, rarely 4; corolla bell- or saucer-shaped, 5-lobed; lobes reflexed; stamens 10, inserted at the base of the corolla-tube; ovary conical; styles or style-branches 2-4: fr. globose to oblong, leathery, indehiscent.

Rubia, Linn. Tender shrub: lvs. ovate, the younger ones silky; peduncles about a third as long as the lvs.; corolla bell-shaped. S. Africa. B.R. 32:40.

291. To illustrate the fruit-bearing of the black Raspberry.

If the main cane or stem of the plant grew in 1899, 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 bad would have been seen (as above A) from which it was to grow the fruit-bearing shoot.

RUBBER PLANTS. Various plants furnish Rubber. The best gutta percha is said to be produced by Isowan- dra Gouta (which see), a native of India. For the Rubber Tree of South America see Hevea Brasiliensis, p. 741. The Rubber Tree of tropical Africa is Landolphia florida; see B.M. 6983. The Rubber Plant of horticulturists is Ficus elastica.

RUBIA (Latin, red; referring to the color of the dye extracted from the root). Rubiaceae. R. tinctoria is the dyeing plant, or Neper, the long, fleshy roots of which are ground to powder. According to Thorburn, Maddner furnishes a good green fodder if ensiled with small quantities of sugar. The genus consists of about 30 species of scabrous, hispid or prickly herbs widely scattered about the world, mostly in the temperate regions. Lvs. in whorls of 4-5 or rarely opposite: lvs. small to minute, in axillary or terminal cymes, 5-merous; involucre none; calyx limb wanting; corolla rotate or rotate-bell-shaped, 5-lobed; ovary 2-loculed or abortively 1-celled.

tinctorum, Linn. (R. tinctoria, Salisb.). Maddner. A scandent herbaceous perennial; lvs. 2-4 in. long, sessile or on very short petioles, or lobed, yellow toward the base, cordate, in whorls of 4-6: cymes terminal, panicked, spreading, leafy.

F. W. BARCLAY.

RUBUS (Latin name, ultimately connected with ruber, red). Rosaceae. Bramble. Blackberries and Raspberries. A most variable and puzzling genus, containing perhaps 200 fairly well-marked species and numberless intermediate forms. As many as 1,300 species have been described. The genus is particularly strong in Europe, where the greatest number of specific names have been made (see Weihe & Nees, "Rubi Germanici," 1822-7; Focke, "Synopsis Ruborum Germaniae," 1877; Dabbington, "British Rubi," 1869; W. M. Rogers, "Key to the British Rubi," 4th ed. 1892). Focke describes 72 species inhabiting Germany. There is also a large extension of the genus in the Himalayan region, about 30 species being recognized (J. D. Hooker admits 41 species in the "Flora of British India"). The species extend eastward into China and Japan. Hemsley, in his "Flora of China," admits 41 species. In Japan, Franchet and Savatier admit 22 species. In North America, about 40 species are 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 specific 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 in "Bush-Fruits" and by the present writer in "Sketch of the Evolution of our Native Fruits," 1898. 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. Oliver admits only 4 in the "Flora of Tropical Africa." Only 2 species are described in Grisebach's "Flora of the British West Indies," but he admits 8 of the genus in "Cuba, the West Indies, and the Seychelles." Hillebrand describes 3 species in "Flora of the Hawaiian Islands." 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 flower. In Rosa, the torus is hollow (formerly said that the calyx is hollow or urn-shaped) and contains the dry fruits or achenes. In Rubus the torus is called calyx and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stems (canaes) that die
after one or two years, but some of them have herba-
ceous tops. Most of them are more or less prickly.
Species are commonly in graceful 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). Usually white or rose-colored,
usually in coruscans or racemes but sometimes solitary;
calyx 5-parted, the lobes persistent; petals 5, usually obovate; stamens
many, inserted on the calyx-rim; petals many, closely
packed on the torus, usually becom-
ing drupelets but sometimes dry
when ripe. The drupelets are usu-
ally more or less coherent at matur-
ity, the collective body forming the "fruit" or "berry" of horticultur-
ists. In the Raspberries, the co-
herent drupelets separate from the
fruits at maturity, causing the berry
to be hollow or concave on the under
side. In the Blackberries, the co-
herent drupelets 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 a number of them are of great
importance. The pomological subjects are more
important in North America than elsewhere in the
world. Here we grow not only Raspberries which,
are popular elsewhere, but also great quantities
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,
R. nigirobacus being the chief. Closely allied to
them are the Dewberries or trailing Blackberries,
which also have been developed from indigenous
species, chiefly from R. villosus and R. inviscus.
Although the European Raspberry, R. idaeus, is
grown in North America, it is mostly unreliable,
and the leading commercial sorts are produced
from the native R. occidentalis and R. strigosus
and from hybrids of the two. Various Japanese
species, recently introduced, also produce fruits
of value.

A number of the species are useful as orna-
tmental subjects, particularly the Rocky Mountain
R. deliciousus, the old-fashioned Brier Rose (R. cox-
ceptifolius), and R. crataegifolius. For its graceful, finely cut foli-
age, and sometimes for its fruit, R. 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 some shrubby Rubi de-
deps largely on the removal of the canes after they
have bloomed once. After flowering, the cane be-
comes 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 en-
tire cane becomes weak or dies (Fig. 2191). Removing
these canes to conserve the vigor of the plant, but it also adds to its appearance of tidi-
ness. These remarks apply with particular force to the
cultivation of Raspberries, Blackberries and Dewberries.
How the roots of Rubi, see Blackberry, Dewberry,
Lobynberry, Raspberry.

Focke (Engler & Prantl, "Die Natürlichen Pflanzen-
farmer"

) divides the genus Rubus into 11 sections,
seven of which are characterized by the species to be
found therein. Those seven are as follows:

A. Herbaceous species: flowering shoots arising
from the crown of the plant.

SECTION I. CHAMÆMORUS.

Stamens numerous: fr.
juicy: fls. dioecious, borne singly on upright leafy
stalks; lvs. simple, lobed. The Cloud-berry or Bake-
apple Berry, of arctic or subarctic regions, and much
prized for its fruits, belongs here.

SECTION 2. CYLACTIA.

Fls. perfect or polyzamous,
singly or several together at the ends of the shoots:
lvs. ternate or pediforim (3-parted), or sometimes only
lobed.

BB. Plant spineless.

SECTION 3. ANOPLOBATUS. (butus, a Greek word for
bramble). Upright
rather soft-wooded shrubs, usually
with spiny or thorny
large, lobed lvs., large erect
tops, and broad torus.

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1929. Cloudberry—Rubus Chamæmorus—  

Natural size.

2. trifolius, Rich. (R. Americus, Brit.). Stems
slender and trailing, 1-2 ft. long, herbaceous, without
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. Potaninii, Regel). Trailing, the stems dying back every year, the stem pithose and weak-spartate; lvs. pinnately 3-foliolate; the leaflets ovate, acute or obtuse, strong 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 pedicel weak-spiny; the petals white; fr. large, ovate, bright yellow, fragrant and palatable, the calyx persistent; China; discovered in 1885 in the Province of Kansu, 40° north latitude, and later found in provinces Sze-Chuen and Yunnan.-Int. into the U. S. in 1888 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 phenomenal winter of 1888-9, but mulched plants have subsequently endured the winters well.

SECTION 3. ANGELOBATUS.

a. Lvs. mostly 7-lobed.

4. trifidus, Thunb. Fire Raspberry. Strong-growing and erect, 7-10 ft. tall: lvs. large, palmately ribbed, 3-5- or even 6-fld; serrate: fls. subsalutary, the pedicels villose; berry of medium size, scarlet, with pointed drupelate. Japan. Sparsely introduced, and prized for its bright autumn foliage (whence the name "Fire Raspberry").

b. Peduncles mostly 1-fld.


c. Peduncles several - to many-flld.

6. odoratus, L. Fragrant Raspberry. Mulberry (erroneously). Fig. 2194. Strong-growing plant, with the shreddy canes reaching 3-6 ft.: lvs. very large, pubescent beneath, 3-5-loped, 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 pedicels and pedicels glandular: berry flat-tish and broad (¾ in. across), rather dry, light red, edible but not valued. Nova Scotia to Mich. and Georgia (Fla. ?). Gnt. 34, p. 230. B.M. 323. J.H. 111:3132.-Proverbically a hybrid. Strong-growing, 15-30 ft., with rather large single, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.


SECTION 4. BATOTHAMNUS.

a. Lvs. simple, but more or less lobed.

8. microphyllus, Linn. f. (R. palmatus, 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-loped and the middle lobe long and acuminate, the margins very sharp serrate: fls. white, rather nearly or quite 3-5 in. across, with broadly ovate petals: fr. small (red l), 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. strigosus). The Mayberry is described as producing a large yellow edible berry, ripening in advance of the Strawberry.

9. crataegioides, Bunge. Fig. 2195 (after Carol.). Strong, erect or diffuse much-spraying plant (3-5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-ovate, acuminate, 3-5-lobed, and the margin coarsely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about ½ in. across: fr. small, orange-red, of no value. 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.


2194. Rubus odoratus. (Flower × ½).
times indistinctly lobed, long-stalked, thin, glabrous or becoming so beneath: its, solitary or in 2's, large, red or purple; fr. large, somewhat conical, salmon-color or wine-red, edible, the drupelets bearing the persistent styles. Calif. to Alaska. B.R. 17:1424. L.B.C. 17:1602. F.S. 21:2296. Mn. 4. p. 87.—Sometimes cult, for its showy flowers and fruits. Canes perennial. Var. Menziei, Wats., has tomentose leaves.

SECTION 5. IDEOBATUS, or Raspberries.

A. Lvs. long-pinnate, with 2 or more pairs of narrow leaflets.

12. rosalífolius, Smith (R. floribundus and R. Simensis, Hort. R. rosátorus, Roxbg.). STRAWBERRY-RASPBERRY, Figs. 2196, 2197. Erect and tall-growing, evergreen in warm countries, glabrous or somewhat pubescent-hirsute: its, odd-pinnate, the lateral leaflets 2-7 pairs, all the leaflets, ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-serrate, more or less silky-hairy beneath: its, 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. sorbitífolius (R. sorbífolius, Maxim.) is a very hairy and hirsut form. Var. coronátus, Sims (R. grandítíorus, Hort.), is a double form, sometimes cult, as the "Brier Rose" and "Bridal Rose" (B.M. 1733. G.C. II. 11:77).—Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan. B.M. 6970. F.S. 17:1714. A.G. 20:82, 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.

AA. Lvs. pedately 3-5-foliate.

b. Plant profusely red-hairy.

13. phénicioláus, Maxim. WINEBERRY. Fig. 2188. Canes long and recurving, furnished with straight, weak prickles and densely clothed with red-brown glandular hairs, propagating by "tips": its, usually 3, broad-ovate to round-ovate, apiculate-toothed: fr. and sometimes indistinctly lobed at top, white-tomentose beneath: its, in dense, small shaggy-haired clusters which spring from the uppermost axils and form a large, loose, leafy panicle; petals shorter than the long, bristly calyx-lobes, 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. 6479. G.C. II. 26:365; III. 11:269; 29:137. J.H. III. 29:216. A.G. 12:205; 15:435. Gng. 3:263.—Interesting as an ornamental plant, and also recommended for its fruit.

BB. Plant not red-hairy all over.

c. Red Raspberries.

15. Idæus, Linn. EUROPEAN RASPBERRY. An erect, mostly stiff grower, propagating by suckers, the canes light-colored and bearing nearly straight slender prickles: its, 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, pedioles and midribs, finely pubescent, but not glabular, and sparsely furnished with firm recurved prickles: its, 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. Id, in Greece. Early introduced into this country, but now nearly driven from cultivation by the harder native species. The Antwerps, Fonteyn, and Fastolf belong here. Rubus Idæus itself is not known to be native to N. Amer., but a most interesting form of it (var. anomalus, Arr.) has been discovered recently in Vermont. See Fernald, Rhodora, 2, p. 195, with figure.
16. *strigosus*, Michx. (*R. Idæus*, Linn., var. *strigosus*, Maxim.). Red Raspberry. Fig. 2080. 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, petioles and calyxes, the latter less pubescent or hisrate: 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 Cuthbert, belong here. Var. albus, Fuller, has amber-white fruits.

17. *neglectus*, Peak. Purple Cane Raspberries. Figs. 2082, 2200. A large and variable race of hybrids between *R. strigosus* and *R. occidentalis* occurs both naturally (*Rubus neglectus*, Peak, 22d Rep. Reg. N. Y. State Univ. 25, 1889) and in the garden (Bailey, Amer. Gard. 11:731, 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 scaterring 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 spine-like glaucous, not bristly; leafs broadly ovate, dull green above and white beneath, finely and sharply serrate, and notched, the petioles usually bearing short prickles: fls. in small, dense, prickly clusters with sometimes fruit scaterring pedicels, the petals shorter than the long-pointed whitish woolly sepals: fr. rather small, hemispherical, firm or even hard, black or occa-

sionally amber-white, dry and sweet. Plentiful in fields and clearings in the northern-eastern states to Oregon and Brit. Columbia and southward to Ga. in the mountains, and to Mo. In cultivation, known in many forms,

19. *fruticosus*, Linn. European Bramble. Strongly growing, mostly pubescent or hairy on the young parts, usually with strong recurved prickles, the canes often

...
many feet long and recurving or half climbing but sometimes erect; lfts. 3-5, ovate or rhomb-ovate, coarsely toothed, thickish, pubescent to white-downy beneath; petioles and usually the midribs beneath bearing prickles: fls. in terminal panicles, white or pink, showy, the buds white-pubescent: fr. black or dull red, apparently only a cut-leaved form of the common European 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. 64, 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 climates 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 Blackberries, with tall, nearly unarmed, furrowed biennial canes, and long, open flower-clusters.


Group 3. Glandular Blackberries, with stout, thorny biennial canes and prominently glandular-pubescent inflorescence.

22. nigrobaccus, Bailey (R. willosus, Authors, not Alt.). Common High-Bush Blackberry of the North. Figs. 2204-6. Canes tall, recurving at the ends, furrowed, the young parts prominently glandular-pubescent, the spines usually large and more or less hooked: lfts. 3-5, ovate-acuminate or sometimes lance-ovate, long-stalked (at least in the largest lvs.), the terminal one often heart-shaped at base, the margins nearly regularly strong-serrate, the under surface glandular-pubescent: fls. white, showy, the petals narrow, borne in a long, open raceme-like cluster which the terminal flower is usually the oldest, each pedicel standing at nearly right angles to the rachis: fr. black, oblong (varying to nearly globular), usually not very juicy, sweet and aromatic. Everywhere 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 Blackberry" series. A. Taylor and A. Albimus, Bailey, the "White Blackberry," is a state in which the fruits are amber-colored and the bark yellowish green; occasionally as far west as Michigan, and probably farther.
Var. sativus. Bailey (R. sativus, Brainerd). Fig. 2207; also Fig. 237, Vol. I. Generally lower and the canes more erect; fls. 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 juicier. Dry, open fields, 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-oblong, 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 Bigelow 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-obovate 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 sepals): fls. large, with broad mostly overlapping petals. Evol. Native Fruits, Fig. 91.—What 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. Rándii (R. argutus, var. Rándii, Bailey). Fig. 2208. Low and wide-spreading (usually less than 3 ft.), sometimes becoming preprominent, 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 fls. 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. Caedentia but oftenest suggesting R. nigrobacces; but it seems to hold its characters better than most Blackberries.
2204. Rubus nigrobaccus (× 5%). No. 22.

larger, often ovate-pointed or elliptic: fl.-clusters 4-10-fl., short, more or less leafy and thorny, the fl.-buds globose 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. floridus*.

SECTION 6. Swamp Blackberries, with weak hispid canes and reddish fruits.

29. setosus, Bigel. (R. hispidus, var. suberectus, 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 infloresecence: lfts. ob lanceolate to ovate, pointed or acuminate, very strong-toothed: fr. small, with few drupelets, reddish black. Pennsylvania, Quebec to Pa.—Not known to be in the trade, but inserted here because it is confused with *R. hispidus* and other species.

AA. Dewberries: Plant trailing or decumbent.

Group 1. Swamp Dewberries, with weak bristly stems, ovate shining lfts., and small red fruit.

30. hispidus, Linn. (R. obcaulis, Michx. R. sempervirens, Bigel.). Fig. 2210. Stems very slender, scarcely woody but usually persisting over winter, creeping, bearing many weak reflexed small bristles: lfts. usually 3, thick, shining above, wedge-obovate or oval-obovate, usually obtuse, doubly serrate: fls. small, white, on few-flowered hermaphroditic nearly or quite leafless peduncles arising from the creeping canes: fr. small and of few 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 New England) 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. nigrobaccus*). When
it was determined, in 1886, 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 the _R. Canadensis_, but he really had the Thornless Blackberry.

Var. _Michiganensis_, Card. A strong-growing form with mostly fewer prickles, very large, irregularly dentate-cut lfts. and pubescent fl.-clusters. S. W. Mich., and probably elsewhere. Not known to be in cult.

Var. _rubricocces_, Bailey. _Lucretia Dewberry_. Figs. 697, 698, Vol. I. Very robust form, with large, wedge-ovate, deep-cut lfts., very long pedicels, very large fls. (sometimes 2 in. across) and leafy-tipped calyx-lobes: fr. large. West Virginia, and in cultivation as the Lucretia Dewberry, which is the most popular current variety.

33. _inclusus_, Bailey ( _R. Canadensis_, var. _inclusus_, Bailey). Figs. 2213, 2214. Canes strong, terete, somewhat ascending, not very prickly (the prickles straightish): lfts. large and rather thin, light green, those on the verdurous shoots coarsely and simply toothed and the teeth usually abruptly pointed; fl.-cluster forking, with 2-6 long, slender, usually hispid pedicels; fls. large, with leaf-like sepals. 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 leadets on the sterile shoots.

Group 4. The Southern Dewberries, with very long, prickly and often hispid canes, narrow persistent lfts., and mostly 1-fld. 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 lvs., on the young verdurous sterile shoots; the smaller lvs., on the canes that are nearer fruit and which often persist over winter and remain at flowering time; the small lvs. 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: lfts. usually 3, narrow-ovate to oblong, short-pointed, rather shallowly and sometimes bluntly toothed, the petiole and midribs usually prickly: fls. 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 lfts. 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 lvs., and fls. often imperfect.

35. _villosus_, Cham. & Schlecht. ( _R. neivius_, Cham. & Schlecht. _R. macropterus_, 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: lvs. various, usually thicker and more woolly upon the staminate plants, composed of three ovate, doubly crenate-toothed leaflets, or sometimes only 2-lobed, the long petiole and usually the midribs prickly; fls. perfect, staminate or pistillate on different plants, borne on shoots 6-12 in. high, which bear 1-2 flowered prickly or hispid and generally pubescent peduncles, the petals of the stamine 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 Anglinbaugh, Skagit Chief, Belle 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 Loganberry (which see, p. 937) is said to be a hybrid between this species and *R. Idaeus*. *R. vitifolius* is recorded as having been crossed with *R. crassifolius* by Luther Burbank. The Mammoth Blackberry of California is said to be a cross between *R. vitifolius* and the Wild Blackberry of Texas (*R. argutus*). 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 2 ¼ 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 evergreen 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 frs.

36. *dumetorum*, Weigl. Fig. 2216. Canes long and slender, terete, often 10-23 ft. long, trailing or half-prostrate, glaucous, thickly beset with rather small somewhat curved spines: frs. usually 3, mostly broad-ovate, pointed; subtending a very irregular and sharply toothed, 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 the plum-droplet. Europe. Lately introduced for the covering of banks and stony places, for which it is highly recommended. Its autumn color is attractive. Hardy in New England.

*R. bi/brus*, Ham. Raspberry, apparently allied to *R. occidentalis*, and prized in the cult. for its glaucous-white canes: reaches 8-10 ft., with strong arching canes that bear strong, recurved prickles: fls. 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 Himalaya. B.M. 4678. R.H. 1935, f. 34, p. 456.—*R. Cipérati*, 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 4-10 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 Shaffer's Colossal Raspberry, of a purplish wine or unberry 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 Gn. 43, p. 126. 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. Moluccanus*.—*R. Japonicus*, Veitch. Known to horticulturists in its variegated form (*R. Japonicus tricolor*): slender trailer, with rose-colored stems and petioles: fls. 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. 16:85. J.H. III. 29:80. G.M. 27:442.—*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 red-hairy and spiny: fls. 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, pendent. B.R. 6:461.—*R. stellátus*, Smith, produces an edible fruit, prized in Alaska: stem simple and herbaceous, only a few inches long, 1-fld.; fls. coruate, 3-lobed or 3-parted: fls. red. Northwestern Arctic America.

L. H. B.

2211. Small form of *Rubus villosus*, the northern Dewberry.

Generally known as *R. Canadensis*. No. 32.
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 fls. 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-flowered 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 several 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 columnar or low and roundish. The season of bloom could be extended. The flowers of many of the kinds are excellent for cutting.

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 unknown. About 1894 John Lewis Childs found it among some plants sent by correspondents. See Fig. 6:370. For the structure of the Rudbeckia inflorescence, see Fig. 529, 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. laciniata and its double form, Golden Glow, do much better if abundantly supplied with moisture. R. hirta, 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 garden plant, and probably the showiest, is Golden Glow, which the under-signs considers the best perennial of recent introduction. If cut back severely when through blooming and well watered, it often produces a second crop of flowers. Autumn Glory will be well liked when better known. It is fine for massing and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It resembles R. nitida, 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. An effective fall-flowering group may be formed by using the lighter-colored flower forms of Hibiscus Syriacus—such as Totus albus, Lady Stanley, and Elegantissima—for a center or background, and interspersing groups of the taller Rudbeckias (except Golden Glow, which is too tall and spreading) and 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. bicolor, var. superba, placed well to the front to be pulled up when its bloom is past. This group will give color from July until frost. The allied plant Echinacea purpurea and E. angustifolia are well adapted for grouping in open bays in shrubby borders, as their flowers are ex-

2214. Leaf of Rubus inuvius, showing the simple teeth (X 5%). See Rubus, page 1586.

tremely durable and seem in harmony with such surroundings. Rudbeckias are easily increased by seeds, cuttings or division.

W. C. Egan.

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RUE. See Ruta graveolens.

RUE ANEMONE. See Syndesmon.

RUE, GOAT'S. Galago officinalis.

RUELLIA (after Jean de la Ruellie, a French botanist). A genus of about 150 species of herbs or shrubs, mostly American, pubescent, villous or rarely glabrous: lvs. opposite, mostly on a 1-2 in. long: nearly 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 heraceous, 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.

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RUELIA

shrub, 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.

RULÍNGIA (after J. Ph. Ruling, a botanist of Göttingen). Sterculiaceae. This includes two plants cult, in S. Calif. R. perillotii is highly recommended as a rock plant by Ernest Brauntan, 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. perillotii is odd and pretty by reason of the feey 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 concave or convolute at the base, with a small, broad or linear ligula 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 1:237.

RUMEX (the Latin name). Polygonaceae. Dock. Sorrel. Herbs, mostly perennial, with strong roots, of more than 100 species in many parts of the world. Most 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. 1400.—Cult. in California.

R. varians, Vent. See Dedaracanthus nervosus.

F. W. BARCLAY.

pannosa, R. Br. Eventually a shrub, several ft. high, but flowering freely at a young age: lvs. scabrous-pubescent above, densely velvety hisrute below, on older plants ovate-lanceolate to lanceolate, on young plants broader and often 3-4-lobed; cymes shortly pedunculate: fls. white. B.M. 2191.—The plant offered in Calif. as Pomaderia apetala is said to belong here.

AA. Lvs. usually less than 1 in. long.

parviflora, Endl. A low shrub, with branches ½-1½ ft. long, ascending or prostrate: lvs. ovate or ovate-lanceolate, obtuse, deeply crenate, mostly lobed: fls. pinkish, in shortly pedunculate cymes. F. W. BARCLAY.

2119. Ruelia formosa (X ¾).

of the species are weedy plants, but some of them afford leaves for "greens" and others are useful for ornament. All are of the easiest culture. Prop. mostly by seeds.
RUMEX

As a genus, Rumex is closely allied to Fagopyrum, the buckwheats, Rheum, the rhubarbs, and Polygonum, theTouchme-nots. They are mostly leafy-stemmed plants, with flowers appearing from the leafy axils in racemes or spikes. The leaves are usually entire, often oblong or broad lanceolate, with a broad base and a tapering or acuminate tip, often with a distinct midrib. The flowers are usually perfect, usually 5-merous, with white, pink, or red petals, and the fruit is a many-seeded achene. Rumex species are found worldwide, mainly in temperate regions, and are often cultivated for their ornamental or economic value.

B. Leaves and Stems: In Rumex, the leaves are usually simple, entire, and often oblong or broad lanceolate, with a broad base and a tapering or acuminate tip, often with a distinct midrib. The flowers are usually perfect, usually 5-merous, with white, pink, or red petals, and the fruit is a many-seeded achene. Rumex species are found worldwide, mainly in temperate regions, and are often cultivated for their ornamental or economic value.

A. Docks: Ivs. not hastate: fls. perfect, or at least not dizeous.
B. Wings of calyx not tubercle-bearing.
venenosus, Pursh. Perennial, 13 ft. or less tall, glabrous, branched: Ivs. oblong-ovate or ovate-lanceolate, usually tapering at both ends, entire, the stipular sheaths (oecem) funnel-shaped and prominent: wings of fr. large and thin, entire, 1 in. or more across, red-veined and showy, the pedicels hanging in fruit. Mo., W., R. D. Stalks: as an ornamental plant, because of the very showy wide-winged fruiting calices.

hymenopus, Torr. (R. Sázei, Kellog). Canaigre. Rai Colorada. Erect, reaching 3 ft., glabrous, the root of clustered fusiform tubers: Ivs. oblong-lanceolate, sometimes 1 ft. long, narrow at either end, short-petioled, entire, grey-green, somewhat mottled beneath: fls. perfect, large, in crowded panicles, greenish, fruiting calyx-lobes 3 in. across, brown, entire, veiny, the pedicels drooping. Indian Terr. and Tex. to Calif. B.M. 7433. — "Leaf-stalks used as rhubarb, for which reason it is known also as pie-plant in California." Frey, 1844.

RUSSELIA juncacea (X 3/4). (See page 1592.)

Acetosella, Linn. COMMON FIELD or SHEEP SORREL. Common in all old fields, where it indicates sterile soil: Ivs. long; from a hastate-lobed base: fls. reddish, in erect racemes. Not cult., but the sour root-leaves are sometimes used for greens. Eu.

BB. Plant annual.
rhéus, Linn. One to 2 ft., with spreading and branched stems, glabrous and somewhat glaucous: Ivs. small, deltoid-ovate, entire, short-pointed, truncate-cuneate or almost cordate at base: racemes short and leafless or nearly so, the pedicels drooping in fr.: wings cordate-ochrile, 3–5 in. across, thin, rosy-veined, without calloisites. Egypt to Persia. — Rarely cult. as an ornamental for its showy fruiting calices.

RUPTURE-WORT. Herniaria.

RUSCUS (an old Latin name). Liliaceae. Butcher's Broom. A genus of possibly 3 species scattered over Europe. Erect shrubs, with minute bract-like Ivs. and branches (phylloclades) simulating leathery, persistent, veined, sessile, leaf-like bodies: Ivs. small, springing from the midrib of the lower surface of the phyllodium.


According to A. Blanc, R. Hypoglossum, Linn., has been highly commended lately in Germany as a decorative subject. This species and R. Hypoglosum, 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. Hypoglosum a variable species of Hypoglossum, differing in having the costa under the cluster of fls. In some cases a large leafy bract lacking entirely the texture of the leaf, in B.M. 1849 R. Hypoglossum is shown with a minute white fls. and handsome red berries nearly ½ in. thick.

F. W. BARCLAY


Sporophyllaceae. About a dozen species of Mexican shrubby 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, many in a terminal raceme; 4-6-flowered; stigma 4: capsule subglobose, 2-celled: seeds numerous, very small, winged. A recent synopsis of Russelia by Dr. B. L. Robinson, with a key to the species, will be found in Proc. Am. Acad. Arts & Sci., vol. 35, No. 16, March, 1900.

Russellias are of easy cultivation. R. junccea and its varieties make excellent basket plants, being almost continuously in bloom. Propagated by cuttings.

A. Peduncles 1-3-flowered.

junccea, Zucc. (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 branches: raceme very loose, remotely flowered; peduncles elongated. B.K. 21:1773. P.M. 4:73.

-Vars. Lemoinii and elegansissima are garden hybrids of R. junccea and R. sarmentosa. They are more floriferous, especially during the winter, than the type.

AA. Peduncles many-flowered.


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. Rusts are of the class Uredinea. The mycelium branches among the tissues of the host and produces several kinds of spores, either upon the one host (aceuceous), or upon different hosts (heterceous). These spores, as shown typically in the disease of the wheat, are called respectively uredospores, telutospores, acidiopores, etc. Recent researches by Eriksson and Henning in Sweden show that the three common rusts which affect the grains, namely: Puccinia graminis (Figs. 2221-2), P. rubigo-vera 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

forms, delimited by differences in the marked capacity of the uredo- or telutospores to inoculate on different hosts. Several rusts are common on cultivated plants, causing disease; viz., beet rust (Uromyces Betae), broad bean rust (Uromyces Fabae), white pine rust (Cronartium ribicola), asparagus rust (Puccinia Asparagi),

chrysanthemum rust (Puccinia Hieracii), black, or wheat rust (Puccinia graminis), hollyhock rust (Puccinia hirsutae, Linn.), etc. JOHN W. HARSDERGER.

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

the rust fungi exists entirely within the tissues of the host. The spores are formed in masses or sori just beneath the epidermals. 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 telutospores on the wheat and acidiopores on the barley.

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 HASSELBERG.

RÜTA (classical name of rue). Rutaceae. 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, odoriferous: fls. yellow or greenish, in terminal corymbs or panicles, hermaphrodite, usually 4-merous; petals 4-5, free, often dentate or ciliate; stamens 8-10: ovary sessile: capsule 4-5-lobed, indehiscent or dehiscing at apex.

grævælæns, Linn. RUE. HERB OF GRACE. Fig. 2223. A hardy perennial, woody at the base, 1½-2 ft. high: lvs. fragrant, much divided; lobes oblong, the terminal obtuse: fls. yellow. July. Prop. by division and seeds.

Patavina, Linn. (Hylophylhum Patavium, Hort.). A hardy perennial herb 4-6 ft. high: lvs. glabrous, the lower oblong-spatulate, narrowed at the base, the others trifoliate and lancate; corymb dense; pedicels somewhat longer than the fls.: fls. golden yellow. June, July.

F. W. BARCLAY.

RUTABAGA, or SWEDISH TURNIP. Consult Brassica campestris, p. 177; also Turnip.

RUTLAND BEAUTY is Convolvulus Sepium.

RYE. See Secale. RYE. Wild. See Elymus.

2222. Ruta graveolens. Flowers slightly enlarged.

2223. Ruta graveolens. Flowers slightly enlarged.
SABAL (possibly a native name in South America, but the author of the genus does not explain). *Palmaeae*. Spineless palms, low, tall or almost stemless, the robust, ringed trunk obliquely ascending at the base, clothed above with dead leaf-sheaths; ivy, terminal, orbicular or cuspidate at the base, flabellately multiform; segments linear, bifid, filamentous on the margins, induplicate in the bud; racis short or long; ligule short, adnate to the racis; petiole concave above, the margins smooth, acute; sheath short: spadix large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spathes sheathing the branches and peduncles tubular, oblique at the throat: bracte and bractlets minute: fwx. small, glabrous, white or green: fruits small, globose, black, the short style basal. Species 6, Florida to Venezuela, and one in Sonora.

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 Ocklawaha 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 northward to South Carolina, but they attain their fullest development in Florida. The undersigned has often found a characteristic 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 found the undergrowth of 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 Cocoos of the australis type, while the species of Washingtonia, Erythea, Livistona and Trachycarpus have been an entire failure.

*S. Blackburnianum* is, in the judgment of the undersigned, the finest of all the fan-leaved palms that can be grown in Florida.

All the species that form trunks are objects of great beauty when well grown. They need to be well fertilized, or the lower leaves will suffer and finally die, thus detracting much from the elegance of the specimen. They will 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 the better 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,

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H. NEHLING.

The Cabbage Palmetto (*Sabal Palmetto*) is rich in his torical 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 chevau 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 6 or 7 feet.

*S. longipedunculatum* somewhat resembles the Cabbage Palmetto, and its flower-spike extend far above the leaves.

E. N. REASONER.

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2224. The Palmetto in Florida—Sabal Palmeto.

SACCOLIUM

2. mauritiiforme, Griseb. & Wendl. Also spelled mauritiiformis, etc. Trunk middle-sized, but occasionally attaining 60-80 ft.; lvs. finally 12 ft. across; branches suberobular, long, drooping, to 8 ft. middle, with loose fibers between the bifid lobes. West Indies.—The name mauritiiforme does not appear in the American trade, but S. glaucescens, Lodd., and S. multifidum, H. & K., according to Nehring, are the same. Nehring writes: "S. glaucescens of the trade rivals S. umbraeculatum in beauty and rapidity of growth. Its leaves, though smaller, have a beautiful bluish green color."

3. Palmetto, Lodd. CABBAGE PALMETTO, S. floridana CABBAGE PALMETTO. Fig. 2224. Stem, 30-80 ft. high: lvs. 5-8 ft long, cordate in outline, recurved at the summit, shorter than the petiole; segments deeply cleft; spatidix, spreading, shorter than the petiole, a drug black, rather long and straight. Southern States. S. S. 10:507. A. P. 12:626.—S. moecini, Hort., is referred to S. Palmetto by Voss, but Nehring describes it as a stemless plant from Mexico, more beautiful than the Dwarf Palmetto, bearing immense lvs. on it, the lvs. attaining a height of 6-8 ft. S. Palmetto has been confused in the European trade with S. Mexicanum.

4. Blackburnianum, Glazebrook (S. umbraeculatum, Lodd.). Stem 30-40 ft. high, thick, black, rough at the middle; leaves are smaller, rather rigid, shorter than the petiole; lobes about 40, ensiform, bifid, filiform, rather rigid. West Indies. G. C. II. 2:777. London's Gard. Mag. 5:52-57, with several species was also confused in the trade with S. Mexicanum.

5. Mexicanum, Mart. Stout tree, with trunk some 50 ft. tall and 2 ft. in diam.; lvs. very large, sometimes 6 ft. long and 7 ft. wide, divided to the middle into many narrow 2-parted segments, which are flattened on the margins: fr. ½ in. in diam., globe or sometimes 3-lobed, with thin dry flesh. Tex., Mex. S. S. 10:508.—Nehring writes: "This species is more robust than the Florida; it is a broader and denser crown of lvs. and grows more quickly."

The following are mostly trade names, but at present they can be only imperfectly described: S. caryas, W. Bull. A native of Colombia introduced in 1875. Apparently only the juvenile state has been described. Lvs. elongate, linear-lanceolate, plicate, with a bluish or bluish green color which is very strong marbled on the under surface. Nehring writes that he cannot distinguish at present his specimens of S. caryas from S. glaucescens.—S. dealbatum, Hort. "This species," writes Nehring, "probably belongs to S. moecini, although it is smaller in all its parts. The leaves are numerous, glaucous green and of a fine fan shaped form. Compared with the Sabals the form of the stem segments have little likeness to them, though they look well as foliage plants in company with Cereas revoluta and Dicond edule." The name "dealbatum" means white or semi-white, which is similar to Dicond edule, hence identical with S. braucilfera, according to Nehring.—S. glaucescens, Hort., Pitcher and Mands, 1995, may possibly be meant for S. glaucescens.—S. Mexicanum, Hort. "A small tree, rather smaller than S. Blackburnianum, has a slender stem and the leaf-stalks are longer and thinner. The leaves have a bluish green color while young, changing to a fine dark green when they get older." Habitat unknown.—S. Hodgendorph, Hort., is cut out by Nehring.—S. javaniae, Hort., Pitcher & Mands, is possibly meant for S. Hodgendorph, since Sabal is an American genus and is not known in Java.—S. longifolium, Hort., according to Nehring "has very numerous, long and slender lvs., which are bright green above and silvery below."—S. longipediata, Hort., according to Nehring, "is a stemless plant with a dark brown trunk, and very long and slender stalks." Reasoner adds that the lvs. are glaucous-green.—S. principalis, Hort., according to Nehring, "is very similar to S. Mexicanum, with one of the basal lvs. 15 or 35 ft. high and upwards of 1 ft. in diam.; lvs. glaucous, very glaucous; petiole stout, conico-convex, unarmed, about 40 in. long, broad and wide, 5 in. thick. Diam. about 40 in. long and wide, multiform, with coarse straw-colored fibers from the sinuses, the center arenately recurved; fr. of a single lvs. 6 ft. high, spreading, glaucous-green, ½ in. in diam., eddile, green, or when dry dingy brown and somewhat glossy, the mesocarp then coryanous; endocarp whitish straw-colored, glaucous, small, seed pelliscent, seed chestnut-shaped, shell labyrinthish-form, rugose, much depressed. Sonora, Mexico, in the vicinity of Ures. Described and figured in vol. 12 (1901) of Rooms Cyclopedia. From the tropical parts of the United States, S. Ursana differs markedly in its pale, very glaucous foliage, and in the size of its fruit, which is of the size of the bud of S. Palmce, and usually a little larger than in S. Mexicanum, with the former of which species it agrees in having but one of the three carpels developed and fertile, while in S. Mexicanum two or even three are not infrequently developed. Considering the extent to which this section of Mexico has been visited by collectors of seeds it is surprising that this native if this situation was not before developed."

SABBATIA (Liberatus Sabbattii, Italian botanist of the eighteenth century). Gentianaceae. About 13 species of Atlantic North American annuals or biennials with showy rose-pink or white lvs. in summer and numerous flowers. Fls. 5-12-merous, in cymes or terminating the branches; calyx 5-12-cleft; corolla rotate, usually with a yellow eye, the lobes convolute in the bud; filaments rather short, filiform; anthers linear or oblong, arculate, reduced or revolute; style 2:6-7-lobed; capsule globose or ovoid, thick-coriaceous or at first fleshy; seeds small, numerous.

Sabbatia requires a light, sweet soil. Seed must be sown in fall or early spring. The plants are easily transplanted.

A. "Fls. 5-parted, rarely 6-2-parted."
B. Lvs. narrow-oblate to linear.
C. Color of fls. rose to white: lvs. obtuse.

Brachia, Ell. Stem slightly angled, 1-2 ft. high: lvs. mostly obtuse, obscurely 3-nerved at the base: fls. showy, light rose to white, 1-1½ in. across, in thyrsiform panicles, the lateral peduncles bearing usually 2-3-flowered cymes; lvs. spathulate-obovate, solitary on naked, somewhat paniculate peduncles; calyx-lobes subulate-linear, about half the length of the spatulate-ovate lobes of the corolla. Margins of pine barrens swamps along the coast. Mass., Fla. B. 2:699.

C. Color of fls. white, fading yellowish: lvs. acute.

Lanceolata, Torr. & Gray. Stem simple, 1-3 ft. high: lvs. about 1 in. long, shorter than internodes, acute, 3-5-nerved, the floral reduced to subulate bracts: fls. about 1 in. across, white, fading yellowish; calyx-lobes more than half the length of the corolla. May–Sept. Ind. to N. C. and S. B. 2:699.

B. Lvs. wider, cordate-ovate, clasping.


A. Fls. 8-12-parted.

Chloroides, Pursh. Stem truly biennial, 1-2 ft. high, often decumbent, loosely and sparingly branched above: lvs. oblong-lanceolate or the lower oblong-spatulate: fls. about 1 in. across, white, fading yellowish; calyx-lobes more than half the length of the spatulate-ovate lobes of the corolla. Margin of pine barrens swamps along the coast. Mass., Fla. B. 2:612.

SACCHARUM (saccharum, old Greek name for sugar). Gramineae. Species 12, in tropical regions, mostly of the Old World. Tall grasses with stout culm and ample panicles, the branches of which are many-jointed; the small, slender spikelets 1-fl., surrounded by long silky hairs. Differs from Erianthus in having the spikelets awns. The most important species is the Sugar Cane, which is extensively cultivated in tropical and subtropical countries for the production of sugar. Propagated by cutting of the stem. Native country unknown, but probably east Asia. Cultivated from time immemorial, for which reason many varieties have lost the power to produce bloom or at least to produce fertile seed. Rum is produced from the fermented molasses.

Officinarum, Linn. Sugar Cane. Stem 8-20 ft. high 1-2 in. thick, third empty glume wanting.

A. S. Hitchcock.

SACCOBLUM (name referring to the sacco labellum). Orchidaceae. Epiphytic herbs with erect leafy stems increasing in length by continued growth at the apex: lvs. diochotomous, pointed and fleshy, usually channelled; inflorescence lateral, in the cultivated species a long, densely-fl. cylindrical raceme: fls. medium or
**HEINRICH HASSELBRING.**

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochinchina, Java, India, Java and Manila. They are closely allied to the genera Aérides, Phalanopsis 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 _S. ampulacea,_ _S. curvifolium,_ _S. coleste_ and _S. Hendersonianum_ can usually be grown successfully in the Cattleya or Cypripedium department. The large-growing species with thick, succulent leaves require a warm, moist atmosphere where the winter temperature can be retained at 65° to 70° F. by night and about 70° 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 frequently dry out, during the resting period especially. _Galea_ is 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, potsherds or other similar material, or securely fastened with copper wire to keep them in position, otherwise being more or less top-heavy they are liable to work loose, under which conditions they cannot become properly established.

Shading should be applied to the glass from February until November to break the sun's direct rays, but during the 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 Saccolabiums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis.

**ROBERT M. GREY.**

A. _Fls. rose-colored._

_Hendersonianum,_ Reichb. f. Dwarf: _Ivs._ 4-6 in. long, strap-shaped, subsacate, distichous on the stems, but spreading in various directions; racemes upright, about as long as the _Ivs._: _Fls._ forming a cylindrical mass, bright rose, ½ in. across; dorsal sepals orbicular, concave, lateral ones larger, obovate-oblong; petals obovate; labellum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. _B.M._ 6222.

_AMPULACEUM,_ Lindl. Fig. 2225. Dwarf: stem 6-8 in. high, with 2 rows of _Ivs._: _Ivs._ strap-shaped, channelled, apex truncate and dentate; racemes nearly erect, 4-6 in. long; _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._ 5595. _P.M._ 13:49. _J._ H. III. 32:463. — Var. _Moulmeinense._ Hort., is a geographical variety with shorter growth and larger _Ivs._

AA. _Fls._ orange or scarlet-orange.

_curviflorum._ Lindl. Stems short: _Ivs._ linear, 8-10 in. long, 2-toothed at the apex; racemes somewhat drooping, 6 in. long, dense: _Ivs._ 1 in. across, bright orange scarlet; sepals and petals ovate to oblong, spreading; labellum orange, blade linear, truncate, spur obtuse. May, June. Burma. _Java._ _B.M._ 5596 (as _S. minutum)._ _I.H._ 13:403.

**SAFFRON THISTLE.** *Carrhamus tinctorus.*

_SAFFRON.* _Crocus sativus.*

_SAFFLOWER.* _Carrhamus._

_SAFFRON, FALSE._ *Carrhamus tinctorus.*

_SAFFRON, MEADOW._ See *Colchicum._

_SAFFRON THISTLE.* *Carrhamus tinctorus.*

_SAFFRON.* _Crocus sativus._


**SACRED BEAN of Egypt.** *Nymphea Lotus._

**SACRED BEAN of India.** *Nelumbo nucifera._

**SADDLE TREE.** Rare name for Tulip-tree, _Liriodendron._

**SAFFLOWER.** _Carrhamus._

**SAFFRON.** _Crocus sativus._

**SAFFRON, FALSE.** *Carrhamus tinctorus._

**SAFFRON, MEADOW.** See *Colchicum._

**SAFFRON THISTLE.** *Carrhamus tinctorus._
SAGE (Salvia officinalis). For at least three centuries this shrubby, fibrous-rooted perennial from southern Europe has been widely cultivated in gardens throughout the world, though it is not a native American plant. The best known and most widely grown species is S. officinalis, which is a hardy and long-lived plant that is often used in landscaping. Sages are generally grown for their attractive flowers, which come in a variety of colors, including red, pink, and purple. They are also valued for their medicinal properties, which have been used for centuries to treat a variety of conditions. Sage is a versatile plant that can be used in both the garden and the kitchen, and it is a popular choice for those who enjoy cooking with herbs and spices.
plunged in open ponds in the summer. The arrowheads are perennials of easy culture, although likely to be infested with aphids. Prop. by division, or sometimes by seeds.

Plants of mostly erect habit, the lvs. and scapes arising from more or less tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monoeccious (staminate fls. usually in the uppermost whorls) or dioecious, with 3 white broad petals and 3 small greenish sepalis, 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 purple blotch at the base. Argentina to Brazil, Chile and Peru. B.M. 6753. Gn. 27:173. L.H. 31:543.—First known as a cult. plant from seeds sent to England in 1883 from Buenos Ayres by John Ball. It is now a popular plant for aquaria and lily ponds. Tender to frost. It is sparingly naturalized in the southern parts of the U. S., on both the Atlantic and Pacific sides.

AA. Sepals of pistillate fls. reflexed after flowering: pedicels of these fls. slender: carpels somewhat glandular.

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

pusilla, Nutt. (S. nauticus, in part. S. subulata, Buch.). Slender and simple, usually only a few inches high: lvs. linear or narrowly oblanceolate, rigid: fls. few, usually in 1 whorl, white, ¼-½ in. across, the filaments slender. N. Y. & Ala., along the coast.—Offered by dealers in native plants.

BB. Bracts 3, at base of the whorls.

c. Lvs. usually distinctly sagitate.

latifolia, Wildl. (S. variabilis, Engelm. S. sagittalata, var. variabilis, Michx.). Fig. 2226. 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 monoeccious, the filaments 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 in lily ponds.

sagittalata, Linn. Old World Arrowhead. Rhizome thick and tuberous, stolon-bearing: lvs. broad and sagittate, very variable in form and size: scapes erect, simple or branched, overtopping the lvs.: bracts narrow-ovate, free or slightly connate at base, shorter than the pedicels; petals large, white; filaments glabrous: 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 fls. (var. flore-pleno, Hort. S. japonica, Hort.). S. Chinensis 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.

c. Lvs. usually obovate or linear and not sagitate.

d. Filaments slender, tapering upward, cobwebby.

lancifolia, Linn. 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.

DD. Filaments abruptly broadened, pubescent.

graminea, Michx. Erect and simple, glabrous, 2 ft. or less high: lvs. reduced to phylloclads, flat, broad-linear to lance-elliptic, pointed: fls. small, white, in 2 or 3 whorls.

SAGO PALM. Consult Cycas.

SAINFOIN, or SAINTFOIN. Onobrychis viciifolia.

ST. ANDREW'S CROSS. Ascyrum Cruz-Andreana.

ST. DABECQ'S HEATH. See Daboecia.

ST. GEORGE'S HERB. Valeriana officinalis.

ST. JOHN'S BREAD. Ceratonia Siliqua.

ST. JOHN'S-WORT. See Hypericum; also Symphoricarpus.

ST. PATRICK'S CABBAGE. Saxifraga umbrosa.

ST. PETER'S-WORT. Ascyrum stans. Also applied to species of Hypericum, Primula and Symphoricarpus.

SAINTPAULIA (from the discoverer of the plant, Baron Walter von Saint Paul). Genus includes Usambara Violet. A monotypic genus from eastern tropical Africa, where it was found growing in wooded places in canyons of limestone and granite rocks, in rich, light soil. It is a stemless hairy perennial herb with short-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 for salad plants are that blanching is often desirable and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm, light soil, in the best mechanical condition, is necessary for the same reasons. 

F. A. WAUGH.

SALICORNIA (Latin, salt and horn; saline plants with horn-like branches). Chenopodioideae. Glasswort. Marsh Samphire. A genus of about 8 widely scattered species of leafless seashore herbs, hardly 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 willow). Salicaceae. Willow. A genus of trees and shrubs characterized by simple Ivs.; buds with a single bud-scale; Ivs. in lax scaley spikes (amets); the fls. subtended by a single entire scale and nearly or quite destitute of petals; the staminate fl. with 1, 2, or 3-6 stamens; the pistillate fl. of a single pistil composed of 2 carpels and 2 more or less divided stigmas; at maturity the pistil dehiscens, setting free the small appendaged seeds. The wood is light, soft and diffuse porous. For the staminate and pistillate flowers of Willow, see Figs. 831 and 833, Vol. II. The catkins or "pussies" are also shown in Figs. 2228 and 2229 herewith.

The role that the Willow plays in the north temperate regions is to a certain extent analogous to that of the Eucalyptus in subtropical regions in that it flourishes in wet ground and absorbs and transpires immense quantities of water. It has been used to plant around cesspools for sanitary effect. But while most of the species occur spontaneously in wet ground or along stream banks, the Willows may be cultivated in various situations. The White Willow (S. alba) has been used very effectively to fix stream banks against erosion. Figs. 2229, 2231. Its root system is very extensive and when well established withstands the force of the rapid streams well as well as action.

All species are readily propagated by cuttings. It has been suggested that the brittleness at base of twigs of some species, notably the Black Willow (S. nigra), is an adaptation to facilitate naturally the distribution of the species. Certain it is that twigs broken from the tree by the wind are carried down streams and, becoming anchored in the muddy banks, grow 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. In the frigid regions are several species. Salix arctica and several allied species among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of north temperate, tropical and south temperate zones are large trees. The 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 cheering in winter. The weeping forms are very popular, but they are often planted with little sense of fitness. The cultural remarks under Populus will apply to Willows.

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 3.
C. Buds small.

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CC. Buds large: 

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1. nigra
2. amygdaledoides
3. lucida
4. pentandra

2230. White Willow on a stream, holding the bank from washing. See No. 6.  
2231. Same tree as in 2230, in summer dress.  
2232. Old roadside trees of Salix alba.
SALIX

   Tree, 30-40 ft. high; bark flaky, often becaming shaggy: twigs brittle at base; buds small; lvs. lanceolate, green, both sides finely and evenly serrate; stamens 1-2 in. long; scales ovoid, deciduous; stamens 3-6; ovary ovate-conical, glabrous; style short but distinct. E. N. Amer. Var. _falcata_, Pursh. Lvs. elongated, narrow and falcate. Var. _pendula_ is cult.

2. **amygdaloides**, Andersson. PEACH-LEAF WILLOW. Tree, 30-40 ft. high; bark longitudinally furrowed, less inclined to be flaky; lvs. broader, glaucous beneath, on rather long, compressed pedicels: stamens loosely fdd.; ovary lanceolate-conical; style very short. Central and western N. Amer.

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

4. **pentandra**, Linn. (S. laevigata, Hort.). BAY-LEAF OR LAUREL-WILLOW. Shrub or small tree, 8-20 ft. high: branches chestnut color; lvs. large, elliptic to broadly oblanceolate, acuminate, shining and dark green above, paler beneath; stamens appearing after many of the lvs. are fully developed, not conspicuous. Europe and Asia.

5. **fragilis**, Linn. (S. viridis, Fries, S. Russelliana, Sm.). BRITTLE WILLOW. Fig. 2233. Tree, 50-60 ft. high, excreant in habit and of very rapid growth: branches slender, obliquely ascending: buds medium size, pointed: lvs. large, lanceolate, acuminate, glaucious or slightly hairy when young, scarcely paler beneath, glandular serrate: stamens appearing with the lvs. (the staminee tree rare in America), seldom bearing good seed, slender; scales deciduous. Eu., N. Asia. Gn. 19, p. 317; 34, p. 99. — Frequently cultivated and also growing spontaneously in many places.

A company of promoters induced many Americans 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 it-

self 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 excrcreant in habit: branches yellowish brown, grey and silky throughout, giving a white appearance to the whole tree, 2-4 in. long, elliptical. Eu. Gn. 53, p. 87. — Heretofore associated with the next species, _S. × connata_, which it differs in color of twigs and vesture and color of lvs., as also in its general habit. It is only occasionally seen in America and has been known as _S. alba_, var. _argentea_, _S. splendidus_, _Bray_, and _S. regalis_, Hort. These forms, not easily distinguishable from one another, can be readily distinguished from the following species.

7. **vitellina**, Linn. (S. blanda., Andressas.). YELLOW WILLOW. Becoming a very large and venerable appearing tree, the rather short trunk often 4 ft. or more in diam. It is often pollardcd. The lvs. are deliquescent and rounded in outline. Branches yellow: lvs. silky-hairy when young, glaucous when mature, glaucous beneath, the whitness intensified after the young lvs. fall. Aments 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. _aurantiaca_, Hort.) branches golden yellow, rather distinctly and usually just before the leaves appear in spring. Var. _britannica_, Hort., bark red. These as well as other choice varieties are grafted. Var. _pendula_, Sm. Gn. 53, p. 371.

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; lvs. small, acute; lvs. 2-6 in. long, attenuate at base and apex: aments appearing with the lvs., slender, the pistillate green capsule, small, 1 in. long. Caucasus. Gn. 1, p. 371; 34, p. 527; 39, p. 72; 55, p. 22. S. H. 1:261. — 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. _annulata_, Forbes, lvs. with 1-2 back a sort of ring. Var. _dolorosa_, Rowen. WISCONSIN WEEPING WILLOW. Lvs. glaucous beneath; very hardy farther north. Var. _salamonii_, Hort., more vigorous and upright. a form originating in France. Gn. 55, p. 19. S. H. 2:375. S. _Salamoii_ of one catalogue is perhaps an error for this. Var. _Japonica_, Thumb., lvs. more decidedly toothed; aments longer and looser.

9. **elegantissima**, Koch. TRULLOW'S WEEPING WILLOW. Tree with more spreading habit and larger crown than _S. Babylonia_: branches long and pendent, yellowish green, sometimes bluish with brown; appears to be more hardy than _S. Babylonia_. Japan. Gn. 55, p. 34. S. H. 2:363. K. _Siboltii_, Hort., is this species or is closely related.

10. **interior**, Rowlee (S. ribra, Rich, not Huds. S. longifolia, Mohl, not Lam. S. falcata, Siebold, and other recent authors in part). Fig. 2234. Varying in stature from a low shrub to a small tree, usually growing along streams and lake shores: twigs smooth and brown or brownish: buds plane-convex, with an obtuse and rounded apex, very small: lvs. nearly or quite smooth, sparsely canescent to extremely canescent, sub-entire, obtuse, acute or acuminate: pedicels minute: stamens the teeth narrow, sometimes quite spinulose: stipules conspicuous, ear-shaped, obtuse, denticulate, deciduous: aments of
Salix

late spring on short lateral peduncles, which bear 4–6 lvs., those borne later in the season on much longer leafy branches, very loosely fld.: lvs. fascicled in clusters of 2–5 on the axis, a distinct interval between the fascicles, first appearing in May and often bearing a second set of aments in early summer; scales usually glabrous or somewhat hairy toward the base, narrowly, dentate or ciliate, veined and hairless toward the margin; flowers: filaments crisp hairy below, smooth above; capsules sessile, clothed when young with appressed silky hairs, becoming at maturity smooth at the base; stigmas short, sessile. Central N. America.— The pistillate ament, lax at anthesis, becomes more so as the capsules mature, and by this character the species can usually be distinguished from related species.

11. argophylla, Nuttall (S. longifolia, var. argophylla, Anderss. S. flaviflora, var. argophylla, Sargent. S. hispida, Bentham). Tree or large shrub, 12–18 ft. high, forming dense thickets but not growing in clumps; branches nearly glabrous and exceedingly tough: bark turning from brown to bright yellow or orange-red when blooming, making of a thicket of it a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely minutely and remotely denticulate, clothed equally on both sides with an appressed and suberect, often more or less conceals the veins; stipules obsolete: scales oblong and obtuse in the staminate ament, narrower and more acute in the pistillate; lower half of the filaments densely crisply hairy: capsule lanceolate, covered with straight appressed silky hairs, closely sessile; stigmas sessile; mature capsule often nearly glabrous. Occasionally the leaves remain upon the plant over winter, the young shoots appearing in their axils in spring. Ament surmounted in length by its leafy peduncles; appearing in May in Oregon and northern California and flowering intermittently all summer. This species is distinguished by its narrowly lanceolate, entire leaves, obsolete stipules, small and rather narrow aments, crenate scales and hairy capsules. S. argophylla occurs on the Pacific slope from southern California to British Columbia. It is a western representative of the long-leaved willows advertised, but a beautiful species common along streams and irrigation ditches.

12. Caprea, Linn. Goat Willow. Fig. 2235. A small tree, 12–25 ft. high, with upright branches, large, 1–3 in. wide, rounded or subcylindrical at base, rugose, very variable: aments appearing before the lvs., large and showy, especially the staminate ones. En. Asia.— The typical form often occurs in yards where it has sprouted from the stock upon which the more popular but scarcely more ornamental variety, pendula, has been grafted. Var. pendula, Hort. KILMARNOCK WILLOW, grafted on stock about 4 ft. high, and forming a weeping shrub. Often planted in yards. S. multibracteata is supposed to be a hybrid, and probably belongs with S. Caprea. S. Caprea, var. tricolor, Hort., is said by F. W. Kelsey to be a round-headed tree, with “tricolored foliage.” S. palmato, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green lvs. and reddish purple young wood.

13. discolor, Mohl. Pussy Willow. Figs. 2226, 2229, 2234. A shrub or short-trunked tree, 10–20 ft. high and nearly black: lvs. smooth and bright green above, whitish beneath, irregularly crenate-serrate: aments appear early in spring, before the lvs., closely sessile, enclosed in long, silky hairs. E. N. Amer.—Worthy of more extensive cultivation and thriving in dry ground.

14. Bebbiana, Sarg. (S. rostrata, Rich.). Fig. 2234. A small tree, 10–20 ft. high, with short but distinct trunk: buds of medium size, conical, brown: lvs. dull green and downy above, prominently veined and hairy beneath: aments appearing with the lvs. in spring, staminate beautiful golden when in flower; scales narrow and shorter than the pedicels; capsules obovate, E. N. Amer.—Prefers dry soil and can be used to good advantage against walls and in rockeries.

15. humils, Marsh. Prairie Willow. A shrub, 3–6 ft. high, varying much in stature, and in size and shape of lvs.: branches hairy; lvs. oblancoate to oblong, nearly entire, more or less revolute: aments densely and many-flowered. E. N. Amer.—Grows in driest situations.

16. tristis, Ait. Dwarf Willow. Fig. 2234. A diffuse shrub, 1–1½ ft., with long deep-set root; branches gray, slender; lvs. small, 1 in. long, linear-lanceolate, very short-pedicelled aments, small and rather few-flowered; stamens orange-red. E. Amer.

17. sericea, Marsh. Silky Willow. A shrub usually 4–8 ft. high, diffusely spreading from base: branches often reddish; buds obtuse and suberect; aments very small and very silky beneath, sometimes becoming less so at maturity: aments densely flled., appearing with the lvs.; stamens often orange-red; capsules short-pedicelled, obovate-oblung, nearly 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 both lvs. and flowers; lvs. slender, much and more pointed: lvs. on the whitish, glabrous, more evidently toothed: aments rather loosely flled.; 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, 10–20 ft. high: branches slender and straight: lvs. linear-lanceolate, beautifully silvery, 4–10 in. long; margins revolute, entire: aments appearing before the lvs., golden yellow. En. Asia.—Most often seen in plantations for the manufacture, for the production of which the plants are cut near the ground every year. Willow culture in experienced hands is often profitable. (For details see Simpson, Osier Culture, pp. 310–315; Div. of For., U. S. Dept. Agr. 1898.) This species does not thrive in this country as well as in Europe.

20. candida, Fluegge. Hoary Willow. Fig. 2233. A shrub, 2–5 ft. high: young branches hoary, becoming smooth, reddish with age; buds reddish, rounded at the apex: lvs. lanceolate-linear-lanceolate, 2–4 in. long, dark green and wrinkled above, covered with dense white tomentum, revolute: aments sessile, appearing before the lvs.; staminate of reddish 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: lvs. glossy, yellowish-green, elliptical to obovate, rounded at both ends, entire and smooth, reticulate-veined: aments rather few-flowered capsules reddish, glabrous. N. E. N. Amer. and En. Usually grows in cold peat bogs.—Probably not in cult. The plant sold under this name is probably some form of S. purpureum, which S. myrtilloides closely resembles in general appearance.

22. cordata, Mull. (S. rigida, Mull.). 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: anents rather slender, appearing with 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, Hort., is a decumbent form.

24. incana, Schrank. (S. petiolaris and S. rosmarinifolia of Amer. gardeners, but not of botanists). Shrub or small round-topped tree, with long, slender branches: lvs. linear, revolute, 2-3 in. long, very narrow, green above, white-tomentose beneath: aments long and slender, appearing with the lvs.: capsule glabrous: filaments of stamens more or less connate. Eu.—This species is grafted upon hardy stock (S. Caprea) when sold from nurseries.

25. purpurea, Linn. (S. Forbyánea, Sm. Vetrix purpúrea, Rafn.). PURPLE OSIRIS. Fig. 2235. A shrub or small tree, spreading at base, with long, flexible branches: lvs. oblanceolate, glabrous, velvety, 3-6 in. long, often appearing opposite: aments sessile, slender; pistillate recurved; scales purple: stamen one: capsules small, ovate. Eu.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket Willow. Var. pendula. Branches pendent. G. n. 4:243.

26. Sitchénis, Sib. 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 lustre of the leaves is preserved in plants in cultivation. N.W. N. Amer. W. W. Rowlee.

2236. Leaves of Salix cordata, showing stipules. (X 1/2.)

SALLOW. Salix Caprea.

SALMON BERRY. Rubus spectabilis. See also Alaska.

SALPICHIROA (Greek, tuber and skin; in reference to the form and texture of the flower). Syn., Salpichiroa. Solanaceae. About 10 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 (sectionalus Salpichiroa) or only about 1/2 in. long (section Perizona); calyx tubular or short, 5-leafed or parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, acute, often short, induplicate-valvate: berry ovoid or 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." Franceschi says the small white berries are sold everywhere in Paraguay as "cock's eggs."

rhomboides, Miers (Salpichiroa rhomboideum, Miers). A half-hardy climber, somewhat woody, with green, flexuous branches: lvs. ovate- rhomboid: fls. small, usually less than 1/2 in. long, solitary, nodding, white; corolla short, constricted 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. 24:450. R. H. 1897:531. Gm. 35, p. 367. —The plant appears to be offered as Withania orientalis. Cult. in S. California. W. F. Bartclay.

SALPIGLOSIS. See Salpichiroa.

SALPIGLOSIS. See Salpichiroa.
beautifully marbled and penciled with several colors. Calyx tubular, 5-crested; corolla funnelform, widely bell-shaped at the throat; lobes 5, plicate, emarginate; stamens 4, didymous; capsule oblong or ovoid; valves 2-crested.

The varieties of Salpiglossis require the general treatment given half-hardy annuals. They prefer a deep, light rich soil not given to sudden extremes of moisture and dryness. The seeds may be sown indoors by the middle of March, or later, or may be sown outdoors in early spring. Care must be taken that the early sown plants do not become stunted before being planted out. They bloom for several weeks in late summer. The flowers are useful for cutting and last well 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** (*Salpina, 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 rich crimson. 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.

**margaritacea, Triana.** (*Bertolonia margaritacea, Bull. Grandsia guttata, var. margaritacea, Nicholson*). Tender perennial herb: stem 1% to 3 inches long, unbranched; lvs. pedicellate, in dichotomous cymes, white or rosy white. Brazil. F.S. 16:1697.

W. M.

**SALSFY** is the spelling preferred in England; Salsify in America.

**Salsify** (formerly sometimes spelled salsaty) is *Tragopogon porrifolius,* one of the composite. *Fig. 2238.* 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 severe, the plants are thinned to stand 2-3 in. apart. The plant requires 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 Sandwich Island and Improved French are probably the best varieties. Salsify is native to southern Europe. In some places it has escaped as a weed. See *Tragopogon.*

Black Salsify is Scorzonera; Spanish Salsify is Scolymus.

L. H. B.

**SÁLSOLA KÁLI, var. Tragus,** is the Russian Thistle. *Figs. 2239, 2240.* Some of the bulletins devoted wholly or largely to this weed are Calif. 107, Col. 26, Iowa 26 and 33, New Mex. 16, Minn. 33, Ohio 55, Wis. 37, 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 Unlike.” 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.

**SALTBUSHES** are plants recommended for alkali lands, belonging to the family Chenopodiaceae and mostly to the genus Atriplex, which see. Used for forage in the dry regions. The introduction of the Australian Saltbush (*Atriplex salsifolia*) has been a great event in the

**SALT GRASS.** Distichlis.

**SALVIA** (Latin, to keep safe or healthy; referring to the medicinal properties of the genus Sage), is characterized by anthers in two cases of about 650 species of herbs, subshrubs and shrubs, hardly and tender, including Sage, Clary, Scarlet Sage and many other interesting plants. Salvia is by far the largest genus of Labiates, described by Bentham and Hooker, and is characterized by certain peculiarities of the stamens that are connected with the crosspollination of the fls. by insects. It has been well said that the structure of the flower in Salvia is as complicated and specialized in any orchid. Some idea of this structure may be gained from Fig. 2241. The bodies shown at 1 and 2 are the two fertile stamens; the points 3 and 4 indicate places where other anther cells might 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 middle member which joins the connective to the corolla. The extraordinary length (or rather width) of the connective is one of the main generic characters of Salvia. In many flowers the connective is mere thread, a linear extension of the filament, and barely separates the two anther cells. In Salvia the anther cells are forced to an exceptional distance, and in many cases 2 of the cells are obliterated or devoid of pollen.

Within the generic limits of Salvia there is a great variation in size and 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. 2245 indicates somewhat 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 other cases the lower lip is longer than the upper lip. There are 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 deeply lobed, and becomes the showy part of the flower. The corolla 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 fls. makes the Salviaceae a natural, not an artificial group.

Three Salviaceae are cultivated for their leaves, which are used in seasoning and also in medicine. These are the Common Sage, S. officinalis; Clary, S. scorterea; and S. horminum. For the commercial cultivation of Sage, see Sage. Clary is a perennial plant, but is cultivated as an annual or biennial. The plants run to seed the second year, after which it is better to pull up the old plants. The seed may be sown in spring, in drills 12-20 in. apart or in a seed bed, from which the seedlings are potted out in the spring. In August the first leaves may be gathered and the plants will continue to yield until June or July of the following year. Clary (S. scorterea) and its near relative, Salvia horminum, are of exceptional interest. They are cultivated for their culinary and medicinal value and also for ornament, but their ornamental value lies not in the fls. (which are usually insignificant) but in the colored bracts or floral iva.s. at the tops of the branches. The various species are known as the Purple-top Clary, Red-top Clary or White-top Clary; also Red Sage and Purple Sage. The two species (S. scorterea and Horminum) seem to be much confused in our catalogues, but the plants may be separated by the following characters: the upper lip of the calyx is 3-toothed in S. scorterea, and truncate in Horminum; the upper lip of the corolla in S. scorterea, by Bentham and Hooker, but straight and concave in Horminum. According to Bentham both of these species have large and showy floral leaves. It is to be inferred from Von Volo that the Authletes (S. scorterea) and Horminum, that S. horminum is the species chiefly cult, for the showy floral leaves, while the name "Clary" should be restricted to S. scorterea. There is another odd feature about the floral leaves of both species. The red, white or purple tops seem to be composed of sterile iva.s., i.e., they do not inclose any whorls of flowers, while the large bracts under the whorls of flowers are green. However, De Candolle refers to S. scorterea two pictures in B.M. and in both the situation is reversed, i.e., the showy colored parts are the bracts under the whorls of flowers and there are no sterile bracts at the top. 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 commonly grown 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 second group, Distichlis, in the form of the "conewort" that is usually called for; of the blue-flowered kinds, S. patens is the most popular of the bedding class, and S. pratensis 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 beautiful of the red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places to light up dark woody recesses. It should have a deep dark soil. A well-managed mass of Scarlet Sage may be maintained in full splendor from the middle of July to frost. It is propagated by either cuttings or seed. It is rather troublesome to keep cuttings or plants over winter, as they are nearly entirely liable to attacks of aphides. A 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 erect racemes, others pendulous, and there are some intermediate varieties. The color varies from the 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 the plants may make too much growth and the fls. will be late and relatively few. The same principles of cultivation apply to other tender Salviae used for bedding. Florists sometimes make a mistake in planting for frost, pot them and find that they make attractive plants in under glass for a month or two. One advantage that Salvia splendens has over many other red-flowered Salviae is that its calyx is as brilliant scarlet as the corolla. Special mention is entitled to the following list, nearly every species of which is distinct at first sight and seems worthy of cultivation. There are many showy, bright red-flowered Salviae which seem to be not cut in the following list, as the following are amongst the most desirable and are described in the supplementary list.
SALVIA

S. Boliviana, confertiflora, elegans, genneratia, leon-uroides, rubescens, strictiflora.

Salvia was monographed in 1848 by Bentham in DC. Prod. vol. 12, and an index to the 407 species therein described is found in Druce’s “Genera, Species et Synonyma,” etc., pars III. In 1876, Hemslay gave an account in The Garden (9:430-434) of 66 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. Fernald (Proc. Am. Acad. Arts Sel., 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.

Section 2. Hymenophace. Like Section 1, but the lobes of the calyx enlarged in fruit, membranaceous 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. Drosophace. Herbs, usually tall and gluttonous: teeth of calyx scarcely enlarged in fruit: posterior lip of the corolla falcate, compressed. Includes hians.

Subgenus II. Sclarea. Corolla with no hairy ring inside; anterior portion of the connective deflexed, abruptly dilated, connected at the callosus 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 6. Plectophace. Calyx ovate (instead of bell-shaped or tubular, as in the two 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-tensis and alyvistris.

Subgenus III. Calosphae. Corolla with no hairy ring inside but sometimes with 2 teeth near the base: anterior portion of the connective deflexed, linear, longitudinally connate or closely approximate, often somewhat dilated, rarely bearing an abortive anther cell. All American species.

Section 7. Calosphae. By far the largest section, characterized as above, and within these limits, immensely variable. Over 250 species, including azures, cacailefolia, cocinea, farinacea, fulgens, involucrata, lanceolata, lecantha, patens, sessel and splendens.

Subgenus IV. Leonia. Corolla with a hairy ring inside: anterior portion of connective sometimes directed outward and bearing either a fertile or sterile anther cell, sometimes deflexed and acute, rarely reduced to a short tooth.


Section 9. Pycomosphae. Bracts imbricate, not spinescent. Otherwise as stated in Section 8. Includes Columbariae.


Section II. Notidosphae. Bracts small or minute: posterior lip of calora entire or with 3 minute connivent teeth. Includes no species cult in America.

Section 12. Hemisphae. 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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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. Elyosphae. Shrubs or subshrubs, rarely herbs. Teeth of the calyx scarcely enlarged in fruit: posterior lip of the corolla erect, straightish, concave. Includes officinalis.
KEY TO SPECIES.
(Based on garden characters.)

A. Color of corolla vivid red, without a trace of purple.
   Tube of corolla neutral colored; lower lip showy.
   1. Greggi

B. Tube of corolla as bright as the lips.
   C. Upper lip conspicuously longer than the lower.
   D. Base of corolla not corolate.
      E. Calyx vivid red.
      F...
date: fls. scarlet, 1 in. or more long; calyx purplish or reddish towards tips; lower lip a trifle longer than the upper, the middle lobe large and 2-echt. Tex., Mex. R. H. 1854, 901 (B.M. 11:1090).—Considered hardy by Thorburn. Section 10

7. Sæsei, Benth. (S. Rosetii, Scheldw.). Fig. 2243. Remarkable for its large fls. (2 in. long), with boldly deflexed lower lip, which is not 3-lobed but merely 2-cut at apex; also remarkable for the large, loose calyx, flushed with brick-red towards the base. Mexican sub-shrub: lvs. ovate, serrate, not cordate. F.S. 14:1407.

8. carduaceae, Benth. Fig. 2243. Unique among Salvias for its three fertile flowers 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., 1-1½ ft. high, very woolly: lvs. all radical, densely woolly beneath. B. M. 4874. C. G. II. 19:56.—Offered by Calif. collectors and lately by eastern seedsmen.

9. Columbæria, Benthe. A common Californian annual hardly worth cult. for ornament, the blue fls. being about ½ in. across and not as long as the bracts. Height 9 in.–2 ft.: lvs. few, wrinkled, radical ones long-stalked, oblong, pinnatifid or bipinnatifid; divisions obrate. B. M. 6950 (fls. lilac).—Offered by Orcutt.

10. officinalis, Linn. Sage. Woolly white, south European subshrub, varying greatly in breadth and woolliness of lvs.: fls. purple, white, large or small: whorls few, dense, 10-20-fl. —The form commonly cultivated as a kitchen herb is var. tenius, Aef., with blue fls. and lvs. 3-4 times as long as broad. Other forms are: var. ambiflora, Aef., with white fls. and lvs. 3-4 times as long as broad; var. sulphurea, Aef., with lvs. 4-7 times as long as broad; var. laticolia, Aef., with lvs. twice as long as broad; var. crispa, Aef., with crisped and variegated foliage; var. stultifera, Aef., with wool; var. herba, Aef., with lvs. somewhat red and spotted; var. aurea, Hort., with golden yellow foliage and compact habit; var. tricolor, Villmorin (S. tricolor, Hort., not Lem.), with lvs. of three colors, gray-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 dandellion: lvs. lyrate, cordate at base, apical lobe largest, ovate-rotund; whorls globose, 20-40-fl.: fls. blue; corollas 8-9 mm. long; Section 12.

12. lyrtæa, Linn. Hardy perennial herb, with somewhat terebriform head and scale-like stems: fls. 1 in. long, blue or violet. N. J. to III., south Fla. to Tex.—Offered by Bassett, of Hammonton, N. J. Section 10.

13. bishops, Royle. Fig. 2243. Handsome hardy perennial herb, from the Himalayas, with large blue or purple fls., the lower lip often white, partly speckled with blue or purple; plant villous, 2-5 ft. high: fls. 3-5 in. long, deltoid-ovate, base truncate or hastate; petals 4-8 in. long: capsule ½-2 in. long: fls. 1-1½ in. long; upper lip 2-lobed, lower lip with large obcordate midlobe and broad revolute side lobes. B.M. 6517. B.R. 27:39. R.H. 1846:145.—Section 3.


16. farinaceæ, Benthe. Fig. 2244, 2245. Charming and popular plant, with violet or purple corollas set off by the light blue mesy 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 narrowly. R. H. 1873:90. Gn. 9:19; 28, p. 59.—Although a native of Texas, it is offered by several dealers in hardy herbaceous perennials. It is also treated as a hardy annual. Section 7.

17. leucanthæ, Cav. Fig. 2243. Delightful Mexican shrub, with white club-shaped fls. (not widely gaping) set off by purple calices. Branches covered with white wool, which is at length deciduous: lvs. lanceolate, serrate: fls. 1 in. long; calyx densely lanate. According to DeCandolle the whorls are many-fl., but in B. M. 4518, F.S. 22:2218, and Gn. 21:236 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 pantele 2-2½ ft. long, usually composed of 3 branches: whorls distant, about 6-fl.: fls. whitish, purplish pubescent 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 as white 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, linear and cordate at base; upper ones lanceolate: upper lip of corolla hooded, lower lip 3-lobed. N. Africa, Spain. B. M. 1774. G. M. 40:487.—Section 5.

20. involucræa, Cav. This has just enough purple in its fls. to exclude it from the scarlet-fl. 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: inflorrescence dense. B. M. 2872. B. R. 14:1205. R. H. 1858, p. 239.—Var.
2244. Habit of Salvia farinacea. No. 16.

From a mass 2 ft. high.

21. laniana, Otto & Dietr. (S. Höwyi, Hort.). Tender herb, doubtless perennial, with the habit of S. splendens, but the flowers purple-violet, the calyces colored still deeper. Supposed to be native to Mex. or Peru. F.S. 6:528. R.H. 1842:61. — S. laniana is not advertised, but S. Höwyl, said to be a sport from S. splendens originating with C. M. Hovey, is probably synonymous with S. laniana. G.C. II. 15:145. — Section 7.

22. azurea, Lam. Blue-flowered perennial, 1-5 ft. high: lower lvs. lanceolate, serrate; upper lvs. narrower, often linear, entire; fls. blue, varying to white. B.M. 1728. S. C. to Fla. and Tex., varying insensibly into the western.

Var. grandiflora, Benth. (S. Pitcheri, Torr.), which differs in being cinnabar-puberulent; indorecence denser: calyx tomentollose-sericeous 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. angustifolia, once offered by John Saul. G.n. 19:288. G.C. II. 14:885. — 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-fl.; corollas twice as long as calyx. Eu., N. Asia. — Section 6.

2245. Flowers of Salvia farinacea. Natural size.

24. pratensis, Linn. Fig. 2246 The most popular hardy blue-fl. Salvia. Perennial herb, sometimes tuberous-rooted, the fls. 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, cordate at base, glabrous above, pubescent beneath along the nerves and stems; stem-lvs. few, sessile; uppermost lanceolate bracts shorter than the calyx, reflexed, cordate-ovate: whorls 6-fl.: fls. about 1 in. long, blue; calyx sticky-villous; corolla thrice as long as calyx. — Var. rubicunda (S. rubicunda, Wender.) is a name which may be used for the reddish-fl. form cultivated in America. Var. alba, Hort., has white flowers. The following forms are given by Voss, and are probably curable from Germany: Var. pervioilea, albiflora, and variegata; the last has pale blue fls., with the midlobe of the lower lip white.

25. Verbenaca, Linn. (S. Spielmanni, Willd.). Hardy perennial herb with blue, rarely white fls. Here probably belongs S. spelmanni of the American trade, which is presumably an error for S. Spielmanni. Lvs. ovate or oblong, lower ones petioled, narrowed at base, upper ones broader, sessile and cordate at base; corolla about half as long again as the calyx. Eu., Orient.

26. lanceolata, Bruns. A plant has been cult under this name in American nurseries, but it is believed to be a hardy perennial, and is probably some common species. The true S. lanceolata is an annual with blue or purplish flowers about ½ in. long. Prairies, Neb. to Tex., Ariz. and Mex.; also E. Fla.


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SALVIA

3,000 ft. above sea. B.M. 5017. Gu. 27, p. 113. Section 1—S. cerasifolia, Linn., is a yellow-fl., baccinal from Asia Minor, common in the Mediterranean. The flowers are smaller than 1 in. long, but they perhaps represent the more typical example of a good yellow that Salvia affords. F.C. 1:5. Section 5—S. chamaederae, Cav. is a small or dwarf plant at base of the Ecuador has probably formis, and is speckled tawny; the lower lip longer than the upper and the fls. marked with white along both lips toward the throat. Also found in Mex. B.M. 808. Section 5—S. reinwardtiana, Benth. is a unique example of a species. The raceeme is extremely long (2 ft.), with about 2 dozen distinct whorls of fls.; whoris many-fl.; fls. small, white, the upper lip marked at base of the throat. The flowers are of 2 types: the lower lip longer than the upper lip, white, the upper lip with a red fl., and the lower lip with a purple fl., but it is the apex at a height. A charming shrub, found in the Organ Mts. in B.M. 3809. Section 7—S. dichroa, Hook., is perhaps a botanical curiosity. The fls. are blue-purple on the lower lobe of the lip, white on the apex. It is a native of the Atlas Mts. in Morocco, probably a tender perennial herb. Root- lvs. form a rosette of 2 ft. in diameter. It is in corolla本着

SAMBUCUS

Most

Section 7—S. eriocaulis, Bertero, is a shrub found in Jamaica be

Section 7—S. Forskohli, Linn., is a hardy perennial, lower lip shorter white, spotted tawny and colored. It is a species which at a height, it is 2-cut at apex. I.L.I. 1:152. B.F. 3: 2033. F. 151:145—S. Gordonii, a trade name in America, seems unknown to any of some sections, ex—S. Grahamii, Benth. The showy part of the fl. in this specie is the midlobe of the lower lip, which is large and obcordate. This species deep etched. It is probably the same fls. at the same time, the latter being the older ones. The species is also remarkable for 2 small white spots, on each half. But the R.F. 161:87. S. Hérivé, Regel. Peruvian shrub, 3-5 ft. high, with scarlet fls., lately offered in S. Calif., and formerly by John Saul, of Oreg., is a vigorous, late-flowering plant. It has a spreading, toothed, pale green above, whitish below, 4 in. long, 1 in. wide: whoris 2-fl.; fls. 74 in. long or more, later straggling with the fr. flowering above. It is a good plant for the greenhouse, and is widely used in modern works, but is probably not worth cultivating. It is an annual with some white calyx. To 3 ft. S. Hispánica, Linn., is included in many modern works, but is probably not worth cultivating. It is an annual with some white calyx. To 2 ft. S. lanceolaria, Gloxin. (S. formosa, L’Herit.), belongs to a small group of scarlet-fl., frs. from Peru and Brazil, which are remarkable for their size. Specimen from the kidney. Peru, B.M. 376. Section 7—S. longiflora, Ruiz & Pav., has probably the longest fls. of the genus. It is a Peruvian shrub, with nodding racemes of red fls., each 6-3 in. long. Section 7—S. macrostachya, HBK., is a shrubby plant, found in Ecuador and Colombia at 10,000 feet. It grows 6 ft. high and has large pale blue fls. which are overshadowed by the too green, persistent bracts. B.M. 7327. Section 7—S. marmorata, Hort., is said to be "white, striped scarlet," doubtless referring to the fr. From a Mexican plant. It is of the variety of S. nigriscens was advertised by John Saul about 1891 and seems unknown to botanists. Possibly a form of some common species, the flowers are blue, but unpleasing to the eyes. S. tans, Linn., is given in many modern works, but is scarcely worth cult. unless for the unusual circumstance that the inflorescence is nodding. The flowers are clustered, blue, and very long. Hardy perennial herb from western Eu. B.M. 2436. Section 6—S. rhombifolia, Ruiz & Pav. Peruvian blue-fl., annual, the lower lip longer and lined with white or yellow, of the genus. It is a shrub with a very long, lower lip larger. B.M. 5047. Section 7—S. Sambucus, Linn. (S. Habitiensia, Willd.). One of the most attractive shrubs said to be hardy. It is a large

SALVINIA

(Santo Maria Salvinii, 1633—1722. Italian scientist). Mariisëaëceae. Salvia is an interesting plant for the small home aquarium. It is a floating plant with slender stems bearing 2-ranked, oblong lvs. It is a perennia and is a pretty plant for the greenhouse. It often passes the winter in greenhouses in a growing condition, producing no spores. Salvia is not a flowering plant. It is a cryptogam and has two kinds of spores, large and one type. The sporangia are borne on a little spore, borne on a stem. Each of which contains a solitary sporocarp. The other sporocarps in the cluster contain numerous pedicelled sporocarps, each of which contains numerous spores. For a fuller and illustrated description see Britton and Brown's Illustrated Flora.

SAMBUCUS

(Santinamia, Linn.), is a common European and Asian species and is probably the same fl. S. Brazilicensis is another trade name, its lvs. are said to have a "delicate hairy surface." W. M.

SAMBUCUS (old Latin name of the Elder, perhaps derived from Greek sambuke, a musical instrument said to be made of Elder wood). Copriphloëceae. Elder. About 20 species of trees or shrubs (excluding the herbaceous species) with opposite, pinnate lvs., fts. serrate or lac
cinate, 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 wild forms are esteemed 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 and pubens may be had from natural plantations of these in the eastern states. S. Canadensis is used as one of our self-sown plants. Elderberry wine is a common home product. The Brainerd Elderberry introduced in 1890 by Brandt has fruits fully three times as large as the wild berries.

Botanically, of the species closely allied to Viburnum, being essentially distinguished by the 3-5-lobed ovary, that of Viburnum being usually 1-lobed. Other general characters: calyx 3-5-lobed or toothed; corolla rotate, 5-petalled, lobed; stamens 5; anther of ovary; ovary convex; style 3-parted; ovule solitary, pendu

lous from apex: drupe 3-5-stoned: stones 1-seeded.
flat 5-rayed cymes: fr. black or dark green.—May, June. The following horticultural vars. are sufficiently distinguished by their names: argéntea, aërea, heterophylla, laciniata, pulverulentà, pyramidalis, rotundifolia, variegàta. Of these var. aërea is distinct by reason of its yellow foliage; laciniata and heterophylla by reason of variously cut lfts., making them very effective in mass planting. Var. variegàta is not constant in its variegation. S. heterophylla, laciniata, variegata, etc., of trade catalogues, are presumably varieties of S. nigra.
and yellow flowers in small, umbel-like clusters. Though grown and used like true Sparphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family Compositae.

For Marsh Sparphire, see Salicornia. M. G. Kains.

SANCHEZIA (after Jos. Sanches, professor of botany at Cadiz). Acanaetha. Strong, erect herbs or half-shrubby plants: lvs. large, opposite, entire or slightly toothed or occasionally. united into 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, 5 equal and单身; 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, spurlike; ovary on a thick disk, 2-loculed, with 4 ovules in each cell. About 8 species in Peru, Colombia and Brazil.

nobilis, Hook. Plants stout, erect, smooth, except the inflorescense: stem 4-angled; lvs. 3-9 in. long, oblong-ovate to oblong-lanceolate, orly toothed, narrowed into winged petioles, connate; fls. 2 in. long, yellow, in heads subtended by bright red bracts, the heads forming a panicle. Ecuador, B.M. 5594. F.S. 23:2437. Var. glauophylla, Lem. (var. variegata, Hort.). Lvs. variegated with pale yellow or white along the veins. F. 1867, p. 134. I. H. 14:528 (as S. nobilis); 16:590. A hot-house plant which is very attractive when well grown, but which becomes straggling and weedy if neglected. Grown mostly for its foliage.

HEINRICH HasSELBERNG.

SANDAL-WOOD. See Adenanthera.

SAND-BUR. See Cenchrus.

SANDERSONIA (John Sanderson, discoverer of S. aurantiaca). Litiaceae. A genus of 1 or 2 species from Natal; tuberous plants growing 1-1\1/2 ft. high, slender, with many sessile stem-leaves and yellow or purple globular bell-shaped flowers, pendulous from a number of the upper leaf-axils, the segments with pointed nectararies at the base. Perianth gamophyllous, urceolate: segments deltoid or lanceolate: stamens 6; filaments filiform; anthers linear-oblong, ovary 3-lobed. Glasshouse plants, to be treated like Gloriosa.


SAND MYRTLE. Leiophyllum.

SAND PEAR. Pyrus Sinenesis.

SAND VERBENA. See Abronia.

SANDWORT is an English name for Arenaria.

SANGUINARIA (Latin, blood; referring to the yellowish red juice of the plant). Papaveraceae. Bloodroot. A single species common in woods of eastern North America. Rootstock several inches long, about 1\1/2 thick, radical; lvs. radical 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; petals 2, fugacious; petals 2-12, in 2 or 3 rows, oblong or obovate, early deciduous; capsule 1 in. long, oblong, 2-valved. The Bloodroot is a showy spring flower usually found in woods and, but not a true shade-loving plant, since its growth is, to a degree, like that of cultivated plants, and 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 amongst grass, if care be taken not to mow down the flowers before they are out. 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.

SANGUISIORBA (Latin name referring to reputed medicinal properties, connected with stigma, "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 inclosing the mature achen. The Sanguisiorbas are natives of the north temperate zone. Two species are sparingly cultivated in this country. See Poterium.

minor, Scop. (Poterium Sanguisiorba, Linn.). BURNET. Perennial, growing in clumps, glabrous or sparsely hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6-10 pairs and orbicular to oblong and deep-toothed; stems 1-3\2 ft. tall, terminating in small globular or oblong heads: lower lfts. in the head staminate, the others perfect, the stigmas purple, tufted and exserted. Ex., Asia, and naturalized in this country. Sometimes grown in the herb garden 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, obtusate, sharp-toothed; fls.-heads cylindrical, 2-6 in. long, the fls. all perfect, whitish. Low grounds, Mich., east and south. An interesting plant, worthy a place in the hardy border, and sometimes sold for that purpose. It produces much foliage. Grows 3-5 ft. tall. 1. H. B.

SANICULA (Latin, to heal). Umbelliferae. Sanicle. Black Snakeroot. 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 globular, small, covered with hooked bristles. Woodland plants with insignificant lfts. Useful occasionally as a ground cover in waste shaded places. The following species have been offered by collectors.
SANICULA  

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 in. long, becoming distinctly pedicellate. Calyx-lobes pubescent. 

aa. Fls. yellow. 

bignn-tifida, Doug. About 1 ft. high, with a pair of opposite lvs. at the base and 1-3 above, long-petioled, triangular to oblong in outline, 2-3 in. long; pinnately 3-5-lobed. fr. sessile. Calyx slightly pubescent. 

aa. Fls. greenish white. 

Marylandica, Linn. Stem stout, 1½-4 ft. high; lvs. bluish green, the basal long-petioled, the upper sessile, 7-7-parted; fr. sessile. Atlantic to Rocky Mts. Common is woods. 

SANSEVIERIA (after Raimond de Sangro, Prince of Sansevero, born at Naples 1710. The spelling Sanseveria is not the earliest).  

Hemodoraceae. B wo-STRING HEMP. A genus of about 10 species from Africa and the East Indies, of essentially tender foliage plants, although beautiful in flower: rhizome short, fleshy, sometimes stoloniferous; lvs. radical, in clusters or rosettes, fleshy, firm, often a pair or nearly flat or terete, the interior fibrous; scape simple, long, stout; fls. white, clustered, in often dense racemes; perianth-tube narrow, often long: ovary free, 3-located, attached with a broad base. Sansevierias are used for various propagations by division or they may be raised from leaf cuttings about 3 in. long. These cuttings form roots in sandy soil after about one month, after which a long stolon-like bud is formed, which produces the new plant at some distance from the cutting. Sansevierias are of easy culture and are well adapted to house decoration, since they do not require much sunlight. A rather heavy soil suits them best. 

aa. Lvs. flat. 

Guineénica, Willd. Lvs. 1-3 ft. long, 3-6 in a cluster, oblanceolate, radical, dark green with lighter transverse markings: scape with inflorescence as long as the leaves; bracts 3-4; fls. greenish white, about 1½ in. long, fragrant. B.M. 1179. G.C. III. 4:73. 

aa. Lvs. concave. 

Zeylánica, Willd. Lvs. 1-3 ft. long, 8-15 in a cluster, sword-shaped, subterete, variegated with transverse markings of a grayish white: scape longer than the lvs.; bracts many; fls. whitish green, ½ in. long. B.R. 2:160.—Rarely blooms in cult. 

aa. Lvs. cylindrical. 

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 flowers extending farther than the leaves; raceme about 1 ft. long: fls. creamy white, tinged with pink. B. M. 6093. G.C. III. 16:222. R.H. 1861, p. 448, 450. 

F. W. BARCLAY. 

SANTOLINA (derivation of name doubtful). Com- pòdia. About 8 species of shrubs or rarely herbs, natives of Europe and Asia, mostly in the Mediterranean region. Lvs. alternate, aromatic; margins tabulately dentate or pinnately lobed: fl.-heads yellow or rarely white, of disk lvs. only, many-fl.: involucre partly cameral, 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 but may be taken bare root in the fall. They are easily rooted in sand. 

Chamaeparjisus, Linn. (S. incana, Lam.). LAVEN- DER COTTON. A hardy half-shrubry, much-branched plant, 1½-2 ft. high, with small evergreen, silvery gray lvs., and small globular heads of yellow fls., borne in summer: branches and lvs. canescence. Var. incana differs but little from the type: involucres pubescent. 

S. hypera, Linn. is Anthemis montana, Linn., which makes a pretty ground cover and has yellow fls., but appears not to be in the trade. 

F. W. BARCLAY. 

SAPAN

SANVITALIA (after a noble Italian family). Co- pòdia. A genus of about 4 species, native of the southwestern United States and Mexico. Annual, usually low, much-branched herbs, with opposite, petioled, mostly entire leaves and small solitary heads of fls. with yellow to white flowers; sometimes growing in a involucrate and broad, of dry or partly herbaceous bracts: receptacle from flat to subulate-conical, at least in fruit; its chaffy bracts concave or partly conduplicate. Akenes all or only the outer ones with-walled, those of the ray, 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 forfiferous annual, growing about 6 in. high, trailing in habit: lvs. ovate, about 1½ long; lvs. with dark purple disk and yellow rays, resembling small Rudbeckias, less than 1 in. across, numerous: akene of the disk flattened and often winged and 1-2 aristulate. Summer to very late autumn. Mexico. B.R. 9:70. R.H. 1860, p. 127.—Var. flore-pleno, Hort. A double-fl. variety coming true from seed, and as vigorous as the type. R.H. 1866, p. 70. Sanvittalas 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 water composed of containing mineral salts and sugars derived from the soil or constructed within the living cells. The water taken from the oil by the roots or other absorbing organs may contain potassium, sodium, magnesia, calcium, iron, and some oxalates, phosphates, sulfates, and chlorides. As the fluids, sap passes from cell to cell in the living tissues some of the mineral salts are withdrawn and used, and the water takes some of the organic compounds which have been formed by proteoplasm. As a consequence, in this action the sap of different parts of the plant is unlike in composition, and the sap of any organ varies with the change of season. The water or sap of a plant may comprise as much as 60 or even 90 percent of its total weight. 

The mineral substances enumerated above may be found in nearly all saps; however, the limits of this note do not permit even an enumeration of the thousands of organic substances which occur in the sap of various species. The more important ones may be grouped under the acids, sugars, or carbohydrates, and asparagin, or perhaps some of the protoels or albumins. Many plants have become valuable commercially because of the large proportion of some useful substance which they contain. 

Among these may be mentioned the sugar maple, the sap of which contains over 3.5 percent of sugar, and the sugar beet and sugar cane, in which the proportion is very much higher. 

Sap is forced from the living tissues into the woody cells and vessels, and these serve as conduits in conducting the sap rapidly from one part of the plant to another. The constant transpiration of leaves demands an enormous supply of water from the roots. The upward passage of this supply would be too slow if conducted through the living cells. The water taken in by the living cells of the roots is forced into the dead cells of the roots and is drawn upward through the wood (see Transpiration). 

The exudation pressure by which water or sap is forced from the living cells is exhibited in the bleeding which ensues when stems and branches are cut away. The pressure which produces bleeding is often called root pressure, although it is exerted by any part of the plant. Bleeding is exhibited by a large number of trees at the beginning of the growing season, and is also especially noticeable in the vine, dahlia, castor-oil plant, calia, nicotiana and corn. 

The amount of sap exuded in the process of bleeding is very great and may be equal to the total volume of the plant in some instances. A specimen of Betula papyracea gave off over 63 lbs. of water in 24 hours; Agave Americana, 12.5 lbs. in 24 hours. A vine may bleed from one to two pints daily, while in the grape, small galls also exhibit very vigorous bleeding. A half gallon of sap has been known to exude from a tropical liana in eleven hours. 

It is to be noted that the flow of sap from the sugar
maple and other trees in the early spring, before the soil has thawed and while it is yet too cold for the living matter of the plant to show any great activity, is not due to the bleeding pressure, but to the expansion of the Lfts and liquids in the trunk and branches of the tree due to the direct warming action of the sun's rays. During the daytime the bubbles of air in the wood cells become heated and expanded, driving the sap from the wood cells into the larger bole which has been bored into the tree, filling the air spaces of the tree trunk 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 of water, 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 explained by forces at hand. See Physiology of Plants. D. T. MacDougall.

**SAPINUS** (Latin words meaning *soap* and *Indian*; alluding to the use of the fruit in India). *Sapium* 

*Sapindaceae*. A genus of about 12 species of trees, shrubs or Woody vines inhabiting the tropical regions of the whole world. Wood yellow; lvs. alternate, stipitate, abruptly pinnate; fls. white, small, in lateral terminal racemes or panicles; sepals 5, obtuse, rarely petaloid; petals more or less pubescent and bearing just above the short claw a villous or ciliated com or appendage; disk annular, usually crenate, bearing 5-10 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.

*Saponaia*, Linn. A small tree with rough grayish bark; lfts. oblong-lanceolate and acute to elliptic-ovate and somewhat obtuse, opposite or alternate, entire, glabrous, veiny and incised above, tomentulose beneath; racemes usually winged: fr. held, 6-8 lines in diam. S. Fl., W. India and S. Amer. Cult. in S. Fla. and S. Calif. 

AA. *Lfts.* 7-18.

**marginatus**, Willd. A tree reaching ultimately 60 ft. in height; lfts. 7-13, lance-oblong, acuminate, glabrous above, paler beneath and somewhat pubescent on the midnerves, 2-5 in. long, the upper nearly opposite, the lower alternate; racis wingless, narrowly margined or marginless: fls. white, sometimes tinged with red in pyramidal panicles; petals ciliate and bearing near the base a 2lobed villous scale; filaments villous; fr. yellow, about 8 lines long. May, June. Kan. to Tex., Ariz. and N. Mexico. B.B. 2:402. —Cult. for ornament in S. Fla.

**Atilla**, Trab. A species from S. China which is not distinguishable from *S. marginatus*, Willd., by description. *Lfts.* 20-14; acute, glabrous; fr. glabrous, nearly globose, strongly keeled. H. 1895, p. 306. —According to Franceschii this tree is cult. in Algeria, where it comes into bearing in 8-10 years. "The berries contain 38 per cent of saponin. Trees have been known to yield 410 to 850 pounds of berries every year. The tree does well in mucky, rocky soil." F. W. Barclay.

**SAPRUM** (old Latin name used by Pliny for a resiniferous pine). *Euphorybiae*. About 25 species of milky-juiced tropical trees or shrubs. Lvs. opposite, petiolate; petioles and scale-like bracts biglandular; fls. in terminal spikes, the pistillate single below, the staminate in 3's above, all apetalous; sepals imbricated, united below; stamens 2–3; filaments free; capsule with 2–3-seeded locules, more or less fleshy, a 3-winged central column remaining after dehiscence.


**SAPODILLA, or NASEBERRY** is a common name of *Achras Sapota*, Linn. (*Sapota Achras*, L.), 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, whitish, scarcely exceeding the rusty calyx; stamens 6. Fruit size and color of a small musket 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*. *Sapontina*. 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 clavate, limb entire or emarginate, scaly at the base or naked; stamens 10: ovary many-seeded; style 5, rarely 3; capsule ovoid or oblong, rarely nearly globose. Saponarias are readily established in any soil and require but little care. *S. oevoides* is an attractive plant for the rockery or for edging. Propagated by seed or division.

A. *Stem stout, erect.*

**Officialinis**, Linn. *Bouncing Ber*. Fig. 2250. A perennial: stems ½–2½ ft. high, leafy, simple, clustered, glabrous; lvs. on the plant; fr. glabrous, dark red or light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petal lobes ovate-oblong, ex- toothed at apex; July, Aug. Europe. —Var. flor- pleno is quite double-flowered. *S. Caudescia, Hort.*, is said to be a deeper-colored double form.

AA. *Stem slender, decumbent.*

B. *Lvs. obtuse; plants annual.*

**Calabrica**, Guss. A low-growing annual, with pink fls.: lvs. oblong-spatalulate, obtuse, about 1-nerved: fls.
SAPONARIA

in a loose corymbose panicle; calyx-teeth ovate, obtuse, membranous-margined. Spring. Italy, Greece. R.H.
1851:281.—Var. alba is also in the trade. Seed should be sown in the fall for spring bloom or in April for
summer flowering.


ocymoides,* Linn. Stems much branched, 6-9 in. high, half-trailing; lvs. ovate-lanceolate, about 1 in. long, 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 subsist on living plants or animals no longer corresponds with facts. The

2250. Saponaria officinalis (× 50).

integrity of the classification has been destroyed by the discovery of certain bacteria in the soil, as the nitriifying
bacteria, which are able, even without sunlight, to appropriate the carbon dioxide of the atmosphere. Among
the fungi we class as saprophytes all plants which live upon a dead or decaying organic substratum. Such are
the baker's yeast (*Saccharomyces cerevisiae*) , the mushroom (*Agaricus campestris*) and the stinkhorn (*Phallus
impudicus*). Most mushrooms and toadstools are saprophytes (*Fig. 2251*). Some of the flowering plants pos-
sessing ectotrophic mycorhiza (Indian pipe, *Monotropa uniflora*) and endotrophic mycorhiza (*Neotia nudia-
avis*, *Corallorhiza inata*, *Epipogium aphyllum*, snow plant, *Sarcodes sanguinea* and *Thamia aseroide*) are also
classed as saprophytes.

JOHN W. HARSHBERGER

SARACA (from Sarac, the name of the genus in

2251. *Saponaria officinalis.*

India). *Leguminosae.* About 6 species of tropical
Asian trees, with glabrous, rigid coriaceous, abruptly
pinnate lvs. and yellow, rose or red fls., in dense, sessile,
axillar, corymbose panicles with somewhat petal-like,
reddish bractlets; calyx cylin-
drical, with a disk at its sum-
mitt; limb 4-lobed; lobes ob-
long, unequal, petal-like; cor-
olla wanting; stamens 3-8,
exserted; filaments filiform;
stamens versatile, opening
longitudinally; fr. a coria-
ceous flat pod.

*Indica,* Linn. A medium-
sized tree: lfts. 6-12, ovate-
lanceolate, acuminate, 4-6 in.
long, entire, short-petioled:
fls. orange-red, fragrant, col-
collected in compact, roundish
panicles which are shorter than
the lvs.; stamens usually
6-7, inserted on the fleshy annular ring at the summit of the calyx-tube; style long, curved; bracts red,
attenuating into a calyx; pod
4-10 in. long, brown; seeds oblong, 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. Procures from southern Florida.

F. W. BARCLAY.

SARCANTHUS (name from Greek words signifying

2252. *Snow plant—Sarcodiae sanguinea*.

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 conical middle lobe. Foliage and habit of Vanda.

Give plenty of water in the growing season. They should have basket culture, with fern root, and a tem-
perature of 65° to 85°. When at rest, give very little water and reduce the temperature to 35°. Culture
practically as for Vanda.

S. *teretifolius,* Lindl. (*Tulia
teria,* Lindl.). Stem 1 ft. high, with cylindrical lvs.; raceme bearing
7-8 inconspicuous fls. in petal-like bracts; petals oblong,
dull green, with red disk; labellum—slipper-shaped, white, lateral lobes edged with red. Sept. China. B.
M. 3571.

HEINRICH HASSELBRING

and WM. MATHEWS.

SARCODIUM Lobbii, Beer, is *Bulbophyllum Lobbii.*

SARCOCÓCCA (fleshy berry). *Euwhorbiaceae.* To

2250. Saponaria officinalis (× 50).

this genus is to be referred *Physochilos 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, axillary racemes of small yellowish fls., and a small purple plum-like fl. *Sarcodes pruiniformis.* Lindl. (*Sal-
Lobelia, Bull. *S. coriacea,* Sweet). It is treated as a
cool greenhouse plant. B.R. 12:1012.

SARCOKÉDES (Greek, flesh-like). *Ericaceae.* *Sar-
Lobelia, Bull. *S. coriacea,* Sweet). It is treated as a
cool greenhouse plant. B.R. 12:1012.

SARCODES (Greek, flesh-like). *Ericaceae.* *Sar-
codes sanguinea,* Torr. (Fig. 2252), is the Snow Plant of the Sierra
Nevadas. It is a low and fleshy plant growing 3-12 in. high and entirely
devoid of green leaves. It
belongs to that strange
family of the gean

2252. Snow plant—Sarcodiae sanguinea.

flesh and parsatite

SARRACÉNIA (Dr. Jean Antoine Sarraxon, an early

Sarrazin, who sent *S. purpurea* to Tourne-
fort). *Sarraceniaceae.* *Pitcher Plant.* SIDE-SADDLE
FLOWER. Three small genera and 8 or 10 species comprise the family 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 southern Oregon; Heliamphora mutans grows in South America. They are perennial aquatic esparto grass, with hollow pitcher-like leaves, and nodding flowers single or several on short scapes. The pitchers catch organic matter and entrap insects, and the plants often utilize these materials. For 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 creeping things. See Darlingtonia. The plants are grown as novelties because of their oddity and the botanical interest that attaches to them. The Sarracenias have been much hybridized, giving rise to distinct and interesting intermediate forms, but these hybrids are known only to specialists and fanciers. Heliamphora 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.

Botanical position of the Sarraceniacae is not settled. Ordinarily it is placed near the Papaveraceae and Cruciferae. Others associate it more intimately with the Drosaceae. The fls. are perfect, the parts mostly free and distinct; sepals and petals each 5; stamens many; pistil 2-locular, united to form a nutlet, bearing many ovoids on axile placenta. In Sarracenia itself, the flower is large and solitary, nodding from the top of a rather stiff scape; petals colored, ovate to more or less fiddle-shaped, incurved; sepals thick and persistent; 3 bracts beneath 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. brown, 3-5; seeds 15:817; 16:11; Courtilt. 9. For an account of hybrid Sarracenias, see also Gn. 28, p. 217, and 48, p. 202. I. H. B.

All of the species comprising those which are indigenous to the southern states only, including S. flav., S. psittacina, S. rubra, S. variolaris, and S. Drummondi, are hardy in the botanic garden at Washington. However, no one out of doors, S. flav., S. rubra, and S. variolaris succeed best. S. psittacina and S. Drummondi do poorly. They are planted in a raised bed, the sides of which are made of 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 Pinguicula. S. flav., S. rubra, and S. purpurea are sometimes well grown on margins of lily ponds, if given plenty of water.

For pot culture in northern greenhouses S. Drummondi is the most attractive species. It produces two crops of leaves each year. Those developed in spring, which are the most so beautifully marked as those which make their appearance during the fall months. S. flav., 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 color in the fall.

Propagation should be effected by division of the rhizome at the time of repotting; this should be done before growth begins. New forms are raised from seed. All the species are easily propagated by cuttings.

Sarracenias thrive best in a substance through which water will pass readily. During the growing period they need an abundant supply of moisture. They are best grown in a greenhouse. Greenfly are the most troublesome pests. Greenfly is most abundant during the earlier stages of the leaves, the thrips appearing later.

G. W. OLIVER.
SARRACENIA

p. 86 bis. Var. crispata, Hort. (S. crispata, Hort.). Differs from the species "in the deepest wing to the pitcher, the strongly reflected margins of the sepals, the white petals, the blunter, less conical, and the shorter and blunter lobes of the disk of the style." Pitchers 2 ft. long. G.C. II. 15:633; 1619. 1.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. erythropus, Bull. (S. Eugelii, Shuttl.). Large, the lid or hood blotted with crimson at the base. Var. limbata, Bull. Large, limb of the lid or hood bordered with band of brownish crimson ¼ in. wide. Var. maxima, Hort. Pitchers large, with green lids. Var. minimas, Hort. Small in all its parts. Var. ornata, Bull. Pitchers large, green, red-veiny, the inner face of the long-stalked lid bearing a network of red veins; fls. said to be 8 in. across, canary yellow. G.C. II. 15:629, 633; 16:12. Var. picta, Bull. (S. Cutelbr., Ell. S. flava, Liddell, William, S. Liddell, Hort.). Pitchers very large, red-veiny, with flat roundish wing.

cc. Base of hood broad, or only moderately contracted.

D. Lid or hood suborbicular.

5. Drummundii, Croom. Pitchers large and erect, 2-3 ft. long, in well-grown plants of funnel-shaped, green and prominently nervet. The upper part of the pitcher richly variegated with purple reticulations and creamy white inter-spaces, the wings 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. 6:560; 10:1071-2. I.H. 41, p. 305.—A very striking species, with its tall pitchers strongly variegated at the top. Var. rubra, Hort., has pitchers with deep red markings. Var. alba, Hort., has paler variegations and flowers. Var. undulata (S. undulata, Decne.) has stouter and 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 somewhat pubescent; fl. 5 in. across, the pendulous petals white or yellow at the base and deep-red above. Swamps, N. Car. to Ala. Said to hybridize in the wild with S. purpurea. Var. acuminata, DC. Lid long-acuminate. B.M. 3515. L.B.C. 12:1163. Var. Swettii, Mast. (S. rubra, Veitch). S. rubra, DC. Smaller: pitchers cylindrical, with a narrow wing; lid ovate-acuminate. F.S. 10:1074.

II. HYBRID TYPES.

7. Atkinsiniana. S. flavo, var. maxima × S. purpurea: More like S. flavo; pitchers long and slender, green, with red reticulations; lid broad, cordate, red-veined.


9. Courtii. S. purpurea × S. psittacina: "It has developed pitchers about 8 in. long, and long and narrow, deep crimson, their form being intermediate between that of the two parents." Raised by Mr. Court, at Veitch's. S. H. 1:177.

10. Maddisoniana. S. psittacina crossed with S. variola: "Compact and dwarf: pitchers short and broad, incurving, ascending, green with dull red veins; lid large, ovate and undulate, deep-purple-veined.

11. Maidalina. S. flavo, var. rubra × S. Drummondii: Described as follows in Pitcher & Manda's Novety Catalogue 1899: "A few plants of this rare and beautiful plant has been collected, growing in many square of S. flavo and S. Drummondii, of which it is not to doubt a nature 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. melanochôda. S. purpurea × S. Sternensis, the latter a hybrid of S. purpurea and S. flavo: "In habit it is like S. purpurea, the pitchers being obliquely ascending and distended like those of purpura, 6-7 in. high, with deep wing, slightly tubed to the eye and roundish sessile lid 2½ in. across. The color is like that of S. Chelsomii." Masters. Raised at Veitch's.

13. Mitchelliana. S. Drummondii × S. purpurea: growth of S. purpurea, but more erect-growing and more green: pitchers 9-12 in. tall, rich green with crimson veins; lid reticulated with red, undulate.


15. Williamsii. Supposed natural hybrid of S. purpurea and S. flavo: 9-10 in. high, erect, bright light green, streaked and veined with crimson, with a broad lid like that of S. purpurea. It was imported by Mr. B. S. Williams, with a consignment of S. flavo." Masters. G.C. II. 15:629.


L. H. B.

SARRASAPARILLA of commerce comes from various species of Smilax. Wild Sarsaparilla of America is Aralia nudicaulis.

SASSAFRAS (Spanish, Salzasfras, Saxifraga; medicinal properties similar to those of Saxifraga were attributed by Spanish discoverers to Laurelia. 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 or black, and often 30 in. diameter, very fragrant fruit. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright red color in autumn, and on account of its decorative bright-colored fruit. It prefers, if 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 when ripe; also cuttings, which are often freely produced, and by root-cuttings.

One species in eastern N. America. Fls. dioecious, rarely perfect, apetalous; calyx 6-parted; stamens 3, the 3 inner ones furnished at the base with 2-stalked, orange-colored glands; anthers opening, with 4 valves; ovary slender, ovoid, loculed; fr. an oblong-ovoid, 1-seeded, dark blue drupe surrounded and held by the thickened scarlet calyx.

officialis, Nees (S. Schizopitys, Karst. S. varifoliolium, Kuntze. S. Schizopitys, Linn.). Figs. 2255 (winter tree), 2256. Tree, 30-60, or occasion al 100 ft. high; young branches bright green; lvs. ovate and entire, or 3-lobed almost to the middle, ovate-oblong-pubescent when young, gla-

SAVORY

SAVORY

SAVORY

father. His sturdy character, sympathetic nature and kindly disposition endeared him to all who came in contact with him.

B. T. GALLOWAY.

SAUROMATUM (saurus, lizard; referring to the spotted flower). Arceae. Perennial herbs, with unisexual naked fls. which bears a single pedate leaf one year, the next year lvs. and fls.: petioles cy lindrical, spotted below; blade pedately parted; peduncle short: spathe soon withering, its tube oblong, swollen at the base, more or less comate, 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 showy 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.

SAVINUM, Schott. Petioles 2 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).

VENEBREUM, Schott. (S. Simulata, Schott.). Petioles spotted, 3-4 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 2 in. yellowish hence with and crowded oblong purple or black spots. Himalayas. B. M. 4465 and F.S. 13:1234 (both erroneously as S. guttatum).

JARED G. SMITH.

SAURUS (Greek, lizard's tail; referring to the curve of the spine of f.). Piperaeae. The Lizard's Tail is a hardy perennial herb suitable for the bog garden. 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 gracefully. Herbs with jointed stems, alternate, entire lvs. and perfect fls. in spikes, entirely destitute of floral envelopes and with 3-5 ovoid, aristate; stamens mostly 6 or 7; fr. somewhat fleshy, wrinkled; carpels 3-4, indehiscent, united at base.

cernus, Linn. Lizard's Tail. Fig. 2237. Height 2-5 ft. lvs. petioled, ribbed, converging. Conn. to Ont., Minn. Mo. and southward. B. H. 1:482. W. M.

SAYON. Jumpei- rae Sabina and J. Virginalis.

SAYOVY. Summer Savory is Satureia hortensis, Linn.

Labiateae. Cultivated in kitchen gardens for its aromatic green parts, which are gathered in midsummer for flavoring meat, dressings and other culinary preparations. The slender, erect, branching, herbaceous stems, 10-12 in. tall, bear soft, narrow, green leaves and clusters of pink, purplish or white flowers in summer, which are followed by brown, oblong seeds whose vitality lasts three years. Propagation is by means of seed, which is sown in drills 12-18 in apart in April or May in light, mellow, well-drained loam of moderate richness. When 2-3 in. tall the plants are thinned to 6 in. apart, and 6 days may he transplanted from hotbeds sown in March.

Winter Savory (S. montana, Linn.) is a hardy Euro- pean perennial species, having much the qualities of
SAXIFRAGA (Latin, rock and to break; said by some to refer to the fact that many of the species grow in the crevets of rock, by others to the supposition that certain species would cure stone in the bladder). Saxifragaceae. Saxifraga. Rockfoil. 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 Saxifragas are herbs, mostly perennial, with perfect small white, yellow or purplish flowers in panicled corymbs; calyx with 5 lobes; petals 5, usually equal; stamens mostly 10, in some species only 5; styles 2; fr. a 2-beaked or 2-divided capsule, or sometimes the capsule nearly or quite separate at maturity, with numerous seeds. See Engler, "Monographie der Gattung Saxifraga," 1872.

Saxifragas 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 Bergenia section are sometimes used as border plants. Some of the small-flowered kind, such as rock-rose, and alpine gardening in America, the Saxifragas are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are less hardy to 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. 1047, 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. Asoon may be taken as a cultural type, produce a dense rosette of leaves at the surface of the ground, from which arises a flower-scape. Some of these forms are very interesting because of the varicolored or all-very effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade.

Most Saxifragas make stolons and offsets freely, and by the plants annually propagated; they are also increased by division. Some make bulblets.

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. Asoon, and somewhat like the latter parent; fr. pale white with purple dots; info. spatulate to ligulate, very obtuse, crenulate-dentate; stem erect, few-leaved, glan-
dular-hairy, 6—8 in. tall. S. hybrida splendens is per-
haps a hybrid of S. Gemm by S. rotundifolia.

INDEX.

AA. Les, with many small punctuate glands or dots on the surface, usually large and thick and of the petiole sheathed at the base; plant aculeous, with a thick root-tok. Bergenia or Me-
gasea.

B. Margin of leaf conspicuously ciliate or apiculate-toothed.

BB. Margin of leaf not ciliate but more or less undulate or cre-
nate; fr. not pubescent.

c. Scope and inflorescence gla-
bra... 4. crassifolia

D. Arrangement of fr. oppo-
site... 8. oppositifolia

DD. Arrangement of fr. alter-
nate (best seen on flow-
ering stems)

E. Leaves margined reflexed,
crenulate or nearly en-
tire, more or less crus-
tate with time...

INDEX.

A. Les, with many small punctuate glands or dots on the surface, usually large and thick and of the petiole sheathed at the base; plant aculeous, with a thick root-toc. Bergenia or Megasea.

B. Margin of leaf conspicuously ciliate or apiculate-toothed.

BB. Margin of leaf not ciliate but more or less undulate or crenate; fr. not pubescent.

c. Scope and inflorescence glabra

D. Arrangement of fr. opposite.

DD. Arrangement of fr. alternate (best seen on flowering stems).

E. Leaves margin reflexed, crenulate or nearly entire, more or less crusat with time.
SAXIFRAGA

EE. Leaf-margins spreading, serrate, sometimes both margins and upper face crassate

11. Cotyledon
12. Alizon

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 causez

13. granulata
14. rivularis

EE. Plant propagating by non-bulbiferous shoots.

FF. Foliage not peltate, usually not large.

g. Petals yellow......16. chrysantha
h. Petals white (sometimes spotted).

H. Lower leaves, pinnate, ovalate or obovate

17. rotundifolia
18. punctata
19. Mertensiana

II. Shape of petals lanceolate-acute, or narrowly oval

20. bryophora
21. leucaenothamnifolia
22. Pennsylvanica

DD. True stem above ground, the plant propagating by evident stolons or offsets.

v. Petals all equal.

w. Pistil more or less adnate to the calyx-lube at its base.

x. Foliage stiff and withering neither than falling, not divided, the margin usually setose.

26. azoides
27. bronchialis

26. Campsis
29. cespitosa
30. aphylla

26. Ivs. ovate or orbicular...

31. umbrosa
32. Geum

EE. Petals unequal, the two lower ones much larger than the others...33. sarmentosa

1. ligulata, Wall. (S. Schmidtii, Regel). Strong-growing plant, with large radical lvs. 3-5 in. across and orbicular or obovate in outline and cordate at base, the margin scarcely undulate but ciliate: scape becoming about 1 ft. tall, this and the pedicels and calices glabrous; fls. white to light purple, orbicular and clawed; fr. subglobose, drooping. Himalayan region. B.M. 3406; "the sepals too scutellated and the leaves too undulate," according to Hooker. L.B.C. 8:747. R.H. 1868:271.

—Not perfectly hardy at Boston. By error, the name is sometimes written S. lingulata, a name which properly belongs to a very different species (No. 9). Var. rubra, Hort., is a form with red-purple fls. Var. speciosa, Hort., has showy blush or rose-white fls.


2. Stracheyi, Hook. f. & Thom. (S. anguiiformis, Hort., not Engl.). Fig. 2256. 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,

2256. Saxifraga Stracheyi (X 3/4).

As the flowers are appearing in earliest spring.

the scape becoming 1 ft. or more tall; fls. 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. 59671. B.R. 29:65 (as S. ciliata). Linn. Hist. II. 32:281.

3. Milesii, Linn. (Stracheyi, var. Milesii, Hort.). From S. Stracheyi it differs in having longer lvs. (9-12 in. long and 4-5 in. broad), white fls., oblong calyx-lubes, the petals distinctly clawed: corymb dense. Himalaya.


5. cordifolia, Haw. Very like the above and probably only a form of it; differs in having broader, round-oblong, and more or less cordate lvs. Altai. Var. purpurea, Hort., has purple fls.

6. purpurascens, Hook. f. & Thom. Lvs. broad-obovate to short-oblong, the margins entire or slightly undulate, somewhat cordate at base: scape 12 in. or less, bright purple, hairy: fls. deep purple, nodding, the calyx-lubes very oblong; fr. elliptic-lanceolate, erect. Sikkim (India), 10,000 to 15,000 ft. altitude. B.M. 5066.—Very handsome because of its purple scape and flowers.

7. Huetiana, Bolso. Annual or biennial, but grown from seed as a hardy garden annual and used for edgings and borders of small beds: dwarf, about 6 in. high, compact in growth: lvs. reniform and shallow 5-lobed, the lobes obtuse or short-acute, long-petioled, bright green in color: fls. 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 thin, subdum-form lvs., and giving a moss-like aspect to the plant; sterile shoots, with lvs. imbricated in four series: fls. solitary on the ends of the annual leafy shoots, lillac 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, fls. white; var. major, fls.
large, lilac; 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, somewhat linear, with the margin somewhat ciliate and crustate with time; stem-lvs. shorter, the margin cartilaginous and less crustate: scape rising 1-2 ft., erect or flexuose, and bearing a thyrsoid panicle of small white fls. with obolate or oblong-ovate 3-nerved petals. Apennines and Alps.

Var. *Lantoscana*, Engler (S. Lantoscana, Boiss. & Rent.). Lvs. short, more or less attenuate below, but not to the apex, the margin thick. Maritime Alps. G.C. 11:100.

10. *Hostii*, 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; corymb 5-9-fl., the fls. white or the oblong petals somewhat purple-spotted. Apennines 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 lingulata to long-obovate, short-apatulate, plane, margin cartilaginous and dentate and bearing many pores; stem-lvs. lingulate-lanceolate: fls. numerous, white, the petals cuneate-obovate and 3-5-nerved. Native to the Alp, the calyx glandular. Mountains of Eu. Var. *pyramidalis*, DC., is a robust form, with a large, many-flowered panicle.

12. *Aizoon*, Jacq. (*S. roseolus*, Schleich. & Rdt., L.,) Fig. 2360. Much tufted alpine plant, forming small dense rosettes and sending up a clamy-pubescent, many fl., scape 5-12 in. high: basal lvs. spatulate, incurred, thick and persistent, the margins white and cartilaginous and porose; stem-lvs. smaller, pubescent or cuneate, serrate toward the apex: fls. small and many, cream color to nearly white, the petals oblong to elliptic and 3-5-nerved, and sometimes spotted at the base. Alpine and boreal parts of Europe, Asia and N. Amer., coming as far south, in our eastern country, as northern Vt. and Lake Superior. —Very variable.

13. *granulata*, Linn. Mex. Saxifraga. Plant erect and branched when in bloom, 6-20 in. tall: radical lvs. reniform, incised-lobed, the lobes entire or crenate, pubescent or tawny; stem-lvs. few, nearly sessile, cuneate: fls. white, somewhat bell-shaped, more or less drooping, about 1 in. across, the petals obvate-oblong and much contracted at the base and nerves. Eu., N. Afr., Asia. —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. *rivularia*, Linn. Mattled little plant, with stems ascending and in clusters. Fls. 3-5-fl., 4-5 in.; 5-lobed, prominently 3-5-lobed, long-stalked; stem-lvs. narrow-ovate to lanceolate, entire: fls. 3-5, white, the petals ovate. Eu., Asl., N. Amer., in this country occurring as far south as Tenn. and Colo.

15. *petalata*, Torr. Umbrella Plant. Strong plant, sending up large peltate 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. Gng. 7:367. —One of the largest of all Saxifrages, and the only one with petioles. The petals are often much measured off from 1 ft. across, and the rhizome 2-3 in. thick. The fls. appear in advance of the lvs. in early spring. Hardy in Mes., with slight protection, and a most desirable plant when bold effects are desired.

16. *chrysanth*, Gray. Dwarf, epipetose plant with corymb blossoming and rosettes, imbricated oblong-ovate, glabrous and flabby lvs.: flowering stems 1-2 in. tall, filiform, glanlular-pubescent, 1-3-fl., the oval petals yellow. Mtso. of Colo. —Has been offered by dealers in native plants.

17. *rotundifolia*, Linn. Root-lvs. thick, cordate-ovulate, dentate-lobed, long-stalked, clustered, and not Rosulate; stem-lvs. nearly sessile, often narrower; fls. stems 1 ft. tall, erect and somewhat branched, hairy: fls. white, the oblong-elliptic petals spotted with purple. Eu. and Asia. B.M. 424. —A very pretty plant for moist places.

Var. *Taygetea*, Engler (S. Taygetea, Boiss. & Heldr.). Basal lvs. very long-stalked, reniform or nearly orbiculate, usually 3-5-lobed and nearly sessile; the branches (several in *S. rotundifolia* itself). Greece.

18. *punctata*, Linn. Plant 1 ft. or more high when in flower, more or less pubescent, the scapes leafless: lvs. at first pubescent but becoming glabrous, reniform, equally or slightly dentate or crenate: fls. white, not punctate, the petals obvate or oblong; the sepals acutish. Asia and boreal N. Amer.


20. *byrophylla*, Gray. Dwarf, the scapes about 3 in. high and branching: lvs. 1 in. or less, on long, oblanceolate to narrow-oblong, entire and ciliate, usually rosulate: scapes 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*, Michx. (*S. Michaelisii*, Britt.). Sallc. plant 5-20 in. tall, much branched, bearing many small star-like white fls. and long-spotted toothed lvs.: petals lanceolate, unequal, the larger ones ciliate at the base and at the base of the lvs.; a pair of yellow spots. Va. to Ua. in the mountains.

22. *Pennsylvaniaea*, Linn. Tall stout herb, sometimes 3 ft. and more high, viscid pubescent, nearly or quite simple: basal lvs. sometimes nearly 1 ft. long, oblanceolate, sometimes ovate; stoloniferous; the panicle 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 3-4 in.: lvs. ovate or oblong, thickish, crenate, narrowed into a petiole: fls. capitate on a naked seape, the head sometimes branched, white, the oblong 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. *Virginianæ*, Michx. Low, viscid pubescent plant, 1 ft. or less tall, from a rosette of ovate or spatulate, crenate-toothed thickish lvs., which are narrowed into a petiole: cyme small and close at first but becoming loose and open: fls. small but many, dull white, the petals oblong-obtuse. On rocks and in woods, eastern U. S. as far south as Va. and Tenn. —A pretty spring flower, and sometimes planted. There is a double-flowered form.

25. *Integriloba*, Hook. Plant at the tops of short stems, viscid and pubescent, the sepalless calyx at the base, the short cajul-lobed somewhat woody: lvs. ovate and very obtuse, entire or very nearly so: fls. white, small, in a more or less loose panicle, the petals obvate and twice the length of the spreading-reflexed calyx-lobes. Calif. northward. —Once offered amongst native plants.
26. azoides, Linn. Tufted plant, 6 in. or less tall, glabrous except for the sparingly setose leaf-margins: lvs. linear-lanceolate, somewhat fleshy, scattered along the stems. Corolla solitary petals 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 England, northern New York, northern New Jersey, and Southern New England.

27. bronchialis, 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 upper ends, the flowers arranged in a loose, terminal, staminate inflorescence on the margin, stiffish: lvs. solitary or corymbous, on long and weak peduncles, yellowish white with orange-red dots, the petals obovate-oblong. Asia and arctic S. Amer., and Rocky Mts. Only var. cerlerioides, Engler (S. cerlerioides, 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.

28. Campsis, Bois. & Reut. (S. Wallaciana, Hort.). Tufted and bright green, with reddish-fl., stems, hairy and somewhat glan- dular: lvs. spatulate, with an abruptly en- largeing end, 3-5-lobed, and sometimes in a tufted: lvs. stems branching, 3-4 in. high, erect: lvs. ½ in. across, white, somewhat bell-shaped, the broad petals much exceeding the calyx. S. japonica, Bl. (S. radicans, Hort.), A.F. 4:493. — Once introduced here, but does not endure the hot climate well. An attrac- tive species.

29. cespitosa, Linn. Exceedingly variable species: dwarf and cespitose, the fl. stems erect and nearly leafless and somewhat glandular-pilose (3-4 in. high): lvs. usually cuneate but some- times nearly linear, usually 3-5-fl. and sometimes 5-6-fld, the lobes linear and obtuse and nearly parallel: lvs. few, white, 1-10 in a raceme or panicle, cespitosa, the petals spreading, oblong and obtuse, 3-nerved. Eu.

30. aphylla, Sternb. (S. lepophylla, Linn). Small, loosely cespiti- taceous species, producing many or several rosettes at the surface of the ground, and sending up short, almost leafless, 1-fl. or 2-fl. glandular scapes: lvs. thin, entire or 3-4-lobed: lvs. 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 spring- ing 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 panicle, the petals ovate or oblong and spreading. Eu., in shady places. — A very neat and attrac- tive plant, frequent in European gardens, but hardly ever seen here. There is a var. variegata, Hort.

32. Gum, Linn. (S. hisirta, Linn.). Differs from S. umbrosa in being hairy, in having orbicular lvs. that are cordate or notched at the base and on long stalks. Range, 12 ft. long, and said to occur in Newfoundland.

33. sarmentosae, Linn. (S. japónica, Hort. S. Chinensis, Lour.). Strawberry Geranium. In England known as Mother of Thousands, a name also applied to Linaria Cymbalaria. Old Man's Beard. Fig. 2261. True stem or caudex scarcely rising above the ground, but the branches 1-2 ft. and much branched, whole plant sparsely hairy: stolons many, long and rooting freely at the joints after the manner of a strawberry: lvs. nearly orbicular, shallowly crenate-toothed, 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. 322. (G.C. II. 7:237 (showing variability of plant to light). Gm. 30, p. 363; 32, p. 57. R.H. 1876, p. 427. — An old-time greenhouse plant, and also one of the commonest window-garden subjects. Of easiest culture. Var. tricolor, Sieb. (S. trifolium, Hort.), has lvs. handsomely marked with creamy white and red varia- gations. F. S. 21:2227-8 (as S. Fortunii tricolor). S. Fortunii, Hook. (B.M. 5577) is a closely allied species, but is less (if at all) sarmentose, the lvs. are more sharply toothed, the fls. are white and the lower petals are dentate.

L. H. B.

2261. Saxifraga sarmentosa (X ½).

SAXIFRAGA. See Saxifraga.

SCABIOSA (Latin, i. e. Scabiosa, referring to medicinal use). Dipsacaceae. SCABIOUS. MOURNINO BRIDE. About 52 species (from Eu., Asia and Afr.) of annual or perennial herbs, often somewhat woody at the base, with en- tire, lobed, or dissected lvs. and blue, rose, yellow or white fls. in mostly long-pedun- cled globular or ovoid-conic heads. Bracts of the involucre in 1 or 2 rows, foliaceous, mostly free; scales of the receptacle small, narrow or none: corolla 4-5-stem: stamens 4, rarely 2, all perfect. For a related plant, see Ophelia.

In any moderately good garden soil a succession of flowers is produced from June until frost. The flowers are very service- able for cutting purposes. Propagated by seed or division. Many of the peren- ial species act like biennials in culti- vation, and often flower the first year from seed. S. atropur- pura is a common gar- den annual.

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A. Radical leaves dentate or lobed.

B. Fils. yellow .................. 1. ochroleea
BB. Fils. dark purple, blue ....... 2. arvensis
CC. Calyx-limb sessile or nearly so ....... 3. arvensis
DD. Fils. sessile .......................... 4. atropurpurea

D. Plant 2 ft. high ....... 5. stellata

AA. Radical lvs. entire.

BB. Les. ovate-oblong .......... 6. brachiala

BB. Les. lance-linear to linear .... 7. caucasica

CC. Heads 3 in. across .... 8. graminifolia

1. ochroleea, Linn. A hardy perennial herb about 18 in. high: stem branching and somewhat hairy: lvs. whitish pubescent, the radical crenate or lyrate-pointed, tapering to a petiole, pubescent on both sides, those of the stem 1-2-pinnately divided or cleft into ob- long or linear lobs: petals 4, quite distinct, lvs. of the involucre shorter than the fls. June to autumn. Eu. and Asia. Var. Webbiana (S. Webbiana, D. Don). Height 6-10 in.: lower lvs. canescent-villous, the upper glabrous. Resembles the type but is smaller in all its parts. B.R. 9:717.

2. arvensis, Linn. (S. varia, Gilib.). A hardy peren- ial 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.

3. Columbaria, Linn. A hardy perennial quite variable in character, 2 ft. high: stem branching, glabrous or nearly so; radical lvs. ovate-obtuse, crenate, membranous, pubescent on both sides; stem-lvs. glabrous, pinnately parted, the segments linear, entire or slightly incised: fls. blue, in ovate-globular heads on long pubescent peduncles. June-Sept. Eu., Asia, Afr.—Var. alba is cult.

4. atropurpurea, Linn. (S. major, Hort.). Sweet Scabious. Fig. 2262. An annual branching plant about 2 ft. high: radical lvs. lanceolate-ovate, lyrate, coarsely dentate; stem-lvs. pinnately parted, the lobes oblong, dentate or cut; fls. dark purple, rose or white, in long-peduncled heads, becoming ovate or oblong in fr. July-Sept. S. Eu. Gn. 21, p. 118. B.M. 247. F.S. 12:1203. —Vars. candidissima, cocinea, compacta, major, nana and pumila are often offered as if they were distinct species, as S. nana, etc.

5. stellata, Linn. An annual plant, hairy, simple or somewhat branched, 6-18 in. high: lvs. cut or somewhat lyrate, the terminal lobe large, obovate, dentate, the upper ones often pinnately parted: fls. blue, in long-peduncled heads: corolla 5-cleft, the lobes radiate. June and later. S. Eu.

6. brachiata, Sibth. & Sm. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately cut, lyrate; the lower lobes decurrent, the terminal large, obovate, oblong: fls. light blue. June and later. Eu. Asia.


SCABIOUS. For Common Scabious, see Scabiosa. For Shepherd's or Sheep Scabious, see Jasione perennialis.

SCALLYON, a name for the Shallot; also used for onions that do not make good bulbs but remain with thick necks, but generally pronounced culvar and written scallion in this country. The word is connected with Ascalon (Allium Ascalonicum).

SCANDIX (Greek, to sting; in reference to the roughness of the fruit), Umbelliferae. 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. Pecten-Veneris, Linn. Fig. 2263. A hardy garden annual 6-12 in. high, with finely cut lvs. and small white fls. in simple umbels. Eu.—Little grown here. S. cerefolium, Linn. See Chervil.

SCAPHOSEPALUM (Greek, boat and sepal; alluding to the form of the lower sepal). Orchidaceae. A genus recently separated from Masdevallia upon the character of the lateral sepals, which are united into a boat-shaped organ. In habit the plants resemble Masdevallia, except that the parts of the rhizome are longer, thus making the tufts less compact, and the racemes assume climbing habits, becoming very long and bearing fls. for months in succession. The dorsal sepal is free or nearly so: labellum and sepals small. The genus contains about 10 species. Grow in a coolhouse well protected from the sun. Keep the summer temperature as low as possible. Give plenty of water when growing. When at rest, water sparingly but do not allow the plants to become entirely dry. Use as small a pan as possible. The culture is like that for Masdevallia.

gibberum, Rolfe (Masdevallia gibberosa, Reichb. f.). Lvs. 3-5 in. long, obov-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.

ish, thickly speckled with crimson; dorsal sepal broadly ovate, concaev, strongly 5-ribbed, ending in a stiff incurved tail; lateral sepals spreading horizontally, falcately incurved, with a filiform process near the tip. Colomb. B.M. 7165.

HEINRICH HASSELBRING and WM. MATHEWS.

SCARIBROUH LILY. Vallea purpurea.

SCARLET LIGHTNING. Lychnis Chaledonica.

SCARLET PLUME. Euorphia fulgens.

SCARLET RUNNER. A red-flowered variety of Phaseolus multiformus.

SCENTED VERBENA. A name found in some books for the Lemon Verbena. See Lippia.

SCHAUÉRIA (after J. C. Schauer, professor at Greifswald, 1819-1849). Acanthoeeae. Erect, half-shrubby herbs, with entire lvs.; fls. yellow, with a terminal thryse or spike; calyx 5-parted, segments linear or setaceous; corolla-tube long, gradually broad-ened upward; limb 2-lobed, the upper lip interior nar-row, entire or crenate, 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 Jacchumina, 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.

SCAPHOSEPALUM (after Scheele, distinguished German chemist). Palmeaeae. About 10 species of pinnate palms from tropical South America. They are spineless, tall or dwarf; leaf-segments arranged in regular series or grouped, linear, in young plants unequally and obtusely 2-cut at the apex: fls. yellowish, dienceous or monocious, 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.

buteńacea. Karst. This species is cult. in S. Calif. Franceschi remarks that it comes from Venezuela and is a magnificent palm with the habit of Attalea. H. A. Schliebert 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.

SCHILMA (said to be an Arabian name). Ternströmi-aceae. About 9 species of tender evergreen trees and shrubs, with 5-petalled white fls. about 1½ in. across. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as Gordonia Javanica. Schili and Gordonia are closely related genera, distin-guished by Bentham and Hooker as follows: Schima has inferior radicles, sepals scarcely unequal, ovules few in each locale and laterally affixed; Gordonia has super-ior radicles, sepals markedly unequal, ovules numerous in each locale and pendulous. Other generic characteristics of Schima: peduncles 1-fld., usually erect: fls. solitary, in the axils or the upper ones crowded in a short raceme; petals connate at the base, imbricate, concaev; stamens numerous; ovary 5-celled (rarely 4- or 6-celled); stigmas broad and spreading: capsule woody: seeds flat, kidney-shaped.


A good pot-plant for the greenhouse. Readily increased by cuttings.

W. M.

SCHINUS (Greek name for the Mastic-tree, Pistacia Lentiscus; applied to this genus on account of the resi-nous, mastic-like juice of some species). Anacardiaceae. Resinous, dienceous trees, with alternate, pinnate lvs., sessile lfts., 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 ex-cept 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 greenhouse 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-

trade one species is offered, S. Mexicana, Seem. (S. ca-ruliseena, Hort.), now more properly known as Ab-chimenes Scherreri, Hemsl. Stem erect, hairy: lvs. ovate, hairy, dentate, stout-stalked, opposite: fls. solitary in the axils, stalked, the corolla 2-3½ in. long; the tube inclined or drooping and curved, the wide-spread 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743.

L. H. B.
vian name of S. Molle, and not, as sometimes supposed, Latin molle, soft, which would not be applicable in this case.

**Molle, Linn.** Peruvian Mastic-tree. Californian Pepper-tree. Figs. 2235, 2266. Evergreen tree, 20 ft. and more, with rounded outline and graceful, pendulous branchlets when not trimmed: lvs. 9 in. or more long, glabrous, of many alternate, linear-lanceolate lfts. 1½-2 in. long; fls. conical panicles, yellowish white; ripe fruits the size of peppercorns (whence the popular, but misleading, Californian name), of a beautiful rose-color. Peru. G.F. 8:565; 222. G.C. III. 19:1573-1574. — In southern and middle California more extensively cultivated than any other ornamental tree except, perhaps, the Blue Gum (Eucalyptus globulus), and thriving in interior valleys, though hardly on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. Molle was a generic name used by Tournefort, and placed in apposition with Schinus by Linnaeus (explained above).

**terebinthifolius, Raddi,** with racemose fls. and lvs. composed of seven broader, somewhat serrated lfts., is sparingly met with in cult, in S. Calif., and proves hardy in San Francisco. Brazil.

**dependens, Orcq.** (Duvalia dependens, D.C.), is a shrub or small tree, with more or less drooping branches: lvs. ½-1 in. long, oblong-lanceolate or spatulate; fls. yellow, 1 line long, produced in great numbers in racemes about as long as the leaves. Western S. Amer. B.M. 7496. B.R. 19:1568 (Duvalia orata); 19:1573 (D. dependens); 25:29 (D. terebinthifolia). — The genus Duvalia was distinguished from Schinus chiefly by its simple foliage, but it is now considered a sub-genus of Schinus. Jos. BURT DAVY.

**Schinus Molle** 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 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 magnificent avenues of them. *S. 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 spathe soon falls off).** *Araceae.* The plants which bear this uncomfortable 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 Dieffenbachias, which they closely resemble. They are tender plants used for the decoration of warm conservatories, but they have been successfully grown by skilful amateurs in living rooms, 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 stoloniferous rhizomes and the caudex lies on the ground. The leaves are large, ovate or lanceolate, banded or blotched with white or pale yellow. The brightness of the colors in variegated plants largely depends upon culture. Fls. unisexual; female flowers in short, stamens in separate spadix; sterile males with staminodes destitute of pollen: female fls. with 2-4 pistils: ovary 1-loculed; ovules antropous; berries oblong, brown, yellowish or scarlet. Engler and Prantl, l. c. 2, 1878. For culture, see *Dieffenbachia.* See also *Philodendron,* to which the genus is somewhat closely allied.

**Schinus Molle, the California Pepper-tree.**

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(S. L. refers to supplementary list.)

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**Spaansch**

2265. Schinus Molle, the California Pepper-tree.

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**1. Lavallei, Linden.** Lvs. lanceolate or lanceolate-oblong, rounded or narrowed at the base but not coriaceous, blotched with silvery white, some of the blotches much larger than others; petiole 6–8 in. long; blade 5–7 x 1½–2¼ in.; sheath reddish. Malaya. I. H. 28:418. — Var. *immaculata* (var. *Lansbergiana, Linden*) differs in having purple sheaths and leaf-stalks, and foliage green above, dark wine-purple below. Var. *purpurea* is a Sumatran form with foliage blotched gray above and dark wine-purple beneath.

**2. variegata, Hook.** *Lvs. oblong-lanceolate, obusate or rounded at the base, long-cuspidate at apex, dark green above, marked whitish along the midrib; 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 sinuses 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 5–5½ in. New Guinea. *B. 27:350 as Colocasia Neoguineensis,* the variegation being a bright creamy white.

**6. pulchra, N. E. Br. (S. deora, Bull.).** Lvs. ovate, obliquely cordate, irregularly blotched with silvery
white, the total mass of green being less than the varie-
gation; petiole 3-4½ in. long; blade 4-5 x 1½-2½ in.
Wittmaackii, was offered in 1893 by John Saul, Wash-
ington, D. C.
S. Roeberlinii, Pitcher & Manda, 1895, p. 138. "Lvs. beau-
tifully marked with silvery white in a broad feathery varie-
gation. Only the center and edge of the leaves are plain light 
green. The plant is compact, free-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 1895:141 as S. Roeberlinii, and the same 
thing is used in A.G. 12:569 (1898) as S. picta and in V. M. 23:71 
(1899) as S. crispa. 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. Selmanii, Hort. Bull., was advertised by the U. S. Nursery 
Co. 1885, but seems unknown to botanists.—S. Siamintit, 
Hort. Bull. still in cultivation, but imperfectly known to botany. 
Possibly a species of Agraema.

**SCHIZANDRA** (Greek, to split). Schizandrae. A genus of 
small ferns with twisted grass-like lvs. and sedge-like 
sporophylls formed of a cluster of closely com-
 pacted pinnae, each with two rows of sporangia, which 
in common with the family are pinnate-shaped, with an 
apical ring, opening by a vertical fissure.

**pasilla, Pussh.** Our only native species, growing in 
sand barrens mainly in New Jersey. Lvs. an inch long, 
glass-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 protonema, being 
filamentous rather than thallose as in ordinary ferns.

L. M. UNDERWOOD.

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2266. Foliage and fruit of California Pepper-tree— 
Schinus Mollis (×⅔).

**SCHIZANDRA** (Greek, schizein, to cleave, and aner, 
andros, man, stamen; referring to the cleft or separate 
thaler-cells). Including Sphaerostema and Maximo-
wiezia. Magnoliaceae. Ornamental deciduous twining 
shrubs, with alternate, simple lvs., white, yellowish or 
red, not very conspicuous fls. on slender, drooping pedi-

**SCHIZANTHUS** 1625

SCHIZANTHUS, Michx. High climbing shrub: lvs. slender-
petioloed, ovate or oval, acuminate, entire or obscurely 
denticulate, glabrous, 2-3½ in. long: fls. monoeocious, 
crimson purplish, ½-¾ in. across; stamens 5, connate 
in a 5-lipped disk with the anther-cells widely sepa-
rated: berries scarlet, forming a loose raceme 2-3 in. 

Chimenis, Baill. (Maximowiczia Sinensis, Rupr.). 
Climbing to 25 ft.: lvs. broadly oval or ovate, acute or 
acuminate, remotely denticulate, dark green and shinin-
g above, glabrous except at the veins beneath, 2-4 in. 
long; petiole ¼-1½ in. long: fls. dioecious, pinkish 
white, ¾ in. across; flower; stamens 5, divided at the 
apex; berries scarlet, forming a raceme 1-4 in. long. 
F.S. 15:1594. Gn. 6, p. 583. M.D.G. 1899:565.—The very 
showy fruit ripens end of August; to secure it both sexes must be planted together.

S. gigra, Maxim. Similar to the preceding: lvs. smaller, 
quite glabrous; fls. white: fr bluish black. Japan. Seems 
more tender than S. Chimenis.—S. propinqua, Hook. f. & 
Thom. (Sphaerostema propinquant, Blume). Lvs. ovate-
like with ovate lanceolate, about 4 in. long on ¾ in. long 
petioles; fls. pale yellowish: fr. scarlet, forming racemes to 6 in. long. 
Himalayas. B. M. 494. For cult. in subtropical regions or in 
the warm greenhouse.

ALFRED REINDER.

**SCHIZANTHUS** (Greek, split and flower; from the 
incised corolla). Solandraceae. BUTTERFLY FLOWER. 
About 6 species of annual herbs from Chile, with mostly 
fine cut leaves and terminal open cymes of variously 
and highly colored fls.: calyx 5-cleft, the lobes linear, 
corolla tubular; limb wide-spreading, oblique, plicate, 
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 semi-hothouse use; the seed being sown in 
early fall and the plants kept in a light house and 
given plenty of root room as they need it.

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: fls. 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. 3045. B.R. 18:1544.—The 
portions of the flower which are rose-colored in the 
type are white in var. alba.

BB. The middle segment of the anterior lip not notched 
at apex.

Grahami, Gill. Lvs. 1-2-pinnatisect: segments entire 
or dentately pinnatifid: fls. typically lilac or rose, 
with the middle half of the middle segment of the anterior 
limb or yellow or rose; the lateral segments of the 
posterior lip falcate, linear, acute, shorter than the middle 

AA. Corolla-tube shorter than the calyx: stamens long-
exserted.

pinnatus, Ruiz and Pav. (S. porrigens, Graham. S. 
Pristi, P. Diet.). Fig. 2267. 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-pinnatisect; the segments entire, dentate or incisely pinnatifid; fls. varying in depth of color, the lower lip usually violet or lilac; the upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B.M. 2404, 2321 (as S. porrigens). B.K. 9:725; 1592 (as var. annua).—Var. ñana, Hort., is somewhat lower-growing. Var. niveus, Hort., has pure white fls. Var. oculatus, Hort., has a purplish black blotch surrounded with yellow at the base of the middle segment of the upper lip or with the typical yellow portion dotted with small dark purple spots. B.H. 1862: 451. Var. papilionaceus, Hort., has a central coloring somewhat as var. oculatus, with the general color of the flower marbled in various shades. Var. tigridioioides, Hort., is also cultivated.

F.W. BARCLAY

SCHIZOCODON
(Greek, cat bell; referring to the fringed corolla). Diapsidiceae. Schizocodon soldanelloides is a pretty alpine plant from Japan with rosy flowers fringed like the well-known Soldanellas of the Alps. It may be readily distinguished from Soldanella (which is a member of the primrose family) by the leaves being toothed, and the stamens 4 instead of 5. The name "Fringed Soldanella" has been proposed for Schizocodon, but all Soldanellias 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 leaves 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 1882 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 fringed-shaped, 5-lobed, the lobes fimbriate; 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-cornered, loculicidally 3-valved; seeds numerous.

soldanelloides, Sieb. & Zucc. Fringed Galax. Fig. 2268. Hardy, tufted, alpine plant a few in. high; lvs. leathery, evergreen, long-stalked, the blade roundish, wedge-shaped or subcordate at the base, coarsely toothed, the teeth apiculate: fls. nodding; sep. oblong, obtuse; corolla deep red in winter passing into buff or white at the edges; staminodes linear. Japan. B.M. 7316. Gn. 44:934. G.C. Ill. 13:415. G.M. 36:206. J.H. III. 34:522. V. 20:119.—This is probably the only species in the genus, as S. ustifolius and S. Shortia and S. illicifolius 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.

SCHIZOLOBIUM (Greek, to cleave and hull; alluding to the manner of dehiscence). Leguminoseae. About 2 species of South American trees, with large bipinnate leaves, with numerous small leaflets, and fls. in axillary racemes or terminal panicles. Calyx obliquely turbinate; segments imbricated, reflexed; petals 5, clavated, ovate or roundish, imbricated; stamens 10, free; filaments somewhat scabrous at the base; ovary adnate to the tube of the calyx: pod 1-seeded. The following has been introduced into S. Calif. by Franceschi, who writes that it has not yet proved a success.

discolor, Raf. (Holodiscus discolor, Maxim.). Fig. 2269. Shrubb, 20 ft. hardy with protection in Mass.: lvs. ovate or oblong, truncate or narrowed at the base, pinnately lobed, usually glabrous above, pubescent or tomentose beneath, ½–3 in. long; fls. creamy white, small, in ample panicles. July. Oregon to Guatam., east to Colo. Gn. 45, p. 56; 47, p. 188; 49, p. 104; 50, p. 273.
G.C. III. 25:21.—A very variable species, of which the following are perhaps the most important forms: Var. aristolus, J. G. Jack (*Spirea aristolosa*, Sm.). Large shrub, with arching branches; Ivs. nearly sessile or ovate, with dentate or entire lobes, pale green and pubescent beneath: panicle drooping, ample to 10 in. long. B.R. 16:1363. G.F. 4:617. Var. Purshianus, Rehd. (Sp. *dilatipetala*, Pursh). Similar to the terminal-cyme-tomentose beneath. Var. fissa, Rehd. (Sp. *fissa*, Lindl., and probably *Holodiscus australis*, Heller). Similar to var. aristolus in habit, but smaller; Ivs. crenate at the base, narrowly dentate, pubescent beneath; panicle drooping, loose, to 5 in. long. Var. dumosus, Dippel (Sp. *du*mo*rra*, Nutt. Sp. *Boursierii*, Carr.). Erect shrub, 8 ft. high; Ivs. cuneate, coarsely toothed, pubescent above, dentate or pinnatifid beneath, tomentose beneath, ½-1 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 *Solanoa purpurascens* Greene, a Californian Asclepiad, not in cult. It is a perennial, with ascending stems 1 ft. high, cordate-ovate Ivs., and small red-purple fls., in compact umbels.—*S. tomentosus*. Lindl.—Sorbaria Lindleyana

**ALFRED REHDER.**

**SCHIZOPÉTALON** (Greek, *cut* and *petal*; in reference to the pinnately cut petals). *Ornithogalea*. A genus of possibly 5 species of annual herbs from Chile, with alternate, sinuate, 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.

**Walkeri**, Sims. Plant 1-2 ft. high; Ivs. sessile, sinuate, dentate, the upper linear; fls. white, fragrant. B.M. 2379. R.H. 1886, p. 355.—*A very pretty annual of quick growth.*

**F. W. BARCLAY.**

**SCHIZOPHRAonica** (Greek, *schizo* and *phragma*, wall: the inner layer of the wall of the valves is cleft into fascicled fibers). *Saxitragracea*. Ornamental climbing deciduous shrub with opposite, long-petioled, rather large, dentate leaves, and 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 Ivs., and make little growth if unsupported and suffered 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; style 1; ovary 4-5-loculed; marginal sterile fls. consist only of one large white sepal, terminating the branchlets of the inflorescence: fr. a small, 10-ribbed capsule.

**Hydrangeoideas**, Sleb. & Zucc. *CLIMBING HYDRANGEA*. Climbing to 30 ft. and more: Ivs. on petioles 2-3 in. long, reddish, orbicular or broadly ovate, shortly acuminate, rounded or crenate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2½-1 in. long; cymes peduncled, 8 in. broad; marginal Ivs. helicoid, consisting of an oval to broadly ovate, white pubescent, with terminal sepal about 1½ in. long. July. Japan. B.M. 2270. A. 1:26. 100. Gn. 15, p. 301; 34, p. 281.—The species is often confused with *Hydrangea petiolaris*, which is easily distinguished by its marginal Ivs., having 4 capsules. It has been once introduced under the name *Corindia integerrima*, which is a Chilean plant with entire green leaves. The plant usually thrives best in a shady exposure.

**ALFRED REHDER.**

**SCHIZOSTYLIS** (Greek, *cut* and *style*: alluding to the stelliform segments of the style). *Iridiaceae*. Two species of South African perennial herbs with tufted, sometimes fleshly roots, growing on a slender scape 3-12 in. long, red sessile flowers in a dis- tichous spike. Perianth with a cylindrical tube and bell-shaped limb divided into 6 nearly equal oblong segments: stamens inserted on the throat of the tube; capsule obovate-oblong, obtuse.

coccineus, Backh. & Harv. *CRIMSON FLAG*. A winter-blooming tender plant: stem 1-2 ft. high, bearing 2-3 Ivs.: basal Ivs. 2-3, about 1½ ft. 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 3-5 buds to each root), and planted out as before.*

**F. W. BARCLAY.**

**SCHOMBURGIA** (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 Leulas, except that they are less compact. Pseudobulbs long, fusiform, bearing several brown scales and 2-3 leathery Ivs. at the summit: fl.-stems from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls. The fls. are like those of Leula except that the sepals and petals are narrow and undulate and the labelium does not completely envelope the column. The labelium is always evidently 3-lobed.

Give Schomburgkias 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. Rest them in a temperature of 55°. *S. tibicinis* and *S. Lyonsii* are rare among the showy easily grown orchids, resembling Leonias.

**tibicinis**, Batem. (*Epipedium tibicinis*, Batem.). Fig. 2279. Pseudobulbs 1½ ft. long, tapering upwards: Ivs. 2-3, oblong, leathery: raceme 4-8 ft. high, bearing

2269. Schizonotus diacolor (× ¼).
numerous fls. each 3/4 in. across; sepals and petals oblong; undulate, crisp; lateral lobes of the labellum large, cucullate, middle lobe small, emarginate: fls. deep pink, speckled with white on the outside, rich chocolate-red within; labellum white within, deep rose color at the sides, with a short chocolate-red middle lobe. Summer. Honduras, Cuba, G.C. III. 4:212; 9:651.


2270. Schomburgkia tibicinis (× 3/4).

*S. Lyonsii*, Lindl. Pseudobulbs about 1 ft. high, with 2-3 linear-oblong lvs. at the top: racemes erect, 9 in. long, bearing 12-25 fls., each subtended by a reflexed bract about 3 in. long: fls. 2 in. across; sepals and petals ovate to ovate-lanceolate, undulate, white, with several rows of purple spots; labellum larger, recurved, acute, white, with a yellowish brown crisp margin; anther 2- horned. Aug. Jamaica. B.M. 5172. P.S. 20:2130. G.C. III. 26:203.

*S. Rosée*, Lindl. Related to *S. undulata*. Bracts, peduncles and labellum light rose: sepals and petals oblong, undulate, narrower than the labellum; labellum with rotund lateral lobes and a smaller subrotund middle lobe, margin crisp. Colombia.


Heinrich Hasselbring and Wm. Matthews.

**SCIDOPITYS**

A genus of 3 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 4-7, spreading; stamens 2, near the top of the corolla-tube: ovary 2-celled.

*S. asiatica*, Roxb. A tree, about 40 ft. high, nearly glabrous: lfts. 5-7, ovate, acute, 4 x 2 in.; fls. white, with brown markings, about 3/4 in. across, in many-flowered cymes. Cult. in southern Florida.

**SCIBERTIA** is a subgenus of Araujia, but in this work it is accounted for under *Physiantbus*.

**SCIDOPITYS**  (Greek, skias, shiados, umbrella, and pitrys, 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 foliage. 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. Monotype 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-
SCILLADITYS
cone., form. B. prtoror. the verna, bear two their Pinus. be oblong-ovate, loose stiff, 28, cone is bulbous). BELL. number, South p. p. in in 3-5 2. Tree, Umbrella, tuneated, 204, Tree, 1485, 1486. Get. 32, p. 149; 57, p. 487. Mz. 4, p. 154. Gng. 1:25. Gn. 28, p. 204, 205; 38, p. 499. R.H. 1884, p. 16, 17. -There is a dwarf var. and a var. with variegated foliage, both introduced from Japan. ALFRED REHDER.

SCILLA (the old Greek name used by Hippocrates; plant injure, according to Miller, alluding to the poisonous bulbs). Liliaceae. SQUILL. WILD HYACINTH. BLUEBELL. 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 (somo in autumn), and therefore, desirable plants for the wild garden, rock garden, or border. Some are house plants. Some of the South African forms have handsome spotted foliage. Generally, the Squills are distinguished as follows: Bulb tunicled, large or small: lvs. radical, 1-several in number, linear, long and slender: oblong or nearly ovate, in Scilla autumnalis appearing after the flowers; scape 1-several, simple, leafless: fls. in racemes, which are several to many-fl., open, compact or spike; bracts small, sometimes minute, hyaline: pedicels short or long, sometimes filiform: fls. small or middle-sized (1 in, in P. bulbifera), those of the N. bulbs, anthine, porcelain-blue, rose-colored or whitish, open rotate, cylindrical-campanulate, or open campanulate, segments persistent for some time; stigmas 6, affixed at base or below the middle of the segments; anthers ovate or oblong, dehiscing longitudinally, intorse; ovary sessile, stigma small capitate; ovules 2 in each locule, rarely 8-16, ascending: capsule globose; seeds 1-2, solitary prayer, Jeffia bulbiflora, embryo small in albumen. The genus is distinguished from Ornithogalum chiefly by the color of the flowers and deciduous perianth, from Hypecyonthus by the segments distinct from one another, Scilla, Scilla autumnalis and S. nutans, while Germany has, in addition to S. autumnalis, three others, viz., S. amana, S. bifolia and S. elegant. 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 forms of white and 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 'Auditorium' is rarely over before the usual ingents to expand. There is also sometimes cultivated in the garden a pleasing white Scilla, with hyacinth-like flowers, known to the trade as S. amana. But these will form are not sufficiently hardy; S. bifolia, first obtained by Mr. Allen, of Shepton, Mallet, in 1891. None of the hardy Squills require special culture, and if planted where they can remain undisturbed for a series of years, they seldom disappoint. Of the varieties, the 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 blue covered until growth commences. Up to the 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 having died, the bulbs may be shaken out of the soil and stored. Virginea Scilla, formerly called 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 oxalate (stated by botanists to ward off snails); the active principles are scillisperin, scillitoxin 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 tliught 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 described botanically. The following names are believed to include all those in the American trade, but other species are known to fanciers.
SCILLA

A. Shape of fls. campanulate: color blue, blue-illiac; rose-purpe, white
B. Pedicels short: bracts linear, in pairs: raceme many-fl; fls. broadly campanulate, produced from April
BB. Pedicels short: bracts in pairs, scarios-hyaline
BBB. Pedicels long (1-2½ in): raceme equilateral, compact: fls. cylindri-cal-campanulate, produced in May
AA. Shape of fls. saucer-shaped to open-rotate
B. Color fls. rose, size small.
C. Size of fls. small, color rose-purpe: raceme dense, 30-60-fl; ves. linear
CC. Size of fls. very small (one-eighth in long): raceme dense: bracts slender: bracts whitish, minute...
CCC. Size of fls. larger (½ in in diam.): pedicels long, ascending or spreading: raceme open. July to Sept.
BB. Color of fls. blue or lilac-blue: size larger (¾-1 in.).
C. Raceme very dense (10-15-fl.), at first conical, then long, compact and broad: scape robust. May.
CC. Raceme several-to many-fl, open; fls. modestly distant.
D. Ves. single: raceme about 5-fl; plant small. May
DD. Ves. in April, ecallate: raceme 3-15-fl, ebracteate: perianth blue, red-dish, or whitish. March.
DDD. Leaves more than 2.
E. Foliation very broad lanceolate: bulb large; raceme many-fl, (70-100). April.
EE. Foliation large, broad (½-1½ in.): margin ciliate-deciliate: racemes many-fl, open. August
EEE. Foliation lanceolate, sometimes narrowly no.
F. No. of fls. 1-3. 12. Siberica
FF. No. of fls. 4-8.
March 13. amena
FFF. No. of fls. 6-30; raceme at first conical, then open.
FFFF. No. of fls. 20-60: scapes 1-3: bracts minute, linear, white 14. Italica
EE. Foliation linear, thick, channelled: raceme 6-10-fl; fls. fragrant. April to May 15. Japonica

1. festalis, Salisb. (S. nitens, Sm. S. nonscripta, Hoff. and Link. S. cernua, Salisb.). COMMON BL U R BELL, HAREBELL. Lvs. 10-18 in long, ¾ in. broad, subacute, concave: scape solitary, tall, stout: raceme 6-15-fl.: bracts in pairs; fls. blue, purple, white or pink, drooping. April to June. Western Europe, Great Britain. B. M. 1461.—Among the garden forms are alba, white; carolina, blue; liliana, light-blue; rosea, rose or pink colored; cernua, nodding. This is one of the most beautiful of Squills, fragrant, thriving best in somewhat shady and sheltered places. 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 (Agaphris, Link; Emdyson, Dumort), either alone or with other species which connect it with the other Scillas.


3. Hispanica, Mill. (S. campanulata, Ait. S. pithula, DC.). SPANISH JACINTH. BELL-FLOWERED SQUILL. Lvs. 5 or 6, glabrous, ascending, lanceolate, ¾-1 in. broad, subobtuse, convex at back: scape long: raceme equilateral, compact: fls. cylindri-cal-campanulate; perianth usually blue but often becoming rose-purple, or white: pedicels 1-1¼ in. long. May. Spain and Portugal. B. M. 1102. —Hardy. Several varieties of it are in the trade under the specific name campanulata; viz., alba, white; albo-major, 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. Numidica, Poir. (S. parviflora, Desf.). BULB OVOID, 1-2 in. thick: lvs. 4-6, fleshy, herbaceous, linear, 6-8 in. long, ½-3 lines broad, suberect: scape solitary or paired, ¾-1 ft. high; raceme dense, 30-60-fl.; pedicels short, ascending, 3-5 lines long: bracts minute, linear, evanescent: perianth rose-purple, ½ lines long: single ovule in each of the ovarian cells: capsule small, globose, grooved. Flowering in winter in its native home, Algeria.


6. autumnalis, Linn. AUTUMN SQUILL. STARRY HYA CINTH. Lvs. several, obtuse, channelled, half-terete, growing on through the winter and dying away in the spring: scapes several: racemes corymbose, spike-like, open: perianth rose-colored, ½ in. across. July-Sep-tember. Europe (Great Britain), North Africa. B. M. 919. —Hardy. The flowering stems generally precede the
SCILLA

1631

Peruvian, in. DWARKIvs. Ivs. (S. ciliaris, Hort. S. Clusii, Part.). Cuban Lily. PERUVIAN JACINTH. HYACINTH of Peru (once thought to be a Peruvian plant). Figs.

7. Peruvian, Linn. (S. ciliaris, Hort. S. Clusii, Part.). Cuban Lily. PERUVIAN JACINTH. HYACINTH of Peru (once thought to be a Peruvian plant). Figs.

It is a graceful and elegant species, suitable for cultivation in pots.

11. hyacinthoides, Linn. (S. pavitiflora, Salisab.). HYACINTH SQUIRREL. Lvs. 10-12, spreading, 1-1½ ft. long, ½-1½ in. broad, arrowed at both ends, minutely denticulate on the margins: scape straight, long; racemes many-fl., broad, open; pedicels long, 1-1½ in.; bracts whitish, minute, persistent; perianth bluish, open, campanulate, Aug. Region of Mediterranean. B.M. 1140.—Hardy. This species is noted for its extreme slowness in flowering. The bulbs are sometimes 2 in. in diameter, and produce a profusion of offsets. In Fitch’s “Bulb Culture” several varieties are mentioned: carnea, fine blue; alba, fine white, free-flowering; rosea, distinct flesh-colored; rubra, deep red, large and fine.

12. Sibirica, Andr. (S. amurensis, var. praecez, Don.). SIBERIAN SQUIRREL. Fig. 2276. Lvs. 2-4, ascending, narrow, 4-6 in. long; scapes 1-6, 3-6 in. long; racemes 1-3-fl.: fs. rotate, horizontal or drooping, with short pedicels; perianth deep blue. March. Russia, Asia Minor. B.M. 1025. Gn. 11, p. 165. 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. amurensis, Linn. STAR HYACINTH. Fig. 2277. Lvs. 4-7, fascicled, ascending, glabrous, 6-9 in. long, ½-½ in. broad: scapes several, equaling the lvs.: racemes several-fl., 4-8 open; fs. distant, ½-½ 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. Italicus, Linn. ITALIAN SQUIRREL. Bulbs ovate, clustered together: lvs. radical, several, fascicled, spreading, lanceolate, acute, 4-8 in. long, ½-½ in. broad: scape solitary, slender, longer than the lvs.: raceme dense, many-fl.: pedicels filiform, spreading; bracts in pairs; fs. fragrant, smelling like lila, 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. Sibirica or S. bifolia, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.


16. verna, Huds. SEA ONION. SPRING SQUIRREL. A delicate little plant, with a small bulb and narrow-linear lvs. 2-4 in. long: scape seldom 6 in. long, with
several small, erect blue f.l.s. 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 Siberica (X 1/2).

SCINDAPUS (an old Greek name, transferred to these plants). Ardeea. Climbing perennials, differing from Monstera in floral characters and in the long-petioled, long-sheathed, ovate-lanceolate or ovate-acuminate lvs. Species 9 or 10. East Indies. Scindapus comprises one popular and worthy houseplant, that known to gardeners as S. argyrophyllum. For culture, follow directions given under Philodendron.

pictus, Hassk. Internodes of the stem 3-4 in. long, 2 in. thick; petioles 1 1/2-2 in. long; blade 4-6 in. long, 2 1/2-3 1/2 in. wide, one side half as wide as the other, coriaceous, bright green (drying black), obliquely ovate-cordate. Var. argyrophyllum, Engler (S. argyrophyllum, Hort. Photis argyrophyllum, Hort.), is the cult. form, with broad, deeply cordate leaf-blades which are spotted and blotched above with silvery white. Celebes, Philippines, Java, etc.

2277. Scilla amoena (X 1/4).

S. anomalous. Hort. = Monstera acuminata.—S. Oceania, Presl. is now referred by Engler to Oceania marantifolia. Not known to be in the trade. It is a question whether the Aglaonema communatum sometimes mentioned in horticultural literature is this species or is Aglaonema marantifolium, var. communatum. Engler.—S. pertianus, Hort. = Rhipidophora pertiana. JARED G. SMITH.

SCOLOPENDRIUM. See Phytolacca decandra.

SCIRPUS (Latin for bulrush), Cyperacea. 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 bristles or none, not enlarged in fruit: ovary one-loculed, with one anatropous ovule; style not thickened at the base, 2-3-cleft. 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: involucral foliaceous, umbel sparingly compound; rays stiff, very unequal; spikes ovoid-oblong, acutish, dark-greenish brown, in dense heads of 5-25; scales oblong, cuspidate; perianth bristles 6, downwardly barbed above; styles 3. Eastern U. S., in mud or damp soil.

Holochenus, Linn. Stiff and rush-like, from stout rootstocks: stems clustered, slender, cylindrical, 1-3 ft. high: lvs. 1-2, basal, stiff, erect and narrow, forked: 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, 3-5 lines in diam.; scales ovate, mucronate, cili-ate; perianth bristles none; styles 2-3-cleft. 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.

iacutilis, Vahl. Great Bulrush. Rootstocks very stout; stems scattered, terete, smooth, tall, stout and flexible, 3-9 ft. high: lvs. reduced to a few basal sheathes; bracts very short, erect; umbel compound, flaccuous, spikes in heads of 1-5, oblong-conical, pale brown, 2 1/2-3 lines long; scales oblong, 3-5 lines in diam.; perianth bristles none; styles 2-3-cleft. In almost 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, Godr. (S. Tabernamontanus, Gmel., and Hort.), but is scarcely distinct. Var. zebrinus, Hort., is a form with alternate bands of green and yellowish white; often known as Juncea zebrinus.

eernus, Vahl (S. riparius, Sprague, not Hort. Isid-epis gredelits, Hort. I. setaceus, Hort.). Fig. 2278. Densely cespitose, forming turf: stems 3-12 in. long, very slender or filiform, cylindrical, erect or more often drooping; basal sheathes leafless or with a very short filiform blade; involucral bract subulate, about halving the spikelet, the latter usually solitary, oblong-lanceolate, 1-3 lines long; scales oblong-oval, obtuse, pale brown or whitish; bristles none; styles 3; ake 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.

SCLEROCÁRPEUS (Greek, hard and fruit; referring to the bony, fruitiferous bracts). Compositae. A genus of about 11 species of mostly Mexican herbs, with branching stems and terminal pedunculate radiate heads of yellow flowers in summer.

uniseriális, Benth. & Hook. (Gymnópsis uniseriális, Hook.). An annual herb 1 ft. or so high, loosely branched, with alternate, deltoid or rhombic-ovate, dentate, petiolo lvs. and fragrant filaments, with 1-6 ovular, oblong, orange-yellow rays. Moist or shady ground, Texas and south. R. H. 1853:261. F. W. BARCLAY.

SCOEKE. A name for Phytolacca decandra.

SCOLOPENDRIUM. See Phytolacca decandra.
SCOLYMUS (old Greek name used by Hesiod). Compositae. Scolymus hispanicus (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 parsnip. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish Oyster Plant, aside from affording a variety in the kitchen garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and so much more delicious to raise it is rarer than that vegetable, alfalfa is highly 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, floecose, lanate or hirsute: lvs. sometimes entire and grass-like, or wifer, sometimes more or less pinnately lobed or dissected; heads long-peduncled, yellow, the fls. all radiate: akenes glabrous or villous. Cult. same as salsify. Hispanica, 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.

SCROPHULARIA (a reputed remedy for scrofula). Scrophulariaceae. Figwort. 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 thyrse in mid- or late summer. Corolla short; the tube globular or oblong, 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.

nodosus, 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 thyrse. Throughout the United States.
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.

F. W. BARCLAY

### SCUPPERNONG
A variety of grape grown in the South. See Vitis rotundifolia and Grape.

### SCURFY PEA
Psoralea.

### SCURFY-GRASS
(Cochlearia officinalis, Linn.), a cool-stimulant European perennial, so called from its anti-acrotic qualities, which have long been recognized. Stimulant, diuretic, 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 acid, bitter, punget, 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 cold, 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, dist; referring to the form of the persistent calyx). Labiatae. Skullcap. A genus of nearly 100 species of annual, perennial or shrubby plants widely distributed about the world, with simple leaves and blue, yellow or red, tubular 2-lipped flowers in terminal spikes or racemes or in the axils of the stem-leaves. Calyx in anthesis bell-shaped, gibbous, with a helmet-shaped projection; stamens 4, ascending and parallel, all fertile, the two anterior longer: anthers ciliate, pilose.

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<tr>
<td>A. Lvs. sessile or nearly so.</td>
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<td>B. Foliage entire.</td>
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<tr>
<td>BB. Color of lvs. red.</td>
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<td>BB1. Color of lvs. not red.</td>
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<tr>
<td>C. Margin of lvs. entire.</td>
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<td>D. Shape of lvs. linear.</td>
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<tr>
<td>EB. Foliate entire or dentate.</td>
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<tr>
<td>EB1. Plant with monitiform tubers.</td>
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<td>EB2. Plant without monitiform tubers.</td>
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<td>EE. Plant without monitiform tubers.</td>
</tr>
<tr>
<td>F. Fls. in terminal racemes.</td>
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<tr>
<td>CC. Habitat procumbent.</td>
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<tr>
<td>CC1. Habitat erect.</td>
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<tr>
<td>Dd. Fls. in axils of stem-leaves.</td>
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<tr>
<td>DD. Fls. on true axils.</td>
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<td>DD1. Fls. 3-5 lines long.</td>
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<tr>
<td>DD2. Fls. longer.</td>
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| 2. B. angustifolia, A. Gray. A half-hardy, compact perennial, 2-3 ft. high: lvs. numerous, oblong, narrow, about ¼ 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 ¾ in. long and violet or rarely white fls. ¾ in. long. Kansas to Texas. |
| 5. alpina, Linn. A hardy spreading perennial, about 10 in. high, with ovate, serrate dentate lvs., and purple and white or somewhat yellowish fls. in dense, terminal racemes. July and August. Europe. R.H. 1889:12.—A handsome rock or low border perennial. |
| 7. Mociniana, Benth. A tender, moderately low, shrubby plant, probably the most robust of the genus, with opposite, long-elliptical, acute lvs., and long, tubular, red fls. with a yellow throat, about 1½ in. long, in dense, terminal spikes. Autumn. Mexico. R.H. 1872:339.—According to Gu. 16, p. 696, 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 ovate to lanceolate, ½-1 in. long, narrow at the base, and violet-blue fls. ¼-1 in. long, with the corolla-tube slender. Moist ground, northeastern United States. |
| 9. antirrhinoides, Benth. Resembles the larger-leaved forms of S. angustifolia, but has longer petals and the lvs. are divided into subulate base and also shorter and broader fls. 7-10 lines long. Moist, shady ground, northwestern United States. |
| 10. lateriflora, Linn. A hardy perennial, increasing by slender stolons, 1-2 ft. high: lvs. ovate to lanceolate, 1-3 in. long; racemes axillary, terminal, narrow, leafy bracted: fls. blue to nearly white. Moist soil throughout the United States. |

### SCUTICARIA (Latin, scutica, lash or whip). Orchidaceae. Skew-crown. 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 flowers, with greenish-white sepals, are rather crowded along the short rhizome. Fls. solitary or several, on short peduncles. In structure the fls. resemble Maxillaria, but the plants are easily distinguished by the terete leaves. Sepals and petals similar, the lateral ones forming a narrow, callous, 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. Steelli 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.

Steéli, Lindl. Lvs. attain a length of 4 ft., as thick as a goose-quill; fls. on short scapes; sepals and petals oblong, convalent, pale yellow, with chocolate blotches; labium large, cream-colored, striped with brownish purple. Fls. at all seasons. British Guiana. B.M. 3573. B.R. 23:1986 (both as Maxillaria Steelli). |

Hádwenii, Planch. Lvs. 1½ ft. long: fls. with spreading sepals and petals oblong, sharply acuminate, yellow-green, with chocolate blotches, with brown; labellum of scarlet, eucalycate, white with fleshy base; lip pouch elongate. B.M. 4629. F.S. 7:231 (both as Bifrenaria Hadwenii). G.M. 41:538. HENRICH HASSLER and R. M. GREY.

### SCYTHIAN LAMB
Refer to Cibotium.

### SEA BEAN
Consult p. 155, second column; Sea Hawthorn is Hippophae; Sea Daffodil is Hymenocallis.
SEAFORTHIA (Francis Lord Seaforth). *Palmaceae.* *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 trees and for a wider variety of purposes, but it has been superseded for such uses by the Kentias (*Hoeua Belmoreana* and *Forsteriana*). *Seaforthia elegans* is often called the Australian Feather Palm. Further more than one thing is cultivated under this name is doubtful.

According to *Flora Australiandica* (1878) the proper name of *Seaforthia elegans*, K. Br., is *Pycho sperma elegans,* Blume. It is variously described as a low or very tall palm; izs, 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 (Granum mari- luma, Linn.)* is a large-leaved, strong, cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home garden, for it supplies an esculent of good quality at a season when vegetables are scarce. Sea-kale demands a deep, rich and rather moist soil, in order to give the best results and to maintain its vigor for a series of years. The plants require about as much room as rhubarb; they should be set from 3 to 4 feet apart each way. The culture and general requirements are much the same as for rhubarb. The young shoots are blanched as they grow, in early spring. The blanching is accomplished by heaping fine, loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower pot so that the light is excluded from the growing shoots. These shoots are eaten when the leaves have begun to expand to any extent, and when 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 seed is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year. The seeds are really fruits or pods, and each fruit may produce two or three plants. Usually the fruits are sown without shelling. The seedlings are raised in the seed-bed and transplanted into one-year old 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 new plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Plants may be forced in hotheds or under the greenhouse benches, as recommended for rhubarb. Sea-kale has large, glaucous, cabbage-like leaves which make it a striking plant for ornamental use 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 use.

Sea-kale grows wild on the sea coasts of southwestern Europe. L. H. B.

**SEA LAVENDER.** *Stata.les.*

**SEA ORANGE.** *Uriginia maritima;* also applied to Ornithogalum caudatum.

**SEA PINK.** *Armeria.*

**SEASIDE GRAPE.** *Coccoloba.*

**SEASON VINE.** *Cissus sicyoides.*

**SEA-URCHIN CACTUS.** *Echinopsis.*

**SECAL (the ancient Latin name, said to be derived from seco, to cut, according to some, applied to spelt). *Gramineae.* Species 2, *S. frutica*; an annual of southern Russia, and *S. cereale*, the cultivated Rye, which, according to Hackel, is derived from the perennial, *S. montanum,* native in the mountains of southern Europe and central Asia. Spikeslets with 2 perfect fls, sessile on opposite sides of a zigzag rachis, forming a terminal spike, empty glumes subulate and 1-nerved, by which characteristic, the genus differs from *Triticum,* in which the empty glumes are ovate and 3-nerved.

**cereal, Linn. Rye. Fig. 2280. A tall annual commonly cultivated in Europe, less so in this country, as a cereal. Also cultivated here for annual pasture. Fl., glume long-awned. Much more commonly grown in New York and New England than westward.*

**SECHIUM** (by some said to be derived from *Siecos,* with which the genus was once united, by others to have come from the Greek *sekos,* a "fold," because swine are fed on it). *Cucurbitaceae.* One very odd tendril-climbing vine, probably introduced from South America. This species, *S. edule,* Swartz, Fig. 2281, is known under a variety of names, as Chocho, Chuchu, Chow-Chow, Chayotte, Cahloeta, Pepinella. The vine itself, with herbaeous animal 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, 3-6 in. long (Fig. 2291, from nature), and edible. Sechium belongs to that group of the *Cucurbitaceae* which comprises 1-seeded fruits. The single flat seed is 1-2 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 are not rare in northern markets. It is also grown to some extent in Florida and southern California. In parts of the tropics, the plant makes a strong wine in one season but does not bear. The plant has little ornamental value.

In *Sechium* the fls. are monocious. The staminate are in short, long-stalked axillary clusters; the pistil-
late are solitary or in pairs on a short pubescent axillary pedicel. Corolla 5-lobed, green or cream-colored. Stamens 3, united into a glabrous or glandular column. Lvs. 4–6 in. across, cucumber-like, cordate-ovate and 5–7-angled, pointed, somewhat semicircular above. Tender opposite the lvs., 3–4-eleft. The plant grows 50 feet in warm climates. G.C. 1865:51; III. 24:476; 28:450. L. H. B.

Section I. Herbaceous Perennials, i.e., plants that die down to the root during winter. (In greenhouse culture some become evergreens.)

A. Flowers unisexual ........ 1. roseum
AA. Flowers bisexual.
B. Lvs. narrow.
C. Arrangement of lvs. opposite. 2. Asiaticum
CC. Arrangement of lvs. alternate.
D. Height about 4 in. ......... 3. Middendorfianum
DD. Height 12 in. or more. 4. Selskianum
D. Stems glabrous.
V. Sepals equal .......... 4. Aizoon
VF. Sepals unequal ......... 5. Maximowiczii
EE. Stems pilose ........ 6. Selskianum
BB. Lvs. broad; roots tuberous.
C. Arrangement of lvs. scattered (rarely opposite in S. Telephium).
D. Margin of lvs. dentate. 7. Telephium
DD. Margin of lvs. nearly entire. 8. telephoides
CC. Arrangement of lvs. opposite (sometimes in 3's in S. spectabile).
D. Buds obvolute, 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. spatulate 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. epithalium
DD. Each fl. ¼ in., across. 12. obtusatum
CC. Fls. white; anthers reddish.
D. Barren shoots with lvs. in 3's ............ 13. ternatum
DD. Barren shoots with scattered lvs. 14. Nevil
BB. Lvs. scattered, i.e., not tufted.
C. Stem eyes with slender or pinkish lvs. 15. populifolium
CC. Stema (barren ones) prostrate.
D. Fls. yellow.
E. Margin of lvs. coarsely toothed above the middle.
F. Petals lanceolate. 16. Kantschaticum
FF. Petals linear. 17. hybridus
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. coricate. 20. opositifolium
EE. Arrangement of lvs. alternate. 21. Eversii
EEE. Arrangement of lvs. in 3's. 22. Anacampseros
AAA. Arrangement of lvs. more or less terete; lvs. usually linear, not wider than the anacote (unless in No. 23).
B. Apex of lvs. sharply pointed.
C. Fls. yellow.
D. Inflorescence decurved. 24. reflexum
DD. Inflorescence not decurved.
E. Gymnocalyptoideum. 25. stenopetalum

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. 26. sempervivoides
BB. Fls. yellow. 27. Formosanum
AA. Lvs. more or less cylindrical.
B. Fls. blue. 28. carnatum
BB. Fls. dull rose or white. 29. villosum

Section I. Herbaceous Perennials (Species 1-10).

1. roseum, Scop. (S. Rhodolou, DC.). Rootstock thick, fleshy, exhaling a perfume of rose water; height 6-8 in.: lvs. scattered, oblong, 1½ in.: fls. greenish or reddish purple, in a terminal flat-topped cyme about 1 in. across; petals 4; stamens 4 in the male fl., absent in the female; capsule 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 pinnatifid 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. Middendorfianum, Maxim. Lvs. alternate, oblong-lanceolate, dentate toward apex: fls. yellow, in a flat-topped cyme. Japan. Amer. Manchuria.—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 1½-2 ft.: lvs. alternate, oblong-lanceolate, coarsely and irregularly toothed for the greater part of their length, 2½ x ¼ in.; fls. yellow, ½ in. across, in a loose, panicked cyme 1-3 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. Gm. 19, p. 203; 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 flake-shaped fl.-buds, which are dilated below and narrowed into a long neck above. Desirable for borders; also used for carpet beds. Seeds, as well as plants, are offered.


7. Telephium, Linn. ORPINE. LIVE-FOREVER. Fig. 2232. 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 and spreads prolifically. 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 of borders and for rockeries. The young shoot in spring are pretty objects and differ with the different varieties. The larger forms with bright fls. are preferable. S. purpureum and purpurascens, 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 peduncles, fls., smaller and earlier; petals less recurved. It is doubtful whether this is really in the trade. See S. spectabile.

2282. Live-evergreen—Sedum Telephium (x 9/4).


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 cordate, 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. 27, p. 316. — Var. variegatum, Hort., has gold and green foliage, according to J. W. Manning. F.S. 36:1699 (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 is apt to get too straggly and needs support.

Var. hammabbes, Mast. Stems 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, Turecz., which appears as a good species in Index Kewensis, is probably a synonym of S. roseum.

10. spectabile, Bor. (S. Fabaria, Hort., not Koch). Snowy Sedum. Fig. 2283. This is the most popular of all Sedums and is used for the greatest variety of purposes. Robust, glaucous, 13/4-2 ft. high: lvs. opposite or in 3's, 3 x 2 in., ovate, obtuse, entire or obscure: lvs. wavy-toothed: fls. 3/4 in. across, in flat-topped, inverse pyramidal, leafy, umbellate cymes 4 in. across. Sept. - Oct. Possibly from Japan. Gn. 27, p. 316. F.S. 8:271. — The fls. vary from rose to purple and perhaps to white. Pitcher & Manda offer a rosy 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 11-35).

11. spathulatum, Hook. Barren stems creeping, with terminal rosettes of obovate lvs.; flowering branches scented, and bearing scattered club-shaped lvs.; fls. yellow, 1/4 in. across, in terminal cymes; sepals oblong-obtuse. May, June. N. W. Amer. G.C. II. 10:377. Gn. 24:415. — Offered in 1881 by Gillett, but is probably not cultivated in eastern states, and probably requires pot culture indoors. Here may belong Franceschii'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. obusatum, Gray. Barren stems prostrate, with rosettes of spathulate lvs.; fl.-stems erect, ultimately leafless and then scarred: fls. yellow, in terminal, umbellate cymes 13/4-2 in. across; sepals oblong-acute. June, July. Calif. — Once offered in America, but probably not now in cult.


14. Nrevii, Gray. Barren stems prostrate, with terminal rosettes of obovate-spatulate lvs., tapering into a short stalk surmounted at the base, sprinkled with pink dots: fl.-stems erect, with appressed, scattered lvs. similar to, but smaller than those of the barren stems: fls. white, 1/4 in. across, in forked cymes whose branches are about 13/4 in. long and recurved; anthers brownish purple. July, Mts. of Va. and Ala. — Hardy in Mass. and desirable for edgings or rockeries, according to Edward Gillett.


16. Kantschaticum, Fisch. & Mey. Height 4-6 in.: lvs. alternate or opposite, obovate, coarsely, but regularly toothed above the middle: fls. yellow, 1/4 in. across, in umbellate cymes 1-3 in. across; petals lanceolate. Late summer. E. Asia. Gn. 25, p. 311; 27, p. 317.
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, ¼ in. across, in terminal and lateral panicled cymes; petals lanceolate. Var. variagatum. Hort., has lvs. with golden blotches, according to John Saul. "S. macrophyllum aureo-margi-

2285. Stoncrop, or Wall Pepper—
Sedum acre (X ½).

19. stoloniferum, Gmelin (S. spathium, Bleb.). 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), ½ in. across, in cymes 2 in. across; anthers reddish. July, Aug. Asia Minor, Persia. B.M. 2370. Gn. 27, p. 315. R.H. 1891, p. 325.—Commoner in cult. abroad. "It has the disadvantage of affording cover for snails," but "one always knows where to look for the snails."

20. opposititubus, Sims. Very close to S. stolonifer-
rum, 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 neater appearance than in S. stoloniferum. Fls. white or whitish. Anthers orange, according to Masters, but yellow in B.M. 1807. Aug. Caucasus, Persia.


24. refléxum, 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, ⅔-⅞ in. long, linear: inflorescence decurved or erect before flowering: fls. ½ in. across, yellow, floral parts in 4's to 8's. England. Var. cristatum, Bartram, and robustum, Hort., has fasciated stems forming a crest like a cockscomb.

25. stenopetalum, Pursh. Glabrous: stems 3-6 in. high, erect from a decumbent base: lvs. crowded on barren shoots, sessile, fleshy, lanceolate, ¼ in. long: fls. bright yellow, in aeciprolated cymes, floral parts in 5's. Rocky Mts.—Offered by Gillett in 1893. Rare in cult.

26. sarmentosum, Bunge. Glabrous: lvs. opposite or whorled, crowded, lvs. yellow, ¼ in. across, in flat-topped, umbellate, 3-5-forked cyme. China.—Var. carneum (S. crineum variegatum, Hort.), has pink stems: lvs. marked with marginal stripe of white or cream-color. This variety is grown in greenhouses and for carpet beds and edgings.

27. pulchellum, Miixz. Glabrous trailer, 3-6 ft. high: lvs. linear, terete-pointed, gibbous at base, scarcely ½ in. long: fls. rosy purple, ¼ in. across: inflorescence a 3-4-branched cyme, with erect fls. crowded in 2 rows along the upper surface and each provided with a leathery bract. June-Aug. U. S. B.M. 6223, Gn. 27, p. 315. G.C. II. 10:683.—The minute folla-
ges assume rich tints of red, brown and purple. The branches of the inflorescence are 3-4 in. long and gracefully arched.

28. âcre, Linn. Stonecrop. WALL PEPPER. LOVE ENTANOLE. Fig. 2285. Barren stems creeping, branched, about 2 in. long: fl-stems 2-3 in. high: lvs. minute, ¼ in. long or less, crowded, thick, ovold or nearly globular: fls. ¼ in. across, in 1-sided cymes having 2-5 forks. June, July. Eu., E. 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 cult. for spring bedding. It gives a bit of color at a dull season. It loses the yellow tint in sum-
mer and is never so sym-
bust as the green form. Var. elegans, Mast., has the tips and young lvs. pale silvery colored. Not as effective or hardy as the commonest. Var. auratum. Var. mah,

29. sexangulare, Linn. Very close to S.
acre but the lvs. not so bitter to the taste, more slender.

2286. Sedum cæruleum. 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 6 in. high, and flower in June and July. It is mostly used for carpet beds.

30. dasyphyllum, Linn. Glaucescent, glabrous or glandular: lvs. oblong or roundish, studded with crystalline pimples: buds oblong, obtuse: fls. pinkish; anthers black. Eu., S. Afr. B.M. 6227.—Wolden says it grows 3 in. high, and is used as an ornamental lvs. edge of lawn or rockery.

31. Hispanicum, Linn. Glaucescent: fl-stems 3-4 in. high, reddish: lvs. ⅜ in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pimples at
the tips: cymes 3-5 branched, umbellate; buds 5-6-angled: fls. pinkish white, ¼ in. across. July. Central and southern Europe. - Readily distinguished by having the floral parts in 6’s.

32. brevifolium, DC. Glaucescent: Lvs. in 4 rows, a tenth of an inch long, pinkish, densely covered with a mealy pubescence: fls. ½ in. across; petals white, with pink margins. 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. Lydium, Boisse. Glabrous. Plants 3-4 in. high: lvs. ¼ in. long, linear, greenish or red-tipped, arched at base and with numerous pimplies at tip when seen with a lens: buds 5-angulat: fls. one-tenth in. across, pinkish; anthers reddish. Aug. Sept. Asia Minor. - Var. azureum, Hort., was offered by John Saul, 1840.


35. Monregalense, Baldi’s (S. cruciátum, Desf.). Glabrous, except in florescence, which is glandular: lvs. linear: fls. ¼ in. across, white; buds roundish, pointed; stamens pinkish. N. Italy, Corsica. L.B.C. 5:464.

SECTION III. ANNUALS OR BIENNALS (Species 36-39).


37. Formosanum, N. E. Br. Height 6 in.: stem repeatedly branched in a dichotomous or trichotomous manner: lvs. 1-3, in whorls at branchings of stem, with occasionally 1-3 on internodes, flat, spatulate: fls. yellow. Formosa. Int. into S. Calif. In 1900.


39. villosum, Linn. Glabrous, pubescent, 3-4 in. high, with no barren branches: lvs. 2-5 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 soil. The white-fl. form is advertised by one dealer in perennials. The species, however, is an annual.

SEEDAGE. Under this term may be included all knowledge respecting the propagation of plants by means of seeds or spores. The word was first used, so far as the writer is aware, in 1887. It is equivalent to the French semeur, and is used more generally to denote the person engaged in graftage, layerage and cuttage. In general literature and common speech, a seed is that part of the plant which is the outcome of flowering and which is used for propagating the species. In the technical or botanical sense, however, the seed is the ripened ovule. The seed contains an embryo, which is a miniature plant. The embryo has one or more leaves (cotyledons), a bud or growing point (plumule) and a short descending axis (caulicle). From the caudicle or stemlet, the radicle or root develops. This embryo is a minute dormant plant. Each embryo is the result of a distinct process of fertilization in which pollen of the same or another flower has taken part. The ovule is contained in the ovary. The ripened ovary is the female part of the carpel. The pericarp, with the parts that are amalgamated with it, is known technically as the fruit. In many instances there is only one seed in the fruit, and the seed and its case may adhere and form practically one body. Many of the so-called seeds of horticulturists are really fruit containing one or a few seeds. Such are the seeds of beet, lettuce and sea-kale.

The winged seeds of elms, hop-tree (Fig. 2287) and ashes are really fruits containing a single seed. Acorns, walnuts, butternuts and chestnuts are also fruits: so are grains of corn, wheat, and the "seeds" of strawberry. The keys of maple are double fruits, with two seeds (Fig. 2288). Beans and peas are true seeds. The fruit part is the pod in which the seeds are borne. Apples and pears are also true seeds, the fruit being the fleshy part that surrounds them. Germination is the unfolding and the growing of the dormant or embryonic plant. The first visible sign of the swelling of the seed. Thereafter the integument is ruptured, and the caulicle appears. When the caulicle protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 2289). Germination is not complete, however, until the young plant has made vital connection with the soil, has developed green assimilative organs and is able to support itself (Fig. 2290). See also, Figs. 2291 and 2292. Seeds that have sufficient life to sprout may still be too weak to carry the process to complete germination. The ideal test for determining the viability of seeds is to plant them in soil in conditions that somewhat nearly approach those in which they are finally to be planted. This test eliminates the seeds which are very weak and are not able to germinate under ordinary conditions and to push themselves through the soil. The sprouting test made in a specially prepared device, in which all conditions are regulated to a nicety, may be of the greatest value for purposes of scientific study and investigation and for the making of comparative tests between various samples, and the greater the sprouting test, the greater the germinating power; but one must not expect that the actual rate of germination be as high as the percentage of sprouting. In many cases, the differences in results between the sprouting test in a specially prepared device, and the germination tests in well-pre-
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 70-50 per cent in April.

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, they are 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 and richer 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 and 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 hothed, 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, thereby enabling the young plants to secure an early start. When the seeds are to be sown, the manure is removed and the surface is then in ideal condition. In the case of young plants in seed-beds, one must take pains that the plants are not too thick and that they do not suffer for light, else they may become "drawn" and be practically worthless. In greenhouses and hotbeds, it is well to handle common vegetables and flower seeds in gardeners' flats (Fig. 2296). 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.
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 root 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 a few plants are selected and their seed saved separately for planting in blocks the succeeding year. Then the remaining plants of this and the other blocks which escaped the first weeding out are very carefully examined and all inferior ones removed, and the seeds from the plants which still remain are saved together. These are usually sufficient in quantity to plant a field, the product of which is used by the seedsman for his general stock seed. From the stock seed he grows the seed which he offers his customers. The same process is repeated every year, at least every few years, and results in marked improvement, if not in type, at least in the fixing and making permanent the good qualities of the variety. Having thus obtained stock seed which is of superior quality and sure to reproduce itself, the seedsman contracts with some farmer, located in a section where soil and climate are favorable to the best development of the sort, to plant a large field and save the entire seed product. This the farmer does with little regard to selection, taking pains only to guard against contamination from adjoining fields, and to remove any chance sports or mixtures that may appear. The seed thus produced is what the seedsman furnishes his customers. This plan enables the professional seedsman not only to produce cheaper seeds, but seeds of better quality than the ordinary planter can, or at least is likely to produce in his own garden, and in consequence grows to have come to get more and more of their seed from the seedsman, whose business has correspondingly increased.

In 1900 a single seed firm contracted for the growing of more than 290 acres of one variety of watermelon for seed, and received on its contracts over 26,000 pounds. More than half of this came from a single field of over 50 acres, and in this entire field there were not 50 seeds which were not good types of the variety. One could go to any part of it and gathering together the nearest 100 fruits would find that at least 50 of them were so nearly alike as not to be distinguished from one another; while of the remaining 50 at least 40 could be distinguished only by some property that had escaped from accidental causes. The same firm had 20- and 40-acre fields of beans, peas, corn and other vegetables in which every plant was, as it were, the grandchild of some especially fine plant produced two years before, and which was itself the product of years of previous selection. Such seed is much more reliable than that produced in a small garden, where other plants of the same species are growing in near-by gardens and fields.

W. W. Tracy.

Seed Testing.—Scientific seed testing was inaugurated in 1869 by Dr. F. Nobbe, director of the Experiment Station at Tharan, Saxony, who was impressed by the large amount of impurities and the low germinating power of many commercial seeds, for which the German farmer was paying fancy prices. The publication of the results obtained by him excited much comment and laid the foundation for the present extensive system of European seed control. During the present time there are more than one hundred so-called seed control stations in Europe alone. Some of these are independent institutions, while others are conducted as branches of agricultural experiment 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 (to be done from foreign matter), (2) a test for trueness to name, and (3) genuine purity, or trueness to name. The latter is known to seedsmen and growers as purity of stock. Unless seeds possess a high requirement in all of these respects their gizir use will entail great loss to the planter.

Puri ty Test.—The percentage of purity is determined by weight, from a fair average sample of seed selected from different parts of the bolt 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 edge which may be turned at will to open or close the holes. The sampler, with the holes open, is thrust through the grain in the crad 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 other seeds, or small other short cylinders of metal, 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. 4194). This 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 white paper or pane of glass and by means of a pair of forceps or forceps are examined for inert matter, such dirt, chaff, brood seeds and foreign seeds. Under the latter designation are embraced seeds of both weeds and useful plants, whose presence is likely to give rise to confusion and may have come to get more and more of their seed from the seedsman, whose business has correspondingly increased.

In 1900 a single seed firm contracted for the growing of more than 290 acres of one variety of watermelon for seed, and received on its contracts over 26,000 pounds. More than half of this came from a single field of over 50 acres, and in this entire field there were not 50 seeds which were not good types of the variety. One could go to any part of it and gathering together the nearest 100 fruits would find that at least 50 of them were so nearly alike as not to be distinguished from one another; while of the remaining 50 at least 40 could be distinguished only by some property that had escaped from accidental causes. The same firm had 20- and 40-acre fields of beans, peas, corn and other vegetables in which every plant was, as it were, the grandchild of some especially fine plant produced two years before, and which was itself the product of years of previous selection. Such seed is much more reliable than that produced in a small garden, where other plants of the same species are growing in near-by gardens and fields.

2293. A gardener’s flat, or shallow box, in which seeds are sown and small plants handled.

A good size for a flat is 16 x 20 inches, and 3 inches deep.

2294. Clover seed "trier."
SEEDAGE

jeeted; 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 stoppered and systematically arranged in shallow paste-board boxes (see Fig. 2296). 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 large, a card index will be of great assistance in finding the specimen.

Germination Tests.—The seeds used in germination tests must be taken indiscriminately from pure seed which has been thoroughly mixed for that purpose. The selection of plump, nice-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 and soil in a greenhouse. Seeds which are known to germinate 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 blotter 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 blotter 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 great 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, ecuorbits and others of a similar size, and 200 seeds of clover, cabbage, 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 seed, 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.

The 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 having 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 the blotter placed in a metal chamber heated by gas, the heat being controlled by a thermo-regulator. The blotter must be free from soluble chemicals. Blue blotter 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 American Agricultural Colleges and Experiment Stations was designed by the members, and serves equally well for bacteriological purposes or experiments in plant physiology as for seed testing (see Fig. 2296).

It is made of 20-ounce corrugated copper, and is 2 feet long, 18 inches deep, and 2 feet high. Outside measurements. The outside, except the bottom, is covered with two layers of felt, each 3/4 inch thick.

A water space is afforded by the double walls, which extend on all sides except the front and are 2 in. apart. Entrance to this water jacket is obtained at a, d (Fig. 2296), while the water can be drawn off at g. At c, 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 tubes 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 3 plates of thick glass set about 1/2 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 chamber. 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, b), which permits the exit of carbon dioxide, and can be closed tightly with a slide. Perfect closing of the door is further effected 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, t, 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 2¼ in. apart, are held in place by copper ledges 3¼ inch wide. These shelves are made of brass rods 1½ in. apart, and each one is capable of holding up 60 pounds weight. The temperature is controlled by a low-temperature thermo-regulator (Fig. 2296, b). A very low and equable flame is secured with a microburnen burner (Fig. 2296, a). 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, \(c, c\)) and out at the bottom (Fig. 2296, \(f, g\)). Each of the openings at the end (Fig. 2296, \(f, g\)) is closed with a screw cap. Thirteen 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 portion which are suspended metal rods, with 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 sewed (as at \(q\)) 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. 2296) 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. 2300. A very simple apparatus for sprouting seeds is shown in Fig. 2301. It consists of a shallow tin basin "re-lined," 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 placed in the bottom 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 open from time 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 seeds may be germinated at one time. A number of 20° C. (68° F.) is generally maintained in germination tests. Seeds of celery, most grasses, and a few other species should be subjected to alternating temperatures of 20° C. and 30° C., the higher being used for six hours out of the twenty-four.

**Duration of Germination Tests.**—For purposes of comparison it is desirable to have uniform periods of time for conducting germination tests. The following periods have been adopted in this country and are practically the same as those used throughout Europe.

For laboratory tests: Ten full days for cereals, spurry, peas, beans, vetches, lentils, lupines, soja beans, sunflower, buckwheat, crucifers, Indian corn, and cow-peas; 14 full days for serradella, espargette, beet fruits, rye grass, timothy, umbelliferae, tobacco, lapeseda, and all grasses except Poa, Bermuda grass, ryegrass, and timothy; and grasses and Bermuda grass. Soil tests are to be continued two days longer in each case and the sprouts counted only at the close.

**Special Treatment of Seeds Preparatory to Germination.**—Soaking seeds in water for 6–15 hours before placing them in the germinating chamber, as frequently practiced, is to be condemned. As a rule, however, seeds of asparagus, lettuce, radishes, and okra may be soaked to advantage. Asparagus should be placed in distilled water for 5 hours, then transferred to blotter which is held very wet for the first 48 hours; okra may be soaked in water at 50° C. for 5 hours. Ordinary fine sand is the readiest with which moulds develop upon onion seed, it should be soaked for an hour in a solution consisting of one part chloroform to 100 parts of water. Seed should be sown in asparagus, adonis, canna, moonflower and lupine sown better if previously clipped, care being taken not to injure the germ. The mold assertions often made of the value of treating seeds with certain chemicals to hasten germination, are not supported in the main, not worth of notice. For treating growing seed beds, afterward, the use of asphyxiation gases have been adopted. Carbonic acid gas has been much used in this country and abroad. Carbonic acid gas is formed by the combustion of wood or coal. The gas is weakly alkaline and attracts water vapor from the air. The gas maintains a uniform temperature, and is free from the action of dew. For carbonic acid gas for this purpose, a carbonic acid generator is made. 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 margin, the purpose of excluding 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 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
SEEDAGE

apparatus with the open side opposite to him and to
ward 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 mirror as it is lifted out. 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 vel

get 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.

Testing 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 8-15 hours, then placed on blotting paper or sand at a constant temperature of 20° C., for 18 hours out of 24, the rest of the time at 30° C.

In 3, 5, 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 changeover 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 100 clusters, together with the number of unsprouted seeds, is ascertained. The average of all the clusters is taken into account, especial 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 horti

cultural 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 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 late Gilbert H. Hicks, of Washington, D. C., in 1899, 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' successor. L. H. B.]

The methods and apparatus in use in the Seed Laboratory of the U. S. Department of Agriculture have undergonesome 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 in the United States, arbitrary standards have much value. The comparison of the price and quality of different kinds offered means more than an ideal standard which it seldom practices 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 20 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 greenhouse, but is being cultivated in the cham

ber by means of alternating temperature. When seeds, as of sugar beet, are sold on a guarantee, the test should be made under conditions similar to those under which the original test was made. The enemy 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, barley, peas, onions, fruits and vegetables, nec

essary in fact for direct use, first claimed the atten

tion 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 one of the articles 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 im

ported. At that time Boston did most of the business.

SEEDAGE

1645

2300. Mold for making plaster of Paris germinating dishes, and a Petri dish.

Among the earliest advertisers of seeds for sale were Nathaniel Bird, 1763, a book dealer of Newport, R. I.; Gideon Welles, "on the Point," 1774, a dealer of general merchandise in New York in 1776; William Davidson of New York in 1758, while in Phila

delphia, in 1772, we find one Pelatiah Webster advertising clover and duck grass seed. James Longhead of large flower" seed in 1775, while David Reid kept a general assortment in the same year.

Development of American Trade. — It was not until the opening of the nineteenth century that American farmers found 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.

Railways and Postal Services.--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 these privileges by members of Congress has largely tended to negative this benefit. The originally beneficent distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no 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.—Great Thorburn's catalogue of 1829 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. It always is: "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 1855 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade has existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1855 to $2,185,796 in 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregated $3,393,663. During the decade ending with 1889 clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $50,739,277. The aggregate was increased by more than $20,000,000 before the end of 1890. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad."

202. Mirror box for testing grass seeds.

An estimate recently made by one of the largest seedsmen in the country gives the capital invested in the business at about $12,000,000, and the actual acreage under seed at the present time as about 150,000 acres.

Staples and Localities of Production.—The following table will give as a general survey of the results of the annual cost of the chief staple garden seeds handled in America:

<table>
<thead>
<tr>
<th>Seed</th>
<th>Annual Cost</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>$100,000</td>
</tr>
<tr>
<td>Lettuce seed</td>
<td>$250,000</td>
</tr>
<tr>
<td>Cabbage seed</td>
<td>$100,000</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>$100,000</td>
</tr>
<tr>
<td>Tomato seed</td>
<td>$50,000</td>
</tr>
<tr>
<td>Radish seed</td>
<td>$25,000</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>$3,175,000</td>
</tr>
<tr>
<td>Probable invoice cost of seeds</td>
<td>$1,700,000</td>
</tr>
<tr>
<td>Total growers' value</td>
<td>$9,025,000</td>
</tr>
</tbody>
</table>

An estimate recently made by one of the largest seedsmen in the country gives the capital invested in the business at about $12,000,000, and the actual acreage under seed at the present time as about 150,000 acres.

Staples and Localities of Production.—The following table will give as a general survey of the results of the annual cost of the chief staple garden seeds handled in America:

<table>
<thead>
<tr>
<th>Seed</th>
<th>Annual Cost</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>$100,000</td>
</tr>
<tr>
<td>Lettuce seed</td>
<td>$250,000</td>
</tr>
<tr>
<td>Cabbage seed</td>
<td>$100,000</td>
</tr>
<tr>
<td>Sweet corn</td>
<td>$100,000</td>
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<tr>
<td>Tomato seed</td>
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<td>Radish seed</td>
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</tbody>
</table>

An estimate recently made by one of the largest seedsmen in the country gives the capital invested in the business at about $12,000,000, and the actual acreage under seed at the present time as about 150,000 acres.


Beets: 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.
Cabbage: About half imported, the other half chiefly from Long Island, Connecticut, Pennsylvania, and to a small extent from New York.

Cauliflower: Finest kinds imported from Denmark; coarser kinds from Italy.

Carrots: The bulk of finest kind imported from France. Some fine grade in Connecticut, and coarser grades in California.

Sweet corn: Connecticut, Nebraska, New York, Ohio.

Onions: Chiefly in Nebraska, western New York, Michigan.

Lettuce: California.

Watermelons: Nebraska, Kansas and the South.

Musk melons: Nebraska.

Onions: Chiefly in California; Connecticut, New York, Michigan.

Peas: Northern New York, Canada, Michigan, Wisconsin.

 Parsley: Imported from England and France.


Turnips: 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.

Celeriac: 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 the main branches of garden and flower seeds and bulbs and agricultural seeds. The latter is practically a business by itself, devoted to such seeds as blue grass, timothy, clover, red top and alfalfa, some of which are exported or imported as the exigencies of the season’s product demand.

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 grocerman in country towns and villages carries a stock during the spring season. These may, however, deal as a rule with the larger houses, and constitute the principal class of middlemen for retail trade.

Wholesale Seedsmen’s League: Its Object.—On August 24, 1900, some 42 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 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 Crotalaria.
1. *rupéstris*, 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 replaced by many allied species in the Rocky Mts. and on the Pacific coast. The writer has separated 6 of these and Dr. Hieronymus, at Berlin, has recently characterized 10 others.

2. *dentícola*, Link. Fig. 2303. Stems less than 6 in. long, matted; lvs. of the lower plane slightly spaced, dentilicate, ciliate on the upper side at base and imbricated over the stem; lvs. of upper plane ciliate. Mediterranean region throughout. — Trade names are var. *anrea* and *folis variegátis*.


5. *unicínap*, Spring (*Lycopodium cistiárum* and *Selagínella cástia*, 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 ciliate, much imbricated. China. — In 1893 John Saul offered "*S. cástia arboréa*" with the remark that *S. bethára* was a synonym thereof.

6. *plumáceus*, 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, Ceylon, China, Malay Isles.

7. *conína*, Spring (*S. serrulátá*, Spring). Stems 1 ft. or more long, copiously pinnately branched, with more or less fan-shaped compound branches: lvs. of lower plane crowded, bright green, glossy, much dilated and rigidly ciliate on the upper side at base; lvs. of upper plane one-third as long, long-cuspidate, much imbricated. Mascarené Islands. — Var. *folis variegátis*, Hort., is cultivated.

8. *stolonífera*, 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 auricled at base. West Indies.

9. *Krassíánía*, A. Br. Stems 6-12 in. long, flat on the back, rounded on the face, copiously pinnate, with compound branches; lvs. of upper plane spaced on the branches and main stem, acute, slightly imbricated over the stem; lvs. of upper plane obliquely ovate, acute. Africa, Madeira. — *S. Brvénici*, Hort., is a dwarf form from the Azores. Var. *anrea* and *variegátis* are American trade names.

10. *Cunningham*, Baker. Stems copiously pinnate, 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 distinctively cuspidate. Brazil.

11. *Brasíliénis*, A. Br. Stems copiously pinnate, 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, cuspidate. Brazil. — Similar to preceding, but with longer leaves.

12. *ápus*, 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. — *Lycopodium densum*, cultivated at the Harvard Botanic Garden, is said to belong here.

13. *ábo-nínetá*, 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.
cuspitate, denticulate 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.


For contrast with Fig. 2305. This species is S. Martensi.

16. Martensi, 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 cuspitate, ciliate 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. Poulteri, Hort. Veitch. Stems densely tufted, slender, sub erect, 2–3 ft. 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, cuspitate. Japan to India and the Philippines.

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 ciliated, 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 ball with a dull brown exterior to expand and show 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 ciliate on the upper side at the base, pale green edged with white; Ivs. of upper plane nearly as long, obliquely ovate, cuspitate. A plant occurring under the horticultural name Lycopodium corticilium 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. Emmelianum, Hort. Fig. 2305. Stems 6–12 in. high, the primary branches ascending, bipinnate: Ivs. of lower plane oblong, 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-cuspitate. S. Amer. Named for Th. Emmel, a German gardener.

23. Wallachi, Spring. Stems 2–3 ft. long, with lanceolate branches and simple crowded branchlets: Ivs. of lower plane crowded, smaller towards the end of the pinnules; Ivs. of upper plane one-fourth as long, cuspidate: spikes 1 1/2 in. long. India and the East Indies.—Highly ornamental.

24. Victoriae, 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 little long, truncate at base and obscurely petiolated; Ivs. of lower plane one-fourth as long, short-cuspitate: spikes 1–2 in. long. Borneo and Fiji Islands.

25. gracillima, Moore. Stems 2–3 ft. long, somewhat crowded, with lanceolate and simple branchlets: Ivs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; Ivs. of upper plane one-third as long, obliquely ovate, cuspitate. Borneo and Sumatra.

27. Wuldenertii, Baker. Stems reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguous: Ivs. of lower plane crowded, ovate or oblong, tinnitae; with blue, obscurely petiolated; Ivs. of upper plane one-third as long, obliquely oblong, not cuspitate. India and the East Indies.

28. grandis, Moore. Stems 1 1/2–2 ft. long, branched above: Ivs. of lower plane crowded, lanceolate, acut, rather firm; Ivs. of upper plane one-third as long, ascending, much imbricated. Borneo.

29. viticulosa, Klotzsch. Stems with deltoid 2–3-pinulate branches: Ivs. of lower plane ascending, acute, short-ciliate and much imbricated over the stem; Ivs. of upper plane one-third as long, obliquely ovate, cuspitate. Central America.

30. caulescens, Spring (S. amena, 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, cus-
In general, Selaginellas are of easy culture. As a rule they prefer shade and moisture and are somewhat tender in foliage compared with some of the commonest of commercial ferns. *S. denticulata*, *Kraussiana*, *Martensi*, and some other commercial favorites may be rapidly propagated without any preliminary treatment in the cutting bench. Cuttings of these species may be inserted into small pots of light sandy soil, placed in a shady position. Suckers will appear lightly the third day, and in a week, at the end of which time they will take root. They will soon grow into salable plants.

The popular *S. Emmeliana*, which is generally considered as a curiosity, requires a very different treatment. It is much more difficult plant and 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. Emmeliana*, cut them into pieces half an inch long, scatter thinly over surface of soil, and put just enough finely screened soil on top of the cuttings to attach some small portion of them to the soil. Water thoroughly, cover with glass, and place in a temperature of 70° F. In this condition they will soon form roots and little plants at almost every joint. When sufficiently well grown they should be set out or transplanted singly an inch apart into boxes, where they may be left until large enough to be potted.

The following list of Selaginellas for special and general purposes is not definitive, but merely suggestive. For commercial purposes, *S. farinosa*, *Kraussiana*, *Martensi* and *Emmeliana*; for carpeting the soil, *S. denticulata*; for table decoration, *S. Emmeliana* and *S. aculeata*; for cutting, the commercial kinds; for veranda boxes, *S. Braunii*; for bronze and blue colors, *S. Wildenowii* and *S. umbrosa*; for specimen plants and exhibitions, *S. Braunii*, *Lyallii*, *victuolosa*, *Waltichii*, and *Wildenowii*. Also the following, which are somewhat less popular and considered difficult subjects: *S. atroviridis*, *humatodes* and *rubricaulis*; for curiosity, *S. serpens* and *lepidophylla*.

The curiosities of the genus call for special mention. *S. serpens* is the most remarkable of all, and for its changes of color during the day. In the morning the foliage is bright green; during the day it gradually becomes paler as though bleached by the light; toward night it resumes its lively green hue again. For *S. lepidophylla*, see *Resurrection Plant*.

The following species also deserve a few running notes: *S. Braunii* is an old favorite which is often included in *S. Wildenowii* in collections. Its branches, or "foliage," is peculiarly suggestive, and is exceptionally hardy and vigorous; *S. oreades* is better adapted for indoor use than for mingling in a fernery, because of its strong-growing, erect, fern-like habit. The branchlets are thrown up from creeping stems and do not root readily, so that this species is usually prop. by division or spores.

W. H. Taplin, N. N. Buckner and W. M. 

**SELENIUM**

*Selénium acrus*, Nutt., is a spring annual of the mustard family, a native of the S. H. It is grown from Texas to the base of the Rockies. It is not known to be cult. in America, but it seems to be one of the prettiest of our few native ornamental crucifers. It has small yellow flowers, 3-5 in. across, on the petioles having a central band of red. It is also handsome in flower, its finely cut foliage and its flat pods through which the seeds may be vaguely seen, as in the case of Lunaria, or "Honesty." It grows about 9 in. high. B.M. 6607.

W. M. 

**SELENIIPÉDUM** (from seléne, moon, and petéon, ground; analogous to Cypelipédium). It is said to be more difficult to grow than the others, intended to derive the second part of the word from petéon, sandal, and some botanists and horticultural writers use the word thus derived, but Reichenbach
SELENIPEDIUM

wrote Selenipedium). The genus Selenipedium comprises the South American Cypripedums. 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.

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. This material is especially to be recommended for the young and divided plants. Give slight shade, and grow on raised benches near the glass. Water sparingly until growth begins. The four species, S. Dominianum, S. Sedeni, S. Schlimii and S. Sargentiannum, 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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1. Schlimii, Linden (Cypripedium Schlimii, Linden). Fig. 2306. Lvs. 4-6, ligulate, leathery, sharp-pointed, 9-12 in. high: scape longer than the lvs., hisrate, often branched, 2-8-fl.: sepals less than 1 in. long, ovate-obtuse, the lower a little larger than the upper and concave, white or spotted with crimson on the inner side; petals like the sepals; labellum an elliptic bag with 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 labellum. I.H. 21:1883. Var. giganteum and supérbum are also advertised.

2. Sédéni, Hort. Fig. 2307. Lvs. numerous, crowded, 12-18 in. long, tapering to a point: scapes 12-18 in. high, about 4-fl. but often sending out secondary flowering branches from the axils of the bracts after the first lvs. have fallen: lvs. 3¼-4 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: labellum 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. 1876:266; 1878:392. K.H. 1872:470. Var. candidum, Reiche. f. Sepals white; petals white tinged with rose; labellum darker rose. A hybrid between S. longifolium and S. Schlimii, var. albiflorum. The following names are also in the trade: grandiflorum, sangunium, supérbum.


4. Porphyreum, Reiche. f. (Cypripedium porphyreum, Reicheh. f.). Lvs. broadly strap-shaped, acute, about 1 ft. long: lvs. mostly purple, resembling those of S. Sédéni, but without protruberances on the open sides of the lip. The sepals and petals are oblong and more acuminate. Garden hybrid between S. Rastii and S. Schlimii.

5. Cardinale, Reiche. f. (Cypripedium cardinale, Reicheh. f.). Lvs. long, straight: dorsal sepal blush-
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. Schlimii. Gn. 27:495.

6. Ainsworthii, Reichb. f. (Cyripedium Ainsworthii, Reichb. f.). Lvs. ligulate, acuminate, 1 1/2 ft. long; scape shorter, pubescent, few-fl.; upper sepal oblong, acute, undulate, whitish or yellowish green with a pale purple border; lower sepal very broad and con-}

9. Lindleyanum, Reichb. f. & Warsc. (Cyripedium Lindleyanum, Schomb.). Lvs. 15-20 in. long, leathery, deep green, with yellow margins; scape many-fl., pubescent, 2-4 ft. high; upper sepal ovate-oblong, undulate, light green with brownish veins; petals 2 in. long, dilated, green with brown veins, ciliate; labellum olive-green, with brown veins and much spotted on the side lobes. Guiana.

10. longiflorum, Reichb. f. (S. Reizii, Reichb. f. S. Hörtegii, Reichb. f. Cyripedium longiflorum, Warsc. and Reichb. f. C. Reizii, Regel. C. Hörtegii, Reichb. f.). Lvs. tufted, 8-12 in. long, narrowly strap-shaped, tapering to a point and strongly keeled; scape 2 ft. high, purplish, sparingly pubescent; fls. large; upper sepals ovate-lanceolate, pale yellowish green, faintly streaked with purple; lower sepals ovate-obtuse, shorter than the lip; petals 3 1/2 in. long, spreading, narrowly lanceolate, twisted, pale yellow with rose-colored margins and with a white line on the edge; labellum 2 in. long, green shaded with dull purple or brown in front, side lobes yellow, spotted with pale purple. Costa Rica. B.M. 5970 and 6217. L.H. 20:138. R.H. 1873, p. 416; 1874, pp. 18, 19. F.M. 1874:119. F. 1871:126. — S. Reizii, sometimes considered as a distinct species, is of more robust habit, having lvs. 2 ft. long and green scopes. Var. magniflorum, Hert. (Cyripedium magniflorum, Hett.), has the petals margined with white. A.F. 7:70. The following varieties are also distinguished in cultivation: grandiflorum, latiflorum, et roseum.

11. albo-purpureum, Reichb. f. (Cyripedium albo-purpureum, Reichb. f.). Lvs. long, strap-shaped and recurved; fls. larger than those of S. Sedeni; sepals oblong-acute, subequal, whitish, with a purplish tinge on the margins; petals 5-6 in. long, linear, hanging downward and twisted, purplish; labellum purplish on the borders, the inflexed lateral lobes nearly closing the mouth, white, with dark purple spots. Garden hybrid between S. Schlimii and Dominiun. Gn. 21, p. 332. — A var. superbum has been advertised.

12. calurum, Nichols. (Cyripedium calurum, Reichb. f.). Lvs. numerous, tufted, long acutish, keeled; scape much taller than the lvs., brownish red, branching; fls. large, about 5 in. across the petals; dorsal sepals oblong-ovate, pale green, with longitudinal purplish ribs, flushed with red on the outside; lower sepal broadly ovate, and much smaller; petals lanceolate, undulate, pale green in the center and at the base, margins rose-red; labellum oblong, rose-red, tinted with brown in front; side lobes deeply inflexed, cream white, with irregular spots of purple. Garden hybrid between S. longiflorum and S. Sedeni. F. 1884:145. — There are several horticultural forms, one known as Rougierii.

13. Schröderum, Hort. (Cyripedium Schröderum, Hort. Veitch, ex-Reichb. f.). Plant of the habit of S. Sedeni, with fls. resembling those of S. albo-purpureum but larger; upper sepals nearly ochre-colored, with purple veins; lower sepals very broad, ochre-colored, with purple veins; petals long-lanceolate, undulate, pendent, 4 in. long, greenish white in the middle, crimson-purple around the margin; labellum purple outside, inflexed lobes yellow, with brown biotches. Garden hybrid between S. caudatum and S. Sedeni.

14. caudatum, Reichb. f. (Cyripedium caudatum, Lindl. Cyripedium Lindeni, Van Houtte. Cyripedium Warscewiczianum, Reichb. f.). Lvs. strap-shaped,

239. Selénipedium Dominianum (\texttimes 15).

-One of the largest of the Selénipedids 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 \textit{Uropedium Lindeni}, Lindl.


15. \textit{grænde}, Reichh. f. (\textit{Cyprípedium grænde}, Reichh. f.). A garden hybrid between \textit{S. Ruzii} and \textit{S. cauda- tum}, 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, obovate-lanceolate, yellowish white, veined with green; petals long, pendent, yellowish green above, becoming rose-pink; labellum large, greenish yellow in front, whitish behind; side-lobes white, spotted with crimson. G. M. 32:87. A. F. 11:149.


17. \textit{Boissierianum}, Reichh. f. (\textit{Cyprípedium reticulid- tum}, Reichh. f.). Plant of vigorous habit: lvs. about 3 ft. long, acuminate: scape few-fl., or sometimes panicu- late, 3-7-fl.: fls. of peculiar light green tints, with a few sepia brown and green blotches on the whitish in- flexed part of the lip and with some brown spots on the margins of the sepal; ovary dark brown, with green apex and ribs; upper sepal ligulate-lanceolate very crisp; lower sepals oblong, about equal to the labellum, crisp; petals spreading, long-linear, twisted and very crisp on the margins. Per. G. C. III. 1:143; 21:54, 55. G. 4:905.

18. \textit{Klotzschianum}, Reichh. f. (\textit{Cyprípedium Schon- burgiánum}, Klotzsch and Reichh. f.). Lvs. linear, 6-12 in. long, scarcely \(\frac{1}{2}\) in. wide, rigid, keeled; scape longer than the lvs., hirsute, purple, 2-3-fl.; dorsal sepal ovate-lanceolate, pale rose-pale greenish, side-lobes white, brown veins, the lower ovate, boat-shaped, colored like the upper one; petals \(\frac{3}{4}\) in. long, linear, twisted, col- ored like the sepals; labellum greenish yellow, the in- flexed side-lobes whitish, spotted. British Guiana. B. M. 7178. G. C. III. 15:625.

19. \textit{caricinum}, Reichh. f. (\textit{Cyprípedium Paecei}, Hort. \textit{Cyprípedium caricinum}, Lindl. & Paxt.). Lvs. 1 ft. long, springing in sedge-like tufts from the long creeping rhizome: scape longer than the lvs., 3-6-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. Per. B. M. 5466. F. S. 16:1648.

HEINRICH HASSELBRING.

SELF-HEAL. See \textit{Brunella}.

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 pol- len. With the rapid strides in plant-breeding, propagation and cultivation, self-sterility and sterility have be- come 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 semi-sterile varieties is now fairly large for apples, pears, plums, peaches, cherries, nectarines and prunes little has been done to determine the number of self-sterile and partially self-sterile varieties which tend to produce self-sterility in cultivated plants may be briefly sum- marized as follows:

(1) Change of environment due to domestication pro- duces change in the reproductive organs of the plants. It may result in (a) the suppression in whole or in part of either stamens or pistils; (b) in the inferiority 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 impor- tance of seed production, and to transmit and for-
THESE DEVELOP ANY TENDENCY TOWARDS SELF-STERILITY AND SEPARATION OF THE SEEDS WHICH THE PARENT PLANT MAY PRODUCE.

The careless practice of taking cions promiscuously from the nursery row and from unreliable sources may perpetuate self-sterile individuals.

(4) Breeding and selecting for other qualities than these associated with seed production but tending to favor these qualities at the expense of the latter.

(5) Crossing and intercrossing of hybrids may tend to modify the reproductive organs and to produce self-sterile types.

(6) Excessive cultivation and over-feeding with nitrogenous fertilizers may induce too vigorous wood-growth at the expense of seed and fruit production.

Self-sterile varieties and seed production may be increased when sown by themselves. When such varieties are desired for planting they should always be planted with other varieties whose time of flowering is the same. Self-sterility is not always complete. There are all intermediate grades between plants that are wholly self-sterile and those that are self-fertile.

For a condensed list of the important varieties of leading fruits which are known to be self-sterile or self-fertile, see Bailey's "Principles of Fruit-Growing," 3d edition, pp. 229, 230, and "The Pollination of Pear Flowers," by M. B. Waite, Bulletin 6, Div. of Veg. Path., U. S. Dept. Agric. A full and popular treatment of the whole problem as it affects fruit crops will be found in Bulletin 181, Cornell Exp. Sta., by S. W. Fletcher. For the self-sterility of grapes, see Bulletin 169, N. Y. Exp. Sta., by S. A. Beach. For pears, see the writings of F. A. Waugh. See Pollination.

E. P. SANDSTEN.

SELENIUM (derivation doubtful). Umbelliferae. About 25 species of rather large perennial herbs, mostly from the northern hemisphere, with mostly decomposed lvs. and compound radiate umbels of small white or rarely yellowish white flowers; petals obovate-emarginate: fr. ovoid or nearly quadrate.

tenfoliüm, Wall. (Oroëcone Candôllei, Edgew.). A hardy perennial with finely cut fern-like foliage and stem often 8 ft. high, branched, with numerous umbels of white fls. ultimate segments of lvs. narrowly lanceolate, acute; fr. 2-3 lines long, much compressed dor-sally, four to six times as broad as thick; lateral ridges much the broadest. India. Gn. 38, p. 221.—Offered as a novelty in America in 1899 and recommended as a foliage plant for single lawn specimens.

F. W. BARCLAY.

SEMÉCARPHUS (Greek, mark and Fruit: referring to use of fruit juice). Anacarduckeæ. A genus of 20 spec. of tropical Asiatic and Australian trees with simple, leathery lvs. and small fls., in branching pedicels: drupe fleshy, oblong or nearly globose, 1-seeded.

Anacardium, Linn. f. MARKING-NUT Tree. A moderate-sized deciduous tree with large, oblong or obovate-oblong lvs. 8-34 in. long by 5-10 in. wide: fls. greenish white, 1/4 in. across, nearly sessile, in stmont branching pedicels about the same length as the lvs.: drupe 1 in. long, smooth, black. India.—The black acid juice of the nut is used for printing cotton cloth. Cult. in S. Fls.

E. N. REASONER and W. F. BARCLAY.

SEMÉLE (mother of Bacchus). Littâceæ. The CLIMBING BUTCHER'S BROOM is a tender evergreen vine which attains a height of 30-60 ft. and is remarkable for bearing its flowers on the margins of the "leaves" instead of on separate flower-stalks. These fls. are small, yellow, 6-lobed blossoms about three-eighths of an inch across. What appear to be leaves are technically "cladophylla," i. e., leaf-like branches. They are organs which have the form and functions of leaves but not the morphology. Semele belongs to the small group of 4 genera known as the Asparagus tribe, all the members of which have cladophylla. Semele differs from the Butcher's Broom in having 6 anthers instead of 3 and in having the fls. borne on the margins of the cladophylla instead of along the midrib. Asparagus differs from both in having the fls. not borne on the cladophylla and the filaments free instead of grown into an urn-shaped body.

Semele is a genus of one species, a native of the Canary Islands. The plant is not known to be cult. in American greenhouses, but it is suitable for outdoor cultivation in the South. Franceschi (Santa Barbara) says it looks like a gigantic smilax and has dark green, tropical foliage likely to be mistaken for some of the Indian climbing palms.

androgynus, Kunth. Scandent, branching; cladodia ovate or ovate-lanceolate, acuminate, leathery: fls. small, yellow, clustered; ovary 3-loculed: berry globose, indehiscent. B. M. 1898 and 3029 (as Ruscus androgynus). R.H. 1894, p. 546. G. M. 31:477; 479; 37:261.—The members which have the position of leaves are minute scales, in no axil of which in borne the climax phylla, the latter being 3-4 in. long.

W. M.

SEMPERVIVUM (Latin, living forever). Crassulaceæ. 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 lvs. are thick, short and succulent. The fls., which are borne in panedical cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual fls. are larger than those of Sedum, but the clusters are less showy. 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 easiest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for permanent carpet beds, and for this special purpose are preferable to the more popular but tender Echeveria. The foliage remains green all winter. The lvs. 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. If these names are to be restricted, the former should be used for Semprevivum tectorum and the latter for S. globiferum. The common species, which grows on the roofs of houses in Europe, is the Sempervivum tectorum 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 all, because 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 fruit is a capsule. The classification of the genus is a difficult one for the botanist. It has been monographed by J. G. Baker in "Gardener's Chronicle" for
1878. Baker's scheme has been closely followed below, but some of the names have been changed.

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SUGGENUS I. SEMPERVIVUM PROPER. Floral parts in 10's, 12's or 14's. Expanded petals widely spreading.

Division I. Rhodantha. Fls. reddish.

Group I. Ciliata. Lvs. of the barren rosettes glabrous on the faces when mature, shortly ciliated on the edges only.

A. Red-brown tip of lvs. conspicuous.

BB. Foliage very glabrous.

AA. Red-brown tip of lvs. none or obscure.

B. Petals bright red.

BB. Petals pale red.

Group II. Pubescens. Lvs. of the barren shoots decidely pubescent on the faces as well as ciliate at the edges, not tipped with a tuft of spreading hairs.

A. Height 6 in.; fls. numerous, the lowest sessile

BB. Height 3-4 in.; fls. few, 4-8, all sessile or sessile.

Barren rosettes 2-7 in. across; fls. bright red.

BB. Barren rosettes 1 in. across at most; fls. mauve-purple.

Group 3. Barbula. Lvs. of the barren rosettes strongly ciliate on the edge, and furnished with a tuft of scales, not fuzzy heads at the cusp. (None in our trade.)

Group 4. Arachnoidea. Differing from the other groups in having the tips of the inner lvs. of the barren rosette connected by fine feathery threads like those of a spider's web.

Division 2. Chrysantha. Fls. yellow.

A. Fls. less than 1 in. across; height 6-12 in.

BB. Fls. 1½-2½ in. across; height 3-4 in.

SUGGENUS II. DIPOGON. Floral parts in 6's. Corolla permanently bell-shaped, with ascending close petals.

A. Petals not fimbriated; young rosettes not peduncled.....11. Heuffellii

BB. Petals fimbriated; young rosettes temporarily attached to the mother plant by a slender stalk.

B. Lvs. obovate-cuneate

BB. Lvs. oblanceolate

1. tectorum, Lind. HOUSELEE. OLD-MAN-AND-WO.

Woman. Fig. 2310. Height 1 ft.; rosettes 3-4 in. across; lvs. obovate-cuneate, cuspidate, 1½-2 or finally 3 in. long, pale green, with a distinct red-brown tip an eighth to a sixth of an inch long; petal 5-6 in. long, 3-4 in. wide, composed of 10-12 scorpoid branches; fls. ½-1 in. across; petals pale red, keeled with deeper red; stamens often changed to pistils; filaments bright purple. Eu. Orient. freet. expamum, Hort., is said to have broader lvs. and more open rosettes.

2. calcareum, Jord. (S. Californicum, Hort.). Height under 1 ft.; baron rosettes 2 in. across; lvs. oblanceo-
late-cuneate, very glaucous, with a distinct red-brown tip, 1-½ in. long; petal 3-4 in. long and broad, with 5-12 scorpoid branches; fls. ¾ in. across; petals pale red, greenish down the keel both on the back and face. Calcareum Alps of Dauphiny.

3. glaucum, Tenore. Height 6-9 in.; baron rosettes 2-3 in. across; lvs. oblanceolate-cuneate, less glaucous than S. calcareum, with only a very faint red-brown spot at the tip; petals 2-3 in. across; fls. 1 in. across; petals bright red. Simplon Alps.

4. Atlanticum, Baker. Height nearly 1 ft.; baron rosettes 2-3 in. across; lvs. oblanceolate-cuneate, pale green, hardly tipped red-brown; petals 3-4 in. across; fls. 1 in. across; petals pale red. Atlas Mts. B.M. 6055 (as S. tectorum, var. Atlanticum). The lvs. of the flowering stem are brightly colored with red, excepting towards the base.

2311. Spiderweb Houseleek—Semperivum arachnoideum. (X ¾.)

5. montanum, Linn. Height 6 in.; baron rosettes 1½-2 in. across, the new ones few, and borne on red pilose peduncles 1-½ in. long; lvs. 60-80 in a rosette; panicle very dense, 1½-2 in. across, the lowest fls. nearly sessile; fls. 1½ in. across, bright mauve-red. Fls. about the end of June. Alps, Pyranees.

6. flagelliforme, Fisch. Height 3-4 in.; baron rosettes 1-½ in. across, the new ones long-peduncled; lvs. 40-50 in a rosette; fls. 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, Bleb. (S. anomalum, Hort.). Height 3-

4 in.; baron rosettes at most 1 in. across, the new ones numerous and short-peduncled; fls. 4-8, in a dense head, all sessile or subserice, 1 in. across; petals bright mauve-purple. Fls. in middle of June. Caucas.

8. arachnoideum, Lind. Corweb or Spider-web Houseleek. Fig. 2311. Height 3-5 in.; baron rosettes ¾-2 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-

fls. less than 1 in. across; petals bright red. Pyranees to Tyroli. B.M. 68.—S. montanum, C. B. Lehm., said to differ in having shorter, more obovate-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, 1896, p. 573.

9. Ruthenicum, Koch. Height 6-12 in.; baron rosettes 1½ in. across, new ones few; lvs. 40-50 in a rosette, slightly pubescent glandular on the faces; fls. pale yellow, less than 1 in. across. Eastern Eu. – Rare in cult.

10. flagelliforme, Haworth. The yellow petals are set off by the red-purple filaments; height 3-4 in.; bar-
ren rosettes 1-1 1/4 in. across, the new ones on stalks 1-2 in. long; Ivs pale green and pubescent all over, among the very tip red-brown; fls. 1 1/4-1 1/2 in. across, yellow, slender thread and ovoid, cuneate, the upper third or even half thinly and weakly red-brown; panicle dense, many-fl., 2 1/4-3 in. across; Ivs. an inch or less across, pale straw-yellow; petals with 3 small cusps, not ambricate. Aug. Mts. of Transylvania and Greece, 5,000-6,000 ft.—One of the latest in flower.

12. glabiferum, Lnn. (S. soboliferum, Sims). Hen- and-chickens. Houseleek. Height 6-9 in.; barren rosettes pale yellow, 1-1 1/2 in. thick, the numerous young ones attached to the parent only by a slender thread and easily separated from it. 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 trilobed, con- spicuously filbricate at the edge and on the prominent keel. Mts. 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 ragwort, and S. Cinereria, 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 confounded with Senecio Cineraria.

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 larger and more stronglyfilbricate; Ivs. oblanceolate; fls. 1-1 1/4 in. across; petals pale yellow, distinctly trilobed, with a linear end tooth, strongly filbricate at the edge and less so on the prominent keel. Tyrol. Gn. 49, p. 220.

R. rosetaris is advertised by one American dealer, but it seems to be unknown to botanists.

W. M.

SENEBIERA (after Joh. Senebier, a naturalist of Geneva). Crucietera. About 6 species of procumbent annual or biennial herbs from the temperate regions of Europe and Asia, and ranging from 1 ft. to the ground, entire or pinnately cut Ivs. and small white or rarely purplish fls., in short, annual racemes; sepals short, spreading, equal at the base; stamens free; silques in pairs, small, laterally compressed; valves 1-seeded, indistinct.

pinnatifida, DC. A common weed in many parts of the world and sometimes used as a pot-herb in foreign countries: plant ½-1 ft. high; Ivs. pinnately lobed; fls. white, small, numerous

F. W. BARCLAY.

SENECA SNAKERoot. Polygala Senega.

SENECIO (Latin name for plants of this genus, ultimately from seneus, "old man"); said to be in allusion to the hoary-pappus). Compositae. Growsmen. The largest genus of plants, comprising some 1,200 species in all parts of the world. A genus comprising so many species and being so widely distributed is necessarily variable, and therefore practically impossible of definition. A distinguishing mark of the Senecio 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 crown. The heads are usually radiate, the ray-fl vector being pistillate and fertile; but sometimes the rays are absent and then the head is homogamous (flores of one kind, i.e., perfect). The disk-fls. are tubular and 5-toothed. The corolla and receptacle is usually naked. The akenes are mostly terete and ribbed; pappus of soft whitish, often copious bristles. According to Gray, "minute short hairs or papillae on the akenes of most species are so fine as to escape all notice."

Before wetting, the akenes may be round or apparently glabrous, and after wetting become canescent." Most of the Senecios are yellow-rayed. Of the very number of species, 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 Kämpferi) of florists, S. wulfanioides 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 confounded with Senecio Cineraria.

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 fleshy shrubs or herbs, with terete or angular stems and whitish or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents, but they are little known outside of botanic gardens. S. vulgaris, Lnn., from Europe, is a common annual weed in various parts of this country. Species of other genera, belonging to the others known to gardeners as Erythrochaste, Farfugium, Jacobea, 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 Cacalia, 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 Farfugium) and Cineraria distinct. For S. conchifolia, 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. 2313.
SENECIO

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Cineraria, 9.
Doria, 12.

crustatus, 4.

A. Stem fleshy, with jointed and swollen branches; heads rayless ... 1. articulatus

AA. Stem not fleshy.

B. Scales of involucre somewhat overlapping and appearing as if 2-ranked; stigma rounded, the style-branches hairy; plants grown for foliage.

(SELigularia, Farfugium.) ... 2. Kämpferi 3. Japonicus

BB. Scales of involucre usually strictly 1-ranked; stigma short, the style-branches hairy only at the tip.

C. Flowers purple (there are white garden forms).

D. Lvs. large and palmately veined; lobes shallow or none.

4. crustatus

DD. Lvs. medium, elongate, palmate-reined or pinnate.

5. elegans

6. pulcher

CC. Flowers yellow.

D. Plant climbing.

7. mikanoides

8. macroglossus

DD. Plant not climbing, usually less than 2 ft. high.

E. Herbage white-omentumous throughout.

9. Cineraria

10. Palmeri

EE. Herbage green or at most only grayish, not white-omentumous.

F. Lvs. large, palmately veined.

11. Petasitis

FF. Lvs. oval-oblong and dentate, the cauline ones denture.

12. Doria

FFF. Lvs. small or ordinary, pinnately veined or divided.

(Native American species; as characterized by Gray.) 13. lugens

14. aureus

15. fastigiatus

16. Bolanderi

17. Dougallii

1. articulatus, Sch. (Kleina articulata, Haw.). CANDLES PLANT. Plant branching, glabrous and fleshy, 1-2 ft. high, the branches swollen at intervals; lvs. flat and fleshy, petiolate, lacinate or runcinate, with acuminate lobes; heads discolored and all the florets perfect, white, in small corymbs on naked peduncles; achenes downy. S. Afr. — Perhaps the commonest Kleina in cultivation, being grown with eulogous succulents. S. (Kleina) Antephoribium, Sch., is sometimes seen in collections, although it is not known to be in the American trade. It is a glabrous shrub 3-4 ft. high, with fleshy stems constricted at the joints, small, erect, fleshy, entire lvs. that are dentate on the stem, and solitary cylindrical yellow-fld. heads (with rose tinged) an inch long. B.M. 6009. According to J. D. Hooker, this plant is one of the oldest Cape plants in cultivation, having, according to Dodoneus, been brought to Europe in 1570, and cultivated in England in Gerard's garden in 1596. * * *

The name Antephoribium was given because of its being a reputed antidote against the acid poison of the Cape Euphorbium. The names Kleina spinulosa and K. supensa have appeared in the American trade, but they are unidentifiable.

2. Kämpferi, DC. (Ligularia Kämpferi, Sieb. & Zucc. var. Farfugium, C. Koch. Farfugium Kämpferi, Benth.). Rhizomatous perennial sending up many lvs. on slender, flesculent-woolly petioles; lvs. large (often 6-10 in. across), orbicular to nearly reniform, cordinate at base, angular-toothed, green; fl.-stems 1-2 ft. tall, flesculent-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 griseum, Lindl. F. maculatum, Hort.). LEOPARD PLANT. Fig. 2313. Differs in having the lvs. biotched 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. argenteus) has lvs. glaucous-green edged with creamy white. Easily propagated by division.

3. Japonicus, Sch. (Ligularia Japonica, Less. Erythrochate palmatifida, Sieb. & Zucc.). Strong perennial herb, growing 5 ft. high (said to reach 15 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. 139. — Intr. 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.


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. 9595. R.H. 1877, p. 94; 1894, p. 329. Gn. 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. sednudens, DC.). GERMAN IVY. Fig. 2314. Slender and glabrous, tall-twining: lvs. ovate or deltoid-ovate in outline, mostly with a deep basal sinus, sharply 5-7-angled or angiolobed: head 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. *macroglossus*, DC. Lvs. mostly hasting, often with acuminate basal lobes, but various in shape: heads only 1-3 together, and bearing yellow rays. S. Afr.

9. *Cineraria*, DC. (*Cineraria maritima*, Linn. Senecio acanthiloicus, Hort.). Fig. 2315. Perennial, 2 ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obute segments: heads small, yellow, in small, compact corymbs, rayless. Europe. F.M. 1872:52.—Var. *candidissimus*, Hort., has very white foliage. Var. *atenuo-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 *Lychnis Coronaria*, and another one is *Artemisia Stelepetana* (P.) 2316. Var. *shortii*, Hort.


11. *Petaitis*, DC. (*Cineraria Petaitis*, Sims.). Fig. 2316. Robust perennial, 2-3 ft. tall, gray-tomentose on the young parts, branching: lvs. both radical and cauline, 6-10 in. across, long-stalked, cordate-ovate-orebicular, strongly several nervet, shallowly many-lobed, dull green above but gray-tomentose beneath: heads in a long open panicle, the cylindrical involucre 3/4 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.


13. *Lagenaria*, Rich. Perennial: deep basal corymbs, when young but becoming nearly or quite glabrous, 6-24 in. tall, the stem practically naked above: lvs. spatulate to oval or oblong, repand-dentateil; rays 10 or 12, yellow, conspicuous. Western U. S. in the mountains and to Alaska.—Var. *exaltata*, Gray, has been offered: 1-3 or 4 ft. tall: lvs. thickish, longer-petioled, abrupt or subcordate at base.

14. *abreus*, 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 caulescent ones lanceolate and pinnatifid or lobate: heads many, 3/5-5/7 in. high, with 8-12 conspicuous yellow rays. Moist places, nearly throughout the U. S.

15. *fastigiatus*, Nutt. Perennial: mostly pubescent, the stem strict and simple and 1-2 ft. tall: lvs. all entire or very nearly so, lanceolate or spatulate-lanceolate, obtuse: heads 3/5-2/7 in. high, with conspicuous yellow rays. Idaho, Oregon, Washington.

16. *Bolanderi*, Gray. Perennial: glabrous or soon becoming so, the stems weak and slender and 6-30 in. tall: lvs. thin, palmately 5-9-lobed or incised, or the stem-lvs., pinnately divided: heads several, 6/5-2/7 in. high, with 5-8 rather long yellow rays. California, Oregon.

17. *Douglasii*, DC. Fig. 2317. Woody or even shrubby at base, with many stems, 2-5 ft. tall, with the aspect of an aster: lvs. small and linear, or the lower ones pinnately parted into filiform divisions: heads numerous, 1/5-2/7 in. high, with 8-18 conspicuous yellow rays. Nebr., W. L. H. B.

**SENOCA.** See *Cassia*.

**SENNI, BLADDER.** Colutea.

**SENSITIVE BLRER.** See *Schrankia*.

**SENSITIVE FERN.** *Onclea sensibilis*.

**SENSITIVE PLANT.** *Mimosa pudica*.
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): lvs. naked, monocoeous, 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 cabinetmakers, 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 do very 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 creeping variety known as S. pendula is advertised, which originated some years ago in Europe, 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.

a. Lvs. dimorphic, usually 2-ranked: buds scaley.

S. sempervirens, Engd. CALIFORNIA REDWOOD. Fig. 2318. 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 ¾-1 in. long, the smaller scale-like: cone oblong, ¾-1 in. long, ¾ in. broad, and persistent after opening and discharging the seed. Confining 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.

S. gigantea, Deene. (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. ¾ to 2½ in. and sometimes ¾ 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.

ARNOLD V. STUENKAUCH.

Taxodium was the group in which Sequoia sempervirens was at first placed by Lambert from the specimens obtained by Menzies in 1793, and it remained there until 1847, when Endlicher established Sequoia for its reception. The type-species of Taxodium is T. distichum, the deciduous cypress. Like nearly all larches, 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 miocene times, fossil Sequoias extended "from the Hebrides to the Steppe of Kirghis." Asa 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 Gray, S. {langsdorfi}, the Sequoia which is found in the miocene in Europe, appears in the miocene of Alaska, Greenland, Spitzbergen and Iceland, and it much resembles {S. sempervirens}. Another fossil species, {S. stenoptera}, found in Greenland, is as large as the original. The wood of the Arizona petrified forest is that of a species of Sequoia, whose wood went down under a primeval 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 Sequoias grew in Greenland, Siberia and Great Britain. We can measure that period only by vast and indefinite epochs. The value and importance of the Sequoias are greatly increased by a consideration of their place as the last modern survivors of such powerful an ancient family.

At the present time the Coast Redwood occupies only a narrow belt of mountainous 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. Compared with the enormous territory once occupied by species of Sequoias, the modern representatives of this ancient and honorable family are reduced to a very small area. The first portion 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 known conifer so persistently sprouts from the stubs as this, and 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 the original area covered by this noble tree has been disturbed by successive fires and destructive lumbering and grazing 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 35 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 group, now only recently destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda county. Well-borers have found Redwood logs in a perfect state of preservation in various parts of the Coast Range far south of where the 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.

The climate where the Redwood thrives is comparatively equable, not excessively hot by our standards, and even by the cool summer winds from the southwest. The tree delights in rich, sheltered mountain valleys and fertile slopes, in dripping fogs and in heavy winter rains. Going east from the ocean, in the Redwood Belt, the hills rise to the top of a ridge, to overlook oaks and pines, and at once reaches the plainly marked edge of the {S. sempervirens} forest.

While {S. sempervirens} is sometimes called second in size among the giant conifers of the Pacific coast, the tallest tree yet authentically measured was 340 ft. high, exceeding in height the great Sitka Spruce of the Sierra since it is probable that trees exist which rise to nearly 400 ft. and so deserve to take the first place among the conifers. Many trees of 20 and even 22 ft. in diameter at five feet from the ground, and from 30 to 45 ft. in height, are still standing in the Redwood forests. The finest groves of Redwoods contain many specimens that range from 150 to 250 ft. or more in height and have a diameter of from 12 to 18 ft. In such forests the trunks rise in clear red-brown shafts to a height of from 75 to 150 ft. before they branch; they stand so close that the masses of timber that exist on each acre are greater than are found in any other known forest, and through their far distant tops the sun seldom reaches the warm, sheltered soil of the great Coast Range Canons. With proper management, under the principles of scientific forestry, the Redwood region as it exists to-day could be maintained, and its future yield greatly increased, but otherwise in forty or fifty years the commercial value of the entire area will be practically destroyed. The state of California has this year (1901) appropriated $250,000 for the purchase of the large Redwood forests of the “Big Basin” in Santa Cruz county, and a commission is now arranging to create a State Redwood Park there.

{S. sempervirens} was discovered by Archibald Menzies in 1793, rediscovered by David Douglas in 1820 and soon after by Dr. Couler. It was introduced to European gardens by Hartweg about 1847. Both Douglas and Hartweg were sent out by the Royal Horticultural Society of London. {S. sempervirens var. adpressa} (Carrière) is a smaller tree than the type form, with creamy white younger leaves and more glaucous older leaves. It is called in California the “White Redwood” and the “Silver-leaf Redwood.” Other horticultural varieties in cultivation are known as {Sempervirens gracilis}, {S. inarfolia}, {S. pecto}, {S. albo-spica} and {S. glauca}. The golden forms found in many other conifers occasionally appear, but cannot yet be called fixed. No really dwarf Redwood is yet known, Large-leaved or more compact forms can be selected from the forest, and the tree responds easily to selection and culture. It thrives in gardens in the Sacramento valley, in the Sierra foothills and in many places of Lower California so that its range for ornamental uses can be greatly extended on the Pacific coast. It has been largely planted in Europe, particularly in English parks, and, as was to be expected, does best in well-drained rich soil near the ocean but thrives also in heavy soils.

Endlicher’s {S. gigantea} (the S. Washingtonia of Sudworth and the S. Wellingtonia of Seemann and of

2318. {S. gigantea} (× ½).

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 of all the giant 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-
stroved. 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 unless he "gets his price" from the state of California, the general government or some noble-minded association. Sequoia and 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 decay 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 Kaweah and on the branches of Tulare river. The preservation 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 not less than 4,000 years. Muir estimates the age 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, Decaisne'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 use Seemann's S. Wellingtonia (1853), were it not for Dr. Winslow's suggestion in 1854 that "if the tree is a Taxodium let it be Taxodium Washingtonianum; if a new genus, Washingtoniana Californica." This appeared in the "California Farmer," and is open to the criticism that it lacked technical precision. 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, by an exception to the Rochester rules, would seem to involve fewer difficulties than the acceptance of either of the newer names.

CHARLES HOWARD SHINN.

SERADELLA. See Serradella.

SERAPIS (ancient name of an orchid derived from Scarpia, an Egyptian divinity). Orchidaceae. Terrestrial herbs with the habit of Orchis. Four or 5 species are known from the Mediterranean region. A stem with a low, inconspicuous in the form of a helmet; petals included, small; labelllum not spurred, with erect lateral lobes and a larger undivided middle lobe; pollinia with a common viscid disk; rostellum laterally compressed. The following species 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.


S. longatá, Hort. Brown; lplarge; little known to botanists.

HEINRICH HASSELBING and WM. MATHEWS.

SERENEA (after Sereno Watson, distinguished American botanist). Also written Serenoa. Palmaeae. Low, spineless, cephalotis palm with creeping branched caudex clothed with the fibrous bases of the leaf-sheaths: lvs. terminal, orbicular, non-glaucous, 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 fertile bractelets very slender: spathes many, sheathing the peduncle: bractlets minute: fls. white; fr. ovoid, black, an inch long. Species 2. Florida to S. Carolina.

serulátā, Hook. f. Saw Palmetto. Fig. 2320. Stem creeping, branching, 4-8 ft. long: lvs. 2-4 ft., circular in outline, fan-shaped, shorter than the slender, spine-edged petiole; segments slightly cleft at the apex, without thread-like filaments: spadix densely tomentose, shorter than the lvs.: drupe black, 3/5-5/5 in. long.

2320. A Florida scene, with Serenaea serulata in foreground and Palmettoes in the background.

arborésæns, Sarg. 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. Reasoner in 1887. First described 1899. Differs from above in arborescent habit, more elongated spadix, much smaller fls., and smaller, glaucous 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 popularity. Crowns are whole tops cut off; they have no roots, and only a part of the stem. They give the effect of the whole 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 2-5 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 8 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.
Clumps of Saw Palmetto's often consist of 18 to 20 low stems and end in hundreds of widespread, many- 
fingered leaves. They are the hiding-place of many small 
birds, rabbits and even rattlesnakes.

H. NEHRING.

SEROCARUS. See Serroa.

SERICARPS (Greek, silken fruit). Compátite. A genus of 5 species of perennial herbs from north- 
western United States closely allied to Aster and scarcely 
distinguishable from the section Floría of that genus. The 
flowers are not so strongly compressed as in Aster, 
which sometimes become purplish. S. rigida, Lindl., 
was offered in 1881 in the eastern states by western col- 
lectors, but it is doubtful if any member of the genus is 
in cultivation.

SERISSA (from the Indian name). Rubiáceae. A single species from southeastern Asia, a tender shrub 
of moderate growth with small, opposite, nearly sessile 
lvs. and rather small, lanceolate, yellow-fls. which are 
sessile in the leaf-axils or terminal: corolla funnel- 
shaped, 4-6 lobed, the lobes 3 lobed; stamina inserted on the 
corolla-tube; style shortly 2-efert: fr. subglo- 
bose, 2-echindled. — Keátia. Lam. (S. Japónica, Thunb.). The young lvs. are ill-smelling if crushed. Summer. B.M. 361. — Of- 
fered by importers of Japanese plants. Var. variegátá: has yellow-margined lvs. Offered in 1865 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 rye. The plant is figured in Bulletin 2. Div. of 
Agric. Culture, U. S. Dept. Agric., where Jared 
G. Smith says: "At the Pennsylvania station the yield 
from two cuttings was 11½ tons of green forage. It 
does not require lime, and is often used as a green ma- 
ture to bring up the value of sterile fields. The for- 
age, which is much relished by cattle and sheep, has 
about the same feeding value as red clover."

The scientific name of Serradella is Ornithópous satí- 
vus. The generic name means "bird's foot," referring to 
the shape of the large, claw-like pods. The genus con- 
tains about 7 species of slender, low-growing annuals 
with pink, white or yellow fls. which are too minute to 
have any horticultural value. Lvs. odd-pinnae; lfts. 
numerous.

W. M.

SERVICE-BERRY is Amelanchier

SERVICE-TREE. See Sorbus.

SESAME. See Sesamum.

SÉSAMUM (Greek name taken by Hippocrates from 
the Arabic). Pedáliláceae. A genus of annual herbs 
from India and Egypt, allied to Martynia, 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 
benne-, gingill-, or teel-oil), which is odorless and does 
not easily become rancid. This oil is universally used 
in India for cooking and anointing. Large quantities of 
the oil used and imported from India to Europe for the 
maintenance of the manufacture of soap and adulteration of olive-oil. Also 
cult. in northern states as a medicinal herb, the mucil- 
ginous leaves being used in dysentery and diarrhoea 
of children. The oil of Sesame is however, which is 
expressed from the seeds is in large doses a laxative.

Indicum, Linn. (S. orientális, Linn.). Lvs. variable, 
3½ in. long, oblong or lanceolate, the lower often 3- 
lobed or parted; corolla pales rose or white, 1 in. long, 
tubular, 5-efert, the 2 lobes of the upper lip shorter.

JULY. B.M. 1688. White- and black-seeded varieties 
have been known for at least two centuries. Runs wild 
in the extreme South.

W. M.

SÉTORIA (seda, a bristle; referring to the bristles be- 
low the spikelets). Gramínaceae. Hackel places the num- 
ber of species at 10, but Schimberg and Merrill describe 28 
species from North America alone (under the genus name 
Chatsochloa). Warmer countries of the world. Includes 
several weed species, the foxtail grasses, S. Linn. viridís, and others, and the foxtail millets. The culture 
of Millet dates from prehistoric times. At present it is 
raised extensively in parts of Asia as a food plant. In 
the United States, M.M. There are several groups of varieties grown here, Common, 
German, Golden Wonder (all of which belong to Só- 
traria Itálica), and Hungarian Grass, which is referred to S. Itália, var. Germanica. New Siberian Millet is 
probably a distinct variety. The "Japanese Millets" be- 
long to Setaria Itálica, while the "Japanese Barnyard 
Milletts" belong to Panicum Crus-galli.

Spikelets, as in Panicum, awnless, but provided at 
base with a cluster of rough bristles which extend be- 
yond the spikelets. The bristles persist on the axis 
after the spikelets have fallen. Inflorescence a dense, 
cylindrical, spike-like panicle, which becomes quite com- 
posed in some of the cultivated varieties. The seed is 
included in the flowering glume, which is usually finely 
transversely wrinkled, a character which distinguished 
the fruit from other similar grasses. The generic name 
of these grasses is confused. By some they are referred 
to Ixophorus, and by others, more recently, to Chat- 
choa.

Itálía, Beauv. Common Millet of the United States 
but not of Europe, which is Panicum milaceum. An 
annual; culm 2-3 ft. high; spike yellow or purple; 
bristles 1-3, often shorter than the spikelet. Thought 
to have been derived from S. viridís. Gn. 12, p. 69.

Sétraria Germanica, Beauv. S. macraché, Schult.). 
Habitually larger than the Common Millet, but smaller 
form more nearly approaching the wild S. viridís: bristles much 
longer than the spikelets.

macrostáchya, HBK. (S. Alópecurus, Fisch. S. alo- 
pécoroides, var. nigra of the trade). An erect or as- 
cending perennial; spike slender, tapering at apex: 
bristles 1 or sometimes 2, ½-1 in long; spikelets one- 
twelfth in length; first glume one-third to one-half, sec- 
ond two-thirds to three-fourths as long as and, third 
glume elongating the spikelet, about ½ of the length 
above the base of the spikelet. Texas to S. America.

mánya, 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 in. long; spikelets one-twelfth in length; the first 
glume one-third as long, and second and third elon- 
gating the spikelet; flowering glume smooth. Marshes 
of Gulf states to Central America. A. S. HITCHCOCK.

SHAD-BUSH. Consult Amelanchier.

SHADDOCK. See Citrus and Pomelo.

SHADE TREES. See Trees.

SHADING. See Greenhouse, page 906.

SHAGBARK. See Hickory.

SHALLOT is Allium Ascalonicum, Linn., native of 
Syria. It is grown chiefly for the small oblong-pointed 
grey bulbs, which are used in cookery for flavoring; 
the leaves are sometimes eaten in a green state. The 
buls are of mild flavor. Shallots are little known in 
North America. They are grown as garlics are (see 
Garlic), the bulbs or cloves being separated and 
planted early in spring in any good garden soil. Each 
bulb will produce several cloves, which can be stored. 
The mature bulbs are 2 in. or less long and only about half 
in diameter. The leaves are small, terete and 
hollow. The plant is hardy. The bulbs will keep 
several months or even a year. Small onions are some- 
times sold as Shallots.

L. H. B.
SHAMROCK. Half the world is sure that Shamrock is the wood sorrel, <i>Oxalis acetosella</i>. It is equally certain that the true Shamrock is white clover, <i>Trifolium repens</i>. 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. Nevertheless there are those who deny that Saint Patrick used the Shamrock as a symbol of the Trinity. These declare that the water cress is the true Shamrock. The question will always remain an open one. See Dyer's "Folk-Lore of Plants." 

W. M.

SHAMROCK, INDIAN. A name found in some English books for the <i>Trillium</i>.

SHAMROCK PEAS. <i>Parochnas communis</i>.

SHAW, HENRY, founder of the Missouri Botanical Garden, popularly known as "Shaw's Gardens," was born at Sheffield, England, July 24, 1800, and died at St. Louis, Mo., August 25, 1889. 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. For his active business 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, 1859, Mr. Shaw was empowered to provide for the conveyance of his property, during his life or after his demise, to trustees, for the perpetual maintenance of his garden as a scientific establishment. In 1885 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. TREELEASE.

SHEEP BERRY. <i>Viburnum Lentago</i>.

SHEEP'S BIT. <i>Jasione perennis</i>.

SHELLBARK. See <i>Hicoria</i> and <i>Hickory</i>.

SHELL-FLOWER. See <i>Cyclobothra</i>; also <i>Alpinia nutans</i>; also <i>Molucella lavis</i>.

SHELL-LILY is <i>Alpinia nutans</i>.

SHEPHERDIA (John Shepherd, an English botanist). <i>Elshoffia</i>. 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 oppositely arranged, and usually very large, with three oblong, lance-oval leaves. One of them, known as the "Shepherdia Berry," is a round, brownish, scurfy berry on both sides: it is about 1/4 in. in diameter and is eatable. It is in full bloom in July and is also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety. The berries are also used for the purpose of ornamentation such as the rosy or the white variety.

SHEPHERD'S CLUB or MULLEIN is <i>Verbascum Thapsus</i>.

SHINLEAF. <i>Pyrola</i>.

SHOEBLACK PLANT. <i>Hibiscus Rosa-Sinensis</i>.
SHOO-FLY PLANT. A name proposed by one seedsman for Physalis.

SHOOTING STAR. See Dodecatheon.

SHORE-GRAPE. See Cocosola.

SHORTIA (named for Dr. Charles W. Short, a botanist of Kentucky). Diapensiaceae. Of the little family Diapensiaeae, with its 6 genera and 8 species; Shortia galacifolia is historically the most interesting. Michaux collected the plant in 1788 in the high mountains of Carolina, but as his specimen was in fruit rather than in flower, Richard, the author of Michaux's "Flora Boraii-Americana," did not describe it. As Gray examined Michaux's specimen, preserved in Paris, in 1839, 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...

SHRUBBERY

SHRUBBERY. Shrubs and bushes have two values: an intrinsic value as individual or isolated specimens; 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. 2322). Every part of the place is equally accented. The area has no meaning or individuality. The plants are in the way. They spoil the lawn. The place is random. If the shrubs are sheared, the spotted and scattered effect is intensified. Rarely does a sheared shrub have any excuse for existence. A mass of planting emphasizes particular parts of the place. It allows of bold and broad contrasts. It may give the place a feeling of strength and purposiveness. The shrubbery-mass usually should have an irregular outline and generally contain more than one species. Thereby are variety and interest increased. Fig. 2292. The shrubbery-masses should be placed on the boundaries; for it is a fundamental concept of landscape gardening that the center of the place shall be open. Fig. 2322; also Fig. 1235. The boundaries are the lines between properties, the foundations of buildings, the borders along walks and drives. Judicious planting may relieve the angularity of foundations and round off the lines. Fig. 2292. The various shrubbery specimens may be used freely, but only rarely should they be wholly isolated or scattered. They should be planted somewhere near the borders, that they may not interfere with the continuity of the place and they may have background to set off the individual beauty of the plants. The background may be a building, a bank, or a mass of foliage. In most places, the mass or border-planting should be the rule and the isolated specimen the exception; but, unfortunately, this rule is usually reversed. It is not to be understood, however, that boundaries are always to be planted or that foundations are always to be covered.

L. H. B.

The 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-

2312. Every part of the place is equally accented.

SHOWER OF GOLD. Catalogue name for Genista.
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 lilies, some of the spiraeas, 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 an early reas, and others, like brenchberry 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 sumachs 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 ornamental grounds. It is especially appropriate along the boundaries of ornamental grounds (Fig. 22) 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. 2225), 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. A well-kept, 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 ground 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. Perfectly no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should 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 spring 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 labeler or a mowing 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 such as is given to a field of corn. Very little trimming should be done. If a bush is tall and spindling it may be well to cut it off next to the ground and allow it to sprout again. If there is any dead wood it should, of course, be cut off. But when a shrub is healthy and vigorous, let it grow in its own graceful way. If it encroaches upon the walk, cut away the encroaching branch near the root so that the mass of thekrinewill 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.

SIBBLÁDIA (Robert Sibbald, Scotch naturalist). Rosáceae. 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. Sibbaldia are densely tufted, hardy perennial herbs with woody stems. The lvs. have prominent stipules and 3 leaflets, each of which is characteristically 3-toothed at the apex. The fls. are about 1/4 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.

proclúmbens, 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 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.

SIÍTHÓRPIA (John Sibthorp, professor of botany at Oxford, author of Flora Graeca, published 1806-15). Scrophulariáceae. 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 pedicels: calyx 4-5-cleft; corolla subrotate, with a very short tube, 5-cleft; stamens usually equal to the number of corolla-lobes; anthers sagittate: capsule membranous, compressed, loculicidally dehiscing, the valves splitting to the middle.

Europea, Linn. A hardly trailing perennial with very slender stems; lvs. orbicular, less than 1/4 in. across. 7-9-lobed; fls. small, on rather short pedicels, 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. BARCLAY.

SÍCÁNA (Peruvian name). Cucurbitáceae. Two or 3 species of tropical American tall-climbing tendril-bearing vines, allied to Cucurbita, but differing in having wide-spreading or reflexed calyx-lobes and the anthers not united. S. odóríterá, Naud., the Curuba of the tropics, has been introduced as the Cassabanana, but long known in the South. Fig. 2327. It is a very quick-growing and interesting ornamental vine: plant gla-
brous, the stems angled: lvs. large (often 1 ft. across), nearly orbicular in outline, deeply crenate at the base, strongly about 5-lobed and the lobes repand-toothed or angled: fls. solitary, monoeous, the corolla small and yellowish, with small reflexed lobes; stigmas 3, each 2-lobed: fr. like a slender vegetable marrow, 1-2 ft. long, smooth, nearly cylindrical, orange-erasinum, with a very strong aromatic odor. R.H. 1890:316. — Probably native to Brazil, but occurring also in Mex. and the West Indies. The Curuba seems to be grown in the tropics as an ornamental plant, although it is said to be able to afford edible preserves. The plant climbs 30-50 ft. It is often grown as an ornamental shrub, or under glass if no has room for it. The fruits are very interesting, fragrant and ornamental. Perennial.


L. H. B.

SIDA (from the old Greek name for Nymphæa alba; given without explanation by Linnaeus). Malvaceae. A genus of about 25 species of herbs or shrubs, mostly native of the tropical regions of the world, with usually serrate, dentate or lobed leaves and small or rarely large, mostly yellow or whitish flowers, which are solitary or in clusters, axillary or disposed in terminal branching spikes or heads; bracteoles wanting or rarely 1-2 and bristle-like: calyx 5-dentate or 5-cleft; staminal column divided at apex into many filaments: locules of ovary 5 or more, 1-seeded.

A. Lvs. large, lobed.

Napea, Cav. A hardy herbaceous perennial 5-8 ft. high, from a stout rootstock: lvs. 3-8 in. long, 3-7-lobed; lobes triangular, long-acuminate, irregularly serrate; fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June-Aug. S. Pa., Va. and Va. B.B. 2:422. — Culture same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to S. dioica, Linn., but according to Gray's Synophytical Flora of North America the two species belong to separate genera, the lvs. of the first being hermaphrodite, of the second diclinous. Napea 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. diclinous, white, smaller than in Sida Napea. For pictures of the two plants, see B.B. 2:420, 422.

AA. Lvs. small, linear.

Éliottit, 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 1881.

F. W. BARCLAY.

SIDALCEA (compound of Sida and Alcea, related genera). Malvaceae. 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. Fl. 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; 2-3 ft. tall, glossy, purple or white, in terminal racemes or spikes; 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. Fl. N. Amer., vol. 1, p. 302.

AA. Fls. normally colored (rarely white forms).

b. Mature carpels smooth (not reticulated).

spinata, Greene. One or two feet tall, sparingly branched or simple, often more or less hisrate; upper lvs. parted into linear and often lobed divisions; fls. rather small, purplish, in an oblong, more or less interrupted spike, the pedicels short or almost none. California, Nevada and Oregon.

b. Mature carpels conspicuously reticulated.

malveiflora, Gray. Stems erect or ascending, 1-6 ft. or even more, sparingly hisrate: lvs. 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.

2327. Sida odorifera, the Cassabanana (× ¾).

SILENE (Greek, salinon, a god described as covered with foam, connected with salix, saliva; referring to the stickiness of stem and calyx). CARYOPHYLLACEAE. A large and scattered genus of herbs, varying greatly in duration, habit and style of inflorescence, but always with 5-petalled fls. ranging in color from white, through pink and rose to purple. The petals are notched at the apex, rarely toothed or fringed.

campestraria, Greene. Two to 5 ft., often branching above, glabrous or sparingly hisrate-pubescent: lvs. green, the lower ones rounded and variously lobed, the upper ones 5-parted into narrow divisions: fls. about 1½ in. across, in strict spike-like racemes, purplish, the petals often lilacine. N. Calif. to British Columbia.

Oregana, Gray. Less hairy than S. campestraria, the racemes becoming branched and paniculate; fls. smaller. Oregon and Washington.

L. H. B.

SIDEROXYLON (Greek, iron and wood; referring to the hardness of the wood). SAPOTACEAE. 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.

Masticodendron, Jacq. A tender tree, with somewhat variable lvs. usually oval or ovate-oblong, 2-8 in. long, and small yellow fls.; fr. about ¾ in. through. West Indies; cult. in S. Calif.—Franceschi says it yields a sort of chewing gum.

F. W. BARCLAY.

SIDE-SADDLE FLOWER. Sarracenia.

SIJEVA BEAN. Phaseolus lunatus.

SILENE (Greek, salinon, a god described as covered with foam, connected with salix, saliva; referring to the stickiness of stem and calyx). CARYOPHYLLACEAE. A large and scattered genus of herbs, varying greatly in duration, habit and style of inflorescence, but always with 5-petalled fls. ranging in color from white, through pink and rose to purple. The petals are notched at the apex, rarely toothed or fringed.
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-loculed, 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 (1866), by F. N. Williams, a specialist on the whole family of Caryophyllaceae. The account is mostly in Latin, and has few descriptions. Williams admits 390 good species. His revision has not been closely followed below. Williams refers our common S. Virginica and PI. plena as well as the European S. viciae to the genus Molyandrum, characterized by a strictly unilocular capsule with no trace of septation at the base. Only a few of the known species are in cultivation.

Silene 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 sandy loam and full sunlight, but the rock-garden kinds require special treatment, and other suggestions for cultivation are given after the specific descriptions. The most popular kinds are the pink and rose annuals, S. Armeria and pulvere. Of the perennials the most popular among the white-fl. kinds, with a capsule, S. Virginica, Pennsylvanica and Schacta are among the most popular kinds with colored flowers. A good horticultural review of the kinds of cultivation is found in The Garden, Vol. 11, pp. 10-13 (1877).

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A. Duration annual or biennial.

b. Petals watched at apex.

c. Plants low and trailing. 1. pulvere

c. Plants erect, 1-2 1/2 ft. high.

d. Calyx sticky-hairy. 2. viciae

d. Calyx glabrous. 3. Armeria

BB. Petals entire at apex

BB. Duration perennial.

b. Height a few inches.

c. Stems 1-ft. or few-ft.

c. Stems 20-nerved, inflated after anthesis.

e. Fls. rose.

e. Fls. white.

d. Calyx 20-nerved, not blad-der-like after anthesis.

e. Lvs. linear.

e. Lvs. oblanceolate or lanceolate.

f. Plant velvety. 9. Canescens

f. Plant glabrous. 10. vallesia

cc. Stems many-ft.

d. Petals 4-lobed. 11. alpestris

d. Petals 2-lobed. 12. Schacta

e. Fls. erect. 13. Pennsylvanica

e. Fls. nodding.

BB. Height a foot or more.

c. Calyx inflated after anthesis.

c. Calyx not inflated after anthesis.

d. Petals laciniate or fringed.

d. Petals not laciniate.

e. Fls. crimson, scarlet or deep red.

ff. Apex of petals sharply 2-toothed. 16. Virginica

ff. Apex of petals obtuse. 17. Californica

ee. Fls. white to pink.

f. Inflorescence leafy. 18. Menziesii

ff. Inflorescence composed of long peduncled cymes. 19. Douglasii

fff. Inflorescence denser, vertically spirate. 20. Souleir

1. pulvere, Linn. Trailing, branched annual, with few leaves or rosy fls. which become pendulous when their beauty is past: plant 6-inches; leaves lanceolate, fls. soliarly or in pairs in the axils; calyx 10-nerved, not bladder-like after anthesis, but constricted at the apex in fruit; petals茫然: seeds kidney-shaped. Monoc. in Pennsylvanian region. It 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. P. WILLIAM-CATCHFLY. Fig. 2929. Vol. 1, 1-1/4 ft. high, with many long, pink, rosy or white fls; glabrous except for the wide sticky bands below the nodes at the top of lvs.; ovate; fls. borne in corymbose panicles; calyx tubular-club-shaped, 10-nerved, in a club-shaped, Southern Europe. Var. alba, Hort, is also popular.

4. compacta, Flsch. Much like S. Armeria but biennial, with more compact inflorescence, longer fls., petals acute and entire at apex, and a more casterly geo- graphical range. En., Asia Minor. L.B.C. 17:328.

—S. compacta of some tradesmen is likely to be a com- pact-growing variety of S. pulvere.

5. Pumilio, Wulf. PIGMY CATCHFLY. Dwarf perennial, with solitary, rose-colored fls. height a few inches: calyx faintly 20-nerved, inflated after anthesis, wholly green or wholly "chocolate- crim- son"; petals "undivided," according to Williams, but prettily wavy-lobed in Gt. 11:55. Austrian Alps. A rare and choice plant. Niven says it has hard wood roots which are easily damaged in transit, and therefore those who wish the species should secure seeds. Woolson advises a sunny position and rich sandy soil.

6. maritima, With. SEA-SIDE CATCHFLY. Trailing perennial, with numerous whorls of many fls. borne on thin 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: lvs. varie-gated; calyx 20-nerved; inflation after anthesis. En. Gt. 57, p. 372. —The seaside plants are said to be more graceful 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 to be 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- sprinkled with soil after every 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. aculae, Linn. CUSHION PINK. MOSS CAMPION. Moss-like, tufted perennial about 2 in. high, with red-dish purplish fls. about 1/2 in. long; root and treatment, and other rootstock much branched: branches short, covered with remains of old lvs. and crowned by dense, spreading clusters of short, green linear lvs., from the center of which arise the fl.-stalks: calyx campanulate, glabrous; petals oblong; petals ovariae; petals obovate; petals oblong; petals oval; petals ovate; petals obovate; petals ovate. There is a white variety with somewhat smaller fls.
Silene

8. petrea, Waldst. & Kit. Tufted subshrub, 4 in. high; lvs. linear; fls. small, solitary; calyx club-shaped; petals bident, with a bident appendage, and ciliate on the claw. Caucasian—Fls. white, according to J. Woodward Manning.

9. Caucalisca, Boiss. This and S. Vallesia are perennial, alpine, white-flowered plants 4–5 in. high, with the flowers rising laterally and blooming from a terminal rosette of lvs.; the stems are usually 1-flled, sometimes 2–3-flled; lvs. oblanceolate; calyx 10-nerved, not inflated after anthesis; petals 4–5 lobed at apex and provided with 2 teeth at the base of each petal in the throat; seed crista-ciliate on the margin. Eastern Eu.—It forms a dense mass of underground stems and is easily propagated by division or seeds. One of the best.


13. Pennsylvania, 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. moody at the base, ovate-lanceolate, or oblanceolate, the 2 or 3 pairs of stem-lvs. much shorter and lanceolate; petals appended, 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. Culebhalma, Wibel). Bladder Campion. Bladder Catchfly. Cow Bell. White Ben. Perennial, 2–3 ft. high, with many-flled panicles of white, drooping fls. about 1/4 in. across; plant branched, glabrous, glaucous lvs. ovate, obovate or oblong; calyx 20-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. incarnata 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 somewhat like green beans.

15. stipalata, Ait. Starr Campion. Readily told by its fringed white and nodding fls. and lvs. in 4s. Perennial, 2–3 ft. high, lvs. ovate-lanceolate, 2–3 in. long; fls. in an open panicle; calyx inflated; petals laciniate, unappendaged. Tex. B.R. 1:47.

16. Virginica, Lindl. Fire Pink. Fig. 2329. Perennial, 1–2 ft. high, with large crimson or scarlet fls., viscid-pubescent: stem unbranched; lvs. spatulate or oblanceolate; fls. 1 in. or more across, loosely cyrmos, nodding or reflexed after anthesis; petals broadly lanceolate, 2-teeth at apex. N. Y. to Minn., south Ga. to Ark. B.M. 3342. G.N. 12:472.

17. Californica, Durand. Perennial, 4 in. to 4 ft. high, procumbent or suberect, with large, deep red, scented fls. and a taproot descending 2–3 ft.; stems several, leafy: lvs. lanceolate or ovate-lanceolate; fls. 1 in. or more broad; petals variously cleft, most commonly with 2 broad lobes, flanked by 2 narrow ones, appendaged. Coast Range.—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. Ménziesii, Hook. Perennial: stems weak, dichotomously branched, 6–12 in. or more high: lvs. ovate-lanceolate; fls. white, "very small for the genus (seed orderly extending 6–8 lines in diam.), borne in the forks of the branches and forming a leafy inflorescence; petals white, 2-cleft, commonly but not always appended. Rocky Mts. and Pacific slope.—Offered in 1881 by western collectors but probably not cultivated.

19. Douglassi, Hook. Perennial, 1 ft. or more high, with white or pink fls. borne mostly in long-peduncled, 3-flled cymes; stems very slender, decumbent; lvs. reduced, linear, 2–3 in. long; rare; western Afr.—This is the old form of the larger eastern catalogue. Var. Macounii, Robinson, was offered in 1881 under its synonym S. Lycali, Wats.


S. orientalis, Mill., is an old name which is not accounted for by Williams, DeCandolle, Boissier, Nicholson, Mottet or Voss. According to Thorbur & Co., it is a hardy perennial, 2 ft. high, with rose-colored fls., which may be readily grown from seed in any light, loamy soil.

W. M.

SILPHIUM

SILPHIUM (from the Greek name of an umbiliferous plant of northern Africa). Compildea. Rosin-weed. A genus of 11 species of tall-growing hardy perennials, 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-flled: involucre of thick, somewhat foliaceous bracts: ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted dehiscing liguules; achenes much flattened, falling free or only with the subtending bract. Silphiums are of easy culture in any good soil. They require full sunlight and are propagated by division or seed.

A. Foliage much cut.

1. laciniatum, Linn. Compass Plant. 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: fl.-heads several, sessile or short-peduncled, 2–5 in. across; rays 20–30. July–Sept. Western prairies. B.B. 3:408.

A. Foliage not cut.

SILPHIUM

BB. Stem-lvs. large.
C. Lvs. connate-perfoliate.

perfoliatum, Linn. Cup Plant. Stem square, usually dentate, branched above, about 6 ft. high: lvs. thin, ovate or deltoid-ovate, the lower contracted into marginated petioles, the upper opposite, connate-perfoliate: fl.-heads 2-3 in. across, with 20-30 rays. July, Aug. Western prairies. B.B. 3:406.

SINNINGIA (after Wilhelm Sinning, gardener at the University of Bonn). Including Rosanowia. Gesneriaceae. A genus of about 16 species of Brazilian tuberous herbs. The generic characters of Sinningia are: the stamens 3-5, the ovary inferior, the disk 2-3 cleft or villous; the corolla tube nearly equal at the base or posterior gibbous, long or broadly cylindrical, the upper part spreading; the 2 posterior smaller; stamens included, attached to the tube of the corolla; thecae broad, the ribs confluent at the apex; glands of the disk 5, distinct; ovary half inferior; style dilated at the tip; stigma concave, entire or slightly 2-lobed. The genus includes the florists’ Gloxinias, which is properly Sinningia speciosa, Hem., but which is treated in this book under Gloxinia. Other than this species, the Sinningias are little known horticulturally. Culture as for Gloxinia.

conspicua, Benth. & Hook. (Rosanowia conspicua, Regel). Root tuberous: stem 1 ft. high: lvs. ovate-oblong, short-connate, somewhat heart-shaped at the base and dentate: fls. yellow, paler on the outside, marked on the lower part of the tube with purple dots and lines; calyx-tube entirely united with the ovary, equal to or shorter than the segments lanceolate, spathulate; corolla-tube obliquely and narrowly campanulate, swollen and recurved at the base; glands of the disk 2: capsule 1-celled: seeds many.

ornata, Benth. & Hook. (Rosanowia ornata, Van Houtte). A hybrid of the above species with a garden variety of Gloxinia with flowers of a bright red: the fruit is a plant resembling S. conspicua, but differing in having the leaves tinted on the veins and petioles with purple and in having a somewhat more elegantly shaped flower, pure white with purple lines on the outside of the corolla-tube and the inside of a yellowish green, lined with purple. F.S. 23:2423.

Rosanowia Hānatehi, Hort. John Saul, is apparently not known to botanists. F. W. BACk.

SIPHOCAMPYLLUS (siphon, tube, and campylos, curved; referring to corolla). Lobellaceae. About 100 tropical American herbs and shrubs, with long, showy tubular fls., red, orange or purplish in color and borne singly or in small clusters; bracts absent or rarely 3 very small ones. About 10 kinds are cultivated in European warmhouses, and propagated by cuttings. Allied genera are discriminated under Isotoma.

betulifolius, G. Don. Height 2-3 ft.: stem woody at base: branches rounded: lvs. alternate, petiolate, 3-4 in. long, coriace, acuminate, doubly serrate, nearly gla- brous; peduncles 1-fl., as long as the lvs., thickened upwards: calyx-segments long awl-shaped, with a few notches; corolla 2½-3 in. long, tube vermilion, limb yellow. Brazil. B.M. 3973.—Tender perennial, not cult. in America, but interesting as one supposed par- ent of Centroplegon Lucanus; itself of little value.

W. M.

SIPHONANTHUS. See Cleorodenron Siphonanthus.

SISASO TREE. Dalbergia Sissoo.

SISYRINCHIUM (an old Greek name first applied to some other plant). Iridaceae. SATIN FLOWER. BLUE-EYED GRASS. RUSH LILY. About 60 species of American perennials, usually with fibrous roots, grass-like, nar- row or terete lvs. and simple or branched stems often flattened and winged, bearing clusters of usually blue or yellow fls. subulately by two spathes; perianth nearly flat or bell-shaped; segments 6, nearly equal, obovate or oblance: stamens inserted on the base of the perianth; filaments more or less connate; ovary sub- oblong or orbicular; style cylindrical, 3-lobed. The species are of easy culture in any good garden soil. Useful in the wild border, where hardy.
A. FIs. yellow.
B. Stem leafless.

Californicum, Dryand. (Miracu Calitithum, Ker-Gawl.) A half-hardy perennial: stem 1½ ft. high, 2 lines through, about 1 ft.: leaves, finely nerved: lvs, many, shorter than 3½ in. broad; spathes of perianth pale yellow, 5½ in. long. Calif. to Ore. B. M. 963.—Swampy grounds.

BB. Stem leaf-bearing.
C. The stem slightly 2-edged.


CC. The stem broadly winged.


AA. FIs. purple, blue or white.
B. Stem terete.

grandiflorum, Dcngl. (D. Doulasitzi, A. Dietr.) A hardly perennial: root fibres slender, long: stem simple, about 1 ft.: lvs. short, sheathing the lower part of the stem: fls. 2-3, cernuous; perianth-segments bright pur-
pure, rarely white, ¾ in. long. May-June. Northwestern U. S. B. M. 3509. B. R. 16:1364.—This is possibly the handiest species in this group. Var. album is also offered and is equally desirable.

BB. Stem flat.
C. Spathes equal in length.

graminoides, Bieckell (S. ducceps, S. Wats., not Cav.) A hardly perennial: stem winged, about 1 ft. high, usu-

C. Spathes very unequal in length.

augustfolium, Mill. (S. ducceps, Cav. S. Bemundii-
num, Authors.) A hardly perennial: root-fibers long: stem about 1 ft. high, 1½ lines through, with 2-3 clus-

Fortuniei, Mast. (S. japonica, Lindl.). Similar to the preceding but of dwarfer habit: lvs. lanceolate or ob-
long-lanceolate, acuminate, dark green above, light green beneath, 3½–4½ in. long: fls. white, in oblong-
olate peduncles, usually perfect: fr. obovate, dull crimi-
son-red. Spring, China. G. C. II. 25, p. 245 (as S. ob-
lata). I. III. 5, p. 32. China and Japan. B. M. 324. B. M. 4719; F. S. 7, p. 39; G. H. 5, p. 183 and 8, p. 519; R. H. 1889, p. 239, and 1880, p. 56. This species fruits more freely than the preceding. Var. rubella, Redh. Pedicels shorter, pedicels shorter, pedicels of the preceding name. Flor. and bolder v. R. H. 1874:311; 1885, p. 189. Var. argentea, Nichols., has the lvs. bordered with white. A hybrid between this and the preceding species is probably S. intermedia, Carr., with narrow oblong-elliptic lvs, dark green above. To this hybrid belong also S. Foremanii, Hort., with lanceolate or oblanceolate yellowish green lvs. and subglo-
bose and obovate fr. on the same pedicel (G. C. III. 5;533) and S. Béberti, Hort., with similar but deep green lvs. and globose squarish fruit.

S. Lauriola, Sieb. & Zucc. Shrub. 5 ft. high, of a strong aro-
matic odor when bruised: lvs. narrow-oblong to obovate, acute or acuminate, bright green: fls. 5-merous. HIMALAYAS.

ALFRED REHDER.

SKIRRET (Sium Sisarum, Linn.) is a vegetable of minor importance the roots of which are used like salsify or oyster plant. It is a hardly, perennial, umbelliferous herb, native to eastern Asia. It grows 3-4 ft. high, has pinnate foliage and small white fls. 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 the flesh is not jointed. The roots have a sweet and slightly floury taste and if well grown are tender. The chief objection to this vegetable is the woody core, which must be removed before cooking, as it is not easily eaten. From this the vegetable is table and detracts from its quality. The thickness of the core varies greatly, no matter whether the plants are propagated by seed, offsets or division of roots.
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 into the second 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 6 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. Spathiphyllum latifolium.

SLIPPER FLOWER or SLIPPERWORT. Calceolaria.

SLIPPER, LADY'S. Cypripedium.

SLIPPERS, BABIES'. Cypripedium.

SLOE. Prunus spinosa.

SMŁOŃSKIA (Prof. T. Smłonskia, botanist of St.
Petersburg, died 1815). Cruciferæ. About 4 species of
alpine plants with small white or yellow, 4-petaled
flowers: sepals almost equal; pod somewhat
shortish, narrowed at both ends; seeds few, arranged
in 1 series: lvs. 1-2-pinnatisect: fls. racemose: bracts
none.

calycina. 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 seg-
ments and a terminal one: rarely a few lvs. entire:
racemes at first dense and subcororybose, but elongat-
ing in fruit; fls. white or nearly so; petals about 2 lines
long. Arctic regions. Recommended by some per-
sons for rock gardens, but it does not seem to be
advertised in America.

W. M.

SMILACINA (resembling smilax). Lilíacea. False
SOLOMON'S SEAL. About 25 species of hardy perennial
herbs of the temperate regions of North America and
Asia, with rhizomes (Fig. 233o) and simple leafy stems
bearing terminal panicles of small usually white or

233o. Rootstock of Smilacina racemosa (X 3/4).
The figures designate the position of the stalks in the different years.
Between each of the figures or scars is a year's growth.

greenish white flowers: perianth of 6 equal spreading
segments; stamens 6, inserted at bases of the perianth-
segments: berry globular or nearly so, 3-celled.

Smilacinæ 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 (ancient Greek name). Lilíacea. A genus of
about 180 species very widely distributed over the
world, usually woody climbers, which ascend by means
of the clinging 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 nu-
merous, rather small, divcous, in axillary, sessile or
peduncled umbels: pedicels nearly equal in length:
berries usually globose, 1-4-seeded.

There are 17 species in the U. S., nearly all of
which are useful wild garden plants, having glossy at-
tractive foliage. The fast three noted below have been
offered by collectors. For Smilax of florists, see As-
paragus medeoloides.

a. Lvs. usually variegated. Exotic species.
b. Plant climbing.

argyræa, Lind. & Rod. Tender foliage plant: stem
wiry, slender, armed with short, stout thorns: lvs. lan-
ceolate, becoming 8-10 in. long, dark green,
blotched with gray, 3-nerved, short-petioled.
Bolivia. I. H. 39: 152. — According to O. F. 8: 365
the above species is a robust healthy plant, doing
well in a moderate temperature and
quickly forming ornamental specimens. It
should be given a rich, fibrous soil and a light
and sunny position. It may be propagated by
half-ripe cuttings of the side shoots with 2-3
eyes inserted in a moderately warm bed.

b. Plant partially climbing.

aspera, Linn. A half-hardy shrub often somewhat
semidentate, unarmed or with spines:
fls. ovate-deltoid or lanceolate, 1'/2-6 in. long,
usually blotched with white, 5-9-nerved:
fls. white, sweet-scented, in many-fld. umbels: ber-
ries 1/4 in. thick, red, according

25 to J. D. Hooker, bluish, while Franceschi
mentions them in his catalogue as shining red.
S. Eu. to India. Gs. 28, p. 615.

aa. Lvs. green. Native species.
b. Stem herbaceous.

herbaceæ, Linn. A hardy perennial with a somewhat
prolific or climbing branched annual stem 4-6 ft.
high, unarmed: lvs. ovate to lanceolate acute to cuspi-
date, obtuse or cordate at the base, long-petioled, 7-9-
nerved; umbels 1:5-8-flld., long-peduncled: fls. carri-
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 evergreen.

Laureliolia, Linn. Stem stout, high-climbing, armed with straight prickles; branches angled, mostly unarmed: lvs. leathery elliptic or oblong-lanceolate, 3-nerved: umbels 6-30-fl., on short, stout peduncles; berries black, ovoid. N. J., south and west to Ark.

2331. Smilacina racemosa (× ½).

S. Foliage deciduous.

Walther, Pursh. Stem climbing, angled, prickly below: branches unarmed: lvs. ovate to ovate-lanceolate obtuse or abruptly acute, 5-7-nerved; umbels 6-15-fl., on short peduncles; berries coral-red or rarely white. Wet soil, N. J. to Fla. west to Mississippi river. B. B. 1:442.

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 ustilaginaceae, 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 arenae), maize and teosinte smut (Ustilago zeae), stinking smut of wheat (Tilletia tritici), rye smut (Urocystis occultula), onion smut (Urocystis cepula), and colchicum smut (Urocystis colchici). For an account of the grain smuts, see Swingle, Farmers' Bull. 75, U. S. Dept. Agric. JOHN W. HARSHBERGER.

SNAILS. See Caterpillars and Worms.

SNAKE CUCUMBER. A form of Cucumis Melo.

SNAKE GOURD. See Trichosanthes.

SNAKEHEAD. Chelone.


SNAKE'S BEARD. Ophiopogon. Snake's Head Iris. Hermodactylus. Snake's Head Lily. Frisillaria Meleagris.

SNAKE'S MOUTH. Pogonia.

SNAKE'S TONGUE. Ophioglossum.

SNAPDRAGON is Antirrhinum.

SNEEZE WOOD. Helenium.

SNEEZEWOOD. See Phlox.

SNEEZEWORT is Achillen.

SNOWBALL TREE. Viburnum Opulus.

SNOWBERRY. Consult Chiococca and Chiogenes; also Symphoricarpos.

SNOWDROP. See Galanthus.

SNOWDROP TREE. Helenia.

SNOWFLAKE. Leucoxemum.

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 BARK TREE. Quillaja Saponaria.

SOAP BERRY. Sapindus.

SOAP BULB. Chlorogalum.

SOAP-PLANT. See Chlorogalum.

SOAPWORT. Saponaria officinalis.

SOBOLEWSKIA (after G. Sobolewski, 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 tetrate, 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 1½ lines wide. May.—Offered by John Saul in 1893.

F. W. BARCLAY.

SOBRALIA (after Fr. Mart. Sobral, a Spanish botanist). Orchideae. 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. macrantha 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, 9-fl., membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading; labellum convolute around the column, terminal portion large, undulate, often fibrillate, smooth.
SOBRALIA

HEINRICH HASSELBRING.

Sobralias are charming orchids, and where room can be given to large plants they will 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 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 and a half across, and the plants themselves present as great variety, ranging from such as S. fragrans, which grows less than a foot high, to that giant of the tribe S. Cattleya, which will reach a height of nearly ten feet. They also give as much variety in their coloring, ranging from a shade of lavender which is almost a blue through different shades of purple to the rich claret color of S. Lowii, and from yellow to the purest white.

F. J. LE MOYNE.

1. leucoxantha, Reichb. f. Stems tufted, 3 ft. high, spotted: fls. 4-6 in. long, lanceolate, acuminate: fls. 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. 7058. R.B. 29:205. J.H. III. 33:77.


3. fragrans, Lindl. A small species with stems about 1 ft. high: fls. 1 or 2, oblong-lanceolate, 4-5 in. long; fls. 2-3 on a long peduncle, about 2 in. long, pale suffruticose yellow; sepals oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and having many fimbriated erests. Columbia. B.M. 4038. —One of the smallest of the genus.

4. macrantha, Lindl. Fig. 2332. Stems tufted, redlike, 4-7 ft. high, leafy all the way up: fls. broadly lanceolate to oblong-lanceolate, long-pointed, 8-10 in. long; fls. several at the ends of the stems, rose-purple, with the front of the labellum deep purple; sepals linear-oblong, more than 8 in. long, reflexed and twisted; petals broader, oblong, wavy above; labellum 5 in. long, with the expanded portion almost circular, 3 in. across and 2-lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several yellow ridges. May—July. Mexico and Guatamals. B.M. 4446. F.S. 7:669. P.M. 14:241 (var.). G.M. 31:519. Var. Kienastiana (var. alba) has white fls.

5. Brändtli, Krzl. Stems 3 ft. high: fls. lanceolate, acuminate, 8 in. long; fls. 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. Resembling a medium-sized S. macrantha distinguished by the long horns of the column, and black spots (not hairs) on the leaf-sheaths. S. Amer.

6. Fenzliana, Reichb. f. Stems slender: sheaths blackish, asperulate: fls. oblong, acutish; fls. rose-colored; sepals oblong, acute; petals ovate-elliptic, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the anther. Nieraguana.—Var. alba, Hort., has pure white flowers.


8. Cattleya, Reichb. f. Stem stout: fls. oblong, acuminate, plaited, bearing several lateral clusters of strong, thick fls. 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.
S. magnifica.—S. plantinii.—S. virginalis.

SOIL

9. Löwii, Rolfe. An imperfectly known species introduced about 1892 from Colombia. It grows about 1½ ft. high and has light uniform purple.

The following trade names are not accounted for: S. magnifica.—S. plantinii.—S. virginalis.

HENRICH HASSLERKING.

SOIL. The soil is a superficial covering of the earth's crust, more or less well adapted to the growth of plants. It is, however, usually only a thin layer. Below it the earth changes its character constantly. The soil often differing, especially in humid climates, from the soil proper in color, texture, or chemical composition. A very striking definition has been suggested by Sir John Ross: 'The soil is the disintegrated remnants of those organisms which have passed through the stages of life from the beginning of the vegetable or animal creation to the present time.' The term soil is often used and occasionally in a more comprehensive way to include both the soil and the subsoil. In soils adapted to the growth of the higher plants consists of fragments of rocks or minerals, organic matter, soil solution, and a soil atmosphere. The mineral fragments vary in size from the finest clay particles to gravel and even boulders. The organic matter is derived from low organisms, from previous vegetation, or from growing plants; as also from stable manure, and occasionally fish or animal matter added to the soil by man. The soil solution consists of water carrying dissolved substances from the living plants and from the organic matter, as well as from fertilizing materials artificially applied, and constitutes a nutrient solution from which the plant derives its mineral constituents. The soil atmosphere consists of the ordinary atmosphere above the soil in being richer in carbon dioxide and nitrogen, and containing more water vapor and less oxygen.

In origin there are two main classes of soils: sedentary soils, formed by the disintegration and decomposition of rocks in place; and transported soils, including those of alluvial, glacial and aeolian origin. The word alluvial is here used to include all water-transported materials. The term transported, frequently used in a more specific sense to indicate the recent flood deposit of rivers. Soils are classified according to their origin and their mechanical and chemical composition and properties. Genetically, they are classified according to the rock from which they are derived, as granite soil, limestone; or according to the manner of their origin, as alluvial, lacustrine or drift. Mechanically, they are classified broadly into stony, gravelly, sandy, sandy loam, loam, clay loam, clay, adobe, black-waxy, or, according to some other physical property; chemically, into zeolitic, humus, calcium, and according to other striking chemical features. In the soil science of the U. S. Department of Agriculture a local name is adopted for each type under which the special characters are given; examples of this are Hartford sandy loam, Norfolkl loam, Glendale loam.

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 undoubtedly constant physical changes going on in the soil, as well as chemical changes, which have much to do with the best development of vegetation. The soil moisture may be looked upon as a nutrient solution in 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 to the soil. The dissolved substances, naturally present in the soil or derived from fertilizers, influence the solubility of the soil components, rendering them more or less soluble according to their nature and existing conditions. It is probable that the chemical nature 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 chemical action is only an amount to produce the yield and quality of crops desired, and this may be increased by methods of cultivation and fertilization so that crops may annually remove larger quantities of nutrient substances without any particular exhaustion to the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils in humid countries, as they are liable to be leached away and also to recombine, forming difficulty soluble compounds with the material of the soil grains. A soil is in good heart or good condition when the physical conditions, such as the water supply, soil atmosphere and temperature relations, are favorable, and when the weathering of the material is sufficient to furnish an abundant and constant nutrient solution in the soil moisture.

One of the most potent agents in the weathering of soils is the organic material contained. This is unquestionably due largely to the amount of carbon dioxide formed, which renders many of the nutrient matters much more soluble. Moreover, the organic matter forms a culture medium for bacteria, ferments and the various organized and unorganized agents which assist in breaking down the organic material, and facilitate as well the weathering of the other soil components. Soils in general have remarkable power of absorbing on the surface of the soil grains vast quantities of carbon dioxide, ammonia and other gases, and of other nutrient materials, which while soluble and actually dissolved, do not readily diffuse out into the solution between the soil grains.

The influence of fertilizers is therefore twofold: the direct addition of plant-food for the immediate use of plants, and the action of the fertilizing compounds upon the solubility of the otherwise difficultly soluble compounds in the soil. There are other offices which are very strikingly shown in the case of lime. This substance when in the form of either caustic or slaked lime corrects the acidity which is very often present in soils. It changes the structure of soils. It renders some of the soil components more soluble, especially when the lime is in the form of the sulfate or gypsum, and it has undoubtedly a physiological role which enables the plant to assimilate larger quantities of other nutrient materials even in amounts which would be detrimental if the lime salt were not present in excess.

The principal objects of the cultivation of the soil are to secure proper aeration, to conserve the moisture supply, and to improve the drainage. The irrigation and artificial drainage of soils are treated elsewhere.

2333. How the gardener makes his soil, by letting it decay in piles. The larger pile is composed of sods.

The physical properties of texture and structure, that is, the size and arrangement of the soil grains, have a greater practical importance with field crops than with the relation of crops to soil under extensive cultivation than upon horticultural crops either in the field or greenhouse, where intensive methods are used. Particularly in the eastern states, where the natural rainfall is relied upon for the water supply, these physical properties have great influence in determining the relation of crops to soils. This is due in large part to the influence
of the physical properties upon the water supply, and the commercial values of many soils are dependent largely upon this one condition. This is notably the case with wheat, corn, sugar beets, tobacco, and such truck crops as celery, cranberries and other horticultural crops. With intensive cultivation, however, the flavor, appearance, texture and chemical quality of the products 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 crops, e.g. the cultivation of tobacco in the Hudson system of cultivation, such as the production of the fine lettuce around Boston, of the carnations, violas, and grasses in other districts. With the present specialization in these modern systems 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, those which are mineral soils, and those which are organic soils or peat. Peat is formed in temperate climates by the accumulation of vegetable matter in swamps, or in some parts of the world under peculiar conditions (see Peat). Mineral soils, which cover the greater portion of the earth's surface, are formed by the disintegration of rocks and stones through the agency of water, frost or the atmosphere. Peaty soils are composed almost entirely of vegetable matter, with but little mineral matter. Mineral soils are just the reverse. The physical differences in peat are practically reduced to two; viz., the absence of air. 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>Sand</td>
<td>0 to 100</td>
</tr>
<tr>
<td>Silt loam</td>
<td>60 to 100</td>
</tr>
<tr>
<td>Loam</td>
<td>40 to 60</td>
</tr>
<tr>
<td>Clay loam</td>
<td>20 to 40</td>
</tr>
<tr>
<td>Clay</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 an operation of great nicety and one that requires an experienced chemist to perform. The chemical constituents which plants derive from the soil are present in most soils, though in varying degree, but they are sure to be present in ample quantity in the potting soil selected by an experienced gardener. The air and water may furnish as much as 98 per cent of the material with which the plant body is built up in some cases, and only the remaining 2 per cent be strictly derived from the soil. 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 natural manures. Moreover, nitrogen comprises four-fifths of the atmosphere and the soil absorbs it chemically in the action of rain when soil is in good physical condition. Hence the importance of remembering always that air in the soil is as important as water. Sorauer, in his "Physiology of Plants," page 56, says: "The condition of the air is one of the greatest importance. It resembles a sponge, and in which it will retain the greatest amount of nutritive substances and water with-out 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 location, 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 eucalyptus, agaves and other succulent plants he selects a sandy loam, or a mixture of 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.

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 aerating the soil. If the soil is sifted too much it becomes very fine, packs close and allows too little aeration. Leaf-mold is decayed vegetable matter, or humus. It may have little manurial value, but is used by gardener to make soils "light" or spongy. For most young plants which require much water at all times 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 aeration. Sand is one in which it is most economical to use. Young plants thrive in it. Sliver sand is best for all purposes because it contains less oxides than red or yellow sands.

![2334. Sieves for sitting or ridding soils.](image-url)
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 rich 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 Cyclopaedia have been with this idea in mind.

Edward J. Canning.

SOIL

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. Dunlap, the latest monographer (DC. Prodr. 13, pt. 1), in 1853, recorded 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-

SOLANUM

2335. Solandra grandiflora (X 1-5).

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Edward J. Canning.

SOIL

SOLANDRA (after Daniel C. Solander, a Swedish naturalist and traveler, 1736-1786). Solandrae. 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, incurved; stamens 5, inserted on the corolla-tube: berry globose, pulpy.

A. Plant becoming 12-20 ft. high.

grandiflora, Sw. Fig. 2335. Lvs. obvate-oblong, acute, glabrous, thick; fls. fragrant; corolla twice as long as the calyx, not contracted at the throat, white or somewhat yellowish. B.M. 1874. G.C. III. 21:272. Gn. 53:1161. J.H. III. 34:123.

2336. Tuber of Potato—Solanum tuberosum (X 3/4).

site the lvs.: corolla gamopetalous and rotate or shallow-campanulate, plaited in the bud, the limb angled or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated and connivent and mostly opening by an apical pore or slit: ovary usually 2-loculed, ripening into a berry which is sometimes 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.

1678

**SOLANUM**

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1. **Solanum**, Linn. Potato. Figs. 1929, 1930; 2336. Low, weak-stemmed, much-branched perennial with tender, herbaceous tops, and perpetuating itself asexually by means of thickened or tuberous underground stems, glabrous or pubescent-hirsute: lvs. unequally pinnate, 5-9-lobed-obovate lfts. interposed with much smaller ones; lvs. lirate or white, in long-stemmed disheptomous clusters, the corolla prominently lobed: fr. a small globose yellow berry, usually not produced on the highly developed modern varieties. Temperate Andes of Chile and adjacent regions. —See Potato. There is a form with yellow-blotched lvs. (known as var. eu-ricatum) sometimes cult. for ornament.

Var. *boreale*, Gray (S. Fánduleri, Gray). Plant usually smaller, as also the tubers, which are about ½ in. in diam. and send off long, creeping subterranean stolons: interposed lfts. one or two or even none; corolla angulate. Mts., S. Colo. to Mex. —Apparently only a northward extension of the species.

2. **Máglia**, Schlecht. DARWIN POTATO. More slender and erect than *S. tuberosum* and nearly or quite glabrous; lfts. usually smaller, the interposed ones few and very small; lvs. smaller than those of *S. tuberosum* white, slender-peduncled, in loose, long-forked cymes: tubers small (2 in. or less long), globose or oblong, soft and watery. Coast region of Chile. B.M. 6756. —Sometimes cult. as a curiosity. It has been thought by some to be the original of the Potato, but this is now given up. Darwin describes the plant in his "Naturalist's 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. **Jámesii**, Torr. Low and slender, 12-18 in. tall under cultivation, the small angular branches glabrous or soon becoming so: lvs. oblong in general outline, the rachis narrowly-winged, the lfts. 5-9, with no interposed small ones, small and lanceolate-ovate in shape: lvs. small, white, the corolla deeply cleft and the anthers large and prominent: tubers few, globose, hard, 1 in. or less in diameter, withstanding frost. Mts. of Col., N. Mex. and Ariz. B.M. 6756. —Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

AA. Species grown (or collected) for the edible fruits: lvs. simple.

4. **nigrum**, Linn. BLACK NIGHTSHADE. MORRELLE OF THE French. Annual, 1-2 ft., branch- ing, glabrous or nearly so: lvs. simple and entire, ovate to cuneate-ovate, pointed, long-stalked: lvs. white, small, in few-fl. clusters, the pedicels drooping: fr. globose, black, size of a pea. —A widespread weedy plant. In the Dakotas, according to Hansen, the plant is often called "Stubbleberry," as it volunteers freely in wheat stubble, and the fruit is much used there for pies and preserves. Hansen says that the plants withstand considerable frost. In warm countries, according to Vilmorin, the leaves are sometimes eaten as spinach is, "and apparently without any injurious result, although the plant belongs to the dangerous family of the 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 they should be united under many and perhaps most of 50 and more species of *Dunal* in the Prodomus, weedy or weedy plants, widely diffused over the world, especially in the warmer portions.

5. **muricatum**, Ait. (S. Guatemalanum, Hort.). PEPINO, MELON PEA. MELON SHRUB. Fig. 2337. Erect bushy herb or subshrub, not spiny, glabrous or nearly so: lvs. long and narrow, mostly oblong-lanceolate, tapering to the petiole and also to the nearly or quite obtuse point, the margin wholly entire or somewhat undulate; fr. rather small, bright blue, deeply 5-lobed, inclined or nodding in a long-stalked forkling cluster: fr. long-ovoid or egg-shaped, long-stalked, yellow overlaid with streaks of red; s. purplish, in cult. 4-6 in. long and seedless. Trop. Amer., at temperate elevations. G.F. 5:173. G.C. III. 3:309. —This plant attracted some attention in this country about ten years ago. It appears to have been introduced into the United States.
SOLANUM

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 acid eggplant. 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. Melongena, Linn. (S. inodorum, Linn.). Erect and much-branched herb or subshrub, 2-3 ft. tall, woolly or sparingly spiny; lvs. large and heavy, ovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose beneath, shallowly sinuate-lobed; fls. large, mostly in clusters, the calyx woolly and often spiny, the spreading, deeply lobed, purplish corolla 1 in. or more across: fr. a large berry. India.

Var. esculentum, Nees (S. esculentum and S. ovigerum, Duh.), COMMON EGGPLANT. GUINEA SQUASH. AUBERGINE. Pigs. 75-753, 830, Vol. II. Cultivated for its large fruits, which are usually oblong, obovoid 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. serpentiniun, Desf.). SNAKE EGGPLANT. Fr. greatly elongated and curiled at the end. Var. depréssum, Bailey. DWARF PURPLE 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. Tezoum, Dunal. S. cocelnun, Hort.). CHINESE SCARLET EGGPLANT. ORNAMENTAL EGGPLANT. ETHIOPIAN EGGPLANT. Fig. 2338. Coarse, bushy herb, 3 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 petiolar: fls. 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. Pseudo-Capsicum, Linn. JERUSALEM CHERRY. Pigs. 2339, 2340. Small shrub, reaching 3-4 ft., but usually grown as smaller specimens in pots, glabrous, erect: lvs. lance-oblong to oblongate, mostly entire, ovate or somewhat wavy, shining green, strongly pinnate: fls. few or solitary in lateral clusters, small, white, the corolla 5-parted: fr. globular, ½-⅔ 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. nanum, Hort., is a dwarf, compact form. Var. Weatherillii, Hort., Weatherill's Hybrid, is a form with strongly veined undulate lvs. and pointed orange-colored fruits.

9. Capsicárum, Link. Fig. 2341. Resembles the last, but the plant attains only about half the size: lvs. much shorter, ovate-lanceolate to oblong-lanceolate, scarcely undulate, subopposite and one smaller than the other: fr. white, in short racemes: fr. ¼ in. or less in diam. orange-red or scarlet. Brazil. P.S. 12:1242. —Frequent greenhouse and window plant. Var. variegatum, Hort., has variegated lvs.


3338. Solanum integrifolium (X ⅔). A species grown for its ornamental fruit.


12. umbelliferum, Eschsch. Perennial, shrubby at the base, hoary-pubescent or sometimes almost glabrous: lvs. obvate-oblong, varying from obtuse to acute: fl. violet-blue (or sometimes white), in umbel-like clusters, ½ in. across, showy and fragrant. Calif. Variable.—S. umbellatum, recently offered, is very likely this species.

EE. Lvs. prominently lobed.

13. aviculare, Forst. (S. laevinnatum, Ait.). Strong, erect herb or subshrub, 4-6 ft., glabrous: lvs. large, pinnatifid into long nearly linear or lanceolate acute lobes: fls. blue, 1 in. or less across, the corolla prominently lobed, showy: fr. oval or globular, varying from green to orange-red, about ½-1 in. in diam. (said to be eaten in New Zealand). Australia and New Zealand. B.M. 349.

DD. Plant more or less spiny: grown for the mass effect.

E. Flowers mainly blue.

14. Indicum, Linn. Strong shrub, sometimes taller than a man, with many stout often recurved prickles,
more or less hairy. lvs. ovate, sinuate or lobed, woolly beneath, usually prickly: fls. blue, 1 in. or less across, triangular-lobed: berry globular, about ⅖ 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. **Torrerjyi**. Gray. Strong perennial herb, with close grayish pubescence and scattering weak prickles: lvs. ovate, with subcordate or truncate base, with 3-7 sinuate 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., globular, smooth, yellow. Kans. to Tex. B.M. 1934.


**ee. Fls. mainly white.**

17. **marginatum**. Lindl. f. Shrubby, 3-5 ft. tall, white-tomentose, bearing many straight but not very large prickles: lvs. mostly ovate in outline, subcordate, shallow-lobed or rounded, 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-fl. clusters, the calyx prickly: fr. 1 in. or more in diam., globose or ovoid, drooping, prickly, yellow. Trop. Afr. B.M. 1928.

18. **robustum**. H. Wendl. Vigorous herb or subshrub, 3-5 ft., densely tomentose, prickly on stems and lvs., the stems winged: lvs. 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. globular, small, hairy, orange-colored. Brazil. R.H. 1866, p. 268; 1886, p. 236.—Bold species, useful for subtropical gardening.

**dd. Fls. small, ⅙ in. or less across.**

20. **jasminoides**. Paxt. **Potato Vine** (from the lvs.). Fine greenhouse twining shrub, reaching several ft. in height, glabrous: lvs. rather small, the upper ones lanceolate to lance-ovate and entire, the lower ones of about 3 narrow, ovate entire lfts.: racemes short and united into a cluster 3 in. or more long and about 8-12-fl.: fls. about 1 in. across, star-shaped, white with tinge of blue, pretty. S. America. P.M. 8:5. B.R. 32:33. Gn. 43, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 53, p. 28.—A most useful deciduous climber for the coolhouse, and much grown. Half-hardy, and useful for the open in the 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. 1:539. Var. **variegatum**. Hort., has variegated foliage.

21. **Sealforthianum**. Andr. (S. arboresum, Hort. f. S. venustum, Kunth). Beautiful slender climber or trailer, 4-10 ft., minutely pubescent: lvs. with 3 lfts. (terminal one largest) or the upper ones simple, the margin entire, the lfts. ovate-lanceolate: fls. many in long, drooping panicles, on pedicels swollen at the apex, the calyx-mauve or azure-blue, star-shaped, usually 1 in. or less across: fr. ovoid, glabrous, scarlet. Brazil. B.M. 1982, 5823. B.R. 12:269. R.H. 1886, p. 177; 1897:424.—A very beautiful plant for the coolhouse. Begins to bloom when very young.

22. **Wendlandii**. Hook. f. (S. Wendlandii magnificum, Hort.). Fig. 2342. Tall-climbing, glabrous, with a few scattered prickles: lvs. various, sometimes 10 in. long, the uppermost simple and oblong-acuminate, the others lobed or trifoliolate and with the terminal leaflet much the largest, all with entire margins: fls. in large cymes, pale lilac-blue, the corolla 2½ in. across and shallow-lobed: fr. globose. Costa Rica. B.M. 6914. G.C. III. 14:329. G.M. 36:610. A.F. 12:1147. P.E. 8:828.—A splendid greenhouse climber, perhaps the most showy of the cultivated Solanums. Blooms in summer and fall. Ernest Braunton 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,
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. bethecum*, Cav., is Cephymandra, for which see *S. kressi*, Voelck. The shrub or small tree, with Cephymandra-like lvs. and the young parts clothed with tiny hairs; fls.: fr. globose, hairy, inclosed in the calyx. *S. Brasii*, B.M. 7491.—*S. ciliatum*, Lam. Most herb or subshrub, 1-2 ft. tall, with prickly stems and ovate acutelobed 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.). Primulacea. About 4 species of alpine plants 2-3 in. high, with nodding, funnel-shaped, fringed flowers of violet or purplish blue, and about 1/4-3/4 in. across. Soldanellas are among the most famous flowers of the Alps, though not the commonest. *S. alpina* ascends the mountains to the line of perpetual snow. Grant Allen, in "Flashlights on Nature," declares that the flower of 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 changing 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: scarps 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 Koch's Synopsis Flora Germanicae. 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 pubecent.**

**montana, Willd.** Lvs. roundish; margin slightly and remotely crenate: fls. violet. May-July.

**b. Pedicels roughish.**

**alpina, Linn.** Fig. 2343. Lvs. roundish; base more or less kidney-shaped; margin entire or somewhat wavy; fls. violet, with darker streaks. May. B.M. 49. G.C. II. 24:457.

**AA. Fls. solitary: corolla split a third of the way to the base; filaments about as long as anthers.**

**b. Pedicels roughish.**

**pusilla, Baumg.** Base of lvs. heart-shaped or kidney-shaped; margin somewhat wavy: fls. copper-colored, verging on blue, the fringes straight, not spreading. May.

**b. Pedicels pubescent.**

**minima, Hoppe.** Lvs. roundish: fls pale lilac, streaked purple inside; the fringes spreading at the tips. June, July.

**SÖLEA** (after W. Sole, author of a monograph of the mints of England). Violacea. 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 near their entire length, the lower one much larger, saccate 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 anteriorly.


**F. W. BARCLAY.**

**SOLENANTHUS** (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, scirploid, panicked 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.
Solanthus, Hohen. (Cynoglossum Apenninum, Linn.). Plant hairy; calyx, 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, panedled racemes. May, June. S. Europe.—A useful plant amongst shrubbery, Goldiennos 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 fall or early spring. The observation of a single season should result in a fine collection of individual plants; and the natural excellence of these specimens should be maintained and augmented by supplying good soil and giving good care. Often it is difficult 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 erect perennial herbs with simple alternate leaves, and many small yellow, rarely with whitish heads in spikes, thyrses, compound panicles, or racemes. The heads are oblong or narrow-campanulate, with small, mostly apressed scales, containing few florets, the disk-florets all perfect and the ray-florets in one series and platelike. 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 states, also Gray’s Manual and Horsman & Brown’s Flora. The following have been offered by American dealers:

bicolor, Linn., casia, Linn., Fig. 2344.
Canadensis, Linn., fig. 2345.
var. procerca, Torr. & Gray.
Drummondii, Torr. & Gray.
elonata, Nutt.
confertiflora, DC.
Junea, Alt.
laceolata, Linn.
latifolia, Linn.
Missouriensis, Nutt.
neoglaea, Torr. & Gray.
nemoralis, Alt., Fig. 2346.
occidentalis, Nutt.
oculata, Nutt.
Ohioensis, Ridd.
patula, Muhl.

peltoiaria, Alt.
puberula, Nutt.
Riddelli, Frank.
rigida, Linn.
rigida, Dusculus.
rigida, Porter.
rugosa, Mill., Fig. 2347.
sempervirens, Linn.
serotina, Alt.
var. gigantea, Gray.
Shoitt, Torr. & Gray.
sepicosa, Nutt.
Sphyridias, Gray.
striata, Alt.
uliginosa, Nutt.
Vidalia, Muhl.
Virgaurea, var. alpina, Bigel.

L. H. B.

SOLYNA (in honor of Richard Horman Solly, 1778-1853, an English botanist). Pittosporaceae. Two species of Australian evergreen twining plants: lvs. narrow, nodding, on slender pedicles, solitary or in loose, few-flowered cymes; 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, 2-6 ft. high, with slender, twining stems; lvs. variable, from lanceolate or oblong-linear to ovate-lanceolate or ovate-oblong, obtuse or slightly acuminate, entire, 1-2 in. long, usually narrowed into short petioles: cymes 4-8-12-fl., terminal or leaf opposite; fls. bright blue, ½-¾ in. long. July. B.M. 3233. B.R. 21:253. B. R. 17:1466.—Hardy 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 an herbaceous 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. BURTT DAVY.

SOLON'S SEAL. Polygonum. SOLON’S SEAL, FALSE. Smilacina. SONERILA (adapted from a native name). Melas tomentosa. 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

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J. BURTT DAVY.
SONERILA

fibrous peat and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaening. A temperature of not less than 75° suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70-80°. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use fine-screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time in early spring) they start into flower. At this time the plants should be hardened off by gradually withholding water, and they should also be kept a little cooler. When 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.

INDEX.

argentea, 7.  
guttulata, 4.  
Hendersonii, 6.  
maculata, 3.  

D. Color of nerves dark purple:  

lvs. covered with short, dark purple hairs ....... 4. orientalis  

DD. Color of nerva glandular-pubescent, the pubescence not purplish.  

E. Lvs. with a dark green ground, and pearl-like spots of regular size and arrangement .... 5. margaritacea.  

EE. Lvs. with a dark green ground, and irregular light-colored blotches between the veins .... 6. Hendersonii.  

EEE. Lvs. silvery, only the nerves dark green .... 7. argentea.  

1. speciosa, Zenker. This is practically the only species cult. for its flowers: height 1 ft.:  

2345. Solidago Canadensis.  

2346. Solidago nemoralis.  

2347. Solidago rugosa.  


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 ft. long; the smaller a half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticulate, 9-11-nerved: fls. violet. India. R.H. 1865, p. 91, is too poor to determine.—Probably not in cult.

3. picta, Korth. Erect or ascending, with scurvy 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. rose. Sumatra.—Of 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 bronzey colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. In J.H. 37:113 the lvs. are shown as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color of lvs. not recorded. Habitat not stated. The typical form is said to have bronzey lvs. with an amaranth reverse. Var. guttulata has green lvs. peppered.
with small white dots and is pale green below. Var. pallida is like the preceding, but with paler leaves. Var. pecta usually has the purplish tinge of the type, and the long lanceolate leaves. Var. Robert Sallier, K.B. 20:61, has dark green, narrow leaves, some with a long white stripe of silver down the middle. Said to be a hybrid of var. pecta 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-lanceolate, acutely serrate, 7-nerved, and green on the upper, pale below, at the base, 5-nerved. B.M. 5194. F.S. 11:1136 (nerves too parallel). I.H. 2:46. Lowe 16.—Supposed to be native of Java. In Vol.II, ed.1, p.684, *Gravesia glutata*, var. *margaritacea*, is erroneously referred to Sonerila instead of Salpinga. *Salpinga* *margaritacea* is readily told from *Sonerila margaritacea* by its 5-nerved lvs. and floral parts in 5's.

6. **Hendersoni**, Hort. This is referred to Cogniaux to *S. margaritacea*, of which it is perhaps merely a horticultural variety. In trade purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotched foliage. It differs from the type in having a broader leaf with a shorter acumen and rounded base, and especially in being covered with irregular blotches, which, however, do not cross the nerves. F.M. 1875:139. I.H. 23:230.—The blotches are all about the same size. *S. Hendersoni*, Lind. is more regular and roundish blotches, which are nearer white and on a darker ground. The under side is netted with rosy purple. 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 silvery foliage, resembling that of certain begonias, with no dark green except on the nerves. This is the parent of most of the forms that have a silvery cast of foliage, just as *S. Hendersoni* is responsible for the irregular blotches. I.H. 23:230.—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 groups is called Mme. Paul de Tio. It has the serrate leaf and some of the silveriness of *S. argentea*, with the number of nerves similar to the *S. orientalis* hybrid. It is merely named by Robert Sallier, but the central coloring is bronzey as well as silvery and very broken up by the green.

*S. sarmentosa* Sieb. et Zucc. cannot be accounted for by the undersigned.

W. M.

**Sophora** (Sophora, Arabian name of a tree with pea-shaped flowers). Including *Styphnolobium* 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 harder. The evergreen species with large yellow flowers, 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 frost. *S. Japonica* is especially valuable for its late-blooming flowers, which are white or pink 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 equally well in rather dry soil. Prop. by seeds and the varieties by grafting on the formal type; some species are also increased by greenwood cuttings and by layers.

There are 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, indehiscent or tardily dehiscent. The fls. and frs. of *S. Japonica* yield a yellow dye, *S. tomentosa* has medicinal properties, and the seeds of *S. secundiflora* contain saponine, a poisonous alkaloid. *S. tetrapetala* is a valuable timber tree in its native country.

2348. *Sophora Japonica*, var. pendula, in winter.

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(Including names advertised under Edwardsia. S. L. = supplementary list.)

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australis, s. l.  
aronia, s. l.  
Chilenia, s. l.  
Chinenes, s. l.  
chrystophylla, s. l.  
viocea, s. l.  

A. Lvs. white or violet.

b. Lvs. deciduous: lvs. in terminal panicles.

c. Calyx rounded at the base.

1. **Japonica**, Linn. (Styphnolobium *Japonicum*, Schott.) *Japan Pagoda Tree*. tree, attaining 90 ft., with spreading branches, forming a dense round head; lvs. 7-9 in. long; lfts. 3-13, distinctly stalked, ovate to ovate-lanceolate, acutate, rounded at base, dark green and glossy above, more or less pubescent beneath, 1-2 in. long; fls. yellowish white, ⅔ in. long, in loose panicles; 15 in. long; pod distinctly stalked, glabrous, terete, 2-3 in. long, ⅔ in. broad. July—Sept. China; cult. in Japan. F. 24:19, pp. 210, 211, 212; 25, p. 222. G.—M. 38:655. Gng, 6, p. 247. M.D.G. 1888:182.—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. 1886:182. 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 its provisional names; such are *S. Chinenes*, *Koroskei*, *tomentosa* and *viocea*, 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 lfts.: lfts. 11-15, alternate, ovate to elliptic-lanceolate, acuminate, glabrous or nearly so, 2-3½ in. long; fls. white, over ⅔ in. long; calyx gradually narrowed into the short pedicel; pod oblong to oblong-lanceolate, compressed and 2-winged, 1-6-seeded. Japan. Has proved hardier than *S. Japonica* and is therefore to be recommended for northern regions.

c. Lvs. persistent: lvs. violet, in terminal racemes.

3. **secundiflora**, Linn. *Lag*. Small tree, 35 ft. high, or shrubby, with short, slender trunk and upright branches forming
SOPHNIINAES. A genus of about 4 species cultivated on account of their neat habit and brilliantly colored flowers; pseudobulbs small, with 1-2 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 leaning into a long, narrow, purplish callus in the wall of the pouch; 2 long, 2 short, the stigmatic surface covering 2 wing-like projections at its summit; pollinia 8. This genus is closely related to Laelia, Cattleya, etc.

4. tetrapera. Ait. Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches; lvs. very numerous, almost sessile, ovate to linear-oblong, silky-pubescent beneath; fls. in 2-8-fld. racemes, densely violet-pubescent with a few dark spots, very fragrant, about 1 in. long, in one-sided racemes 2-3 in. long; pod white-tomentose, terete, 1-7 in. long, ½-3½ in. thick; seed bright scarlet. Spring. Texas, New Mexico. S.S. 3:121. B.R. 1884:301.—On account of its handsome fragrant lvs. to be recommended for planting south.

AA.

B. Pod 4-winged: lfs. about 1½ in. long.

5. macropus, Smith (Edwardsia Chiselia, Miers). Shrub or small tree, with the young branches densely tomentose: fls. in 10-20 pairs, elliptic or obovate obtuse, silky-pubescent beneath, ½-3¼ in. long; fls. ½-3 in. long, in short racemes; standard as long as wings. B.M. 1442 3715. Grn. 24, p. 211. Grn. 12:87 also seems to belong here.

BB.

B. Pod not winged: lfs. 3½-1 in. long.

violaee, Lindl. One of the smallest of cultivated orchids: pseudobulbs ovoid, 1 in. long: lvs. linear, 2-3 in. long; fls. bright rose, about 1 in. in diam.; sepals and petals obovate-lanceolate, acute; labellum rhombic-ovate, flat. Winter. Organ Miss., Brazil. B.M. 6800

HEINRICH HÄsselBING and WM. MATHEWS.

SORBARIA (derived from Sorbus: the leaves resemble those of the mountain ash). Basitima. Rosaceae. Ornamental deciduous shrubs with rather large, odd-pinnate or bipinnate leaves and white flowers in terminal showy panicles. Sorbaria sorbifolia, S. alpina and S. Aitichioa are hardly north, while S. Lindleyana is only half-hardy. They are well adapted for borders of shrubbery and woods or for planting on banks of brooks or rivers, but should not be brought together with slow-growing and delicate shrubs, as they spread in suitable soil rather rapidly by means of suckers and are likely to overrun other plants. The pods of the some 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. Milleri, which prefers a rather dry and sunny position, grow best in a somewhat moist and rich

SOPHORA Japonica, var. pendula, in summer.

dark spots, very fragrant, about 1 in. long, in one-sided racemes 2-3 in. long; pod white-tomentose, terete, 1-7 in. long, ½-3½ in. thick; seed bright scarlet. Spring. Texas, New Mexico. S.S. 3:121. B.R. 1884:301.—On account of its handsome fragrant lfs. to be recommended for planting south.

AA.

B. Pod 4-winged: lfs. about 1½ in. long.

5. macropus, Smith (Edwardsia Chiselia, Miers). Shrub or small tree, with the young branches densely tomentose: fls. in 10-20 pairs, elliptic or obovate obtuse, silky-pubescent beneath, ½-3¼ in. long; fls. ½-3 in. long, in short racemes; standard as long as wings. B.M. 1442 3715. Grn. 24, p. 211. Grn. 12:87 also seems to belong here.

BB.

B. Pod not winged: lfs. 3½-1 in. long.

violaee, Lindl. One of the smallest of cultivated orchids: pseudobulbs ovoid, 1 in. long: lvs. linear, 2-3 in. long; fls. bright rose, about 1 in. in diam.; sepals and petals obovate-lanceolate, acute; labellum rhombic-ovate, flat. Winter. Organ Miss., Brazil. B.M. 6800

HEINRICH HÄsselBING and WM. MATHEWS.

SORBARIA (derived from Sorbus: the leaves resemble those of the mountain ash). Basitima. Rosaceae. Ornamental deciduous shrubs with rather large, odd-pinnate or bipinnate leaves and white flowers in terminal showy panicles. Sorbaria sorbifolia, S. alpina and S. Aitichioa are hardly north, while S. Lindleyana is only half-hardy. They are well adapted for borders of shrubbery and woods or for planting on banks of brooks or rivers, but should not be brought together with slow-growing and delicate shrubs, as they spread in suitable soil rather rapidly by means of suckers and are likely to overrun other plants. The pods of the some 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. Milleri, which prefers a rather dry and sunny position, grow best in a somewhat moist and rich
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.

**SOEBUS**

* Millefolium, Foekke (Spiraea Millefolium, Torrey. Chamisobalanieria Millefolium, Maxim. Basilia Millefolium, Kuntze). Aromatic, glabrous-pubescent spreading shrub, 2-4 ft. high; lvs. lanceolate in outline, 1-3 in. long, with minute, densely set, oblong and obrunescent lfts. 2-5 in. across. The young Aria and Aug. Calif. to Wyoming and Arizona. G. F. 2. 500. G. C. III. 22. 235.—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.

**ALFRED REHDER.**

**SORBUS** (ancient Latin name of *S. domestica*). Including *Aria, Aronia, Ceymus, Miroeetis Mal dominaria, Roadagea*. Ornamental deciduous trees or shrubs, with alternate simple or odd-pinnate leaves, white or rarely pinkish flowers in terminal corymbus and berry-like, usually red fruit. Most of them are hardy north except some Asiatic species and Sorbus domestica, which seem tender north of Mass. They are chiefly inhabitants of mountainous regions, and the northern species, as *S. Americana* and *Sambucaea*, do not thrive well in warmer and drier climates, while *S. 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, 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 Ancieaparia group are more adapted for cool and moist mountain regions; those of the Aria and Tormentaria group, which grow specially well on limestone soil, are suited to warmer and drier climates. *S. hybrida* is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit. *S. oblata* and *S. melanocarpa* are handsome shrubs for borders of shrubbery; they prefer moist soil, but *S. melanocarpa* also grows in drier rocky situations. Prop. by seeds sown in fall or stratified; or by layers, and *S. arbutifolia* and *S. melanocarpa* from greenwood cuttings. Varieties and rarer kinds are usually budded or grafted on allied species, but most kinds will grow on *S. Acoecaparia* 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 Fla. and New Mex., in Asia south to the Himalayas. Lvs. simple or odd-pinnate, stipulate; fls. in corymb or cap.; stamens and petals 5; stamens 15-20, with red or yellow anthers; styles 2-5, free or conate at the base: fr. a 2-5-lobed pome, usually rather small, with 1 or 2 seeds in each cell. Closely allied and often referred to Paraguay, from which it is chiefly distinguished by its compound inflorescence and by the fls. being more or less perigynous except in the *Microeetis* group, which has a decidedly inferior ovary like *Pyrus*; the fruits, too, are usually smaller and berry-like.

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**Sorbifolia**. A. Braun (Spiraea sorbifolia, Linn. Basilia sorbifolia, Raf.). Fig. 2350. Upright shrub, 3-5 ft. high: Flts. 13-23, lanceolate or ovate-lanceolate, long-acuminate, doubly serrate, stipulate-pubescent beneath when young or glabrous, 3-4 in. long: panicles 5-12 in. long: sfs. 3/4 in. across. June, July. N. Asia from Ural to Japan. A. G. 11:129. G. 16, p. 217.—Escaped from cultivation in some localities in the Middle States.

**c. Fls. 3/4 in. across.**


**BB. Panicles with spreading ramifications.**

**c. Young branches pubescent, green.**


**cc. Young branches glabrous, usually red.**

A. Foliage pinnate.
B. Lvs. regularly pinnate, with the lfts. of almost equal size.
C. Fruits small, 2½-5 in. across or slightly larger, berry-like. (Aucuparia group, species 1-4.)
D. Winter-buds covered with white villous tomentose glabrous. Young branchlets and lvs. pubescent................. 1. Aucuparia
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B. Styles 5; trees or rarely shrubs.
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E. Pairs of veins 5-6.
F. Base of the usually broadly ovate lvs. mostly rounded........ 9. latifolia
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(Aucuparia group, species 1-4.)

1. Aucuparia, Linn. (Pyrus Aucuparia, Geoffr.). European Mountain Ash. Rowan Tree. Fig. 2351. Round-headed tree, 20 to 40, occasionally 60 ft. high: young branchlets pubescent, grayish brown when older: petals more or less tomentose; lfts. 5-9, obtuse, oblong-binate, serrate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, 2½-2 in. long: fls. white, ½ in. across, in flat, 4-6-in. broad, tomentose or glabrous corymb: stamens about as long as petals: fr. globose, about ½ in. across, bright red. May, June. Europe to W. Asia and Siberia. —Var. dulecis, Kratzl. (var. Morvidovii, Zengerli.) Almost glabrous: petals purplish, lfts. oblong-lanceolate, 2½-3 in. long, broad, bright green. The fruits are of an agreeable acid flavor and recommended for preserves. The tree thrives well in cold northern climates where hardly any other fruit tree will grow. —Var. dulecis Jancinata, Belson, is a handsome and graceful form with the lfts. pinnately lobed and the leaf-stalks and young branchlets bright red. Var. fastigiatam, Loud., forms a narrow pyramidal tree, with upright branches. Var. pendula, Hort., has long and slender pendulous branches. Var. Rosacea, Hort., seems little or not different from var. dulecis. Var. fructu luteo and var. Fichiina, Hort., have yellow fruits. There are vars. with variegated foliage of the typical and of the weeping form. The fruits of S. Aucuparia and S. domestica, tormentalis and var. dulecis are edible, and the strong and close-grained wood of S. domestica and S. tormentalis, in a lesser degree that of S. Aucuparia, is valued for handles of tools and similar small articles. See Pyrus.

2. Tianschhanica, Rupr. (Pyrus Tianschhicae, Regel). Small tree or shrub, similar to the preceding: young branchlets glabrous, red-brown and glossy when older: petals and lvs. glabrous; lfts. 11-15, lanceolate, acuminate, serrate, entire toward the base, dark green and glossy above, light green beneath, about 2 in. long: corymb glabrous; stamens half as long as petals: styles 2-5: fr. globose, bright red. May, June. C. Asia. Gt. 40, p. 8. B.M. 7755.—Very handsome on account of the contrast of its dark green foliage and red-brown branches.

3. Americana, Marsh. (Pyrus Americana, DC. S. microdonta, Dum-Cours.). American Mountain Ash. Doeberry. Fig. 2352. Small tree, attaining 30 ft., with spreading branches, domed or shrubby. Lvs. and corymb: lfts. 11-17, lanceolate, long-acuminate, sharply serrate, glabrous or slightly pubescent when young, light green above, paler beneath, 1½-4 in. long: fls. one-fifth to ¾ in. across, in dense, 3-6-in. broad, usually glabrous corymb: fr. globose, bright red, ¾-⅔ in. across, with the calyx-lobes very small and conning. May, June. Newfoundland.

2351. Sorbus Aucuparia. (X ½.)

to Manitoba, south to Mich. and N. C. S.S. 4:171, 172. —Var. microcarpa, Torr. & Gray (S. microcarpa, Pursh), has narrower foliage and very small fruits about ½ in. across.

4. sambucifolia, Roem. (Pyrus sambucifolia, Cham. & Schlecht.). Western Mountain Ash. With the previous. W. Asia. Glabrous: petals purplish, lfts. oblong-lanceolate, 2½-3 in. long, broad, bright green. The fruits are of an agreeable acid flavor and recommended for preserves. The tree thrives well in cold northern climates where hardly any other fruit tree will grow. Var. dulecis Faciniata, Belson, is a handsome and graceful form
confounded with the preceding species; both are very handsome in Autumn with their large clusters of bright red fruits. Sometimes a form of S. hybridra is found in American nurseries under the name of S. sambucifolia. 

(Corpus and Hybrid group, species 3-7)

5. domestica, Linn. (Pyrus Sorbus, Gertrn. P. domestic, Smith. Corbus domestica, Spach). SERVICE Tree. Fig. 2353. Round-headed tree, 30-60 ft. high; winter-buds glabrous; petals tomentose; leaves 11-17, obovate-oblong to oblong, sharply and rather coarsely serrate, with acuminate teeth, usually entire near the base, green and glabrous above, floccose-tomentose beneath, at least when young, 1-2 in. long; fls. white, ⅓ in. across, in broadly pyramidal rather loose, tomentose corymbs: fr. ⅓-½ in. across, usually yellowish, with red or orange cheek, apple-shaped in var. maifolia, Lodd., pear-shaped in var. pyriformis, Lodd. May. S. Eu., N. Afr. and W. Asia. G.C. II. 1:283; 6:649. M.D.G. 1897:576-378. - This species is often confused with the European ash, from which it is almost indistinguishable without fruits or flowers, except by the glabrous winter-buds.

6. hybridra, Linn. (Pyrus pinmatlifolia, Ehrh. P. Fennica, Babington. S. intermedia × Aucuparia). Tree, attaining 40 ft., of regular, pyramidal habit with upright branches; young branchlets and petals whitish tomentose; fls. ovate to oblong-ovate, with 1-4 pairs of deciduous leaves at the base, or at least pinnately lobed, upper part lobed with the lobes becoming gradually shorter and more indistinct toward the apex, dark green above, whitish or grayish tomentose beneath, 2½-4 in. long; petals about 1 in. long; fls. ⅓-½ in. across, in tomentose corymbs about 1 in. broad; fr. globose-ovoid, ⅓ in. high. May. June. - Natural hybrid, occasionally found with the parents in Europe. Two different hybrids are usually included under S. hybridra; the typical one is S. Aucuparia × intermedia, which has the petals oblong-ovate to oblong, 3-5 in. long, with 10-12 pairs of veins, the leaves and lobes narrower and pointed and the veins often slightly recurved. It is mostly cult. under the name of S. querocollata or quercobole, Hort. The second hybrid is var. Thuringia, Rehd. (Pyrus Thuringiae, lobe), and is a hybrid of S. Aucuparia × Aria; it has ovate-ovate-oblong fls., somewhat more deeply lobed, 2½-4 in. long, with 8-10 pairs of veins, lfts. and lobes broader and obtuse, with the veins usually curving upwards. This is known in gardens as S. quercifolia hybridra nana. Var. decidua, Koehne (S. laungina, Hort., not Kt.), is a transition to S. Aucuparia; only the 3 or 5 upper lfts. are conuate into a terminal lft., which, like the upper separate lfts., is deciduous at the base, under side less densely tomentose. In some nurseries under the name of S. sambucifolia.

7. spuria, Pers. (Pyrus heterophylla, Dur. S. Aucuparia × arbutifolia). Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches; fls. ovate to oblong-ovate, obtuse, about 2-lobes or lfts. near the base, simply crenate-serrate toward the apex, 1½-2½ in. long, pubescent or glabrous beneath: fls. white or pinkish white, in pubescent or glabrous corymbs 1½ in. broad: fr. subglobose or pear-shaped, dark purple or almost black. May. June. Of garden origin. B.R. 14:1196. - Sometimes cultivated under the name S. querocollata floribunda nana. Hybrids of different origin are usually united under S. spuria: the more pubescent forms with dark purple fr. are probably the offspring of S. Aucuparia and 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 fls., originated at the Arnold Arboretum and probably a hybrid of S. Americana and S. melanocarpa, was named S. Sargentii, Dipp. (Torminaria group, species No. 8.)

8. torminalis, Crantz (Pyrus torminalis, Ehrh. Torminalia torminalis, Dipp. T. Clusi, Rom.). WILD SERVICE Tree. Round-headed tree, with spreading branches, 40-80 ft. high; fls. broadly ovate, slightly cordate to broadly cuneate at the base, with several triangular-ovate, serrate lobes on each side, the lower sinuses reaching about half way to the middle, floccose-tomentose when young, 2-4 in. long; petals 1½-3 in. long; fls. white, ⅓ in. across, in broad, rather loose: tomentose corymbs: fr. oval, ⅓-½ in. high, brown, dotted. May. June. Southern and middle Europe. - The foliage turns bright red in fall. (Aria group, species 9-13.)

pinnately lobed with broad and short, irregularly serrate lobes and 5-8 pairs of veins, whitish tomentose beneath, 1/2-4 in. long; petals 3/4-1 in. long; fr. about 3/4 in. across, broad, yellowish-brown, corymbose, red, globose or subglobose, about 2/3 in. high. May.

Northern and middle Europe.—This is sometimes confounded with **S. hybridra** and considered to be a hybrid of similar origin or a good variety. There never before exists leaves at the base and the sinuses do not reach farther than one-third toward the middle.

**11. flabelillifolia**, Schau. (Pyrus Aria, var. flabelillifolia, Arbo. Kew. *Aria flabelillifolia*, Decne. *Sorghum.* Hort.). Small tree, attaining 20 ft.; the fruits are to broadly oval, obtuse, usually broadly cuneate at the base, incised lobed above the middle, with the short lobes truncate or rounded and coarsely toothed, snowy white beneath, 1/2-2/3 in. long; fls. scarcely 3/4 in. across, in dense, white-tomentose corymb; fr. depressed-globose, orange-red. Southeastern Eu., W. Asia.—Cult. in some nurseries as *Pyrus aurea striata*.

**12. Aria*, Cranta (Pyrus Aria, Ehrn. Aria nivea, Hort. *Malus Aria*, Med.). White Beam-Tree. Fig. 2354. Tree, with broadly pyramidal or oval head, 25-50 ft. high; lvs. roundish obovate to oblong-oval, usually cuneate at the base, acute or obtuse at the apex, sharply and doubly serrate, of firm texture, bright or dull green and glabrous above, white-tomentose beneath, 2-5 in. long; petals 3/4-3/4 in. long; fls. 3/4-3/4 in. across, in tomentose, 2-3-in. broad corymb; fr. subglobose, orange-red, about 3/4 in. high. May. Middle and southern Europe and Siber.—Desirable tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and sides of the leaves. Several varieties are known. Var. *Crítica*, Lindl. *Aria Greca*, Decne. *Lvs* orbicular-obovate, coarsely doubly serrate, 3/4-2 in. long, with 6-10 pairs of veins. Southern Eu. *Var. Decaisneana*, Rehd. (Aria Decaisneana, Lah. *Pyrus Decaisneana*, Nichols.). Lvs. elliptic to oblong-ovate, acute or inapinate, coarsely serrate, of long-stemmed longer than petals; fr. oval. Probably from the Himalayas and sometimes cult. as *S. nepalensis*. *Var. edulis*, Wenzig (Pyrus edulis, Wiltld.) Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2-5 in. long; fr. oval, 3/4-3/4 in. high. There are some garden forms, as var. *aurea*, *chrysophylla* and *lutescens*, with more or less yellow foliage.

(Aaronia group, species Nos. 12 and 14.)

**13. arbutifolia**, C. Koch (Pyrus arbutifolia, Linn. f. *Aaronia arbutifolia*, Elliot. *A. pyrifolia*, Pers. *Mespilus arbutifolia*, var. erythrocerca, Michx.). **RED CHOBERRY**. Upright shrub, 6-12 ft. high; lvs. short-petioled ovate or acute or oblong-ovate, acuminate, crenately serrate, glabrous above except on the glands on the midrib, whitish or grayish green and tomentose or pubescent beneath, 1 1/4-3 in. long; corymb tomentose, few to many-flowered, 1 1/4 in. broad; fr. white or tinged red, 3/4-3/4 in. across, subglobose or pear-shaped, bright or dull red, about 3/4 in. April. May. Nova Scotia to Minn., south to Fla. and La. **B.M. 3608.** G.F. 3:417. **G.S. 2354. Sorbus Aria (X 34).**


**SORGHUM.** The genus Sorghum is referred to *Andropogon* by Hackel 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, Kaffir Corn, Jerusalem Corn, Milo Maize, Durra, etc., are considered as having been
derived from the wild species, *Sorghum vulgare* (Andropogon Sorghum). Others maintain these cultivated forms as varieties of a distinct species, *Sorghum vulgare* (Andropogon Sorghum). The cultivated forms are annuals, with tall jointed stems, bearing large terminal panicles. They fall naturally into three groups, depending upon their uses: (1) Broom Corn, in which the branches of the panicle are elongated and are thus adapted to the manufacture of brooms; (2) the Sugar or Saccharine Sorghums, with loose panicles, the branches drooping, and red-brown spikelets, cultivated for the sweet juice and for forage. Amber and Orange are leading forms of Sorghum. See Saccharum. (3) The remaining varieties are grouped together as Non-Saccharine Sorghums. They are grown for forage and for the seed. *Sor* 4, p. 83 (B. bicolor). The common forms grown in this country and offered in the trade are: *Kaffir* Corn, with stems 4-5 feet high, stocky growth, and dense, upright panicles; *Millo* Maize, or African Millet, similar but about twice as tall; *Dura* (variously spelled *Doura*, *Dhaura*, etc.), including Egyptian Rice Corn, Guinea Corn, etc., with compact panicles on a recurved stalk.

A. S. Hitchcock.

**Sorrel.** Various species of *Rumex* (which see) produce large, thick, acid leaves which are prized for salads or for "green-supper". 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. The 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.

**Sorrel-tree.** *Oxydendrum.*

**Sorrel wood.** *Oxalis Acetosella.*

**Sour gum.** See *Nyssa sylvatica.*

**Sour sop.** *Anona muricata.*

**Sour wood.** *Oxydendrum.*
adapted. The cherry, peach, pear, grape, small fruits and apple afford an 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 towards growing fruit and vegetables for home purposes in mills, so numerous in this section, we have converted the farms in their vicinity into market gardens. The typical mountain waggons, hooded with white canvas, laden with luscious apples, mammoth cabbages, mealy potatoes and fragrant onions, products of the region. The habits 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.

J. S. Newman.

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. 43° 57' N. and 42° 26' S. and long. 95° 30' 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 76,815 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 extreme southeast corner, the state being 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, include 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 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. These are White, Bad, Cheyenne, Moorean or Owl, and the Big rivers. The rainfall in this part is too light to make general farming feasible, but the native grasses are very nutritious and stock-raising is profitable. Cattle, horses and sheep are raised in immense numbers, cotton 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-raising and dairying are the main industries owing to the lesser rainfall. Since the grading 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 326,800,000 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 utilised, it is confidently believed that the horticultural area shown on the map below will be increased to 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-
SOUTH DAKOTA

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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 grain-ras

s and stock-raising. The orchard is a dairying affording more profitable sources of income. In making up a list of apples for planting throughout the state, it will be a safe rule not to plant any variety less hardy than the Dakota-bull. This bull Experimental orchard desires a long-lived, fruitful orchard and cannot afford to experiment. The State Horticultural Society recommends the following for trial or general cultivation in the severest part of the Dakotas: viz., Dakota-bull, Oldenburg, Hibernal, Charlamuff, Wealthy. The largest orchard in the state is Turner county, consisting of 7,000 trees on about 132 acres. This orchard was planted in the early seventies and still yields the profitable crops. About 4,000 of the trees 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 pushed, and Dakota will be one of the largest fruit states of the northwest. Piece root-grafting will not be a fair test, as everything below ground should be Siberian. (See Bull. 65 of S. Exp. Sta., and Am. Pom. Soc. Rpt. 1896, p. 148.) Of plums, only those of the Americana type, such as DeSoto, Wyant, Wolf, Forest Garden, Rollingstone and Hawkeye, are of any value for general cultivation. Havens and southern tier counties already mentioned the Miner does well and is much grown. Prunus americana is indigenous throughout the state. Many varieties from the native thickets are being grown by the people, and those probably superior to the varieties named above, which originated in Iowa, Minnesota and Wisconsin. Plums rightly managed are very profitable and the general interest in them is increasing. The main trouble hitherto has been the planting of those 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 drawback to the grower of the hardy plum. This fact is becoming more generally known. Trees worked on Americana seedlings or trees on their own roots find favor, as no trouble is then experienced from root-killing. The native and semi-native to the state, is being tested as a stock at the Experiment Station at Brookings. So far the indications 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. 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. Straw-berrys are considerably grown in the southern part of the state, and irrigation is found profitable, as it insures a crop in dry seasons. Grapes are grown to some extent in the southern tier of counties, and the experimental vineyards are severe 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 hardy to the severest part of the state. It is probable that new varieties of grapes adapted to the prairie northwest will be produced by plant-breeding, using the indigenous Vitis riparia as a foundation. Thousands of the 5,000 old grape seedlings grown by the Experiment Station at Brookings in 1900 are grown in 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 object is placed upon pure selection, acting upon the theory that "essential fruit requires essential selection." The following native species have been taken in hand in this plant-breeding work: sand cherry, choke-cherry, pin cherry, black currant, golden currant, goose-beer, high-bush blueberry, Juneberry, plum, red raspberry, black raspberry, strawberry. The work with cultivated fruits is mainly with the apple, an attempt being made to combine the hardiness of the native varieties with the capacity of the best American winter varieties. Several Siberian fruits have also been taken in hand. These were picked by the writer in 1897-98 when sent on a tour of inspection of the fruit-growing districts of northwestern, central and eastern Asia by U. S. Secretary of Agri
culture 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 cinipers, the hemlock, white pine, balsam fir, arborvitae and Norway spruce all on the open prairie, while Jack pine, bull pine, Scotch pine, northern red cedar, western white spruce, and Colorado aspen or balsam spruce all do well in open exposure. Of deciduous trees, the native species, such as ash, elm, box elder, black cherry and hackberry, all do well. Cottonwood and willows show the most promise of those that have been experienced in the earlier planting from a 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.

Floriculture 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 interests have assumed no importance, except near the larger towns. Agriculture has been extensive, rather than intensive. In a state yielding heavy crops of wheat and hay, it is probably surprising that commercial fertilizers are not thought of and yard 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 prac
tice, 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 are better acquainted with these things, and the demand decided modifications of eastern practices. The list of hardy trees and shrubs would be much longer were it not for the fact that the severest freezing of the Dakotas destroys, in a single winter, many of the varieties. The State Agricultural College at Brookings is a flourishing institution, the annual attendance being about five hundred. The United States Experiment Station is in connection with the college and presents the problems of 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 of the society are published from time to time in the agricultural press of the state. The twelfth annual meeting was held at Sioux Falls, January 22-24, 1901. The dry climate is very salubrious, and many people have taken up residence in the Dakota prairie because of the healthful climate and loca

N. E. HANSEN.
SOUTHERNWOOD (Artemisia Abrotanum, which see for botanical account) is a European herb, aromatic, much branched, woolly-stemmed, rather tender, perennial, 3-5 ft. tall, with pale green or grayish 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.

M. G. KAINS.

SOW BREAD. An old name for Cyclamen.

SOY BEAN (Glycine hispida, which see for botanical description) is a legume, and while it has long been a staple crop in Japan it has but somewhat recently been cultivated in the United States. Figs. 191, 195. It grows to perfection only in a tropical or semi-tropical climate. In its native country, Japan, the seed is an important human food product, but in the United States its principal use at present is as a forage plant for farm live stock and as a soil renovator. It is an upright, leafy, branching plant, growing 3-4 ft. high. Two distinct plants are often called Soy Bean; the smaller one (Phaseolus radiatus) is grown principally in Japan; the larger species, the true Soy Bean, is Glycine hispida. This latter species has become popular in some sections of the United States because of its power of resisting drought and for the further reason that it may supply a large amount of forage rich in protein. In the northern states it is probable that the Soy Bean will be acclimated and that it will serve as an adjunct to the maize crop as a food for stock, although it is coarse in leaf and stalk.

It thrives best upon a warm, well-drained loamy soil, and seed should not be planted until all danger from frost is over. The land should be prepared by plowing and harrowing in the early spring, and the harrow should be used two or three times before the seeds are planted. Best success is attained by planting in drills, rows to be from 2½-3 ft. apart and the hills in the row 18-20 in. apart. During the early periods of growth cultivation should be frequent, preferably with a fine-toothed implement. After the plants have grown so that the ground is well shaded the tillage may be discontinued. It is doubtful whether the curing of the plants for hay will ever come into general practice, but the crop may be largely grown for green feeding and for ensilage purposes. It may be cut into the silo with corn and serves to improve the quality of the food.

To the horticulturist the Soy Bean is valuable chiefly as a soil renovator. The soil of the orchard can be given clean culture during the early summer and the Soy Beans may be sown broadcast about July 1 and harrowed in. One bushel of seed per acre will be required. One bushel of rye per acre should be sown at the same time, for when the beans are killed down by the frost in the fall the rye will survive as an additional forage during the winter. When the soil is so hard and forbidding that clover will not thrive the Soy Bean may be made to serve as a nitrogen-gatherer, and when plowed under it serves to greatly improve the physical condition of the land. See also Glycine.

L. A. CLINTON.

SPANISH BAYONET. See Yucca.

SPANISH BROOM. Spartium junceum.

SPANISH LIME. Melicocca bijuga.

SPANISH OYSTER PLANT. Scutellaria.

Sparaxis (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Trigonia). 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 and exhibiting an extraordinary range of colou and throat markings. These plants are less popular than Ixias, which they much resemble. The plants are dwarfer and more compact than Ixias, usually 6-12 in. high, the spikes are shorter and flower development is sometimes later. Sparaxis is essentially distinguished from Ixia and other allied genera by the sub-regular perianth, unilateral and arcuate stamens, and scurceous, lacerated spathe-valves. Other general features are: the rootstock a corm; fls. linear or lanceolate and arranged in a basal rosette; inflorescence a simple or panned spike; perianth-tube short; ovary 3-celled; ovules many, superposed. 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 S. pulcherrima.

Sparaxis pulcherrima of the Dutch trade is properly Dierama pulcherrima, Baker. This grows 6 ft. high and more and has pendulous fls. bright blood-purple but apparently with pale rose and perhaps other varieties (also a white vari.). It is distinguished by its pendulous fls., with regular perianth, simple style-branches, equilateral stamens, and large bracts which are not laciniate. B.M. 5555. F.S. 17:1810. Gn. 20:315; 44, p. 281. This plant is said by F. W. Burbidge to be "perhaps the most graceful of all the Cape Irids."

A. Throat of flower same color as segments.
B. Fls. small; segments ⅓-⅔ in. long

1. bulbifera

BB. Fls. larger; segments 1 in. or more

2. grandiflora

AA. Throat of flower bright yellowish with a dark blotch on the lower part of each segment

3. tricolor

bulbifera, Ker. Corm globose, ⅓-⅔ 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-like cory; perianth-tube ½ in. long. B.M. 545 (Ixia bulbifera). To this species Baker refers S. albiflora, Eckl., with fls. whitish inside, and S. violacea, Eckl., with dark purple fls.

grandiflora, Ker. Habit, corm, lvs. and spathe just as in S. bulbifera but the fls. larger, the limb 1 in. or
more long, usually yellow or purple, and larger anthers. B.M. 779 (fls. primrose inside, flamed purple outside). B.R. 3:288 (fls. white inside, black purple). B.M. 541 (S. grandidirole. Fls. rich purple, margined lighter). — According to Baker, the primary named forms are: atropurpurea, dark purple; amoenomellitora, pale yellow; Liliago, white, flushed with claret-purple outside; and stellatoris, dark purple, the segments narrower than the type, oblanceolate and acute rather than oblong.

tricolor. Ker. Fig. 2358. Differs from S. grandidirole 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. 1482; 381 (S. tricolor). F.S. 2:124. F. 1843: 213 (S. 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 lavender, which latter color usually appears in the throat.

W. M.

2358. Sparaxis tricolor. (X 2/3).

SPARAXIS. (Greek, filet; referring to the ribbon-like lvs.) Typhaceae. BUR-REED. Bur-reeds are marsh herbs closely allied to cat-tails but with fls. in globose heads instead of oblong spikes. Three hardy perennial kinds are advertised by collectors of native plants and one or two are procurable from specialists in aquatics. Bur-reeds are desirable only in bog gardens or in wild gardening operations. The beauty of these plants often lies in each species being massed alone, as well as in the mixing with other plants.

Sparaxiaceae have creeping rootstocks and fibrous roots. Some are floating plants. Stems branched or not; lvs. linear, alternate, sheathing at the base: fls. monocious, in globose heads, the staminate uppermost: fr. sessile or peduncled, mostly 1-loculed and nut-like.

A. Inflorescence unbranched.

simplex. Huds. Stems weak and slender, 1½-2 ft. high, unbranched; lvs. more or less triquetrous; staminate heads 4–6; pistillate 2–4, 1–3 lines in diam.: fr. stalked. June–Aug. N. Amer. B.B. 1:64.

AA. Inflorescence branched.

b. Height 3-8 ft.


BB. Height 2-3 ft.

ramosa. Curt. Lvs. flat; heads 5-9, disposed in axillary and terminal, interrupted spikes; the lowest one larger and pistillate, the others wholly staminate: pistillate heads, 5–10 lines in diam. July. Southern U. S., particularly in mountain bogs.

W. M.

SPARAXIS. (after Andreas Sparmann, who visited the Cape with Thunberg). Tiliaceae. About 5 species of African shrubs or trees with cordate, dentate or lobed leaves and white flowers in terminal, umbelliform cymes: sepals 4; petals 4, naked at the base; stamens several, free, the anther-bearing ones interior, the staminodia exterior: capsule globose to ovoid, spiny. S. Africana is of easy treatment and is suited to heat 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. densely 5-7-lobed.

palmata. E. Mey. A slender shrub much smaller in all its parts than S. Africana: branches half herbaceous; lvs. on long petioles, the lobes long-acuminate, incisedly sinuate and unequally toothed, prominently 5-7-nerve below: fls. white or purplish, closely arranged on the subterminal peduncles: capsule 4-celled. Cult. in S. Calif.

AA. Lvs. not lobed.


F. W. BARCLAY.

Sparaxiaceae Africana is not common in S. California, but is highly esteemed. One in Singers Cou. is 25 years old, is 12 ft. high and 16 ft. through, and consists of about fifty trunks ½-4 inches in diameter. It was in full bloom in January and February and one of the finest sights imaginable. It was finely flushed with snowballs of 4 inches diameter, and admired by numbers of people. The blooms were so heavy that the ends of the branches touched the ground, necessitating severe pruning as soon as blooms were past beauty. No viburnum, hydrangea or other shrub can compare with it at its blooming season. During the remainder of the year it has the appearance of a clump of basswood suckers, the leaves being nearly identical in appearance with those of the basswood. It is therefore a dense mass of broad leaves and looks well anywhere and at any time. This is one of the finest white-flowered shrubs or trees in cultivation. The double variety is not so desirable as the single.

ERNEST BRANTON.

SPARROW-GRASS. Provincialism for Asparagus.

SPARTINA. (Greek, spinax, a cord; on account of the tough leaves). Gramineae. BUR-REEDS. Perennial marsh plants of various parts of the world, most of which are found in the United States. Calms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inwards: spikes 1-4 flled., in rows on two sides of the triangular or rachis; spikelets 2-3 flled., in a raceme.

cynosuroides, Wildl. FRESH-WATER 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.

SPARTIUM. (Greek spartos, the ancient name of the plant). Syn., Spartidithus. Leguminosae. Ornamental shrub, with long and slender green branches, small and sparse foliage, and showy papilionaceus yellow fls. in terminal racemes. It is a handsome shrub especially adapted for warmer and drier regions; in the East it is probably hardy as far north as Philadelphia. It becomes naturalized easily, as happened in several localities in S. America, whence it was afterwards described as S. Americana, 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 seeds and by open-rooted cuttings made of softwood 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 above, the tube tipped, tip with 5 minute teeth; keel incurved, acuminate; pedicel linear, compressed, many-seeded; seeds with callose appendage at the base like in Genista. The slender branches yield
SPARTIUM

fiber, which is used in S. France and Spain for making ropes, cords, and cloths. Many species of Cytisus and Genista were formerly referred to this genus. For *Spartium Lébeneus*, Riv., *S. ferox*, Poir., *S. monspess., Linn., S. radiatum*, Linn. and *S. virgatum*, Alt., see Genista; for *S. purpureus*, Linn., and *S. scoparium*, Linn., see Cytisus; *Spartium multiflorum*, Alt., see Cytisus albus.

*juncem*, Linn. (*Genista juncem*, Lam. *Spartidithus juncem*, Link.). *Spanish Broom*. Upright shrub, 10 ft. high, with slender, terete, green, rush-like branches sparingly leafy or almost leafless: lvs. oblongate to linear, entire, bluish green and sparingly appressed pubescent, ½-1½ in. long; fls. fragrant, white, about 1 in. long, with ample standard; pod linear, pubescent, 2 in. long, seed Cytisus; *Spartium umbraticum*, Alt., see Cytisus albus.

SPATHIPHYLLUM (Greek word, referring to the leaf-like spathes). *Arceae*. 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 spadix subtended by an oblong or lanceolate, leaf-like, white, persistent, flat spathe: stigma 3-4-lobed: ovules 2; style long; anthers indurate; locule 3-8; fixed at the interior angles of the cells. Gardeners recommend as sill for their culture a mixture of leaf-mold, peat and fibrous loam, together with some sand and charcoal.

A. Spath. less than 4 in. long.

b. *Lvs.* 2-3 in. wide.

c. Scape thickened and curved below the spathe.

*paridium*, 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: spathe oblong-lanceolate, long; cuspidate-acute, acuminate, about 3½ in. long by 1 in. wide, white; spadix white, a little shorter than the spathe. Colombia. *I.H.* 21:159. F. 1886. p. 76.

b. *Lvs.* less than 2 in. wide.

c. Scape straight.

*Pálini*, 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-lanceolate, very long-acumin ate, white except for the green costa, spreading or recurved; spadix long stipitate (5 lines), a little shorter than the spathe. Colombia. *I.H.* 27:397.

SPATHOGLOTTIS (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, 1-3-lvd.: lvs. elongate, long-petioled, narrow, plicate, articulated : scape lateral, bearing large fls. in a terminal, large, spathes free, subequal; petals similar or broader and longer; label lumbum not spurred, lateral lobes somewhat convoluted, middle lobe clawed; column slender; pollinia 8. About 10 species in Asia, Australia and the Malay Islands.

*Spathoglottis* Poepp., ex Schott. *Spathoglottis Póepp., ex Schott.* A group of terrestrial species, rarely inserted in a pseudobulb: leaves long, narrow, leathery, acuminate, with a rather long, acuminate, slightly curved, white or green, often with a marginal brown band; inflorescence a raceme or spike; sepals and petals similar or subequal; pollinia 8; polliniferous gland sometimes rather long, acuminate. There are about 40 species. *S. rumphiana*, L., is perhaps the best known species. They are found in tropical America, Asia, and the Pacific Islands.

**2339. Spathoglottis Vieillardi.** (×3/4.)

*Púlica*, Blume. *Lvs.* 2-4 ft. long, finely acuminate, scape 2-3 ft. high, with a raceme 6-12 in. long: fls. 1 in. across, lillac; sepals and petals broad, acute; middle lobe of the labelium long and narrow, cuneately dilated at the tip; calli yellow, villous. Malay Peninsula.


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SPATHOGLOTTIS

Viellidi{e}, Reichb. f. (S. Augustinum, Reichb. f., Fig. 2535. Lvs. long-lanceolate, acuminate, 1-5 ft. long; scape 12-18 in. high, robust: raceme 6 in. long, broad, eoryn-thyme at first; fls. 2 in. across, very pale lilac, nearly white; sepal and petals ovate-oblong, subacute; labellum as long as the sepal, lateral lobes orange-brown, with orange at tip, deep red, middle lobe narrow, with a broadened tip variable in form. New Caledonia. B.M. 7013. A.G. 12:93. A.F. 6:631. — N. aurea-Viellidii, Hort., is a hybrid between this and S. aurea. Fls. pale lilac-yellow, with the sepal slightly and the petals profusely dotted with crimson, the tips of the lobes of the lip rich crimson. G.C. III. 23:369. G.M. 41:308.

S. Kimballiana, Hook. is often regarded as a variety of S. aurea, on which it differs in having the backs of the sepal mottled with red-brown, the crest glabrous, and narrower lvs. B.M. 7443. — S. polycata, var. Michelottii, is advertised by Sander. Fls. amaranth color, with the segments broader than in the type. Habit more dwarf.

HEINRICH HASSELBRING and R. M. GREY.

SPATHYEMA (Greek; referring to the spathae).

Ardeaee. 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 considered a weed by flower lovers who have nothing but contempt 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 3-6 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 are a matter of much discussion; the stamens are generally out in February or March. The hoods 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, and by collectors. There is a considerable demand for it outside of its native region, and particularly in England, where the "bog 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

2360. Skunk Cabbage, as the hoods come up in spring.— Spathyema forida (X 1-5).

celebrated by outdoor writers from Thoreau to the present day. The question of its pollination has been much discussed, but long supposed to be pollinated by the action of the carrion flies which are attracted by its odor. However, Trelcass has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later. Skunk Cabbage has long been known as Symlocarpus, 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 sepal; anthers 2-ellular; style pyramidal, 4-sidet; ovary 1-loculed, with a solitary, suspended, anatropous ovule; berries in large heads, 1-seeded. Only one species.


W. M.

SPATTER-DOCK. Nuphar advena.

SPEARLEAF. See Mentha.

SPEAR-WOOD. Eucalyptus doratoxylon.

SPEARWORT. Certain species of Ranunculus.

SPECULARIA (from Speculum Veneris, meaning Venus' Looking-glass). Campanulaeae. VENUS' LOOKING-glass (Specularia Speculum) is a pretty little hardy annual herb with 3-lobed blue flowers not quite an inch across. The plants grow about 9 in. high, bloom 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, S. perforata, 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. oblate 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-loculed; stigma shortly 3-lobed.

A. Peduncles about 3-fld.

Speculum, DC. (Campánula Spéculum, Linn.). VENUS' LOOKING-glass. Fig. 2361. Erect, 9 in. high: calyx glabrous or pubescent, the tube constricted at the sepals, which are finally reflexed towards the rim. There is one North American species, S. perforata, 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. oblate 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-loculed; stigma shortly 3-lobed.

A. Peduncles about 3-fld.

pentagonia, DC. Calyx plicate, 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.

W. M.

SPEEDWELL. Veronica.

SPELT. See Triticum.

SPERGULA (Latin spargere, to scatter; the seeds are said to be expelled). Caryophylláceae. A genus of 3-8 species of annual herbs including Sperula, which see. The flowers adapted to dry, 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 ¾ in. across and borne in terminal panicles. Important generic characters of Spergula are the small, scarios, stipules, 5 styles, alternating with the sepal and capsule-valves opposite the sepal.
Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

**arvensis**, Linn. *Spurry*, 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. Ed. B.B. 2:36.

W. M.

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**SPHAGNUM**


**SPHÆRÁLCEA** (Greek words, globe mallow; referring to the fruit). Malvidæae. **Globe Mallow.** About 23 species of tender herbs, subshrubs and shrubs, mostly native to the warmer parts of America: lvs. usually angled or lobed: fls. solitary or clustered, axillary, in terminal racemes or spikes, violet, rose, flesh-color or various shades of red: bractlets 3, free or united at the base; calyx 5-cut: locules of the ovary numerous, 2-3-ovuled, 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.

**acerifolia**, 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 spike clusters terminating the branch. Rocky Mts. B.M. 5404.

BB. Fls. in umbels.

**umbellata**, Don. Mexican shrub, 3 ft. or more high, with scarlet, pendulous fls., about 1½ 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-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, rose-colored: panicles axillary and terminal, numerous. Dry plains, Brit. Col. to Idaho and south. B.M. 3557 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 miniata*.

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**SPHERÓGYNE** (Greek words referring to the globe stigma). Melastomáceae. This genus has been referred to Toecca, which see for *S. latifolia*. This handsome foliage plant known to the French as Spergocolle 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 the larger plant with long parallel veins running from base to apex and many parallel transverse veins connecting them. Peru. I.H. 24:294.—Native of Peru, and introduced to Europe by Lindén in 1871. It is said to be easily grown in a warm house.

**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 northern 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 distinguishing characters 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 incised 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 epiphytal or swamp-loving character, such as Sarracenia, Darlingtonia, etc. Sphagnum often forms at least one-third of the growth 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 stock plants, such as Cordyline, Nepenthes, etc.; for starting tropical tuberos - rooted plants, such as fancy caladiums; for sowing seeds of orchids, Anthuriums, Nepenthes and Sarracenias 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.

BB. Fls. brick-red.

**cisplatina**, A. St. Hil. (S. miniata, Spach. *Mályva miniáta*, Cav. *M. miniáta*, Jacc. 1). Tender branching subshrub, 2-4 ft. high, formerly considered desirable for conservatories and rock gardens, but in November when it produces its brick-red flowers: lvs. 1-2 in. long, 3-lobed, coarsely and unequally crenate, midlobe longest: fls. 1-1½ in. across, in axillary, few-fl. cymose racemes. La Plata. The above description from B.M. 5986.—Miniata means circular-red, the color of red radish. There seems to be no reason why *Spergulae cisplatina* and *Munroana* should be confused. The lvs. of Munroana are obscurely 3-lobed, the lobes broad, blunt and short; the lvs. of *S. cisplatina* are deeply and sharply cut, acuminate and narrowed towards the base, the lobes narrow and acute, the midlobe 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. cisplatina*.

W. M.
SPHENÖGYNÉ. See Ursinia.

SPICE BUSH. Consult Benzoïn.

SPIDER FLOWER. Cleome.

SPIDER LILIES. Hymenocallis and Panteratum.

SPIDER PLANT. See Cleome.

SPIDERWORT. Tradescantia.

SPIGÉLIA (after Adrian von der Spigel, physician, 1558–1625). Loganiáceae. 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 small red, yellow or purplish flowers, usually borne in terminal, one-sided, somewhat curved spikes: calyx 5-lobe; segments narrow; corolla tubular; stamens 5, alternate; stamens 5, attached to the corolla-tube: ovary 2-loculed: style articulated, simple, obtuse or somewhat capitate and stigmatose at the summit: capsule flattened, circumference above the persistent base.

Marilándica, Linn. PINK ROOT. A handsome hardy perennial herb, with slender, tufted stems 1-2 ft. high, opposite, ovate, sessile, thin lvs. 2-4 in. long, and red, tubular fls. with yellow throats in terminal, 1-sided spikes. June, July. Woods, N. J. to Wls. and at lvs. B. B. 2:605. B. M. 80.—An elegant plant for the hardy border. Shade is not necessary for its welfare if planted in good, loose, deep loam.

P. W. BARCLAY.

2392. Spinach (×¼).

SPIKENARD. Aralia racemosa. FALSE S. Smithiana.

SPILANTHES (Greek, spotted flower). Compositae. This genus includes the Paré Cress (Spíldæthes olerácea, Linn.), the leaves of which impart a pungent flavor to salads and stimulate the salivary glands. 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. olerácea has broadly ovate, dentate lvs. and long-peduncled heads. Gn. 25, p. 295.

SPINACH

SPINACH (Spinácia olerácea, which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 292. It is a cool-season plant, and therefore grown in fall and spring. It is a plant of easy culture, thriving in any good garden or field soil, although for quick results and for tender, succulent foliage, land 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 in August; in eight weeks the leaves may be large enough for eating. The spring crop is grown from seed raised from seed 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 nevertheless thrive better if given this protection, particularly in soils that are likely to heave. It is customary to sow the fall-winter crop in hotbeds or coldframes; the beds that are made by blowing several furrows together, leaving a dead furrow between them. This allows of surface drainage. These beds may be from five to ten feet wide. On these beds, seeds are planted, 2 to 3 in. running lengthwise, the distance between the rows being from 10 to 20 inches, depending upon the methods that are employed for tillage. If hand tillage alone is to be given, the plants may be placed closer. In the spring these plants are removed from the coldframes or hotbeds, and are set out directly in the garden. 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 twice or three times in the spring, especially when the plants have been set directly from the coldframes or hotbeds. The 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 as an application in tandem with applying extra nitrogen as 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 warm weather plant. This plant has no pungent smell, with the exception of the creeping (Xanthophylla). It is usually best to sow Spinach seed where the plants are to stand, although it is sometimes transplanted into frames for home use. Care must be taken that the plants do not become choked 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 roots will be very few and the plant will quickly throw up flower-stalks. Spinach is always grown as a
succession or companion crop, as it occupies the land for a small part of the year. There are few insects and diseases that are generally troublesome. Spinach is usually transported to market in barrels or crates. Plants are usually separated, the crowns of the root are left with them. All dirt is removed, as also all broken and dead leaves. The plants are packed tight. It is essential that the plants be dry before they are shipped.

There are several important varieties of Spinach. The large, broad-leaved varieties are most popular in the markets, such as the Viroflay 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.

SPINACH (from spinus; alluding to the spiny fruit) Chenopodiaceae. Spinach. Spinach. According to Volkens (in Engl & Prantl's Pflanzenfamilien), there are only two species of Spinacia, S. oleracea, Linn., the common Spinach, and S. tetrandra, Stev. The latter is the native herb of the 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, and bearing two rows of leaves, and these leaves are for "greens." Later in the season it sends up a branching flower-stem 2-3 ft. high, bearing axillary clusters of seed-like fruits. In one of these fruits these are spiny: this is the form once described as S. spinosa, Muhl. and is now considered to be a distinct variety, S. oleracea, which is the oldest and most common of our species. Whether the round-seeded or the prickly-seeded type is the original form of the Spinach is not known, but as a matter of nomenclature, Linneus' S. oleracea, which is the oldest and is held to be the true Spinnach, is the most generally used.

Spinacia belongs to the spire or tribe. The genus is distinguished from Atriplex in the fact that the pistillate flowers are bracteate, whereas those of Atriplex are fertile. The bracteate calyx of 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 stigmata, in a 2-4 toothed calyx, this calyx hardening and enclosing the seed and often becoming horned on the sides and giving rise to "prickly-seeded" Spinach. The cultivated forms have developed much thicker and broader radical leaves, which are used for greens, often showing little of the halberd or sagittate shape.

L. H. B.

SPINDE TREE. Eponymus.

SPIRAEA of florists. See Aisitile.

SPIRAEA (ancient Greek name of a plant used for garlands, derived from spireo, band, wreath; probably first used for the present genus by Clusius). Rosaceae. Ornamental deciduous shrubs, with alternate, estipulate, simple and rather small lvs., and small white, pink or almost crimson fls. in showy umbels, corymbs, or panicles. Many are hardy north, some of the best of them are Spirea arguta, Thunbergii, Van Houttei, pubescens, trilobata, bracteata, media, vitifolia, alba, Douglassi, Mjenesi, tomentosa. Spirea blanda, Japanica and albiflora require a sheltered position, though S. japonica and its allies, even if killed almost to the ground, will produce flowers on shoots of the same season. Spirea Cantoniensis, Blumei, Chinensis canescens and bella will be recommended for the North, but are hardy or nearly hardy in the Middle States. S. prunifolia is hardy north of Boston. In regard to the flowering season, the Spireas can be divided into two groups. The first one consists of the species of the section Chamaedryon, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calosperma and Spiraeria, with white or pink flowers in corymbs or panicles. Some of the most important species, arranged according to their relative flowering time, are the following: Early flowering Spi- rea—S. Thunbergii, arguta, hypericifolia, prunifolia, media, Pikoviciensia, pubescens, camadryfolia, triloba, Van Houttei, Cantoniensis, bracteata. Late-flowing Spirea—S. bella, corymbosa, densiflora, camescens, japonica, albiflora, satiata, albescens, Dolgoi, tomentosa. The species of the second group do not produce their flowers all at once like those of the first group, but continue blooming for a longer time.

The Spireas are all medium-sized or low shrubs and well adapted for borders of shrubbery, as single specimens on the lawn or for rockeries. Especially the species of the early flowering group are so well adapted to habit and make effective single specimens, except perhaps S. chamaedryfolia and media, which are somewhat stiffer and less handsome and produce suckers. Spirea cantoniensis 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, Douglassi, Mjenesi and tomentosa should be planted in shrubberies only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockeries Spirea duccumbens, corymbosa, densiflora, bullata, and some dwarf hybrids of Japonica and alba are the best. The species of the section Chamaedryon, and also S. canescens and bella, should be pruned as little as possible,—only thinned out and the weak wood removed, in removing these of the species, Spirea Douglasi, these should be pruned more severely if necessary, since they produce their flowers at the ends of the young shoots. Some of the early-flowering Spireas, especially S. arguta, prunifolia, Van Houttei and S. Bumalda, are sometimes forced.

The Spireas grow in almost any moderately moist soil. The Spiraria species are generally more moisture-loving; and S. tomentosa thrives well only in a peaty soil which is kept moist. Spireas should be planted in spring and covered only slightly with soil, or by hardwood or Greenwood cuttings. The species of Chamaedryon 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 Spiraeria are also often propagated by dividing the spreading by suckers.

About 50 species in the temperate regions of the northern hemisphere, in America south to Mexico. Lvs. simple, short-petioled, entire or serrate, sometimes lobed, without stipules, in unbranched, in umbel-like clusters, or panicles, perfect, rarely polygamous; calyx cup-shaped or campanulate, 5-lobed; petals 5, rounded; stamens 15-60, inserted between calyx and disk; pistils usually 5, distinct, developing into follicles dehiscent and often winged, the inner sepal, or nucule, oblong seeds. Many species formerly included under Spirea are now referred to other genera; see Physocarpus, Schizogenus and Sorbaria for shrubby species and Aruncus, Umlaria and also Astilbe for the herbaceous ones. There is a monograph of Spirea and the allied genera by Maximowicz in Acta Horti Poel- politani, vol. 6, p. 106-261 (1878) and a monograph of or cultivated species, with their numerous hybrids fully described by H. Zabel, Die straucheni Spireai der deutschen Gärten (1893). There is much horticultural literature on Spirea, for the plants are popular and the species are many.

ALFRED REHDER.

The name Spirea is often spelled Spirea. Whenever the generic and specific name are both used, S. arguta should be read as S. arguta, rather than S. arguta. Whenever one speaks of "Spireas" in an untechnical way, we spell the name without the digraph, in harmony with the Editor's writings. The name Spirea should be considered an English spelling of the Latin name, just as geranium and chrysanthemum are. In fact, many people speak of plants as "Spireas" which do not belong to the genus. For example, a delightful white-flowered bushy species of Calosperma, in great quantities, especially at Easter, is properly an Astilbe. Compareable instances are pomo, bougainvillea, etc.

W. M.
KEY TO THE SECTIONS.

A. Lvs. always entire: Fls. in simple or panicked racemes: foliages usually 2-seeded. (Bostryospira, Zabel.)

B. Plants tufted, suffruticos: Fls. perfect, in usually simple racemes.

SECTION 1. PETHROPHYTUM (Species not in cult.)

BB. Plants a upright shrub with shoot branches: Ryd., fls. polygamous in panicked racemes.

SECTION 2. SIBIRIA (Species No. 1)

AA. Lvs. usually serrate, rarely entire; Fls. in umbel-like racemes, corymbbs or panicles; seeds several.

B. Inflorescence a simple umbrella-like raceme: Fls. white.

SECTION 3. CHAMADERION (Species Nos. 2-20)

BB. Inflorescence compound: Fls. white or pink.

CC. Fls. in panicles

SECTION 5. SPIRABIA (Species Nos. 37-49)

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SECTION 1. PETHROPHYIUM (Species not in cult.)

This section contains a few rather rare American species of which none is in cultivation. The best known is S. caspitsa, Nutt. (Pethrophyum caspites, Rydb.), a dwarf caspiote 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 from the allied Kelseya uniflora (Ryd.), Eriogyna uniflora, Wats., and Eriogyna pectinata, Hook.

SECTION 2. SIBIRIA (Species No. 1)

1. laevigata, Lim. (S. Alticca, Pall. Spirea laevi-

2. hypericifolia, Lin. Vigorous shrub, 5 ft. high, with slender arching or upright branches: lvs. almost sessile, cuneate-obovate to obovate-lanceolate, 3-seeded or with few lateral veins, almost glabrous, 1½-3½ in. long: fls. polygamous, greenish white in terminal panicles, 3-5 in. long, those of the staminate plant somewhat shorter. May. Siberia.—Hardy.
rower, ob lanceolate: fls. smaller, yellowish white; pedi- cels glabrous; petals obovate, shorter than stamens; flowers somewhat earlier, but less showy. Var. fiabel- lata, Zabel (S. fiabellata, Bertol. S. hypericifolii, var. crenata, Boiss. & Buchh.). Lvs. obovate to obovate-lan- ceolate, 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. thalictroides, Hort., not Pall.). Lvs. broadly obovate to obovate-obovate, truncate and cre- nately dentate at the apex. Siberia.

3. Thunbergii, Sieb. Fig. 2363. Shrub, 5 ft. high, with spreading or arching branches: lvs. sharply serrulate, 1-1/4 in. long: fls. pure white, about 3/8 in. across, in 3-5-fld. naked umbels; petals obovate, much longer than stamens; follicles with the spreading styles below the apex. April. May. China, Japan. S.Z. 1:99. G.F. 8:84, 85.—A very graceful early-flowering shrub, the slender arching branches clothed with feathery bright green foliage, turning late in fall to orange or scarlet. Almost hardy, but tips of branches sometimes killed by severe frost; valuable for seaside planting.


5. multiflora, Zabel (S. crenatii x hypericofolii). Shrub, 5 ft. high, with slender, arching branches: lvs. obovate, euneate, serrate above the middle, usually 3- nerved, glabrous at length, about 1 in. long: fls. pure white, in many-fld. umbels, sessile on the upper, 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.


7. eana, 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, 3/4 in. long: fls. 3/4 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 arching, angular, reddish brown branches: lvs. oblong- obovate to oblongate, acute, usually entire, glabrous, penninerved, 3/4-1 in. long: fls. white, rather small, in short-stalked, small glabrous umbels; petals roundish, little shorter than stamens; sepals upright in fr.: folli- cles curving outward. May, June. N. E. Asia.—Hardy shrub, with graceful foliage.

9. crenata, Linn. (S. crenatii, C. A. Mey.). Shrub, 3 ft. high, with slender striped branches: lvs. oblong- obovate to oblongate, acute at both ends, crenate serrate toward the apex, grayish green, puberulous beneath when young, 3-nerved, 3/4-1 in. long: fls. white, rather small, in dense almost semi-globose umbels; petals roundish, shorter than stamens; sepals upright in fr.: follicles with erect styles. May. S. E. Eu. to Caucasus and Atal. L.B.C. 13:1232.—Hardy.

10. Pikovienia, Bess. (S. crenatii x media. S. Nicou- dierti, Hort.). Shrub, 4 ft. high, with tertite upright branches: lvs. oblong, cuneate at base, with few sharp teeth at the apex or sometimes entire, penninerved to 3-nerved, almost glabrous, 1-2 in. long: fls. white or greenish white, in many-fld. 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. Nippophica, 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, 3/4-1 1/4 in. long: fls. over 3/8 in. across, in umbel-like ra- cesmes, sometimes compound at the base; petals orbicu- lar, longer than stamens; sepals spreading in fr. June. Japan. G.C. II. 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. rupstris, Sieb.). Shrub, 4 ft. high, with spreading and arching branches: lvs ovate to rhombic-ovate, incised crenate-serrate, pale bluish green beneath and rather prominently veined, 3/4-1 1/4 in. long: fls. solitary, white, in many-fld. umbels; petals roundish obovate, about as long as stamens; follicles with spreading or reflexed styles. June, Japan. B.H. 8:36.—Not hardly north, rare in cult.; often the following or other species are met with under its names.

13. triloba, Linn. (S. triloba, Linn.). Fig. 2365. Shrub, 4 ft. high, with slender spreading branches: lvs. almost orbicular, incised-dentate and often 3-lobed, obtuse, pale bluish green beneath, 3/4-1 in. long: fls. pure white, in many-fld. umbels; sepals upright in fr.; follicles with ascending styles. May, June. N. China to Siberia and Turkestan, L.B.C. 13:1271. G.F. 1:432.—
Handsome bushy shrub, quite hardy; cult. under many different names as S. aquilegiifolia, adiantifolia, crapegilita, Blumei.

14. Van Houttei, Zabel (S. Cantoniensis x triloba, S. aquilegiiolia, var. Van Houttei, Briot). Fig. 2366. Shrub, 6 ft. high, with arching branches: lvs. rhombic-lanceolate or ovate-obovate, somewhat ovate or sometimes quite narrow at the base, acute, incised serrate, dark green above to pale bluish green beneath, 3½-1¾ in. long: fls. white, ¾ in. across, in many-fl. umbels; petals twice as long as stamens, spreading in fruit. May, June. Of garden origin. Gn. 53, p. 251. G.F. 2:317. Gng. 5:210. A.G. 15:297. P.G. 3:173. 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. Cantoniensis, Lour. (S. Rebecsiandiana, Lindl. S. lanceolata, Polt. S. cantoniensis, Rehder.) Shrub, 4 ft. high, with slender, arching branches: lvs. rhombic-lanceolate, incised doubly serrate, dark green above, pale bluish green beneath, 1½-2 in. long: fls. over ¾ in. across, in rather dense umbels; sepals upright in fruit: follicles with spreading styles. May, June. China, Japan. B.R. 30:10. A.G. 18:356. —Very handsome shrub, with large pure white fls., but only half-hardy north. Var. flore pleno, with double fls. and narrower lvs. is still more handsome and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.

16. blanda, Zabel (S. Chinensis x Cantoniensis. S. Recesistiana robusta, or nova, 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, 1½-1½ in. long: fls. rather large, pure white, in pubescent umbels; sepals ovate-lanceolate, upright in fruit: follicles pubescent, with spreading styles. May, June. Of garden origin. —Only half-hardy north.


18. pubescens, Turcz. Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but more grayish tomentose beneath and somewhat smaller: fls. 1½-1½ in. long: fls. rather large, pure white, ¾ in. across, in glabrous umbels; sepals triangular-ovate, upright in fruit: follicles glabrous, with the spreading styles below the apex. May. N. China. G.F. 1:331. —Hardy north, and the large-fl. form as handsome as the foregoing species.

19. média, Schmidt (S. contina, Regel & Kœhn). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young: lvs. ovate to oblong, ovate at the base, incised serrate above the middle, almost glabrous or pubescent, 1½-2 in. long: fls. in many-fl. rather long-stalked, umbel-like racemes; follicles with the spreading or reflexed styles somewhat below the apex. May. S. E. Eu. to Japan. —Var. glabra, Zabel. Almost glabrous. Var. oblongifolia, Rehder. (S. oblongifolia, Waldst. & Kit.). Lvs. elliptic-oblong to oblong-lanceolate, narrowed at both ends, entire or with 1-3 teeth at the apex. Var. sericea, Regel (S. sericea, Turcz.). Lvs. pubescent on both sides.

20. chamaedryfolia, Linn. Shrub, 5 ft. high, with slender, angular, glabrous branches: lvs. distinctly petiolate, ovate to lanceolate, sharply and often doubly serrate, almost glabrous, bluish green beneath, 2½-3 in. long: fls. in lower umbels, the lower ones long-stalked, the upper ones often shorter: follicles with the styles upright and terminal. S. E. Eu. to Japan. —Var. flexuosa, Maxim. (S. flexuosa, Fisch.). Less high, with spreading more or less zigzag branches: lvs. narrower, sharply serrate above the middle. Siberia to Daulasia.

Var. ulmifolia, Maxim. (S. ulmifolia, Scop.). Upright: lvs. ovate, incised or doubly serrate from below the middle: fls. larger, about ¾ in. across, appearing later. L.B.C. 11:1042. B. T. 15:1222. Both vars. are often cult.; they spread, like the preceding species, by suckers. Sometimes as S. atritilia or ambiloba in gardens.

SECTION 4. CALOSPIRA (Species Nos. 21-36).

A. Stamens as long as petals: lvs. small, ½-1 in. long; fls. white.

B. Height 3-6, occasionally 12 ft.... 21. canescens

Bb. Height about ¾ ft. 22. decumbens

AA. Stamens longer than petals.

BB. Corolla with lateral bractlets along the branches of the previous year.

C. Winter-buds slender, longer than petals 23. longigemmis

CC. Winter-buds shorter than petals.

D. Shoots angular: lvs. usually broadest at the base.... 24. bella

Dd. Shoots terete: lvs. ovate-lanceolate.... 25. expansa

BBb. Corolla terminal on upright shoots of the year.

CCc. Inflorescence pubescent, rarely glabrous, very compound, sometimes bearing one or more corolla lateral ones blooming somewhat later appearing beneath it, only weak branches with a single corolla.

DD. Shrub 1 ft. or less high, with bullate lvs. less than 1 in. long... 26. bullata

DDd. Shrub 1-5 ft. high, with larger lvs.

EE. Branches terete.

FF. Ripe follicles diverging.... 27. Japonica

GG. Fls. whitish or flushed.... 29. Fozii

EE. Branches not angular, rather stiff, almost glabrous.

FF. Color of lvs. pink.

GG. Fls. whitish or flushed.

CCc. Inflorescence usually glabrous, consisting of only one terminal corolla: follicles and diverging.

DD. Sepals reflexed in fruit: petals orbicular.... 32. superba

DDd. Sepals spreading or half upright: petals ovate to oblong.

EE. Fls. white.

FF. Corolla usually pubescent.... 33. corymbosa

GG. Comb. usually glabrous.

EE. Fls. pink.

36. densiflora

21. canescens, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches: lvs. broadly oval to obovate, very short-petioled, crenately dentate above the middle, grayish green, pubescent beneath or sometimes almost glabrous. Fls. white, rather small, in dense, semi-glomerate corymbs 2 in. across, appearing very profusely along the branches; sepals upright or spreading in fr.: follicles villos, with the ascending styles a little below the


25. *expänusa*, Wall. (S. bélla, var. *expänusa*, Regel. S. Kumaonénis, Hort.). Closest allied to the foregoing, more vigorous and upright, 6 ft. high, with terete branches, becoming when young: lvs. ovate-elliptic 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 corymb; foliages puberulous: Himal.—S. pulchélía, Kunze (S. Kumaonénis, Hort.), is supposed to be a hybrid of this and the foregoing grayish green beneath, ¾–1¼ in. long: fls. deep pink, in small and dense corymbs, ½–3 in. across. July, Aug. Japan. G. 35:1216.


Var. *Fortunéi*, Rehd. (S. *Fortunéi*, Planch. S. caliösa, Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2–4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurved, callous-tipped teeth, rugose above, bluish white beneath: corymbs very compound, rather loose; disk none or very minute. This seems to be the Chinese form; the Japanese form grows less high, has smaller and broader, coarsely doubly dentate-serrate lvs., not rugose and less whitish beneath; the stems are slightly striped by the decurrent petals and the inflorescence is less compound. Var. *atrosanguinea*, Hort. Fls. deep pink, in tomentose corymbs. Var. *rubérìna*, Hort. Fls. deep pink, in puberulous corymbs. Var. *macrophylla*, Simon-Louis. Lvs. becoming 6 in. long, bullate: corymbs small. Var. *glabrátia*, Nichols. (S. glabrátia, Lange). Of more rigid habit: lvs. ovate, glabrous: fls. bright pink, in glabrous corymbs. Var. *pubescens*, Regel. Lvs. pubescent on the veins beneath: corymb tomentose. Most of the other forms often enumerated as varieties are hybrids of this species.

27. *Margaritae*, Zabel (S. *Japónica* x *supérba*) Shrub, 5 ft. high, puberulous: lvs. ovate-elliptic to elliptic, coarsely and often doubly serrate, pubescent on the midrib beneath and pale green, 2–3 in. long: fls. rather large, bright pink, in broad corymbs; sepal spreading in fruit; foliages upright, glabrous, with upright styles: July, Aug. Of garden origin.—Handsome, very free-flowering form.

28. *Féxili*, Zabel (*S. corymsb* x *Japónica*). Similar to the preceding: branches more or less striped, almo glabrous: lvs. ovate, doubly serrate, closely: 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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31. albilora, Miq. (S. Japonica diba, Regel. S. leucoeditha, 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 corymb, 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. albiflora x corimbosa). Low shrub, with striped dark brown branches; lvs. elliptic-oblong to oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1-3 in. long: fls. rather large, pink or almost white; disk prominent; petals orbicular or broadly obovate. June, July. Of garden origin.

33. corimbosa, Raf. (S. crataegifolia, Link.). Low shrub, with usually little-branched stems, rarely to 3 ft. high: branches purplish brown: lvs. broadly oval to ovate, acutish, coarsely and often doubly serrate, especially above the middle, pale bluish green beneath and glabrous, 1½-3 in. long: fls. white, rather small, in somewhat convex usually pubescent corymb, 1½-3 in. across; petals oval: follicles and styles upright. May, June. N. J. to Ga. L.B.C. 7:671.

34. lutea, Doug. Closely allied to the former: branches yellowish brown or brown: lvs. more incisely serrate, oval or obovate: corymb glabrous, usually looser and more flat, broader. June, July. Dakotas to Brit. Col. and Oregon. The allied S. Virginiana, Brit., is more branched and higher: lvs. oblong to lanceolate, dentate above the middle or almost entire: inflorescence glabrous. Va. to N. C. B.B. 2:197.

35. betulifolia, Pall. Low, much-branched shrub: lvs. oval to ovate or obovate-oblong, usually cuneate at base and very short-petioled, serrate or coarsely serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ¾-1¼ in. long: corymb usually glabrous, 1-2 in. across. June, July. Siberia to Manchuria, Kanschatcha and Japan. The two preceding and the following species are all closely allied and considered by some botanists as varieties of S. betulifolia in their broadest sense.


SECTION 5. SPIRÆIA (Species Nos. 37-49).

A. Inflorescence a broad panicle, about as broad as high. (Hybrids of species of this and the preceding section.)

B. Petals rather small, on lateral branchlets at the end of last year's branches

BB. Panicles large, terminal on long, upright branches.

C. Lvs. glabrous or nearly so.

D. Apex of lvs. acute, 38. conspicus.

DD. Apex of lvs. obtuse or acute.

E. Shape of lvs. broadly ovate or obovate 39. notha.

EE. Shape of lvs. oblong or oval-oblong 40. pyramidal.

CC. Lvs. pubescent or tomentose beneath.

D. Base of lvs. acute 41. Sansouciana.

DD. Base of lvs. rounded 42. Nobleana.

AA. Panicles elongated, longer than broad. (Spiraea proper.)

B. Foliage glabrous or nearly so.

C. Lvs. sharply serrate, except at the very base.

D. Panicles tomentulose.

E. Fls. light pink 43. salicifolia.

EE. Fls. white 44. alba.

DD. Panicles glabrus 45. latifolia.

CC. Lvs. coarsely serrate above the middle: fls. pink 46. Menziesii.

BB. Foliage pubescent or tomentose beneath.

C. Follicles glabrous: lvs. grayish or whitish tomentose beneath.

D. Lvs. acute at both ends 47. Billardii.

DD. Lvs. rounded or nearly so at both ends 48. Dougallii.

CC. Follicles pubescent: lvs. usually light tomentose 49. tomentosa.

27. Fontenaysii, Billard (S. Fontenaysiensis, Dipp. S. canescens x 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, 1-2 in. long: fls. white or pink in 1½-3 in. long panicles; petals orbicular, about as long as stamina, sepals spreading in fruit. June, July. Of garden origin. Not quite hardy north. Var. alb., Zabel, is the white-flowered, var. rosea, Zabel, the pink-flowered form. S. prunosa, Hort. (S. brachybotrys, Lange. S. betulifolia x Dougallia), is a similar form, but the lvs. are tomentose beneath and the fls. pink.

38. conspicus, Zabel (S. albiflora x diba). Upright shrub, 3 ft. high, with dark brown puberulous branches: lvs. elliptic-oblanceolate, 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. syringatiflora, Lem. (L. albiflora x salicifolia), with oblong-oblanceolate or oblongate lvs. serrate above the middle and pink fls. Closely allied is also S. semperflora, Zabel (S. Japonica x salicifolia, S. Japonica x Fontanysia, var. pubescenti, Hort.). Higher than the former: lvs. oblong-lanceolate, usually doubly serrate; fls. pink. R.H. 1890, p. 496, 497. Gn. 45, p. 48.
39. nótha, Zabel (S. corymbea x laticifolia). Shrub, 3 ft. high, with brown glabrous branches; lvs. broadly ovate to obovate, short-petioled, coarsely and doubly serrate, almost glabrous, 1-2 in. long; fls. white to pinkish white, in broad, glabrous panicles; stamens almost twice as long as the orbicular petals. July, Aug. 
   Of garden origin.

40. pyramidáti, Greene (S. laticida x Ménziesii). Upright shrub, 6 ft. high, with old-oblong, somewhat acuminate or oblong-obovate, sharply and usually doubly serrate, grayish tomentose beneath, 2-3 in. long; fls. pink, in broad corymb-like panicles; follicles glabrous, with spreading styles. July, Aug. Of garden origin.—A similar form is S. intermédia, Lemoine (S. albiflora x Douglasii), similar in habit to S. syringaeflora but with the lvs. tomentose beneath.

42. Nobléána, Hook. (S. Douglasii, var. Nobléána, Wats. S. Douglasii x densiflora). Shrub, 4 ft. high, similar to the former; lvs. oblong-lanceolate, sharply and sometimes doubly serrate with often incurved teeth, 1½-3 in. long; fls. light pink, in dense broadly pyramidal tomentose panicles, 3-6 in. high; petals half as long as stamens; sepals reflexed in fr.; styles erect. June, July. 
   A similar form is S. pachyacáthyas, Zabel (S. corymbosa x Douglasii), with broader lvs. and fls. of paler pink.

43. salícifória, Lin. (S. Sibériaca, Raf. S. salícifória, var. edwensi, Ait.). Upright shrub, 5 ft. high, with lte-te 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., the flowers exceeding the ascending ramifications; stamens twice as long as petals; sepals reflexed in fr.; follicles ciliate at the inner suture. June, July. S. E. Eu. to Japan and probably Alaska. 

44. álba, Dur. (S. salícifória, var. paniculáda, Ait. S. lanceoláda, Borkh.). QUEEN OF THE MEADOW. MEADOW SWEET. Attractive upright shrub, attaining 6 ft., with reddish brown branches puberulous when young; lvs. narrow, oblong to ob lanceolate, 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. salícifória.

45. latífória, Borkh. (S. salícifória, var. latífória, Ait. S. eapinifória, Willd. S. Camánemésia, Hort. S. Bethlehemásia, Hort.). QUEEN OF THE MEADOW. MEADOW SWEET. Fig. 2365. Branching shrub, 2-5 ft. high, with bright or dark red-brown glabrous twigs; lvs. broadly oval to obovate or oblong, usually coarsely and often doubly serrate, 1½-3 in. long; fls. white, larger than those of S. alba, sometimes 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. Newfoundland 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. salícifória. S. alba is chiefly found west, S. latífória east of an in the Alleghenies.

46. Ménziesii, Hook. (S. Douglasii, 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. pink, in smaller panicles, smaller, paler, and narrower, 5-8 in. long; stamens more than twice as long as the roundish petals; sepals reflexed in fruit. June-Aug. Alaska to Oregon.

47. Billárddi, Hort. (S. Douglasii x salícifória). 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, 2-3 in. long; fls. bright pink, in 5-8 in. long, tomentose or tomentulose panicles, usually rather narrow and dense. July, Aug. Of garden origin. — S. Lenneána, Bethlehemésia rubra, tríumhus, extima, Constánntia, Californica, Hort., are very similar and probably of the same parentage.


49. tomentósa, Linn. HARDHACK. STEEPLELEUSH. Shrub, 4 ft. high, with upright, brown, tomentose branches; lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely yellowish or grayish
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SPIRAEA

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tomentose beneath, 1-2 K in. long: fls. deep pink or purnarrow dense panicles, brownish tomentose and
3-8 in. long; stamens somewhat longer than the obovate petals; sepals reflexed: follicles pubescent, usuNova Scotia to Ga., west to
ally diverging. July-Sept.
ple, in

closely allied to S. alpina, but not yet introduced; S. canescens-

and Sorbaria sorbifolia are sometimes cult, under this name.
Medium -sized
diffurmis, Zabel (S. alba X corymbosa)
<S'.

.

shrub, with oval to oblong-lanceolate, serrate, almost glabrous
and white fls. in large corymb-like panicles. Garden hySchizonotus discolor. S. dumbsa,
brid.
S. discolor, Pursh
Schizonotus discolor, var. dumosus. S. Filipendula,
Nutt.
Linn.
Ulmaria Filipendula. S. fissa, Lindl.
Schizonotus
discolor, var. fissus. S. floribiinda. A trade name of indiscriminate meaning. S. semperflorens and Sorbaria sorbifolia
are sometimes met with under this name. S. gemmata,
Zabel (S. Mongolica, Hort., not Maxim.). Allied to S. alpina;
axillary buds much longer than petioles: Ivs. small, penninerved, oblong-lanceolate, usually entire: fls. white, in shortstalked, rather few-fld. umbels. Mongolia. <S. Qieseleriana,
Zabel (S. eanaXchamoedryfolia). Medium-sized, shrub, with
ovate, sharply serrate Ivs. and rather large white tts. in longstalked umbels. Garden hybrid. S. gigantea, Hort.
Ulmaria
Camtschatica. S. grddlis, Maxim. (S. vacciniifolia, Lodd., not
Don). Low shrub, allied to S. canescens, with slender, arching
branches: Ivs. small, ovate, obtuse, entire or erenate above the
middle, quite glabrous: fls. white, in hemispherical loose
corymbs. Himal. L.B.C. 15:1403. S. grandifldra, Sweet
Sorbaria grandiflora. S. grandiflora, Hook.
Bxochorda
grandittora. S. Hacguetii, Fenzl. & Koch. Closely allied to S.
decumbens, but grayish pubescent and with the sepals upright
or spreading in fr. N. Italy, Tyrol. S. Hpbkeri, garden name,
applied to S. nudirtora, bella, expansa, tristis and others, and
also to Exochorda grandiflora. S. Hiimboldtii, Hort.
Aruncus Sylvester. S. Japonica, Hort., not Linn. f.
Astilbe Japoniea. S. inflexa, C. Koch (S. crenataX mollis). Mediumsized shrub, with slender arching branches Ivs. elliptic-oblong,
entire, sparingly pubescent beneath: fls. white, rather large, in
many-fld. stalked umbels. Garden hybrid. <S. Kamaonensis
spicdta, Hort., is a form of S. semperflorens. S. Katnschdtica,
Auth.
Ulmaria Camtschatica. S. lancifdlia, Hoffmsgg, supS. vacciniiposed to be S. Hacquetii. <S. laxiflbra, Lindl.
folia.
S. Lindleyana, Wall.
Sorbaria Lindleyana. S. lobdta,
Grpnov.= Ulmaria rubra. S. micropetala, Zabel (S. hypericifolia X media). Medium-sized shrub, with grayish green, oblong-obovate Ivs., entire or serrate at the apex, 3- or penninerved: fls. white or greenish white, in umbels on leafy or
Similar to S. media: Ivs. smaller, usually entire, pubescent:
Garden origin. S. Mongolica,
fls. smaller, umbels pubescent.
Maxim., is closely allied to S. crenata, but not yet introduced;
the S. Mongolica of gardens is S. gemmata. S. monogyna,
Torr. & Gray
Physocarpus monogynus. S. NepaUnsis, a
garden name applied to several species, as S. micropetala,
canescens, salicifolia, etc. S. nlvea, Zabel (S. canescens X
expansa). Similar to S. canescens in habit, corymbs larger and
looser: Ivs. coarsely doubly serrate, pubescent, 1-2 in. long:
Garden hybrid. S. nudiflbra,
fls. white or pinkish white.
Zabel (S. bella Xulmifolia). Medium-sized shrub, with ovate,
doubly serrate, almost glabrous Ivs. and pinkish white fls. in.
Physocarpus opulifolia. <S.
oxybdon, Zabel (S. chamaadryfolia X media). Similar to S.
media, but branches angular: Ivs. narrower, follicles with the
Garden hybrid. S. Pdllasii,
styles terminal and spieading.
Ulmaria
G. Don=Sorbaria grandiflora. S- palmata, Pall.
Ulmaria purpurea. S. palpalmat.i. S. palmata, Thunb.
S.
mata, Linn.= Ulmaria rubra. S. parvifbiia, Bertol.
dium-sized shrub, with oblong, coarsely serrate Ivs., pubescent on the veins beneath: fls. light to deep pink, in large
corymbs; blooming in summer and usually again in fall. Garden
Physocarpus capitatus. S. rubra,
hybrid. S. ribifblia, Nutt.
tomentose beneath, and deep pink fls. in ovate panicles. Garden
hybrid. S. Schinabeckii, Zabel (S.chamaadryfoliaX trilobata).
Medium-sized shrub, with arching branches: Ivs. ovate to oblong-ovate, doubly serrate, glabrous: fls. white, rather large,
in peduncled umbels: petals longer than stamens. Handsome
shrub, similar to S. Van Houttei. Garden hybrid. S. sorbifolia,
Sorbaria
Linn.
Sorbaria sorbifolia. /S. Tobolskia, Lodd.
Gillenia trifoliata. S. tristis,
sorbifolia.
S. trifolidta, Linn.
Zabel. Hybrid of unknown origin, similar to S. expansa, but
corymbs and the whitish pink fls. smaller; sepals upright in
Ulmaria pentapetala. S. vacciniifr.
S. Ulmaria, Linn.
Ivs.

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Spiraa Douglasi (X%).

2369.

F.E. 8:833. Gng. 5:149.
Alba, Hort. With white fls.
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.

Low shrub, with pink fls. in broad corymb-like panicles. Garden hybrid. S. astilboldes, Hort. = Aruncus astilboides. S.
Boursi&ri, Carr. = Schizonotus discolor, var. dumpsus. S.
brumalis, Lange (probably S. expansa X alba). Medium-sized
shrub, with oblong, incisely serrate, almost glabrous Ivs. and
/S. Camtschatica, Pall.
Pursh = Physocarpus capitatus S.
chatica. S. capitdta,
Zabel
Medium-sized
canaX
(S.
cinerea,
hypericifolia).
shrub,
with small, oblong, usually entire, pubescent Ivs. and white fls.
in short-stalked umbels. Garden hybrid. S. conctnna, Zabel
(S. albiflora X expansa). Medium-sized shrub, with lanceolate,
sharply serrate, almost glabrous Ivs. and pinkish white fls. in
broad corymbs. Garden hybrid. S. compdcta multiflbra, Hort.
= Astilbe J aponica var. S. conferta, Zabel (S.canaXcrenata).
Medium-sized shrub, with small, ovate to oblong-lanceolate,
3-nerved, entire or erenate Ivs. and white fls. in dense, small,
peduncled umbels. Garden hybrid. S. Dahtirica, Maxim., is
S.

fblia,

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D. Don (S. laxiflora, Lindl.). Shrub, to 2 ft., with arching branches: Ivs. long-petioled, ovate, crenately dentate, almost glabrous, %-\%. in. long: fls. whitish, in tomentose
S. vacciniiS. gracilis.
F.S. 7, p. 190. S. vacciniifblia, Lodd.
S. ventmta, Hort.
S. canescens, brumalis, etc.
fblia, Hort.
Ulmaria rubra, var. venusta. S. veniistula, Kunth &
fblia,

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Boueh6 = S.

vacciniifolia.

SPIRAL FLAG.

ALFRED REHDBR.

See Costus.

SPIRANTHES (name

Greek; referring to the twisted
Orchiddcece. LADIES' TRESSES. A genus including about 40 species dispersed throughout the ternspikes).


SPRAYING

1707

SPRAYING

To spray means to apply a liquid to a plant to kill disease-causing organisms. The liquid may be a fungicide, an insecticide, or a pesticide. Spraying can be done by hand or by machine. Machines called sprayers are used to apply the liquid unevenly.

S. E. B.: 1:4.5. (A. M. T.)

SPRAYING

The primary purpose of spraying is to control pests. Pests are any organism that damages or destroys property. Pests can be animals, plants, or microorganisms. They can be found in homes, businesses, and outdoor environments. Spraying can be done by hand or by machine. Machines called sprayers are used to apply the liquid evenly.

S. E. B.: 1:46. (A. M. T.)

PRUNING

1708

PRUNING

Pruning is the practice of cutting off branches and leaves from a plant to control its growth. Pruning can be done by hand or by machine. Machines called trimmers are used to cut off branches and leaves from a plant. Pruning can be done by hand or by machine. Machines called trimmers are used to cut off branches and leaves from a plant.

S. E. B.: 1:47. (A. M. T.)

PRUNING

The primary purpose of pruning is to control the growth of a plant. The growth of a plant can be controlled by cutting off branches and leaves. Pruning can be done by hand or by machine. Machines called trimmers are used to cut off branches and leaves from a plant. Pruning can be done by hand or by machine. Machines called trimmers are used to cut off branches and leaves from a plant.

S. E. B.: 1:47. (A. M. T.)

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 now has been largely displaced by fruit sprayers, 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 formulae, 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 oily 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 the discovery of the eafficiency of Paris green in destroying leaf-eating insects did a great deal to stimulate spraying, but due credit should be given plant growers, owing to his tracing the life-histories of many fungi destructive to cultivated plants.

Fungicides.—Early in the eighties diseases of grape-vines threatened the existence 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, "bouillie bordelaise" was found to be effective in preventing the growth of downy mildew and other plant parasites infesting the grape in that region. The announcement was definitely made in 1885. The following year the European formula for Bordeaux mixture was published in several places in the United States and immediately 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 spread of 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 before the depredator, and (c) by protecting the plant with a covering unfavorable to the growth of the pest. The diuious farmer insures his crop against injury by insect or vegetable parasite 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 possible injury by insect or fungus 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 poisons principle; their efficiency depends largely on the time and thoroughness of the application. If applied too soon they may be displaced before the insects appear; if applied late the injury is only partly prevented, because 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-bug 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. For 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 rail 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 spacious barrel. The tank, suitable for spraying Orchard areas up to 15 acres in extent; may be mounted on a cart, wagon, or stoneboat, 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 belts and sprockets to the or 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; power being furnished by steam, gasoline, or compressed air. When the orchard is 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 (copper compounds corrode 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-heavyness 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 has a gauge attached which rises or falls according to the amount of water passing through a jet, the liquid measured being the amount of water passing through the jet. The mixing is mechanical and automatic. This form of pump is used in making and applying the arsenic mixture.

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 a coarse 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 Vernmorel (Fig. 2380), or fine spray type, is best, while for old orchards and park work, nozzles of the McGowan 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. 2380, 2381).

FORMULAS.

(The commoner mixtures, excluding resin washes.)

PARIS GREEN.

Paris green .................................. 1 pound
Water ....................................... 100-500 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 8 ounces of the arsenite to 50 gallons of the mixture. The action of neither is weakened, and the Paris green loses its caustic properties. For insects 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 composition of London purple is variable, and 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.

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and lime are added in this proportion, the compound is Bordeaux mixture. Potatoes demand full strength; Diluted Easy Bordeaux mixture is effective against certain mildews and fruit diseases.

Weighting 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 not advisable. It is desirable to have thick preparations of sulfate of copper and of 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 smooth. Important. When slaked must always be covered with water to exclude the air. In this manner lime can be kept all summer unimpaired.

One gallon of water will hold in solution, all summer, 2 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 36 pounds of sulfate are suspended in 25 gallons of water on an evening, each

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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 barrel so as to make a dilute milk of lime, but never allow it to be dense enough to be of a creamy thickness. In the latter condition, lumps 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 pint 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.

**AMMONIACAL COPPER CARBONATE.**

Copper carbonate .............................................. 5 ounces
Ammonia (25° Baumé) .......................................... 1 pint
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.

**IRON SULFATE AND SULFURIC ACID SOLUTION.**

Water (hot) ......................................................... 100 parts
Iron sulfate, as much as the water will dissolve .................................................. 1 part
Sulfuric acid (commercial) ..................................... 1.1 part

The solution should be prepared before using. Add the acid to the crystals, and then pour on the water. Sometimes recommended for grape anthracose, 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) .................................. 4-4/1 ounce
Water .......................................................... 1 gallon

This preparation loses its strength upon standing, and should therefore be made immediately before using. Particularly valuable for surface mildews.

**HELLEBORUS.**

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 ......................................................... 1/2 pound
Boiling soft water .............................................. 1 gallon
Kerosene ......................................................... 2 gallons

Dissolve 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 spiders, 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 Corbett, 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 successful beyond expectation by using the tank of a kerosene pump and placing the Bordeaux and arsenic in the barrel in the ordinary manner." For apple aphids, eating insects and fungous diseases.
SPR Koung. —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 calenders.” 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. Lamson Scriber, then of the Division of Veg. Pathology, Washington. Soon after appeared “Insects and Insecticides,” and “Fungi and Fungicides,” 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 Sprekelsen, 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 conave and enclosing the stamens and ovary: bracts only one, spath-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 scales at the base of the filaments: ovary 3-loculed: style long, slender; seeds compressed ovate or orbicular, black.

Formosissima, Herb. (Amaryllis formosissima, Linn.). Fbs. red. B.M. 47. —Var. glauca has somewhat paler and smaller fls, and glaucous lvs. B.R. 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. ezeca. Sitka S. is P. Sitchensis. Tidaland S. is P. Sitchensis.


2381. A Y-figure with Bordeaux brand of nozzle. 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-fitied 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 Squash has any place. Sometimes written Spurrey.

L. A. Clinton.

Squash (Plate XXXVIII) 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. 410. The pictures show some of the forms of these species. Plate XXXVIII is the Hubbard Squash, Cucurbita maxima. Fig. 2382 is the Winter or Canada Crookneck, 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.

2380. A Y-figure with Vermorel nozzles. A leather shield is shown, for protecting the hands from the drip.
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 tillage. 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 levelled 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 frosts.

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 hothed 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 position.

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, be-
be killed with very heavy applications of arsenic,—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 true Squashes (Cucurbita maxima) do not hybridize with the true pumpkin species (Cucurbita Pepo). There need be no fear, therefore, of mixing between the Crookneck or Scallop Squashes and the varieties of Hubbard or Mar-

row types. The summer or bush Squashes are of three general classes: the Crooknecks, the Scallop or Patty- pan varieties, and the Pineapple or oblong-conical va-

rieties. 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 Crook-

neck or Cushaw types, which are varieties of C. mos-

chata; the Marrow and Marblehead types, which are the leading winter Squashes and are varieties of the C. maxima; the Turban Squashes, which have a "Squash within a Squash" and are also varieties of C. maxima. The mammoth pumpkins or Squashes which are sometimes grown for exhibition and which may weigh 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 20° 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 shriv 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. Dicentra Canadensis.

SQUIRING CUCUMBER. Ecballium Elaterium.

STACHYS (from an old Greek name applied by Dios- corides to another group of plants, coming from the word for spike). Labidata. 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-pedicled, 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 forni- cate, rarely somewhat flat; stamens 4, didynamous, the anterior longer, ascending under the upper lip and very little exserted, often deflexed 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. Sieboldi) has lately come into notice as a kitchen-garden plant.
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. (Bellonica 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.

**grandiflora**, Benth. (Bellonica 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 and sessile, 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. 666.—Showy.

**bb.** Corolla-tube little exceeding the calyx.

**c.** Herbage green.

**aspera**, Michx. Erect, usually strict, 3-4 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.

**cc.** Herbage white-woolly.

**lanata**, Jacq. Woolly Woundwort. A hardy perennial 1-2½ ft. high, white-woolly throughout: lvs. oblong-elliptical, the upper smaller, the uppermost much shorter and whorled: fls. small, purple, in dense 30- or more fl. whorls in interrupted spikes. Caucasus to Persia.—Often grown as a bedding plant. Valuable for its very white herbage.

**aa.** Plants grown for edible subterranean tubers.

**Sieboldi, Miq. (S. affinis, Bunge, not Fresenius, S. tuberosa, Nakd.). CHOROG. CHINESE OF JAPANESE ARTICHOKE. KNOTROOT. CROSSES DU JAPAN. Fliz. 2389. Erect, hairy mint-like plant, growing 10-18 in. tall: lvs. ovate to deltoid-ovate to ovate-lanceolate, cordate at base, obtuse-dentate, stalked: fls. small, whitish or light red, in a small spike: tubers (Fig. 2389) 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 Polk 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, glaucescent: lvs. cordate-oblong-lanceolate, blunt-toothed, stalked: fls. small, light red, in an interrupted spike: tubers cylindrical, uniformly nodose, 4-6 in. long. Pla.—Has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. 61), but practically unknown heretofore. The tubers are fully as good for, as eating, as those of **S. Sieboldii**.

**L. H. B.**

**STACHYTARPHETEA** (Greek, dense spike). Verbenaceae. About 40 species of herbs or shrubs, mainly from the tropical Americas. Opposite or alternate, dentate, often rough leaves and white, purple, blue or red flowers solitary in the axils of bracts, sessile or half sunk in the racis of the long and dense or short and lax spikes.

**mutabilis**, Vahl. A low shrub, seaborne-pubescent: lvs. ovate, dentate, seaborne above, whitish pubescent beneath: spike long, erect: bracts lanceolate, subulate: calyx 4-dentate, hispid, 4-5 lines long; corolla crimson, fading to rose, 35-45 in. across. West Indies, Mexico to Guiana. Offered in S. Calif.

**F. W. BARCLAY.**

**STACHYRUS** (Greek, spike and tail; in allusion to the form of the inflorescence). Ternstroemiaceae. Two species of glabrous shrubs or small trees 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, free; style simple: berries 4-valved.


**STACKHOUSIA** (after John Stackhouse, an English botanist). Stackhoussiacae. About 10 species from Australia and sparingly from other islands of the S. Pacific ocean. Mostly perennial herbs with slender, erect stems at and near the entire, often fleshy leaves and terminal spikes of flowers. The genus is the only one of the order: fls. 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 tube; ovary 5-celled; ovary of the disk: ovary free, 2-5-lobed, 2-5-ilocerc: fr. of 2-5 indehiscent cocci. Consult Flora Australiensis 1:405.

**monogyna**, Labill. (S. linearifolia, A. Cunn.). A half-hardy perennial herb, usually simple, about ½ ft. high, with linear or lanceolate lvs. about 1 in. long; spikes at first dense, then lengthening to 4-6 in.: buds pinkish when young: fls. white. B.R. 22:1917.—The plant in the Californian trade is Stachyphlactus as the above species, for the catalogue says it is a tall, robust shrub with fl. heads 1-2 in. across, surrounded by imbricated bracts and bright yellow fls. with a purple-streaked keel.

**F. W. BARCLAY.**

**STADMANNIA** (named by Lamarck in 1793 after a German botanist and traveler). Sapindaceae. The only species of this genus that is well known is a tropical tree from the Bourbon Islands, 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 is **Stadmannia oppositifolia**, Lam., a synonym of which is **S. Siderægylon**, 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 Linden's catalogue. They are
STANHOPEA

STANHOPEA 1715

sheathed with scales and each bearing a single large plaited leaf contracted to a petiole at the base.

HEINRICH HASSELBRING.

Stanhopeas enjoy a shady, moist location. A temperature 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 suspended from the roof in orchid cabinets or terra cotta baskets with large openings at the bottom, and if drainage is used it should be placed in such a manner that it will not interfere with the exit of the abundant flower seeps. Equal parts chopped sphagnum and peat fiber forms a good compost. By severing the rhizome here and there between the old pseudobulbs, new growths will be sent up and thus the stock may be increased.

R. M. GREY.

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1. eburnea
2. Wardii
3. oculata
4. Bucephalus
5. platycecar

A. Labellum with an exuviated or saccate base and a plane ter-
minal lobe.

b. Mesochil and pleuridium want-
ing

BB.

b. Mesochil and pleuridium present.

C. Hypochil entire or obso-
etely 3-toothed at the apex.

D.

Epipichl entire or obso-
etely 3-toothed at the apex.

D. Epipichl evidently 3-toothed

CC.

Hypochil saccate or globose.

Epipichl evidently 3-toothed

at the apex

AA. Labellum reduced to a saccate

pouch


1. eburnea, Lindl. (S. grandiflora, Lindl.). Pseudo-
bulbs conical, 1½ in. long; Ivs. leathery, 8-12 in. long; scales penicillate, with short bracts, 3-5-fld.: fls. 5 in. across, ivory white; sepals broad; petals narrow; lab-


2. Wardii, Lodd. Pseudobulbs 2 in. long; Ivs. large, broad and leathery; flower-stem 9 in. long, bearing 3-9 fls., which are bright yellow to golden orange, spotted with crimson; lateral sepal round-oblong, concave, acute; petals lanceolate, revolute, the cavity in the base of the pseudobulb deep violet-purpl. Aug. Mex. and S. B.M. 5289.—Var. aurea, Hort. (S. aurea, Lodd.). Fls. golden yellow, with 2 dark spots on the hypochil. Fragrant.

3. oculata, Lodd. Ivs. ovate, with a blade 1 ft. long; sepals 1 ft. long, clothed with scarse paler brown sheaths, 3-4-fld.: fls. 5 in. across, very fragrant, pale yellow, thickly spotted with purple; sepals 3 in. long, reflexed; petals one-half as long; hyochil narrow, white, spotted with crimson and having 2 large dark brown spots near the base. Mexico. B.M. 5300. B.R. 21:1800. L.B.C. 18:1764 (as Ceratochilus ocularis). S.H. 2. p. 435. G.C. III. 19:264. Ga. 56:1450.—Distinct from S. Shuttleworthii and S. Wardii by the paler color and long, narrow hyochil. There are sev-

erable varieties, differing in color and markings.

STANHOPEA

STANHOPEA

STANGÉRIA (Wm. Stanger, surveyor-general of Natai; died 1854). Cynecadce. Stangéria paradoxa, T. Marsson, is interesting, but the relationship of its flowers to the venation of its leaflets. 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 cycad, and in fact it was so described before the fruits were known. Stangéria is a South African plant with an odd turnip-shaped seed, properly candenax (from the Greek, "a legend," at the time of its discovery), which is curled to a lysts of some 8-12, opposite, oblong, short-stalked, obuse, carnosous, entire, oblique at base; panicules dense, cylindrical, 3-4 in. long; fr. hard, globu-

lar, nearly 1 in. thick.

W. M.

STAGHORN FERN. Platycerium.

STAGHORN SUMACH. See Rhus.

STANDING CYPRUS. Gilla coronopifolia.

STANGÉRIA
4. Bucephalus, Lindl. (S. grandiflora, Reichb. f.). Pseudobulbs crowded, rugose; lvs. petioled, 9 in. long, pointed; the pendulous raceme bearing 4–6 large, tawny orange lvs, marked with large crimson spots; sepals and petals reflexed. The former broad; lower part of the label- bellum curved, boat-shaped, bearing 2 curved horns and a broad fleshy middle lobe; column green and white, spotted with purple. Aug. Mexico, Peru. B.M. 5726. B.R. 31:242. Fls. very fragrant. Distinguished by its very short ovaries.

5. platyécras, Reichb. f. Pseudobulbs and lvs. as in S. Bucephalus but stouter: scape 2–3 ft., with ovate acute bracts one-half as long as the ovary: lvs. 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 labelleum colored like the sepals. Colombia. Gn. 33:552.

6. insignis, Frost. Figs. 2390, 2391. Pseudobulbs clustered: lvs. broadly lanceolate; scape 6 in. long, covered with dark brown scales, 2–4 ft. : lvs. 5 in. across, dull yellow, spotted with purple; sepals broad, concave; petals narrow, wavy; hypochil globose, almost wholly purple inside, heavily spotted outside, horns 1 in. long, falcate, middle lobe eordate, keeled. July-Sept. Brazil. B.R. 22:1837. L.B.C. 20:1985. Gng. 2:117 (from which Fig. 2390 is adapted).—Distinguished by the broad wings of the column.


8. Shottleworthii, Reichb. f. Pseudobulbs large, conical, sulcate: lvs. broadly oblong, acute; raceme pendulous, loose; sepals, petals and base of the labelleum apicort color with dark purplish blotches, front part of the labelleum 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; lvs. 6 in. across, waxy and very fragrant; sepals broadly ovate, concave; petals oblong-lanceolate, both dingy yellow motiled toward the base with large blotches of dull purple; hypochil broad, cup-shaped; horns 1 in. long, fleshy, bent forward at right angles; middle lobe rhomboid, with 3 fleshy teeth at the apex; column large, spatulate. Mexico. B.M. 4197. B.R. 25:4. G.M. 32:398; 36:149. F. 1845:39. G.C. 111:4:481.—One of the most striking forms among orchids. Var. luteócems, Hort. Brilliant yellow to orange marked with chocolate. Guatemala. Var. supérba, Hort. Van Houtte. Fls. yellow; sepals and petals heavily blotched with redish brown. F.S. 7:719. Var. atràla, Hort., is adv. STAPELIA


2391. Stapelia insignis (X 5%).

11. sacctá, 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, epichl quadrate. Guatemala. I.H. 8:270 (as S. radiosa).


S. Améniáns, Hort. Hugh Low, belongs to the hornless class of which S. ecornta 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 labelleum. G.M. 36:352. Habitat! HEINRICH HASSELBREIN.

STANLEY (Edward Stanley, Earl of Derby, 1779–1849, ornithologist, one president Lincoln's medical man in the Civil War. Cruciferae. Stapelia pinнатíflída 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 stout herbs native to the Western U.S. It belongs to the Sisymbri tribe of the mustard family, which tribe is characterized by long, narrow pods, seeds in a single series and incumbent coryledons. Stapleya is distinguished from its 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 and style nearly equal, penultimate.pinnatíflída, Nutt. (S. pinmatá, Britton). Stems flexu- ous: lvs. very variable, commonly pinnatifid; segments lance-oblong or oblong-lanceolate-elliptic, rarely linear, almost entire; terminal segment larger: fls. deep golden yellow, according to D. M. Andrews. May-July. W. Kan. and Neb. to Tex. and S. Calif., in dry clay or alkaline soils. B.B. 2:109.—Procurable from collectors of Colorado wild flowers. W. M.

STAPÉLIA (J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). Asclepiadaceae. Carson Flower. Odd fleshy cactus-like plants from South Africa. Schumann, in Engler and Prantl's "Naturpflanzenfamilien," considers that the genus con- tains 70–80 species. Decaisne, in De Candolle's Pro-
dromus, 8 (1844), describes 89 species, and makes references 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; and flowers from plants are leaves. The strongly angled usually 4-sided green branches or stems are generally more or less covered with tubercles and excrements. The flowers commonly arise from the angles and saucer-shaped; the petals are leathery; the sepals, and not uncommonly, the calyx and corolla are 3-parted; the flowers being spreading and usually narrow, usually fleshy, mostly purple or marbled, in some species pale; crown comprising 2 series of scales or bracts, of which the inner are narrower, each series in 5 or 6 rows, the outer usually quite short, of 2 follicles, containing comose seeds. Some of the species have flowers several inches across, although the plants themselves are relatively small; in fact, the flowers of St. gigantea are a foot across.

The Stapelias are easy of cultivation. Most of the species demand the treatment given to Cape Euphorbias, and to cacti, —a light, airy, rather dry position during the growing and blooming seasons and a soil made poor with their要求 about sumer and fall bloomers. They should remain dormant in winter. Propagated easily by cuttings. They do best, however, when not grown so dry as cacti are grown.

The Stapeliae are known in cultivation mostly in botanic 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 Echinopsis. Several other species are likely to be found in fanciers' collections. A. Coronas formed only of the cohering anthers, Echinopsis.

cylindrica, Hort. This is properly Echinopsis cereiformis, Hook. f., omitted from Vol. II, but known in the trade as a Stapelia: stems cylindrical, tufted, 1-2 ft. long, becoming reddish at the base, and somewhat furrowed or less thick, nearly or quite simple, 8-grooved, and marked by shallow transverse depressions; flo., arising from furrows in the stem, small (about 3/4 in. across), yellow, sessile. Probably South African, but habitat unknown. B.M. 1899.

AA. Coronas with scales.

b. Fls. pale yellow, about 1 ft. across.

gigantæa, N. E. Br. The largest and finest species yet known, one of the largest and oddest of flowers: branches many, usually less than 1 ft. long, usually 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 ciliate margins of very silky purplish hairs; each flower lasts two or three days, and on first opening emits a disagreeable odor." Zululand. B. M. 1908. G. C. H. 7:393; 11: 4:792. G. F. 8:515. —The requirements of *S. gigantæa,* Watson writes, "are somewhat exceptional. It thrives only when grown in a hot, moist stove 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.

vargiætæa, Linn. (S. Curtisi, 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. 36. R. H. 1837, p. 43. —An old garden plant, still seen in collections, often under the name S. Curtisi.

bb. Fls. purple, 6 in. or less across.

grandiflora, Mass. Fig. 2392. About 1 ft. tall, gray-purple, the branches strongly angled and toothed; fls. 4 or 5 in. across, dark purple with a lighter shade on the segments, striped or marked with white, hairy. R. H. 1856, p. 154. —An old garden plant.

glabriifolia, N. E. Br. (S. grandiflora var. minor, Hort.). Fls. somewhat small and not hairy, the segments becoming strongly reflexed, dull purple-red with yellowish white lines. G. C. II. 6:890.


In 1865, Blanc catalogued the following names, in addition to some of those above: S. angustata, Jacq. (properly S. picta, Donn.) "Fls. glabra, ovula, ovula, ovula, ovula, yellow, marked with numerous rufous spots; the orb or circle is marked with large spots of two forms, dark brown, yellow." —S. delicata, (S. deléza, 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 dotted with dark purple." —S. revoluta, Mass.: "Distinct flowers, red, with whitish blotches, smooth, very fleshy, and with fringed margins." —S. viola, 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. Tzoménésia, N. E. Br.: "A very rare species from the Tsomo river. Corolla 3 in. in diameter, the face entirely dull, smoky purple, darker at the tips of the lobes."

L. H. B.

2392. Stapelia grandiflora (X 1-3).
with 1 or few subglobe or rather large, bony seeds in each cell.

**A.** Lvs. 3-foliolate.

**b. Middle leaflet short-stalked: panicles sessile.**

**Bumálda, DC.** Shrub, 6 ft. high, with upright and spreading slender branches: lfts. broadly oval to ovate, shortly acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1½-2½ in. long: fls. about ¾ in. long, in loose, erect panicles 2-3 in. long; sepal yellowish white, little shorter than the white petals; capsule usually 2-lobed, somewhat compressed, ¼-1 in. long. June. Japan. S.Z. 1:95.

**2393. Staphylea trifolia (X ¾).**

**bb. Middle leaflet slender-stalked: panicles stalked.**

**trifória, Linn.** AMERICAN BLADDER NUT. Fig. 2393. 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 ¾ in. long, in nodding panicles or umbel-like racemes; sepals greenish, ovate, 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. *pauciflora*, Zabel. Low and suckering: lfts. smaller, broader, glabrous at length: fls. in short, 3-8-fl. racemes: fr. often 2-lobed, 1½–1¾ in. long.

**a. Lfts. 5-7-foliolate, only occasionally 3-foliolate: panicles stalked.**

**pinnata, Linn.** Upright shrub, attaining 15 ft., sometimes tree-like: lfts. 5–7, ovate-oblong, long-acuminate, sharply and finely serrate, glabrous and glaucous beneath, 2–3 in. long: panicles 2–5 in. long, on peduncles about 2 in. long; sepals ovate, whitish, greenish at the base, reddish at the apex, about as long as the oblong leaves: capsules 2–3-lobed, much inflated, subglobose, about 1 in. long. May, June. Europe to W. Asia. Gn. 34, p. 280.

**bb. Panicle broad, ovate, upright or nodding: fl.-buds obovate-oblong.**


**S. Bolanderi, A. Gray.** Allied to *S. trifolia*: lfts. broadly or almost orbicular, glabrous; stamens and styles exserted; fr. 2–3-flowered, elegans, Wall. Intermediate between and supposed to be a hybrid of *S. pinnata* and *Cólchica*: lfts. usually 5; panicles very large and nodding. A very free-growing variety with pinkish tinged fls. is

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**a. Fls. in long, cylindrical spikes.**

**b. Spikes in open panicle.**

1. **Suwórowi.**

**bb. Spikes in dense panicles.**

2. **superba.**

**aa. Fls. in more or less unilateral spikes or clusters.**

**b. Branches winged.**

1. **Calyx blue: corolla white.**

2. **Plant herbaceous.**

3. **sinuata.**

4. **macrophylla.**

5. **Calyx white: corolla blue.**

6. **speciosa.**

7. **Calyx green or white: corolla red.**

8. **Tatarica.**

9. **Calyx and corolla yellow.**

10. **Bondueill.**

**bb. Branches terehe or simply angled.**

1. **Fls. yellow.**

2. **australis.**

3. **Fls. not yellow.**

4. **Calyx blue.**

5. **Petioles rather long.**

6. **Petales short or none.**

7. **Gmelini.**

8. **Calyx white or green.**

9. **Breasts green.**

10. **Collina.**

11. **Breasts white-margin.**

12. **Fls. Spikelets 4-fl.**

13. **Eximia.**

14. **Fls. Spikelets 2-fl.**

15. **Fls. Spikelets 1-fl.**

16. **Tattoria.**

1. **Suwórowi, Regel.** A tall annual: lvs. radical, ob lanceolate, obtusate, mucronate, 6–8 in. long; margins entire or sinuate: scape several, stout, obtusely angled,
STATISTICS

beari ng 1 long terminal spike and several distant, sessile lateral ones 4-8 in. long, nearly ¼ in. through; fls. rose, small, nearly sessile, crowded. June, July, Western Turkestan. B.M. 6959.—A handsome annual, suitable for growing in masses and useful for cut blooms.

2. superba, Regel. A hardy annual resembling S. Sineowowi, but with the spikes densely crowded into a pyramidal panicle. Asia.—According to Wm. Falcner in G.F. 1:283, this species is not as handsome nor as vigorous as S. Sineowowi. Var. flore-albo, Benary, is also offered.

3. sinuata, 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 bearing a bristle: scapes several, 3-5-winged, the wings produced into linear-leaf-like appendages: branches several, 3-winged: floral branches or peduncles broadly 3-winged, the wings dilated below the spikelet and prolonged into 3 unequal triangular, acute appendages: spikelets 3-4-fl.; corolla white; calyx large, blue. Late summer. Mediterranean region of Europe. B.M. 71.

4. macropbylla, Brouss. (S. Höflordi, Hort., is a garden form of this species). A tender, somewhat shrubby species 3-4 ft. high: stem branched and bearing clusters of large fascicle-like, oblong-spicate flowers: scape leafless: much branched into a large, paniculate corymb; branches winged: spikelets 2-fl.; calyx blue; corolla white. B.M. 4125. B.R. 31:7.—Cult. in S. Calif. Makes a good pot-plant for winter flowering in a cool greenhouse. T. D. Hatfield, in G.F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather undersized 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 cuttings 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. speciosa, Linn. A hardy perennial, about 1 ft. high: lvs. obovate, attenuate on the petiole, stiffly and shortly mucronate tipped, often purplish underneath; scape somewhat branched: branches 4-6 in. long, narrowly 2-winged, somewhat recurved, not crowded, bearing unilateral, scorpioidly capitate, densely imbricate short calyx: perianth, persistent, crowned with a silvery white funnel-shaped corolla: petals purple, very deciduous. Midsummer. Siberia. B.M. 606.

6. Tatárica, Linn. (S. inéana, var. hybrida, Hort. S. Besseriána, Schult.). A hardy perennial, 1-2 ft. high: lvs. tufted, obovate to oblong-spicate, 4-6 in. long, narrowed into the petiole: scape widely branched: branches triangular, slender, narrowly 2-winged, somewhat recurved: spikelets 1-2-fl., in usually lax, simple or branched spikes: fls. 2 lines long, typically red, with several garden varieties. Caucasus. B.M. 6357.—Var. nana, Hort. (S. inéana, var. nana), is a dwarf form.

7. Bondunélí, Lestib. Fig. 2394. A tender annual or biennial plant, about 18 in. high: lvs. radical, spatulate, sinuately lyrate, hairy, subulate-pointed at the apex; lobes rounded, the terminal larger: scapes several from the same root, terete: branches angled, dichotomously cymose; ultimate branches 4-rayed, 3-winged, forked at the apex: fls. yellow, individually large for the genus, clustered in the fork of the branches or peduncles: bracts scarious, the inner furnished with short spines. Afr. Algeria. R.R. 1865:276. B.M. 5185. F.S. 20:2329.


11. collina, Griseb. (S. Besseterína, Fr.ivald). A glaucous perennial with oblong-lanceolate, long to lanceolate lvs. sharply awned, attenuate on the petiole: scape corymbose-paniculate from near the base, the branches triangular, wide—spreading: spikelets 1-fl., in dense, short, numerous fascioid-like spikes: fls. rose. South-eastern Europe and Asia Minor.


The flowers are about one-third inch across.


S. Armeria, Linn., la Armeria marítima.—S. grandiflóra, Hort.—Armeria latiflóra, Koch.—Armeria elon- gata.—S. Pseudo-armeria, Pax.—Armeria latiflóra.—S. undu- lata, Bory & Chaub.—Armeria argyrogyna.

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 Synopitical 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 Elev-
enth Census, 1890. In this Cyclopedia statistics ap-
pear under such large topics as Horticulture, Cut-flow-
ers, Floriculture, and the various articles on states.

STEIRRÔNÉMA (Greek, sterile threads; referring to staminodia). *Primulaceae*. Loosetang. Herbs, all
erect, with opposite entire leaves and rather large yel-
low axillary and leaf-corymbed flowers: corolla rotate,
5-parted; stamens 5, opposite the lobes, with 5 alternat-
ing subulate staminodia: capsule 1-loculed; seeds many
on a central placenta. Differs from Lysimaehia in
the presence of the sterile stamens, and in the stivation
of the corolla. Useful showy plants for borders in damp
soils. All perennials.

ciliatâm, Raf. (Lysimaehia ciliâtâ, Linn., St.). Stem 1–4
ft. high, sparingly branched, nearly glabrous: lvs. 2–6
in. long, ovate-oblong to ovate-lanceolate, ciliate, acute or
acuminate, base rounded; petioles ½ in. long, entire: lvs.
on slender peduncles, showy, 5–12 lines broad; cor-
olla-lobes rounded erose, often mucronate: capsule
longer than the calyx. Moist thickets. U. S.

longîloînum, Gray (Lysimaehia quadriîloîva, Sims.
L. longîloîla, Pursh). Erect, strict and glabrous: stem
4-angled, 1–2 ft. high: lvs. linear, thick and firm, 1-
nerved, acute at both ends, 1–4 in. long, smaller ones
clustered in the axils, margins slightly revolute, basal
broader and petioled: peduncles slender, ½–1½ in.
long: lvs. numerous, often appearing clustered; corolla
8–10 ft. long, broad, the lobes oval, often erose.
Eastern U. S. June, July. B. M. 660 (as L. quadriîloîva).—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 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: lvs. usually white and
dispersed in terminal or rarely axillary leafy or naked
paniculate cymes; sepals usually 5; petals usually 5,
rarely none, bâl, often deep: stamens 3–10; styles
3–4, rarely 5: capsule ovoid to oblong, relatively short,
dehiscent by as many or twice as many teeth as there
are carpels. See Gray, Syn. Flora of N. Amer.

a. *Fls. 1–4 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: lvs. white, abundant, in terminal leafy panicle;
sepals one-half or two-thirds as long as the petals.
May, June, Eu., Asia. B. B. 2:22.—This and the next
are desirable for dry banks, where grass will not grow
well and for other carpeting purposes.

AA. *Fls. 2–5 lines across.

b. Lvs. narrow.

graminea, Linn. A slender-stemmed, hardy per-
ennial plant not usually over 6 in. high, from a
creeping rootstock: lvs. sessile, linear lanceolate,
usually about 1 in. long: lvs. white, in terminal or
lateral scarious bârâted open panicles; sepals and
petals nearly equal in length. May, June, Eu-
rome; naturalized in America. B. B. 2:23.—Var.
orea, Hook. GOLDEN STITCHWORK, has pale yel-
low leaves and is lower and more matted in
growth. Well adapted for sandy banks where grass
does not grow well.

BB. Lvs. oval.

média, Linn. CHICKWEED. Fig. 2396. A low, decum-
bent annual weed common in all rich, moist, cultivated
soils, especially troublesome during the cooler months

STELLARIA mediâ (d. fl. 3).

One of the commonest of weeds, blooming nearly
every month in the year.

2396. STELLARIA mediä (d. fl. 3).

H. NEHRING

ST. BERNARD'S LILY. *Anthericum Liliago*.

ST. BRUNO'S LILY. *Paradisea Liliastrum*. 

ST. BERNARD'S LILY. *Anthericum Liliago*.

ST. BRUNO'S LILY. *Paradisea Liliastrum*. 

ST. BERNARD'S LILY. *Anthericum Liliago*.

ST. BRUNO'S LILY. *Paradisea Liliastrum*. 

ST. BERNARD'S LILY. *Anthericum Liliago*.

ST. BRUNO'S LILY. *Paradisea Liliastrum*. 

ST. BERNARD'S LILY. *Anthericum Liliago*.

ST. BRUNO'S LILY. *Paradisea Liliastrum*.
of the growing season and in frames, etc., during winter. 1 to 2 lines to 1 ½ in. long, the fleshy petiole, the upper sessile: fls. axillary or in terminal leafy eymes; sepals longer than the petals. Eu., As. B.B. 2:21. —It is considered to be a good fall and winter cover-plant in orchards and vineyards, but is never cultivated. It is an indication of good soil.

F. W. BARCLAY.

STENACIS. See Erigeron.

STENANDRIUM (Greek, narrow anthers). Acan- thaceae. About 25 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 lubricated bracts or is interrupted and has smaller bracts; calyx 5-parted; corolla-tube slender, enlarged at the top, 5-lobed; stamens 4; anthers 1-celled; style shortly 2-lobed: capsule 4-seeded, or by abortion fewer-seeded.


F. W. BARCLAY.

STENANTHIUM (Greek, narrow flower; referring to perianth-segments). Lilidaceae. Stenanthium occidentale is a rare, hardy, sun-loving, blooming bulb from the Pacific coast, with nodding, greenish purple, 6-lobed, bell-shaped fls., about ¾ across, borne in a slender panicle. Generic characters: fls. polygamous; perianth narrowly or broadly bell-shaped, persistent; segments con- nate 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 Sachalin, another Mexican, the rest western American.


W. M.

STENOCAPUS (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 scattered lvs. entire or with a few deep lobes and red petioles, terminal leafy, axillary, sometimes clustered umbels; perianth somewhat irregular, the tube open along the lower side, the limb nearly globular; anthers broad, sessile: ovary stipeitate, with a long, tapering style dilated at the top; seed winged at the base.

saligus. R. Br. A medium-sized tree, with willow-like, ovate-lanceolate lvs. 2-4 in. long, with short petioles: fls. usually less than ⅜ in. long, greenish white, in umbels of 10-20 fls.: peduncles shorter than the lvs. B.B. 6:441. —Cult. in Calif.

F. W. BARCLAY.

STENOLOMA (Greek, narrow-fringed). Poly podieae. A genus of ferns formerly included with Davallia; characterized by the decumbent lvs. with curved tips, acuminate or acute, the ultimate divisions with toothed cuneate lobes; sori terminal, usually solitary. Tropical Asia and Aus-Polynesia. — Var. stricta, Hort., has a more upright habit and narrow leaves.

L. M. UNDERWOOD.

STENOMÉSSON (Greek, small and middle; alluding to the corolla-tube, which is usually contracted near the middle). Amaryllidéaceae. About 15 species of tropical American bulbous herbs, with linear to broadly strap-shaped, yellowish, glazious, 6-angled leaves in a usually many-flowered umbel: perianth-tube long, erect or recurved, the lobes short, erect or spreading; filaments straight, connected by a membrane: capsule somewhat globose, 3-4-valved, 3-seeded. It is hardy.

Stenomésson requires a good soil and a sunny house with a temperature never below 45°. During the growing season they should have plenty of water, but when at rest comparative dryness is necessary. The offsets should be removed from the old bulbs before growth commences. The plants continue in bloom a number of weeks.

A. Style shorter than the perianth.

incarnátum, Baker (Cobrigia incarnáta, Sw.). A tender plant: bulb somewhat globose, 1 in. through: lvs. thick, glaucous, obtuse, about ⅜ ft. long, strap-shaped: scape 2 ft. high: fls. 4-5 in. long, few to many in an umbel, variable in color but typically crimson, with a green spot on each segment. August.-Pern. I.H. 38:129 (perianth-limb light yellow). Gn. 50:1076.

AA. Style longer than the perianth.

flávum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, obscurely pedicelled, at first compressed on the margin: scape 1 ft. high: fls. yellow, about 2 in. long, usually few in an umbel. B.M. 2641. B.K. 10:778 (as Stellaria flavula).

F. W. BARCLAY.

STENOTAPHRIUM (Greek, stenos, narrow, and taphro, a trench; the spikelets being partially embedded in the rachis), Gramineae. About 3 species of tropical regions, one of which is found along 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 rhizomes and creeping habit as does that grass. Spikelets 2-fl., the staminate and neutral 1 or 2-fl., 1-celled; the staminate a short spike, which is embedded in the alternate notches of the broad rachis, thus forming a spike-like panicle. Creeping grasses with compressed culms and flat, divergent leaves.

Amerícareum, Schrank. (S. secundátum, Kuntze). St. Augustín Grace. Flowering branches erect, 6-12 in. high. Var. variegátum has leaves striped with white, and is used as a basket plant. A. S. HITCHCOCK.

The introduced form of St. Augustín Grass is one of the most valued lawn grasses for the extreme South. It will grow on almost any kind of dry or shaded soil. The leaves are rather broad, never over 6 in. high and require little mowing. This grass does not become coarse, does not hold dew or rain, and is peculiarly good for borders of flower beds and does not need as much water as Bermuda or St. Lucie grass. It is mostly propagated by cuttings.

E. N. REASONER.

STEPHANANDRA (Greek, stephanos, crown, and aner, andros, male stamen; alluding to the persistent crown of stamens). Rosáceae. Ornamental small decidu-ous shrubs with alternate, stipulate, lobed lvs. and with small white fls. in terminal panicles. Graceful plants, with handsome foliage, hardy north or almost so. Well adapted for borders of shrubbery or rocky banks on account of their graceful habit and handsome foliage. Prop, easily by greenwood 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 or pedicelled, small, with cup-shaped calyx-tube; sepals and petals 5; stamens 10-20: carpel 1; pod with 1 or 2 shining seeds, dehiscent only at the base. Closely allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1-2-seeded pod.

flexuosa, Sieb. & Zucc. (S. sincera, Zabel). Shrub, 5 ft. high, almost glabrous, with angular spreading distinctly zigzag branches: fls. small, ovate, coriaceo-dentate or truncate at the base, long-acuminate, distinctly lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish

STEPHANANDRA
green, ¾-1½ in. long; fls. white, about ¼ in. across, in terminal short, 8-12-fld., usually paniced racemes; stamina. June, Japan, Korea, Gn. 53, p. 141.

**Tanaka, Franch. & Sar. Fig. 2397.** Shrub, 5 ft. high, almost glabrous; lvs. triangular-ovate, slightly cordate at the base, abruptly and long-acuminate, usually 3-lobed and doubly serrate or lobulate, pubescent only on the veins beneath. 1¾-3 in. long; fls. in terminal loose panicles, slender-pedicelled, ⅝ in. across; stamens 13-20. June, July. Japan. B. M. 7295. Gr. 45:1431.

Handsome shrub much resembling Neillia in foliage, coloring in fall brilliant orange and scarlet or yellow.

**Stephanandra**

*Stephanandra flexuosa* is closely allied to *Spirea* and has the *Spirea* 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 red and purple. This species can be increased by cuttings, but it 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 *Ruellia.*

**Stephanotis**

(from Greek words for crown and ear; alluding to the 5 ear-like appendages on the staminal crown). *Asclepiadaceae.* Twinning 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.

**Stephanotis floribunda** (X ¾), melon-like seeds which are provided with a tuft of hair. Madagascar.

B. M. 4058. Gn. 21, p. 141 (showing a pycnym plant blooming in a small pot and not climbing); 46, p. 208; 55, p. 150. G. C. I. 14:169 (a dwarf variety, the *Elves*); 24:817; 25:157; 31:175. R. H. 1874, p. 366; 1885, p. 384, 439. This is a most useful old greenhouse twiner, blooming in spring and summer. In winter it should be kept partially dormant at a temperature suited to carnations (say 50-60°). Enrich the soil every year. Propagated by cuttings of last year's growth in spring. Good seeds are rarely produced under glass. When planted in the open in warm countries, it thrives best in partial shade. Very liable to mealy bug.

*S. Thoudsia,* Brongn., from Madagascar, appears to be the only other species in cult., but it is not in the American trade. It has obovate lvs., fls. in 3's, and sepals about one-third the length of the corolla-tube.

L. H. B.

**Stephanotis floribunda** is one of the handsomest of our greenhouse climbers, blooming in spring and summer. In the days when short blooms were used in bouquets it was one of the most valuable flowers that the florist had, its large-flowered umbels having a delicious odor. It should be kept about 60° during the winter, with less water. In the summer it delights in the temperature of our warmest houses with plenty of syringing. When given too much root room it grows very rampant and is less inclined to flower. Seed pods are occasionally seen on the plant, but it is easily propagated by cuttings from pieces of the last year's growth and they strike freely in sand. This is also one of the most valuable plants for private points of interest. When grown in a 12- or 15-inch pot or tub and trained on a balcony trellis it makes splendid specimens and is often seen at our horticultural exhibitions; and when in bloom there is nothing finer for the conservatory. Wm. Scott.

**Sterculia** (*Sterculiaceae*)

Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the odor of the leaves and fruits of some species. *Sterculia.* Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the odor of the leaves and fruits of some species. *Sterculia.* Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the odor of the leaves and fruits of some species. *Sterculia.* Some 50 or 60 species of tropical trees or shrubs, most abundant in Asia, a few of which are planted in the odor of the leaves and fruits of some species.
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 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. platanifolia, S. diversifolia and S. acerifolia, the last two known in California as Brachychitons. All are easily grown from seeds. Sterculaceous plants are allied to the Malvaceae.

2399. Mature follicles or fruits of Sterculia platanifolia, bearing seeds on the margins. Natural size.

A. Carpels expanding before maturity into leaf-like bodies, exposing the seeds.

platanifolia, Linn. f. (Floribunda platanifolia, Schott & Endl.). JAPANESE VARNISH TREE. CHINESE PARASOL TREE. Fig. 2399. Strong-growing, smooth-barked, round-headed tree of medium size, with deciduous foliage: lvs. very large, glabrous, coriaceous, palmately 3-5-lobed like maple lvs., the lobes sharp-pointed: lvs. 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 of 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.

fodiida, Linn. Tall, handsome tree, with all parts glabrous except the young foliage: lvs. crowded at the ends of the branchlets, of 5-11 elliptic, oblong or lanceolate, entire, pointed, thick leaflets: lvs. large, dull red, in simple or branchless panicles, age of which with the race fr. large and woody follicles, glabrous outside, often 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. Lvs. entire or only lobed (compound forms sometimes borne on S. diversifolia).

alata, Roxbr. Large tree, the young parts yellow-pubescent, the bark ash-colored: lvs. large, coriaceous, ovate or ovate-lanceolate, acuminate or acute, 7-10-nerved: lvs. about 1 in. across, in few-fl. panicles shorter than the lvs., the flowers which arise from the leafless axils, the calyx tomentose and the segments linear-lanceolate: follicles 5 in. in diam., globose, with wide-winged seeds. India.—Intro. into S. Florida.

cc. Follicles glabrous on the outside, usually villous within.

acerifolia, A. Cunn. (Brachychiton acerifolium, F. Muell.) BRACHYCHITON. FLAME TREE. Evergreen tree, reaching a height of 60 ft., glabrous: lvs. long-petioled, large, deeply 5-7-lobed, the lobes oblong-lanceolate to rhomboid, glabrous and shining: lvs. bright red or scarlet, the only in large, silky, pubescent trusses: follicles large, glabrous, long-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.). BRACHYCHITON. Tall tree, glabrous except the fls.: lvs. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes variously 3-5-lobed on the same tree, all parts acuminate: lvs. tomentose when young, ballow, greenish, red and white or yellowish white, in axillary panicles: follicles 1½-3 in. long, ovoid, glabrous, stalked. Australia.—Planted in California, and commoner than the last.

Var. occidentalis, Benth. (Brachychiton Grigorii, F. Muell. S. Grigorii, Hort.). Lvs. deeply 3-lobed, the lobes narrow, sometimes with short lateral ones: fls. salmon-color; calyx smaller and more tomentose. West Australia.—Offered in S. California.

L. H. B.

STEREOSPERMUM (Greek; hard seed). Bygnotideae. About 10 species of tropical trees native to Asia and Africa, of which 2 are cult. in S. Fla. and S. Calif. They have handsome foliage, which is once or twice pinnate, and large bignonia-like 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 at apex: capsule long, terebute, loculicidally 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. stereospermum has the elegance of its conger, and it does not sproat as readily as after it has been frozen down.

A. Foliate twice-pinnate: lfs. pale yellow.

Sinicum, Hance. Tree, said to attain 60 ft.: lvs. opposite, bipinnate; pinnae about 4 pairs, each pinna with about 7 lfts.; lfts. ovate-lanceolate, 2 x 3¼ in.; corolla pale yellow, 3 in. long; lobes 1 in. long, somewhat crisped. Hong Kong.

AA. Foliate once-pinnate: lfs. pale or dark purple.

suaveolens, DC. Tree, 30-60 ft. high: lvs. 12-18 in. long; lfts. 7-9, broadly elliptic, acuminate or acute, 5½ x 3 in.; panicle many-fl. viscid and hairy: fls. 1½ in. long; lobes crisped-crescent. India.

II. NEHRLING AND W. M.
STERNBERGIA (after Count Caspar Sternberg, a botanist and writer, 1761-1838). Amaryllidaceae. A genus of 4 species of low-growing hardy bulbous herbs from eastern Europe to Asia Minor, with strap-shaped or linear leaves and bright yellow or orange-like flowers. Perianth regular, erect, funnel-shaped; stamens inserted on the perianth-tube; filaments long, filiform; anthers dorsifixed, versatile: fr. fleshy, scarcely dehiscent; seeds subglobose. The bulbs should be planted rather deeply, about 6 inches. J. N. Gerard says of their culture in G.F. 10:158 that they require a rather heavy soil, in a somewhat dry, sunny position where they will be well ripened in summer.

240. Sternbergia lutea (× 1/4).

A. Fls. and lvs. appearing together.
B. Blooming in fall.

lutea, Ker-Gawl (Amaryllia lutea, Linn.). Fig. 2400. Bulb about 1½ in. through; lvs. 6-8 to a bulb, strap-shaped, becoming 1 ft. long; fls. yellow, 1-4 to a bulb; tube less than ½ in. long; perianth-segments about 1½ in. long. Mediterranean region of Eu. and Asia. B.M. 290. Gn. 44, p. 365; 47, p. 114. G.C. II. 13:21.

bb. Blooming in spring.

Fischeriana, Roem. Has the habit of S. lutea, but differs in season of bloom and stipitate ovary and capsule. Wm. Watson says (G.F. 8:144) that the fls. are a brighter yellow and as large as the largest forms of S. lutea. Caucasus. B.M. 7414.

AA. Fls. and lvs. appearing at different seasons. B. Lvs. linear: fls. small.

colchiciflora, Waldst. and Kit. Bulb about 1½ in. through; lvs. appearing in spring, 3-4 in. long; fls. yellow, in fall; segments about 1 in. long by 2 lines broad. East Europe, Asia Minor. B.R. 23:2008.

bb. Lvs. strap-shaped: fls. large.


F. W. Barclay.

STEVIEA. 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 Stuarta.

STICK-TIGHT. Vernacular for burs of Cynoglossum.

STIGMAPHYLON (Greek, stigma and leaf; referring to the leaf-like appendages of the stigmas). Sometimes known as Stigmaphyllum. Malvaceae. A genus of about 50 species of tropical American woody vines with usually opposite, entire to lobed, petioled and yellow flowers in axillary, peduncled umbel-like cymes: calyx 5-parted - glandular; stamens 5, 2 fertile and 4 antherless or deformed; styles 3; stigmas produced into leaf-like or hooked appendages: ovary 3-loculed, 3-lobed.

ciliatum, A. Jess. A tendry woody twining vine: lvs. evergreen, smooth, opposite, cordate, elliptic; fls. bright yellow, large, in peduncled axillary clusters of 3-6. P.M. 15:77. Gn. 33:637.—Apparently the only species in the trade and possibly the most handsome of the genus. G. C. Smith later says that one of the best medium-sized vines for outdoor trellis work for pot culture it is of little service and thrives in the greenhouse only when planted out. September is the best month for propagation. On outdoor plants much of the world is useless for this purpose, being thin and soft. Choose the wood made early in the season; a heel or joint is not necessary; root in bottom heat and carry through the winter in the greenhouse as small plants.

Ernest Braunton says of its culture in the open it must have shade, protection from dry or hot winds, and an open soil. Under the right conditions it flowers admirably.

F. W. Barclay.

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, Oliver A. Stiles, in 1833 founded Mount Retirement 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, from taking up the profession of law by constitutional weakness and defective eyesight, his many-sided nature found expression in diversified activities. He was a teacher, a teacher-grandfather, a teacher in 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 gauger in the New York custom house. During a long period of business 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 specimens 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 an editorial writer of the New York Tribune, a relation which continued throughout his lifetime. In 1883 he became agricultural editor of the Philadelphia Press. Keenly interested in introducing scientific discoveries and 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. His writings on the conduct of business 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 "Conservation and Forest" in 1893, W. S. True 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 of the most able and influenceful periodical in the country. His judgment, sound judgment, masterly use of English, and persistent energy, all contributed to the success of this part of his life-work, and his profound, sympathetic understanding of contact with nature 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 public, for the protection of our city parks and their preservation from invasion and despoliation. His special ability and influence received public recognition in 1895, when he was appointed a park commissioner of New York city, a position in which he rendered splendid 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. COULTON.

**STILLINGIA** (after Dr. Benj. Stillingfleet, an English botanist). Emphoriboea. About 15 species of herbs or shrubs from North and South America with alternate simple leaves, small, mossy, fleshy flowers in terminal spikes. The genus is closely related to Sapium, but differs mainly in the fruit, which in Stillingia is of 2-3 dry 1-seeded carpels with no central 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 stem, 2-3 ft. high. Lvs. numerous, very short-petioled 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 Bitmore, N. C. The plant grows readily from seed, but does not bear transplanting well.

For *S. sebiferum*, see Sapium sebiferum.

F. W. BARCLAY.

**STIPA** (Greek, stipe, tow; in allusion to the plumeous awns of one of the original species). *Graminae*. A genus of some 13 species of grasses. The whole genus is made up of plants with awned spikelets, except the corydalis. They are particularly characteristic of the plains, savannas and steppes. The long, sharp-pointed awns of some species are troublesome or destructive to stock, especially sheep, on account of their tendency to lodge on the skin or through the skin of the vital organs. Perennial grasses with narrow involute leaves and loose panicles: spikelets 1-fl.; empty glumes membranaceous, longer than the indurated fl.-glume; fl.-glume with a sharp hairy callus 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 *waving-stipa*. Stipa capillata, capillata.

*pennata*, Linn. *Feather Grass*. Culms 2-3 ft., in bunches: empty glumes narrowed into an awn 1 inch or more long; fl.-glume 1/2 in. or more long; awn a foot or more long, lower portion smooth and twisted, the upper very plumose, giving the plant a very feathery ornamental appearance. Steppes of Europe and Siberia. *S. capillata*, Linn. 9, p. 199. *V. 3:247*. R.H. 1890, p. 489.

**STILLS**

Furnish fiber from which are made ropes, mats, paper, etc. In Africa it is called Halfa or Alfa.

spartea, Trin. *Porcupine Grass*. Culms 2-3 ft., in bunches: panicles contracted; empty glumes broad, nerved, about 1/4 in., tapering to a slender point: fl.-glume nearly 1 in.; swu usually about 6 in. long; the lower half erect and sharply twisted, the upper half bent to one side, rough. Illinois to California.
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 in the first week in April, keeping them close for a few days until germinated, gradually thinning 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 pot-bound), 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. Malcolmia maritima.

STOKES’ ASTER. See Stokesia.

STOKESIA (Jonathan Stokes, M.D., 1755-1831, English botanist). Compositae. 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 chilicoys. 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 long, 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 frosts. According to Chapman, the heads of wild specimens are only an inch across, but the size of heads in cultivated plants is stated by many horticultural experts to be 3-4 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.

Generic characters: heads many-flowered; marginal florets much larger, deeply 5-cleft; involucral suborbicular; outer bracts prolonged into a large, leafy, bristly-fringed appendage: achenes 3-4-angled, smooth: pappus of 4-5 thread-like, deciduous scales.

Stokesia, L'Herit. 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: florets blue or purplish blue, 3-4 in. across. Aug.–Oct. Ga., S. C. M. 4966. Mn. 5, p. 214. R.H. 1863:211. W. M.

STONECROP. See Sedum.

STORAGE. Various ideas 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 storage of cut flowers for sale. Usually the floor is two or three feet below the level of the ground.

The house shown in Fig. 2405 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 cellar is provided with ample ventilation by several outside windows, and also by means of a chimney that runs from near the middle of the cellar 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 close-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 12-inch matched 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 $1,200. It has 18-foot posts, a tin roof, the two rooms in the first floor ceiled with pine, but the top floor not celed.

An apple storehouse in Grand Isle, Vt., is shown in Figs. 2406 and 2407, and is described by Waugh (Bull. 55, Vt. Exp. Sta.):
"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, 5 feet high, 2 1/2 feet wide at the bottom, and 2 feet at the top; 2-inch plank for sills on this, bedded in mortar, doubled so as to break joints; 2 by 4 studding above this; outside of studding matched pin, then paper, and then clapboards, painted; in middle of studding, lath and plaster; inside of studding, matched pin, then paper, and then 5/8-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 storage rooms. 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 erected 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 imbed 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 secured by placing 2 1/4 studding in between 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 studding and the storage chamber. See Fig. 2409, cross section of such a wall. The ice chambers should extend the whole length of the building or storeroom. They may be as narrow as six feet, but should be made wider, and the amount of capacity and cooling power. The floor is made of metal overlaid with 2 1/4's 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 slat 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 staging carrying 2 x 12 joists 18 inches apart, and floored with 2 1/4's one inch apart, will give ample support for the ice chambers and second-story ware-rooms. The roof to the second-story room should be built so as to make it near a non-conduc- tor of heat as possible. Dead-air spaces are the cheapest and most easily constructed non-conductors. This is essential 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 shingle or slate roof used in place of metal. The ceiling in the second story must be provided 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 sufficient to fill the ice chambers. It is not advisable, in the writer's judgment, to use the ice chambers as ice houses for storing ice; they are merely ice chests to be used to cool the ware-rooms and fruit as it appears. The chambers can be made much smaller than would be necessary 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. L. H. B. Refrigeration or cold storage is the name given to the preservation of perishable products, such as fruits and other organic foodstuffs. Cooling was first used 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 those localities where an abundant supply of natural ice was available, the process did not come into general use until the machin- istry for producing artificial ice was perfected. Various principles have been employed 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 anhy- drate and ammonia anhydrate have chiefly been em- ployed. After the cooling has been effected by artificial
Storage

If compression due to 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 purposes. European 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 horticultural 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 leed, 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 over-supply 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 act, 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° as a ripe fruit at 35°, 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°F., from January 4 to

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2406. Apple storehouse in Vermont.

2407. Structural details of the building shown in Fig. 2406.
April 20, showed losses as follows: Open shelves, 5,364 grams; in sealed cans, 692 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 43⁄8 pounds on a barrel of 1393⁄4 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 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>Year</th>
<th>Common storage.</th>
<th>Cold storage.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Barrels.</td>
<td>Barrels.</td>
</tr>
<tr>
<td>December 1, 1889</td>
<td>400,000</td>
<td>200,000</td>
</tr>
<tr>
<td>December 1, 1890</td>
<td>720,000</td>
<td>360,000</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 1896 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>Season of</th>
<th>Month</th>
<th>1897-8</th>
<th>1898-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 1</td>
<td>$1.00</td>
<td>$1.50</td>
<td>$2.00</td>
</tr>
<tr>
<td>Dec. 1</td>
<td>0.75</td>
<td>1.25</td>
<td>2.00</td>
</tr>
<tr>
<td>Jan. 1</td>
<td>1.00</td>
<td>1.50</td>
<td>2.00</td>
</tr>
<tr>
<td>Feb. 1</td>
<td>1.25</td>
<td>2.00</td>
<td>3.00</td>
</tr>
<tr>
<td>March 1</td>
<td>1.50</td>
<td>2.50</td>
<td>3.50</td>
</tr>
<tr>
<td>April 1</td>
<td>2.00</td>
<td>3.00</td>
<td>4.00</td>
</tr>
<tr>
<td>May 1</td>
<td>2.50</td>
<td>3.50</td>
<td>4.00</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 $2.371⁄2 per barrel, which gives the aggregate of $2,899,375 on the apples in cold storage during the year 1900.

The apple, grape and pear are important cold storage fruits in Eastern 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 peach, strawberry, plum and plum industry have resulted from the development of the refrigerating car service. As early as 1863 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 idea as the Pullman sleeping car—that is, of providing refrigerating cars, which run over certain roads, gathering the fruit from areas having a large output, re-icing the cars at given points, and carrying the product 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, III.

With the application of refrigeration to the storage of fruits in Illinois, Indiana, Wisconsin, Illinois 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 Oceana 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. Cold storage is now accepted as good order on the English markets. With refrigeration, time is of less importance than rehandling, shaking and a constant temperature.

Modern 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 be. 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 neighborhood of the cooled coils is so low as to freeze 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 many branches 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</td>
<td>For three or four days</td>
<td>34-36</td>
</tr>
<tr>
<td>Cauliflowers</td>
<td>Carry only about three weeks</td>
<td>32</td>
</tr>
<tr>
<td>Cranberries</td>
<td></td>
<td>33-34</td>
</tr>
<tr>
<td>Dates, figs, etc.</td>
<td></td>
<td>32-36</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>36-38</td>
</tr>
<tr>
<td>Peaches</td>
<td></td>
<td>35-45</td>
</tr>
<tr>
<td>Pears</td>
<td></td>
<td>36-40</td>
</tr>
<tr>
<td>Watermelons</td>
<td></td>
<td>35-40</td>
</tr>
<tr>
<td>Asparagus</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>Cabbage</td>
<td></td>
<td>32-34</td>
</tr>
<tr>
<td>Carrots</td>
<td></td>
<td>33-38</td>
</tr>
<tr>
<td>Celery</td>
<td></td>
<td>33-35</td>
</tr>
<tr>
<td>Dried beans</td>
<td></td>
<td>32-38</td>
</tr>
<tr>
<td>Dried corn</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>Dried peas</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td>33-34</td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td>34-36</td>
</tr>
<tr>
<td>Sauerkraut</td>
<td></td>
<td>35-36</td>
</tr>
</tbody>
</table>

"Asparagus, cabbage, carrots, and celery are carried with little humidity; parsnips and sausages alike as onions and potatoes, except that they may be frozen without detriment.

"Apples with the skins 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. Citrus 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 as a temperature as 38°. 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 spelling 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 in 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 in order to avoid loss. If, new, 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 iced box for
transportation to the storage rooms. No perishable fruit that has been exposed to ordinary temperatures for twenty-four hours after picking is fit 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 and keeping quality of any fruit is self-limited, that the processes of ripening and subsequent deterioration are constantly going forward, and that all 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 usually 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 stimulate the ripening processes and as 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 spots of incipient decay that cannot be entirely checked by refrigeration. It is far safer 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. 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. 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.

2411. The piling of barrels of apples in a cold storage house.

Apples are best preserved at a temperature of 30° F., two below the freezing point. It is generally held that they should be taken from the tree as soon as matured and colored, immediately put in a cold room and at 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 addition to "seasonal" up much longer than if carried at a higher temperature. Bartlett pears put in while green and as soon as the stem will cleave from the twig, at a temperature of 32°–33°, 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. Peaches and other stone fruits will take a temperature of 36° and are not, as a rule, carried successfully to exceed two weeks. They are very deceptive; the outside will appear satisfactory, but the fruit will be tasteless, and around the pit it will be black and in a semi-decayed condition. Berries, one week to ten days at a temperature of 38° will, if they are not bruised or broken, carry nicely and many times tide over an overstocked market.

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, particularly sprouts 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 storages: 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, 5 cents per lb.; grapes, 5 cents per lb. first month, 1-5 cents each additional month; maple sugar, 4 cents per lb. first month, 3-5 cents each additional month; pears, 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 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 an overstocked 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.

S. 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-
STORAGE

Different 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 wood, stone or brick, but it is very desirable that it should be divided into many small rooms, and that each room 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 refrigerating 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

Now, with refrigerator cars of strawberries coming in from Florida in early May and continuing well into July, when the last strawberries come in from Maine and northern New York, berries just as fresh and bright as "home-grown" are to be seen in all the eastern markets for a few weeks. Chicago and other western markets are in like manner supplied from Texas to northern Wisconsin and Michigan.

Without the refrigerator car, the great peach orchards of Georgia and Texas would not be practicable, as the most of their fruit must be sold at the North. The "peach season" now extends from May till November. The "seasons" of other fruits are likewise extended in a less degree, and there appears to be little danger that competition now has little effect on the local market. Michigan or Missouri may be sending peaches to New York, Boston and Philadelphia one season on account of a failure of the crop in Delaware, New Jersey and Connecticut; while the next year a failure of the crop at the West enables Connecticut, New Jersey and Delaware to return the compliment and supply Chicago, St. Louis and Minneapolis. Yet without the refrigerator car such reciprocity would be almost impossible, except in the most favorable seasons. The refrigerator car is really a great ice-chest on wheels. Most of these cars are connected with ice-bunkers at each end, with a capacity of 4 to 6 tons of ice for each car. Fig. 2413.

One style has some two feet of the whole top of the car as an ice-bunker, and a second season, the ice is completely fed all the way in transit. Railroad people object to it slightly. In fact, guarantee refrigeration until the ice is unloaded. This is the most expensive service, but is safest and best for long distances. Bids for one and two days' shipments, where the cars need not require re-icing, the shipper can save money by using the railroad refrigerators and do his own icing, and there is no good reason why the leading railroads cannot establish icing stations and re-ice the ice-cars, charging the expense along on the freight bill.

In loading a refrigerator car, care is taken that an opportunity is provided for air circulation around each package; this is accomplished by properly spacing the first row of packages, then by "stripping" across the tops of these two strips about 1¼ inches, and finding a small nail down through them, one into each package. The packages are held in place, and the stripper serve as the next tier of packages to rest on and leave an air space of an inch between the two layers. In this way cars are loaded full up to eighteen inches or two feet of the top, care being taken usually to have the ripest or poorest carrying fruit in the bottom of the car, and the firmest, long-keeping at the top; and if the ice-bunkers are not kept "chock-a-block" full all the time, the top tiers do not get as good refrigeration. It is also the custom of many marketmen in unloading these cars to sell out the top tiers first, for the bottom-tier fruit keeps best; while often in case of fruit picked a little too green, top tiers show up best and bottom tiers are sold out of the car a day before being offered for sale. The best results in refrigerator car service are attained when the car has been fed at least twelve hours before loading, and the loading is quickly done by opening the car doors only a few times.

The writer's belief is, when fruit is abundant, is not to start loading a car till he has fruit enough packed to fill it; then with a gang in each end of the car to properly space the packages and do the "stripping" and nailing, open the doors and rush in all the middle of

miles usually arrived in bad order and were very unsatisfactory to both dealer and consumer, and, except for the first few early shipments, prices were very low. It was only at the ripening of "home-grown" strawberries that the crop was not supplied satisfactorily, and the publicly readily paid two and three times the price they would for "shippen-in berries" a few weeks earlier.

2413. Icing cars (at the top) at one of the stations of the Fruit Growers' Express, Georgia.
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, the car and its contents are loaded all day long in the Georgia peach orchard. Where small lots are put in by many different growers and the car is one or two days loading and opened many times, the fruit is not so quickly cooled down and, even in the same car, the fruit of the same variety and in the same route, may be 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 in the beginning and melted 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 inside of the car be brought to 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 difficult thing here is fruit-loading and the first twelve hours thereof.

When well re-iced en route refrigerator cars arrive at destination with bunksers nearly full of ice, and in many of our cities, which are not fruit cannot be sold in a day, dealers often use the cars for storage purposes, re-icing when necessary. Peaches from 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 Styrax.

STORK’S BILL. Erodium and other members of the Geranium family.

STONE PLANTS. The term "stone" applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of bricks. Such structures came to be called stonehouses or stoves, and the plants grown in them "stone plants." (A stove, or in those days an unheated glasshouse in which plants were merely kept alive over winter.) These terms still exist in England, but are applied to strictly tropical plants or those requiring a warm temperature for their successful culture in glasshouses, whereas such plants are spoken of as warmhouse or tropical plants.

In England, at the present time, more distinction is made in the names applied to plant houses than in this country. For instance, "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 plant houses in England are therefore: Stove, for tropical plants; intermediate house, for plants hailing from warm-tropical climates; greenhouse, for those plants requiring the least degree of heat. A conservatory or show house is one in which plants are planted 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 glasshouse itself is a warm house, warm-tropical house, tropical house, palm house, acacia and succulent house, experiment house and propagating house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stové plants is too heterogeneous a subject to be treated exhaustively in a single book, because the stové contains thousands of dissimilar plants grown in the tropics, specially those plants at low altitudes. In general, the stové 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. Asparagus stems.

ST. PETER’S WREATH. Spiræa hypericifolia.

STRATIOTES (Greek, soldier; referring to the sword-shaped leaves). Hydrocharitaceae. The Water Soldier, or Water Aloe, is a hardy aquatic plant of small ornamental value and considerable botanical interest. It is native to lakes and watery ditches throughout 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 white or yellow teeth somewhat after the fashion of Pandanus. The flowers 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 spathe of 2 bracts about an inch long. The male flowers are several in a spathe, stalked, and have usually 12 or more stamens. The female flowers are solitary and sessile in the spathe of a male flower. It is an aquatic and behaves the same as general, but is most common in European marshes and is a very different plant from the rule among monocoleytodes. Stratilotes aloides, Linn., is the only species in the genus. It is sometimes called Crab’s Claw or Freshwater Soldier. In England the planting of this species is discouraged from the fact that it spreads to too rapidly. Technical characteristics: peduncles rising from among the leaves to a few inches above the water, much thickened at the top, bearing a spathe of 2 bracts: ovary and stigma nearly as in Hydrocharis, but the fruit is ovold and somewhat succulent. It is offered by one American specialist in aquatics.

W. M.

One of the peculiarities of Stratilotes is that in summer the whole plant rises to a point near the surface when it is only partly submerged, and later in the season the plant sinks below the surface of the water. The plant is thus. It is propagated by side shoots from the base of the leaves. Toward fall and early winter these shoots are merely bulbous and are readily detached from the plant and are in a good condition for traveling.

W. M. Thacker.

STRAWBERRY. Plate XXXVIII. The Strawberry is an herbaceous perennial. It naturally propagates itself by means of runners that form chiefly after the blooming season. These runners can be cut off and planted, or if 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 plow up strawberry beds after the first two years and plant new 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 plants therefore occupy the land only one year and the crop works into schemes of short rotation cropping. The Strawberry delights in a rich, rather moist soil and a cool season. It can be grown in the cool part of the year in the South and thereby becomes one of the most cosmopolitan of fruits. The young plants may be separated from the parent and put into new plantations in August, but under average conditions in the North it is usually better to wait until the following spring, since the weather 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. 3414 shows such a plant, with the parts colored, and Fig. 3415 shows one of the strawberry plants that have borne. This plant bore fruit in 1900, and has thrown up a new crown in 1901. The old dead crown is seen on the right. The young growth is lateral to this, and is dark green and hard and thick. 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 1-33⁄4 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. This he accomplishes 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 proficacy of the variety, plant-maker, etc. 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. 1436, 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 sea-coast, 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 sort of retarding material. This mulch is often left on the plants as a sort of protection, especially in the North, where it often prevents the plants from suffering from cold weather. 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 hermaphroditic (having both stamina and pistils) and is consequently self-fertile. In others it is pistillate, producing no pollen, and requiring a pollen-bearing variety to pollinate it. Fig. 2418. There are no varieties bearing only staminate or sterile flowers. The perfect-flowered varieties differ greatly in the amount of pollen they produce. Some, as the Crescnet and Glen Mary, bear so few sta-
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 akenes 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>$11.00</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>18.00</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. 1888, Vol. I). Perhaps the most popular single variety has been the Wilson (Fig. 2420), 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. moschata) 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.


Aside from these writings, the Strawberry is well treated in various books devoted to small fruits and to fruit in general.

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. 13, 1820, and died at Green Bay, Feb. 20, 1894.—L. H. B.)

The Japanese 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 to recollection of ever seeing small bed of Strawberries cultivated before he was 25 years old. In boyhood he often accompanied his father

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**STRAWBERRY**

4216. Pot-grown Strawberry plant.

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**STRAWBERRY**

4218. Sexes of Strawberry flowers.

At the left, a perfect flower; at the right, a pistillate flower (lacking stamens); in the middle, stamens few.

4217. Heavy mulching of Strawberry plants, as practiced in parts of the North.

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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 variety. 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 1855, 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 undrained 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 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), dip 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 hayrake with the headpiece of pine or some other light wood, and about 12 feet long, the teeth set two feet apart and sloping a little backwards instead of forwards as in the common hayrake. 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 mel- low. A boy follows with the prepared plants, and drops one at each crossing of the marks. He is followed by the settlers, of whom there should be two to work 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 roots 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 tended. 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 views in this: 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 their way 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 they 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 harrowing 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;

\[\text{Expense of an acre of Strawberries up to picking time.}\]

\begin{tabular}{|c|c|}
\hline
\textbf{Expense} & \textbf{Amount} \\
\hline
Interest and taxes & $15.00 \\
Flowing, harrowing and surface-draining & $2.00 \\
Value of 11,000 plants at $5 per 1,000 & $55.00 \\
Manure, 60 loads, at $1 per load & $60.00 \\
Marking and setting plants & $4.00 \\
Summer cultivation & $8.00 \\
Training runners around the plants & $3.00 \\
Winter covering and cost of putting it on & $6.00 \\
Taking off winter cover, and spring cultivation & $5.00 \\
\hline
Total & $161.00 \\
\hline
\end{tabular}

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 $635 per acre. These were both hard years for Strawberries. In 1875 exactly one-quarter of an acre yielded 3,317 quarts, or 111¾ bushels, of marketable fruit. The average price was 12 cents per quart. In 1876 one-fourth of an acre yielded a fraction less than 100 bushels. These were both unfavorable seasons for berries. But we take the above mentioned crop for our estimate, as it was the poorest of the four. The boxes and crates cost a fraction less than $7 per 1,000 quarts; picking, packing and carrying to the depot not to exceed $15 per 1,000:

\[\text{The story of an acre of Strawberries in an unfavorable season.}\]

\begin{tabular}{|c|c|}
\hline
\textbf{Expense} & \textbf{Amount} \\
\hline
Gross receipts & $500.00 \\
Cost of growing & $157.00 \\
Picking, crating and marketing (7,136 quarts) & $318.00 \\
\hline
Total & $1,175.00 \\
\hline
\end{tabular}

Net profits above expenses & $122.00
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.

Marketing.—A home market is the best if one can have it, although it is a well-known fact that but few Strawberries are eaten in the neighborhood where they are grown. Along the Gulf coast, Strawberries begin to ripen in February and are at once shipped north, and the consumption continues until 46° north latitude is reached; hence the necessity of a variety that will bear shipping. If we all had cooling-houses for berries, and refrigerator cars 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 has 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 heads the list of small fruits, and, admitting as competitors tree and vine fruits, it easily holds the place of first importance. Among the many things that come under 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 tending planting and cultivation; the enormous yields possible from well-selected soils properly treated; and the fact that, aside from being the first fruit to ripen, it seldom, if ever, fails to reward the painstaking grower with an ample harvest to cover all cost for attention bestowed.

While good results are had from settings made at almost any time of the year, November and February are the months during which plantings may usually be made with the least risk. In some sections, especially near the Gulf, plantings are frequently made during rainy spells in late summer and 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 stands on newly 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-buts, 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, over-vigorous 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 continue to market berries 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, building and icing 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. McKay.

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 practicing, 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 in July, August or September makes a good, strong growth by winter along the isotherm of the Carolina and Georgia coast, where summer planting and the system of annual rotation are almost exclusively practiced. In fact, the plant continues to grow, especially under ground, through the entire winter, setting in the spring a heavy and profitable crop, which is marketed. The plat is seldom worked out, but used to reset another plat in the late summer, and then turned under. 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 until the second, or "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 fruited the next spring.

The biennial rotation (though often under the erroneous title of annual) is much the most common, and is almost universally employed, except on the coast, where the light, sandy soil, the humid climate and more

2425. Shuster Gem Strawberry (X ½).

long and sometimes hot and dry summers. The southern cow-pea is possibly the best crop to precede the Strawberry. This leaves the ground clean, mellow 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 the rows as become too thickly matted should be properly thinned on the advent of cool fall weather.

With spring setting, cultivation begins shortly after plantings are made. The plow, cultivator and hoe are the implements most used, and these are employed in cultivating but enough to keep the ground free of tillth and free from weeds. Cultivation usually ceases early in the fall. Any weeds that interfere with the proper development 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,

2426. Leaf-blight of Strawberry (X ½).
STRAWBERRY

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 plat 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 plat is to be established only every two years. The plat 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:

| Year | 1899 | 1899
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Plat</td>
<td>No. 1, planted November, 1899.</td>
<td></td>
</tr>
</tbody>
</table>

| Year | 1900 | 1900
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Plat</td>
<td>No. 1, fruited lightly spring, 1900; cultivated through season of 1900. No. 2, planted November, 1900, from new purchased plants.</td>
<td></td>
</tr>
</tbody>
</table>

| Year | 1901 | 1901
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Plat</td>
<td>No. 1, fruited main crop, spring, 1901; plowed under November, 1901, after resetting No. 2. No. 2, fruited lightly spring, 1901; cultivated through season of 1901. No. 3, planted November, 1901, from runners of No. 1.</td>
<td></td>
</tr>
</tbody>
</table>

| Year | 1902 | 1902
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plat</td>
<td>No. 2, fruited main crop, spring, 1902; plowed under November, 1902, after resetting No. 4. No. 3, fruited lightly, spring, 1902, and cultivated through season. No. 4, planted November, 1902, from runners of No. 2.</td>
<td></td>
</tr>
</tbody>
</table>

And so on, indefinitely. In this way, while each plat runs two years, that is, biennially, a new plat 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 plat is reserved for resetting, after it has borne its main crop, it must be cultivated, not 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 plat before its abandonment, and the perennial system when the plat 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 crucial test of a prolonged drought.

H. N. STARNES.

STRAWBERRY

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

2427. Fancy packing of Strawberries, each quart wrapped in paper; a picking stand on the left.
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 Jueunda, are thus enabled to flourish to such a degree as to be among the most prized. 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.

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 districts on the northern coast, 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 littoral and alpine types. The West 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 are freely tried, but few are successful and they retain local popularity after abandonment in their birthplaces. A striking instance of this fact is the continued popularity of Longworth Prolific, Sharpless, Monarch of the West, and Mission. This former, which 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 in 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 situations 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-growing 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 seepage by means of the small water supply secured by windmills. In this case water is applied very frequently, even oftenener 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 soils, 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.
STRAWBERRY

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 states of Oregon and Washington in their areas lying west of the Cascade mountains have conditions especially suited to the great Strawberries. 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 Maqueen 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 particular demand of the potted plants or their fruits. The first expense of the pot method is considerably more than when the plants are grown in the benches, but after the pots are once purchased the cost of each method should be about the same.

The problem, as mentioned 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 lined and taken to the potting shed or other convenient place, where they are at once shifted into the fruiting pots (usually a 6-inch pot). The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting soil should have mixed with it bone-douir or dissolved rock at the rate of about one pint to two bushels of soil. Ample drainage should be given, as through the season of ripening the crowns and the following forcing period a large quantity of water must be given and none should be allowed to stand around the roots.

The pots should then be plunged to near the rim in some coarse material, preferably coal ashes, which, if deep enough to extend from 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 growing season. Late in September or early in October the pots 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 a foot or six 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 once. For the first few days the house should be held at about 30°, with little if any rise through the day. After a week a rise of 10° may be given. At the end of the second week 50° at night, with a rise of 10-15° through the day, will be about right.

1743

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2430. The forcing of Strawberries under glass.

2431. A good winter Strawberry plant in bloom.
2432. Streptocarpus Reginiae. (X 54.)

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A Strike attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel-hair brush is useful for distributing the pollen. A ladle or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. Dur-

STRAWBERRY BUSH. See Euonymus.

STRAWBERRY GERANIUM. Saxifraga sarmentosa.

STRAWBERRY-RASPBERRY. Rubus rosaiolius.

STRAWBERRY TOMATO. Phyalsa Azhekengi and other species of Phyalsa.

STRAWBERRY TREE. Arbutus Unedo.

STREPTOLITZA (after the wife of King George III, Charlotte Sophia, of the family Mecklinburg-Strelitz, a patron of botany). Strelitzieae. BIRD or PARADISE FLOWERS. A South African genus of 4 or 3 species of perennial herbs, with generally large, long-petioled leaves and showy flowers of peculiar form: rhizome subterranean or produced into a large woody stem: pedicels short: spathe long or short, peduncled. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A night temperature of 50° is sufficient. This plant may be induced to set seed if the flowers are hand-fertilized.

a. Plant nearly stemless.

Reginae, Banks. BIRD of PARADISE FLOWER. Fig. 2432. About 3 ft. high: roots large, strong-growing: lvs. oblong, about 1 ft. long, stiff, concave; 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-ft., the florets orange and blue-purple. Winter. B.M. 119, 120.

bb. Plant with woody stems.

Augusta, Thunb. (S. angustata, D. Dietr.). Becoming 12 ft. high. Lvs. at the summit of the stem, 2-3 ft. long: oblong, acute: pediole 4-6 ft. long: peduncle short, from a leaf-axil: spathe deep purple: florets on short purple pedicels, all parts of the flower pure white; petals round at the base. B.M. 4167, 4168.

b. Fls. pale blue and white.

Nicolai, Regel & K. Koch. Resembling S. Augusta in habit and foliage, but the fls. and spathe are much larger and the petals are hasteately condensed and blue in color. B.M. 7038.

F. W. BARCLAY.

STREPTOCRYPUS (twisted calyx). Bromeliaceae. There are 1 species of Streptocrypis according to Mez (B. Monogr. Phanerog. 1916). It differs from Bromelia in having strongly imbricated broad sepals and long corolla-tube. No species are in the American trade, but S. Piaratensis, Mr., is described in horticulture, as Aechmea Piaratensis, Morr. & Wittm.). It is a stemless pineapple-like plant, with 30-40 rigid lanceolate leaves in a dense rosette: cluster a central dense panicle 1-1 1/2 ft. long, with many 2-sided spikes of rather dull flowers.

STREPTOCRYPUS (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 Rexii. 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 weeds in the neighboring pots, and a succession of flowers may be obtained at almost every period of the year." In 1828, John Lindley made the genus Streptocarpus for this plant, calling it S. Rexii, the name it now bears. It appears to have been nearly thirty years after the introduction of S. Rexii that another Streptocarpus bloomed in England. This second species was S. polyantha, which may be taken as the type of a group that has one leaf lying on the ground and from the mid-
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 monochilous section to which S. polyantha belongs. In the meantime, S. parviflora, a species allied to S. Rexzi, had been introduced from the Cape region. With the three species, S. Rexzi, S. parviflora 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 Tydcas." 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: Gesneraea, with ovary more or less inferior and fruit a capsule; Cyrtandrae, 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 DeCandolle's "Monographie Phanerogamarum," contains the genera Streptocarpus, Episcia, Cyrtandra, Eschynanthus, Ramonda, and others. The Streptocarpses are stemless or nearly stemless herbs, bearing 1 or more tubular nodding flowers on short scapes that arise either from the crown of the plant or from the midrib of a flat prostrate leaf: corolla-tube cylindrical, the limb 5-lobed and somewhat 2-lobed; perfect stamens 2 included; pistils with ovary linear, usually hairy, with style as long 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. Rexzi, 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 stow or warmhouse plants. Of the new hybrid forms, seeds sown in February or March should produce plants that will bloom the following fall and winter; after blooming, the plants may be discarded, for better results are usually secured from new plants than from those more than one season old. The season of most 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. Fils. red.

Dunnii. Hook. f. Soft-hairy: leaf becoming 3 ft. or even more in length and 16 in. wide, thick-nerved, redish disherit monotosome beneath, rounded at base, obtuse at apex, coarsely toothed: scapes several to many, in a row beginning at the base of the leaf, erect, 1-3 ft. tall, many-flled; corolla long-tubular, curved, 1¼ in. long, the limb narrow, bright rose-red. Transvaal. B.M. 6903. G.F. 3:609.—A very floriferous species, one plant sometimes bearing more than 100 flowers.

d. Fils. blue, mauve or lilac.

Saundersii. Hook. Hairv: leaf 1 ft. by 9 in., cordate, obtuse, coarsely serrate, yellowish green above and purple-rose beneath: scapes 10-16 in. tall, bearing a com-
polyantha, Hook. Hairy: as compared with S. Sandersonii, 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.


Wendlandii, Damman. Fig. 2433. Hairy, 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. 7474 (part of which is copied in Fig. 2433). G.C. III. 22:275. Gn. 45, p. 511; 50, p. 394. J.H. III. 28:223.—Probably the finest species yet introduced.

BB. Leaves several, rising from the crown.

Rexii, Lindl. Fig. 2434. Hairy: lvs. ovate-oblong, 6–9 in. long, short-stalked, obtuse, crenate: scapes several, 3–8 in. tall, 1-fld. or rarely 2-fld.: fls. 2 in. long, 2–3 in. wide, the tube downy and nearly white, the large spreading limb blue to purple. S. Afr. B.R. 14:1173. B.M. 3065. L.B.C. 14:1305.

parviflora, E. Mey. Soft-hairy all over except the corolla: lvs. ovate, obtuse, sessile or nearly so, crenate, appressed to the ground: scapes several, 6–10 in. tall, reddish, bearing corymbose racemes: fls. small, the corolla-tube about ¾ 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).
STRYPHNONODENDRON


J. Burt Davy.

2436. Streptosolen Jamesonii (×½).

STROBLANTHES (Greek, cone and flower, referring to the inflorescence). Acanthaceae. A large genus containing about 120 species inhabiting the warm regions 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 coleus, the slightest cool weather changing the color of their leaves to a very undesirable shade. In the greenhouses they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much spraying. 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.


calláus. Nees. Shrub. 6-8 ft. high: lvs. elliptic-lanceolate, acuminate, puberulous, narrowed into a long, slender petiole which is winged to the middle: fls. in short, oblong spikes, large, pale violet-blue; corolla-tube very short, dilated in the subcampanulate throat and expanding into a limb 2 in. across; lobes orbicular, undulate. B. M. 7538. —A native of western India, where it forms a shrub 6-8 ft. high; said to flower in its third year.

isophyllus, T. Anders. (Goldthwaite isophylla, Nees). A low, much-branched, bushy shrub, 2-3 ft. high, swollen at the joints: lvs. short-petioled, opposite, narrowly lanceolate, distantly serrulate or entire: peduncles axillary, shorter than the lvs., bearing several fls.: corolla 1 in. long, funnel-shaped, blue and white; limb 5-lobed; lobes emarginate. India. B. M. 4363. B. 5:244.

—isophyllus, T. Anders. (Goldthwaite isophylla, Nees). Branches somewhat zigzag: lvs. broadly lanceolate, acuminate, serrulate, opposite but one of each pair much smaller than the other: fls. purplish and white; corolla funnel-shaped, very broad at the mouth, with somewhat irregular 5-lobed limb. India. B. M. 3404. B. R. 11:955 (as Ruellia persicifolia). Similar to the preceding in habit and use. Heinrich Hasselbring.

STROMÁNTHE (couch and flower; said to allude to form of inflorescence). Scitamineae. Five tropical American plants (according to Petersen in Engler & Prantl’s Naturpflanzenfamilien), closely allied to Calathes, Maranta, Phrynium and Thalia. It agreed with Maranta and Thalia in having a 1-loculed capsule, and thereby differs from Calathes and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segments not standing opposite each other. From Thalia it differs, as does Maranta, in having 2 side staminodia rather than one. For culture, see remarks under Calathes.

Porteána. Griseb. (Maranta Porteána, Horan.). Two to 4 ft. high, with maranta-like lvs., the blades long-lanceolate or oblong-lanceolate from a short petiole to almost obtuse, purple beneath, bright green above with transverse stripes or bars of silvery white; fls. solitary or twin on the rachis, blood-red, the inflorescence simple or compound. Lowrey.

sanguínea, Sonder (Maranta sanguínea, Hort.). Leaf-blades about 1 ft. long, oblong-acuminate, purple beneath and green above; sepal 12-20 in. tall, red towards the top, bearing a panicle of bright red and red-bracted fls. Probably Brazilian. B. M. 4846. F. S. 8:758.

—is a 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). Liliidae. Very like Brodiaea, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and wide open at the base. The only species is B. Californicum, Torr. (Brodíacea volubilitis, Baker). In many ways it resembles Brodiaea coccinea, except that the scape is climbing to a height of 3 or 4 ft, and bearing an umbel of delicate rose pink flowers. The scape is weak and branchy, often wind-twisted, and the flowers are on long stems. —Culture as for Brodiaea coccinea. —Carl Purdy.

STRYPHNONODENDRON is a genus of tropical American unarmored trees belonging to the legume family. Ten 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. floribundum, both of which are known as Acacias, the latter as A. pulcher rina. 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 Stew- artia. *Ternstroemia.* 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 in size hardly surpassed by any others of our harder 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 hisrate capsule, loculicidally dehiscent into 5 valves; seeds 1-4 in each locule, compressed, usually narrowly winged.

**A.** Styles united: petals always 5.

**Malachodendron**, Linn. (*S. Virginica*, Cav.). Shrub, 6-12 ft. high: lvs. oval to oval-oblong, acute at both ends, serrulate, light green, pubescent beneath, 2-4 in. long: fls. 2½-3 in. across, with obovate spreading petals: seeds wingless, shining. May, June (July and

**2438. Stylophorum diphyllum (X ¾).**

**2437. Stuartia pentagyna (X 2/3).**


**STURTEVANT**, EDWARD LEWIS, agricultural experimenter and writer, was born in Boston, Mass., January 23, 1842, and died at South Framingham, Mass., July
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 (Wachakum) and muskmelons (New Christiana), and afterward devoting particular attention to the modifications which cultivated plants have undergone as shown by such records as occur in the older books. In connection with these studies, Dr. Sturtevant brought together a rare collection of books dealing with plants published before the time of Linneus (say 1753), which, with his index cards and herbarium, is now 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 career is suggestive of worthy work 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. TRELFASE.

STYLFORUM (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 sap: lvs. lobed or cut: fls. yellow or red, rather long-stemmed, solitary or clustered; sepals 3-2; petals 4; stamens numerous; placenta 2-4; stigma 2-4-lobed. Radiate: capsule linear or ovoid, dehiscent to the base.

diphylum, Nutt. (Papaver Stylophorum, Hort.). Celandine Poppy. 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 2-5, May, June. Moist shade, W. Pa. to Wis. and Tenn. B.B. 2:102. J.H. III. 34:475.—An attractive plant of easy culture in any rich, rather loose, moist soil either in shade or open, but preferably in shade.

F. W. BARCLAY.

STYRX (ancient Greek name of Styx officinalis), Styracaceae. STORAX. Ornamental deciduous or evergreen trees or shrubs, simple, serrate or entire leaves and white or golden yellow flowers in axillary clusters or terminal racemes, followed by drupaceous dry or fleshy fruits. S. Obassia, Americana and Japanica, with fragrant flowers and stand the winter in sheltered positions as far north as Massachusetts; S. grandifolia is hardy about Philadelphia and S. Californica only south. The Storaxes 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 shrubberies or as single specimens on the lawn, and thrive best in a light, porous soil. Prop. by seeds sown soon after ripening any time, or by layering, sometimes grafted on Haloxylon intermedius.

About 60 species in the tropical, subtropical and warmer temperate regions of America, Asia and Europe. Trees or shrubs: lvs. short-stalked, exstipulate, more or less covered, like the inflorescences, with at least 30 fls.; white; calyx campanulate, obscurely 5-toothed or truncate; petals 5, connate only at the base; stamens 10, inserted at the base of the corolla and usually somewhat constricted below: ovary 3-loculed, or often united at the base with the calyx, 3-loculed at the base, 1-located at the apex; style slender: fr. a drupe, mostly subglobose, flabby or dry with dehiscent pericarp, 1-seeded, with large, subglobose seeds. Styx Benzoin yields the benzoin, a balsamic exudation of the wounded tree; storax, a similar gum-resin, was formerly obtained from S. officinalis, but the storax of to-day is a product of Liquidambar.

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 tricuspidate at the apex, glabrous above, pubescent beneath, 6-10 in long; fls. fragrant, in racemes 5-7 in long; racis glabrous, pedicels and calyx densely tomentose; corolla 3/4 in long, with slightly spreading obvate-oblong petals: fr. 3/4 in long, ovoid, pointed. May-Japan. S.Z. 1:46. B.M. 7039. G.C. III. 4:131 (not correct in regard to habit). A.F. 12:30. M.D.G. 1898:16.

AA. Fls. in few-fld. clusters or short racemes: lvs. 1-3 in long.

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, 1-3/4 in. long; fls. in few-fl. terminal clusters; pedicels about as long as calyx; corolla 3/4 in long, with 5-8 oblong-elliptic 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.

American, Lam. (S. glabrum, Cav. S. laevigatum, Ait.). Shrub, 4-9 ft. high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1-3 in long: fls. nodding, in few-fl. clusters; pedicels about as long as calyx or little longer, puberulous; corolla about 3/4 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. 10:969. B.R. 11:503 (as Halesia parelliflora).
Agave, cacti, the saxifrage above. Notice tanical pages left are Sukkulenten, much and benzine, white, or sometimes with stellate hairs. Disappales: Ivs. broadly elliptic to elliptic-lanceolate, acute at both ends; often acuminate, crenately serrulate, glabrous, 1-3 in. long: fls. pendulous, in 3-6-fl. glabrous racemes; corolla about ½ in. long with elliptic, elliptic, tomentulose petals; calyx usually with short and broad, obtuse teeth. June, July, Jap., China. S. Z. 1:23. Gt. 17:583. B. M. 1930 (as S. serratulatum). M. D. G. 1899:229, 230.


SUCOURY. Another name for Chicory.

SUCULENTS are desert plants that live on a minimum of moisture. Kitchen vegetables are said to be "succulent" when they are tender, sappy, full of juice, and so tender that they can be eaten raw. In ornamental gardening "Succulents" are such tough and dry plants as cacti and century plants. The cacti are typical Succulents, as they represent a botanical family created by ages of desert life. Even in flower and fruit the cacti are much removed from other botanical families, and in the structure of their vegetable parts they are highly specialized to accord with desert conditions. Near to cacti, botanically, are supposed to be the fidelos, of which the large genus Mesembryanthemum is most important. The family Crassulaceae contains many fleshy or succulent plants, the most important genera of which are mentioned under Crassula. Other families that have left succulents in the desert, though, are very much related to the more familiar families, and in appearance and habits of life, are the illy family, e. g., Agave and Aloe; the spurge family, e. g., Euphorbia; the milkweed family, e. g., Stapelia; the purslane family, e. g., Portulaca, and among composites certain species of Senecio, Kleinia and Hertsa. Rümpler's Die Sukkulenten, Berlin, 1892, is an illustrated book of 263 pages covering the above ground, mostly from the botanical side. Nearly all the good cultural books on cacti note the desert plants of other families. In this work consult Cacti and the various genera indicated above. See also special books published in Europe. There is no special American book literature. W. M.

SUGAR APPLE. Anona squamosa.

SUGAR BERRY. Celtis occidentalis.

SUGAR BUSH. In some English books this name refers to Protea mellifera, a plant not cult. in America. In the U. S., Sugar Bush, or Sugar Orchard, refers to a grove of sugar maples.

SUGAR CANE. See Saccharum.

SUKSANDORFIA violacea, Gray, and Sullivantia Oregana, S. Watson, are two small perennial herbs of the saxifrage family native to the Columbia river region. They are well described and illustrated 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.

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 used in salads. See Bull. 60, Div. of Chemistry, U. S. Dept. Agr. The Sunflower Plant, its Cultivation, Composition and Uses, "The Sunflower, its Cultivation, Composition and Uses," 1901.

SUN ROSE. Helianthemum.

SUN温室 CHERRY. Eugenia Michelli.

SUTHERLANDIA (James Sutherland, one of the earliest superintendents of the Edinburgh Botanic Garden, author of "Hortus Medicus Edinburgensis," 1683). Leminium, Stellaria, Salsola, etc., the BLADDER SENNA of the Cape, might be roughly described as a red-flowered Swainssonia. It is a tender shrub said to grow 3 ft. high or more in South Africa. Each leaf is composed of about 9-11 leaflets. The fls. are bright scarlet, drooping and in the best variety an inch or more long. The blossoms are not petal-shaped; 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 1 x ¾ inches.

Botanically Sutherlandia is very imperfectly understood. There are at most 5 species, or S. trutescens may prove to be the only one. Generic characteristics: fls. as described above; calyx campanulate, 5-toothed; stamens 9 and 11. Berry stalked, many-seeded; fls. are pedered: pod many-seeded, indehiscent: seeds reniform.

At the Cape S. trutescens runs into two forms. The common or typical one has the leaflets glabrous above, while in the seaside form, var. formosae, the 1871:610, 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 Sutherlandiae are kept for several years in a greenhouse 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. grandi flora), which in France at least does not flower until the second year. (3) A white-fl. 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.

Sutherlandiae are highly esteemed by French connoisseurs. 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 season for formosae, var. formosae, the 1871:610, 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 Sutherlandiae are kept for several years in a greenhouse 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. grandi flora), which in France at least does not flower until the second year. (3) A white-fl. 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.

Harvey calls the typical form var. communis; it has lfts. glabrous above, elliptical or oblong: ovaries and pods glabrous. B.M. 181 (as Colesia trutescens). R.H. 1896, p. 206. Var. chlorophyllus, shorter and broader, ovate or obcordate, silvery white on both sides: ovaries and pods hispid. Var. grandiflora, Hort. (S. floribunda, Carr., not Vilm.), has large red fls. and does not slowly-pend. Until 1871:610, the 1871:610. Var. Alba (S. floribunda, Vilm., not Carr.) has white fls. Ernest Bruntorn, of Los Angeles, received in 1900 a plant called S. spectabilis, of which little is known. W. M.

SUWARIO. Cereus gigantus.

SWAINSÖNA (Isaac Swainson, an English horticulturist of the latter part of the eighteenth century). Often spelled Swainsonia. Logemiiosa. About 25
SWEET HERBS

Australian undershrubs and herbs, differing from 
Cutoutia chiefly in smaller stature and the large 
and large stigmas. Flowers pea-like, in axillary racemes, purple, 
blue, red, yellow or white, often showy; standard or 
vesiulum bar and short, conical; wings obovate, 
and often 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: lvs. unequally pinnate, usu-
ally with semi-amplexicaul petioles. Now and then 
various species are seen in the collections of amateurs 
or botanic gardens, and 8 species are offered by one 
German dealer, but by far the most popular kind is S. 
Segoviana, var. albi flora.

Segoviana. R. Br. (Vicia galegifolia, Andr. Cebutea 
galegifolia, Sims. S. Osbornii, Moore). Small, gla-
icious shrub, with long, flexuose or half-climbing 
branches: lfts. 3-5 pairs and an odd terminal one, 
small, oblong and obtuse or somewhat emarginate: ra-
cemes axillary and mostly exceeding the foliage, bear-
ing rather large deep red fls.: pod 1-2 in. long, much 
inflated, stipitate. Australia. B.M. 792. - Swainsonia 
galegifolia is an old-time garden plant, blooming freely 
in a cool or intermediate house along with carnations 
and roses. It thrives well either as a pot-plant or in 
beds. It is hardy at San Francisco. It is a nearly con-
stant bloomer. Cuttings taken in late winter bloom in 
summer; these plants may then be transferred to the 
house for winter bloom, although maiden plants are to 
be preferred. By cutting back old plants, new bloom 
may be secured. Cuttings grow readily. The plant is 
easy to manage. The original form of Swainsonia is 
small known in cultivation, but the advent of the white 
form has brought the species to the fore.

Var. albiflora, Lindl. (var. alba, Hort. S. albiflora, 
G. Don). Fig. 2440. Flowers pure white. B.R. 12:994. 
5:185. - In North America this is now one of the most 
popular of white florists' flowers for use in winter dec-
orations. It has been called the "Winter Sweet Pea" 
because of the shape of the flowers, but it has no fra-
grant. The delicate bright green foliage affords an 
excellent contrast with the pure white flowers. This 
variety is often grown at the end of a rose or carnation 
house, or trained on a trellis. It likes abundant sun-
light, rich soil and liquid manure. When allowed too 
much root room the plants become very large and are 
slow to bloom, wherefore a large pot or tub is prefer-
able to the border.

Var. violacea, Hort., has rose-violet fls., and is some-
what dwarf. S. coronillotica, Salis., probably repre-
sents this form or something very like it. B.M. 1725. 
S. coronillotica is an older name than S. galegifolia, 
and if the two names are considered to represent the 
same species the former should be used.

Var. rosea, Hort., has pink flowers.

S. Ferrudik, Hort., is called a "garden variety" by Kew au-
thorities. Var. alba is described in R.H. 1858, p. 562, and var. 
carminia is in the American trade.

L. H. B.

SWALLOW THORN. Hipppophae rhamnoides.

SWAN RIVER DAISY. See Brownbeche iberidifolia.

SWEET ALYSSUM. See Alyssum maritimum.

SWEET BASIL. See Basil.

SWEET BAY. See Laurus nobilis.

SWEET BRIECK. Rosa rubiginosa.

SWEET CICELY, or SWEET-SCENTED CHERVIL (Myrrhis odorata, Scop., which see), indigenous to 
Europe upon the banks of streams, is a graceful, hardy 
plant, with very large, oval, pale green, much-divided leaves, hairy stems and leaf-stalks, 
small, fragrant white flowers, and large brown seeds of 
transient vitality. The leaves, which have an aromatic, 
anime-like, sweetish flavor and odor, characteristic of 
the whole plant, are still occasionally employed in fla-
voring soups and salads, though their use as a culi-
nary adjunct, even in Europe, is steadily declining. In 
American cookery, the plant is almost confined to our 
unassimilated, distinctly foreign population. Though 
easily propagated by division, best results are obtained 
from seed sown in the autumn either spontaneously or 
artificially; the seedlings, which appear in the follow-
ing spring, are set 2 ft. apart each way in almost any 
ordinary garden soil. Spring-sown seed frequently 
fails to germinate. When once established common 
care will be sufficient.

M. G. KAINS.

SWEET CLOVER. Melilotus alba.

SWEET FERN. Myrica Gale.

SWEET FLAG. Acorus Calamus.

SWEET GALE. Myrica Gale.

SWEET GUM. Liquidambar.

SWEET HERBS. The term "Sweet Herbs" has long 
been applied to the fragrant and aromatic plants used 
in cookery to add zest to various culinary preparations, 
principal among which are dressings, soups, stews and 
salads. At the commencement of the nineteenth cen-
tury 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 dur-
ing this time has been marked by so little improve-
ment. Except in parsley, very few distinctly new or 
valuable varieties have been produced or disseminated. 
This is mainly due to the prevailing ignorance of their 
good qualities, to which ignorance may be charged the 
 improper handling, not only by the grower, but by the 
seller and often by the final purchaser. With the public
duly awakened to the uses of herbs, improvements in growing, handling, and in the plants themselves will naturally follow, to the pleasure and profit of all.

In this country the herbs best known and appreciated are parsley, sage, thyme, savory, marjoram, spearmint, dill, fennel, etc. Balanced and arranged out of consideration in their order of importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs. Hence sung of the men do not rank par with Sweet Herbs. Sage is the universal flavoring for sausage and the seasoning par excellence for rich meats such as pork, goose and duck. It is more widely cultivated than thyme, savory and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken and veal. With the exception of spearmint, without which spring lamb is esteemed 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 epleurean 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 cloudy day after the dew is off, dried in current of warm, not hot air, rubbing fine and stored in air-tight vessels.

For specific information see articles on the following: Anise, Angelica, Balm, Basil, Caraway, Catnip, Celandine, Dill, Fennel, Horchow, Hyssop, Oregano, Thyme, Par, gold, Marjoram, Mint, Parsley, Peppermint, Sage, Sampshire, Savory, Tarragon, Thyme. M. G. Kains.

SWEET MARJORAM. See origanum.

SWEET PEA (Lathyrus odoratus. See Lathyrus for botanical account). For structure of the flower, see Legum). 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 floricultural competition.

Its early botanical history has been traced back to 1667. The history of the Sweet Pea is elaborately treated by S. P. Dicks, of London, in American Gardening, for July 34, 1897. The origin of the Sweet Pea is divided principally between Sicily and Ceylon, the original purple variety being indigenous to the former is the genus. The long varieties of Sweet Pea are divided into seven sorts, which are classed as the crimson-scarlet sorts having the common crimson-scarlet variety named by Father Francisca Capanni, a devout Italian monk and enthusiastic botanist, is credited with being the first creator of this flower, at Panormus, in Sicily, in 1699, and the name by which the purple variety was sent by him to England and elsewhere. The seed of this flower became an article of commerce as early as 1790. In 1793 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 Buttery. 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 1882 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 Boreaston, 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 1890, 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 percentage 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 unequaled 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
SWEET PEA

primrose-cream, buff-cream, buff-pink, various shades of light pink, flesh-pink, rose-pink, several shades of bright rose, scarlet, crimson-scarlet, rich blood-red, 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 seed 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 few petals.

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 any 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 1/2 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, reflexed standard and deteriorated style. S u b s c r i p t i v e 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 habits formerly made it easy to grow have been reduced. Closer attention must now be given 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 bloom. In all likelihood staking the ground by trellising or ending it 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 no 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.

T. W. Hutchins.

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 the seed at a price within 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, however. 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 effort of nature to adapt the plant to changed conditions, an entirely distinct type of growth soon appeared in the California fields, having a low, compact, spreading habit. The dense, not at all woolly foliage lying closely to the soil, serves to mulch, shade and protect the strong network of roots lying beneath the surface. This type is known as the Cupid Sweet Pea. 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 sports of the original Cupid. This Cupid Sweet Pea succeeds 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.

Some varieties 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 or running growth, but grows only 18 inches high and comes into full flower greatly in advance of the taller varieties of Sweet Peas without any forfeit 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 flowers. Wherever there, the entire crop has been mainly 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 other popular flower.

E. D. DARLINGTON.

SWEET POTATO. Ipomoea 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 edible tubers, Fig. 2445, are borne close together under the crown and unlike the common potato they do not bear definite "eyes." The varieties differ greatly in length of vine and the "vineless" Sweet Potato has a white root, but is much less well cared for rarely bloom, and even then the flowers may not produce seed. The plant is tender to frost. The species is widely distributed in tropical regions, although it originated in America. It has been cultivated from prehistoric times by the aborigines. The plant is exceedingly variable in its leaves (Fig. 2446), and the varieties are sometimes classified on the foliar characters. In the southeastern states the cooler "potato" usually means sweet potato, the potato of the North being known as "Irish," "round" and "white" potato. The Sweet Potato crop amounts to fifty million bushels annually, mostly deep ground varieties grown in the Carolinas, Georgia, Texas, Alabama, Mississippi, Virginia and New Jersey, the last state being the farthest north point 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 slips or cuttings rather than from sprouts or culls at which the tubers ripen. It is also propagated by means of cuttings or slips taken from the tips of fresh runners. A bushel of ordinary Sweet Potatoes will give from 3,000 to 5,000 plants, if the sprouts are taken off twice. An average yield of Sweet Potato in 200-400 pounds per acre. Yields twice as high as these are sometimes secured.

In the northeastern states amateurs occasionally grow Sweet potatoes of the chile or gingersnap type in a small warm ridge 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 supply 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, dry, mealy tuber is the preferred 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. 696, 698. Some of the most important bulletins are those of the U.S. Dept. of Agric. and Ga. 25, by Hugh N. Starnes. Md. 59 and 60 deal with the insects and diseases.

L. H. B.

COMMERICAL 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 memoranda on diseases, are compiled from a strictly southern standpoint.

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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 not the normal method, and, indeed, they are the practicable means of propagation. Tubers of the last season’s crop are “bedded” for this purpose; that is, an outdoor bed is constructed in which the tubers are placed in single file 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 frosts 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 or “strings” consistently planted from year to year, produce as heavily as the choicest and largest. This is, no doubt, due to the fact that the Sweet Potato is merely an enlarged, inaxial, fleshy root, and heavy tubers, when sprouted, should have little direct 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 smoother and more slightly tubers—due, doubtless, to the fact that by this method the mycelium of the black root is conveyed from the healthy 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 any land will produce potatoes. Yet a light, sandy loam is best. Stiff, red soil is to be avoided, as in it the potato splits, cracks and “roughens,” by reason of the suspension and sudden resumption of growth during variable weather.

The following formula has been found to be, per acre, as follows:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen (ammonia equiv. 50 lbs.)</td>
<td>600 lbs.</td>
</tr>
<tr>
<td>Phosphate acid</td>
<td>70 lbs.</td>
</tr>
<tr>
<td>Potash</td>
<td>50 lbs.</td>
</tr>
<tr>
<td>High-grade acid phosphate</td>
<td>300 lbs.</td>
</tr>
<tr>
<td>Sulfate of potash</td>
<td>100 lbs.</td>
</tr>
<tr>
<td>Total</td>
<td>1,000 lbs.</td>
</tr>
</tbody>
</table>

This requirement would be met by a compound of:

<table>
<thead>
<tr>
<th>Compound</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate of soda</td>
<td>30%</td>
</tr>
<tr>
<td>Sulfate of potash</td>
<td>40%</td>
</tr>
<tr>
<td>Phosphate of soda</td>
<td>30%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

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 starch content, which in southern-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 Potatoes, but it is, of course, too variable in character and too uncertain in quantity to be generally adopted. Smaller crops 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:

(a) 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 favoring conditions, and reducing, sometimes in a few weeks, the entire contents of a bin or hill to a mass of corruption, emitting a most disgusting odor. A few simple remedial measures will greatly reduce loss from this cause: (1) Dig only when set is dry. (2) Never tubers become sappy from a "second growth." (3) Remove all affected tubers before storing. (4) Use padded baskets in handling to avoid bruising in small bulk and keep dry and well ventilated.

(b) Black Rot (Ceratostomata fimbrata): The 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 completing 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 germs are much less 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 tuber's surface at "setting-out time." Remedy: 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 than futile.

c) Soil Rot (Aecogus Batatas): 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 the vascular 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 and preventive—and the most simple—remedy for any and all rots—rotation. The same areas should never be planted in potatoes two years in succession, nor should the same spot be used twice for a hotbed 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 blotch, 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. Remedy, in this case, must be more than superficial. The 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 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 unaffected draws, for selection purposes.

k. When drawn in bed are affected with diseased roots (black rot) and cannot be thrown away, plant in a separate plat 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 these different typesudevleped. The writer has personally cultivated and tested some fifty odd kinds, and, without doubt, exist in all, 75 or 80—the number still increasing. But one uniform method of classification exists by which the "leaf" into tribes, falling under the three heads, "Leaves entire," "Leaves shouldered or lobed," 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 yeild of fine quality, a safe keeper and free from disease. No potato embodies, superlatively, all of these characteristics. All of the heaviest yielders belong, unfortunately, to the "milky" or "earline" group—as Norton, Hayman, Southern Queen, White St. Domingo, Early Golden, etc.—and their sappy consistency prevents them from keeping their quality uniformly poor. Regarding quality, however, tastes differ. The northern market prefers a dry, mealy potato, represented by the Jersey or Yams strain, while the southern market, on the other hand, demands a rich, sugary potato, like the Georgias or Yellow Yams, 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"), Early 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 Villa Noce, which closely approaches it in quality and is a much heavier cropper.

HUGH N. STARNES.

SWET SCABIOUS. See Scabiosa.

SWET-SCENTED SHRUB. See Calycanthus.

SWET-8OP. Aonoa aquamosa.

SWET SULTAN. See Centaura moschata.

SWET VERNAL GRASS. See Anthoxanthum.

SWET WILLIAM is Diasthus barberus.

SYMPHORIAKPOS

SYMPHORICARPOS in Europe is Acer Pseudo-platanus: in America Platanus occidentalis. The Symphorema of the ancients was a kind of fig known as Pharaoh's Fig, Symphorina antiquorum, or better Ficus Symphorina.

SYMBIOSIS is the intimate association of two or more distinct organisms, with benefit to one only, or to both; commensalism; consortium; copartnership. In this association each organism is called a symbiont.

According to the character of the union, several kinds of symbiosis have been recognized: (1) Mutual antagonistic symbiosis (mutual parasitism), when two organisms are foes of each other, as certain bacteria and animals, the latter showing a "natural resistance"; also the sympotropism of certain lichens with lichens. (2) Antagonistic symbiosis (true parasitism), when the host is partly or completely killed by the parasite, as the potato and the rot fungus (Phytophthora infestans); or galls (hypertrophies) produced on the host as in the black knot of plums; and in higher plants, which live at the expense of others, as the mistletoe (green) and the dodder (chlorophyllous). (3) Mutual symbiosis, when there is often reciprocal advantage; (a) nutrition, when one symbiont nourishes the other without apparently receiving any return, as the mycorrhiza and the roots of forest trees; (b) mutualism, when a mutual benefit results from the union of two organisms capable of living separately, as the bacteroid and the roots of the Leguminosae; (c) individualism, when the symbionts are so interdependent in their growth as to suggest a single individual, as the union of algae and fungus to form a lichen. (4) Prototrophy, the wet nurse relationship, as in the lichen Lecidea intumescens, which eventually gets its nourishment by means of a lodger, a different lichen. (5) Contingency, when one symbiont lives in the interior of another for shelter, as Nostoc in the tissues of Hepatica, Lemma, Cycas, Gunnera; and Anaboea in Azolla.

JOHN W. HARSHBERGER.

SYMPHORICARPOS (Greek, fruit borne in clusters). Caprifoliaceae. Shrubs with simple, opposite, oval, entire and exstipulate lvs.; frs. small; calyx 4-5-toothed; corolla campanulate or bell-shaped, 4-5-lobed on short pedicles; stamens 5, exserted; stigma capitate: fr. a 4-lobed, but 2-seeded berry. About 10 species.

These little American shrubs are all excellent plants for covering the ground under trees, for massing in the lower parts of beds or borders, or for detached groups where something low is desired. They will thrive in almost any soil from heavy clay to dry gravelly banks. Their habit of suckering enables them to cover the ground rapidly and effectively. All have a tendency to retain their fruit until it is forced off, and one species retains its foliage. For these reasons they are pleasing additions to the winter landscape. Of easy propagation by suckers, seed or layers.

A. Fruit white.

b. Stamens and style included.

racemosus, Michx. Snowberry, Waxberry. Fig. 2447. A shrub, 2-6 ft. high: lvs. smooth, entire or sometimes repand or even lobed: lvs. rose color, in a loose and often leafy raceme; stamens and style included: fr. globose, white, persistent. July, Aug.
SYMPHORICARPOS


Stamens and style exerted.

occidentalis, R. Br. WOLFFERY. 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 not as clear cut and waxy. Lvs. ovate: fls. in spikes, both terminal and axillary; stamens and style exerted: fr. the same dimensions as 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.

vulgaries, Michx. I. of Currant. Coral Berry. 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 Dakos, south to Ga. and Tex. Mn. 1. p. 84. G. 34, p. 230. — A rather more compact bush than the two previously described species. Valuable because of its abundant persistent flowers and foliage. Var. variegatus, Hort., has the leaves marked white and yellow and is the same as var. foliis variegatis. Var. glomeratus, Hort., is a form with longer terminal spikes.

JOHN F. COWELL.

SYMPHYANDRA (Greek; anthers grown together). Campanulaceae. 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." Sympphyandra 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 cordate, dentate; radical lvs. long-stalked; stem-lvs. few or small: fls. white or yellowish, usually nodding, racemose or loosely panicled; inflorescence centraul: calyx-tube adnate, hemispherical or top-shaped, with or without reflexed appendages between the lobes; corolla bell-shaped, 5 lobed: ovary 3-loculed.


This desirable bellflower has been cultivated 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. COMFREY. 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 3-5 cut or parted, lobes linear; corolla tubular, lobes very short and nearly erect; stamens 5, attached to the middle of the corolla-tube, included: nutlets 4; seeds nearly globular.

Of easy culture in any good soil. The shade of overheating species 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.


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.

asperium, Donn. PRICKLY COMFREY. Fig. 2449. A branching perennial, more vigorous than S. officinale, often 5 ft. high: lvs. ovate-lanceolate, prickly on both sides: fls. reddish in the bud, becoming blue, smaller than in S. officinale. June, July. Canescus. B. M. 929. Var. variegatum, Hort., has leaves distinctly marginated with yellow.

J. D. KELLER and F. W. BARCLAY.

SYMPLOCARPS. See Spathyphyllus.

SYMPLOCOS (Greek, symplocos, entwined or connected, the stamens being connate at the base). Including Hopea and Lobodra. Styracaceae. Ornamental deciduous or evergreen trees or shrubs, with alternate, entire or serrate lvs. and usually white fls. In racemes or panicled flowers, 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. tincotaria, 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 160 species widely distributed through the tropical regions except Africa; only a few outside the tropics in trees: fls. in terminal or axillary racemes or panicles, rarely solitary; calyx 5-lobed; corolla 5-parted, often almost to the base; stamens numerous, usually connate at the base; style filiform: ovary 2-5-loculed, berries, drupe, with 1-5 1-seeded stones. Several species have medicinal properties; S. tincotaria yields a yellow dyes.

2449. Symphycum asperatum. (X½.)
SYMPLOCOS
branches pubescent: Ivs. short-petioled, oval or ovate to oblong-ovate, acute or acuminate, sharply serrate, distinctly veined beneath and more or less pubescent at the veins, rarely glabrous, 1½-3 in. long: fs. white, fragrant, the spreading oblong-oval petals in panicles 1½-3 in. long: fr. usually oval, blue, about ½ in. high. May, June. Himalayas to China and Japan. G. F. S. M. 1901: 100, 101.
RALPH REEDER.
SYNADENIUM (Greek name, indicating the united glands), Euphorbiaceae. A genus of 3 species of some South American shrubs and African trees, differing from Euphorbia in having the glands of the involucre united into a ring.
S. arborvescens, Boiss., has yellow involucres. B. M. 784.
J. B. S. NORTON.
SYNCARPA (Greek, together and fruit, referring to the head-like clusters of capsules), Myrtaceae. Two species of Australian trees with opposite, ovate, pennerved, evergreen leaves and rather small white flowers in dense, globular heads either solitary in the axils or in terminal panicles; calyx-tube adnate to base of ovary, the free part erect or dilated with usually 4 persistent lobes; petals usually petaloid; ovary sessile; stamens many; free: ovary inferior, 2-3-loculed; ovules 1-several to each seed; cells linear-cuneate.
lauroliolia, Tenore. Turpentine Tree. Ivs. broadly ovate to elliptic-oblong, obtuse or obtusely acuminate, 2½-3 in. long: sts. whorled of 4: fs. 6-10 in a head, with 2-3 bracts of variable shape below the head; callics conate at the base; petals broadly ovate or orbicular, less than 2 lines long: ovary 3-4-lobed; ovules several to each locule. — According to Von Mueller, "Select Extra-tropical Plants," this tree, attains a height of 200 ft., with a trunk often 30 ft. in circumference; it is of quick growth and well adapted for a shade tree. The wood is very durable and almost fireproof, and is valuable for piles, railway sleepers and shipbuilding. It takes a high polish and is used for flooring and cabinet work. Offered in S. Calif.
F. W. Barclay.
SYNDESMON (Greek, bound together, because the plant units characters of Thallactrum and Anemone), Rubiaceae. Rice Anemone. A monotypic genus of the American tropics, characterized as a cluster of tuberosous roots: basal Ivs. 2-3-ternately compound: involucre similar but sessile, the Ifts. being stalked: fs. white or pink, in an umbel; pedicels and style slender; stigmas sessile; achenes acuminate: skene aterete, deeply grooved. The more common generic name is Anemonecella, which dates from 1839, but Syndesmon was used in 1832. The plants are used in medicine in humble fashion, where they should be left undisturbed for years. They will then form a carpet of great beauty. Prop. by division of roots in spring or fall.
thallactridae, Hoffm. (Anemoneae thallactrideae, Thal-lactrum anemoneum, Michel.). Plant 3-6 in. high: Ivs.
K. C. Davis.
SYNOGIUM (Greek name, said to refer to the coalescence of the ovary), Araceae. About 10 species of tropical American woody climbing or creeping plants, with milky juice and stems rooting and leaf-borne flowers: Ivs. sagittate, becoming with age pedately 6-parted, on long pedicels, with a persistent accrescent sheath: peduncles short; spadix white or whitish green; tube small, ovoid, persistent; spadix shorter than the spathe: stamine fs. with 3-4 stamens, distillate ft. with oblong-ovoid 2 or aborally 1-loculed ovary; seeds solitary in the locule, obvoid or globose. All the aroids are monographed in Latin in DC. Mon. Phan. vol. 2, 1879.
podophyllum, Schott. A tender creeping plant: Ivs. becoming 5-7-pannatisped, 4-8 in. long; pedioles becoming 15-20 in. long: tube of the spathe 1½-1½ in. long: blade of the spathe 2½ in. long, greenish outside, white within. The typical form is probably not in cult.
Var. alboineanum, Engl. (S. alboineatum, Bull.), has whitish costate, lateral nerves. Offered by John Saul, 1893, presumably as a tender form for greenhouses.
F. W. Barclay.
SYNTHIRSYS (Greek, together and little door or valve, the valves of the capsule long adhering below to the short placental axis), Sapotaceae. Six species of hardy herbaceous or woody perennials native to western North America. S. reniformis is a tufted plant bearing a few scapes about a foot high. The inflorescence is a raceme about 5 ft. long with about 40 purple-blue ft. each 1½% of an inch across. In England this plant is considered a winter bloomer; it flowers there in February or March, occasionally November.
Synthysis is nearly related to Wulfenia of southeastern Europe and to Himalayas, but the anther-cells are not confluent and the seeds are discolored. In their native region they are summer-blooming plants with small purplish or flesh-color racemes or flowers. Generic characters: Plants glabrous or pilose; rhizome thick: radical Ivs. petioled, ovate, or oblong and crenate or incised-pannatisped: calyx 4-parted: corolla-tube very short; lobes 4 or none; stamens 2; style entire at apex: capsule compressed.
reniformis, Benth. Larger and stouter plant than the above, with more acutely cut, leathery Ivs., long and stouter scape and raceme, shorter pedicels, narrow sepals and corolla-lobes, a globose corolla-tube and more seeds in the cells. Ore. to Wash. Introduced by Woolse Passiac, N. J.
rotundiflora, Gray. Smaller, with weak, slender scape 3½-4 in. long, shorter than the membranous, broadly crenate Ivs., a small few-fl. raceme, broader sepals and corolla-lobes, fewer seeds in the cells and capsule di-variate 2-lobed instead of merely emarginate. Shady coniferous woods of Oregon. Offered in 1881 by Edward Gillett.
W. M.
SYRINGA (of doubtful meaning; probably from syringa, pipe, because pipes are easily made from the straight stems of Philadelphia by removing the pith, and the name Syringa had been originally applied to Philadelphia, but was transferred afterwards to the Lilac). Oleaceae. Lilac. Ornamental deciduous shrubs or rarely trees, with opposite, slender-petioled, entire Ivs. and Lilac, purple or white ft. in large and showy upright panicles. The Lilacs are among our most ornamental flowering shrubs, and hardly any garden or park is found without them. The fragrance of the common Lilac is very sweet, as also of Syringa oblata and S. pulchra. The S. vulgaris is the best of all. S. villosa and Josikaea are almost scentless. S. Amurensis and its allies have only a slight odor similar to that of the Privet. Almost all species are hardly north. S. villosa, var. Ewoudi, is somewhat tender north.
W. M.
The Lilacs are very showy in bloom, especially when massed in groups, and these as a rule are the more effective the fewer different varieties they contain. The mixing of species and varieties differing in habit and bloom 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 true 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 and seldom exceeds a few feet. The first in bloom is *S. oblata*, followed closely by *S. vulgaris*, *Chinensis*, *pubescens*, *Persica*, *villosa* and *Jostakka*; after the middle of June *S. Amurensis* and *Pekinensis* come into bloom, followed at the last by *S. japonica*, which blooms 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 handsomely variegated comparatively early in fall, especially in the case of *S. japonica*, without assuming any fall color, except a russet. 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 bright hue or turns pale yellow.

The foliage is not much attacked by insects, but a fungus, *Microsphaera alni*, late in summer often covers the whole foliage of *S. vulgaris* and also of *S. chinensis* and *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 borers, *Trichotillum denudatum*, which lives in the stems and branches of *S. vulgaris*, but is rarely found in any other species.

After blooming, the inflorescence should be removed if possible and the pruning done as far as necessary. Pruning in winter or spring would destroy a large part of the flowers 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 simple ones; they also remain mostly cawer and have a more compact habit. The faded fls. do not fall off, but remain on the inflorescence; this gives the plant a very ugly 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 suffering in some cases.

Some of the best single-flowered var.s are the following:

**Single-flowered Lilacs.**

**White:** *Alba grandiflora; Alba pyramidalis*; Frau Bertha Dammann, A.F. 12:1678; Madame Moser; Marie Lemoine, one of the very best, B.H. 29:133; Princess Marie.

**Blue, lilac or pink:** *Ambrosie Verschaffelt*, pale pink; Dr. Lindley, pinkish lilac, F.S. 14:1481; Géant des batailles, bluish lilac; Geheurnath. Heyder, light lilac; Giganteum; Glabre des Moulins, pale pink; Goliath, purplish lilac; Lovaniara, light pink; Macrostachya, light pink (Princess Alexandria is a favorite variety of this class in America); Sibérie, purplish lilac; Tristanluna, bluish lilac.

**Red:** Aline Moqueris, dark red; Charles X (Carolii), dark lilac-red, A.F. 12:1076. F. 1873, p. 76; Marylenensis, sometimes called Rubra de Marley, lilac-red; Rubra impota, purplish red.

**Dark purple:** Philémon; Ludwig Spith (Andenken an Ludwig Spith, Louis Spith), very large panicles, the best of the dark var.s

**Double-flowered Lilacs.**

**White:** Madame Abel Châtenay, compact panicles; Madame Casimir-Perier, large, graceful panicles, one of the best; Madame Lemoine, large fls. in dense panicles; Obélisque; Virginité, white and pink.

**Blue, lilac or pink:** Alphonse Lavallé, bluish lilac, A.F. 12:1077; Belle de Naney, fls. pink with white center; Charles Baltet, lilac-pink; Condorect, blue, A.F. 12:1074; Doyen Ketelleer, lilac-blue; Jean Bart, pinkish violet; Lamareck, pale lilac, large, loose panicles; Lemoinei, lilac-pink, B.H. 28:174; Léon Simon, changing from pinkish to bluish lilac. Gt. 43:1407; Maxime Cornu, pinkish lilac; Michel Buchner, pale lilac, large and very double fls.; President Carnot, pale blue.

**Purple:** Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d'Aurvongree, 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. Marylenensis, Marie Legrave, Alba virginallis, Ludwig Spith and other varieties are also good for forcing. Of the double-flowered varieties the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Léon Simon, Chinensis duplex and others. Either grafted plants or plants on their own roots are used. Both force equally well, but grafted Lilacs can be grown into plants well set with flower-buds and suited for forcing in two or three years, while plants grown from cuttings require four to six years. Marylenensis 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.

The 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-
rather dry in fall, so that the wood may ripen thoroughly and early. When the leaves have fallen off, the plants are stored away in convenient places, where they are sheltered from severe frost. Sometimes the Lilac, especially 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 Asparagusa," 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 Ätherverfahren beim Frühtreiben mit besonderer Berücksichtigung des Flieders." That the ether has a particular effect on the metamorphosis and regeneration of the albuminoids in the plant has been stated recently by other botanists also.

Lilacs may be propagated by seed, which is sown in spring. This method is usually practiced only with the more common typical species. The many varieties and rarer kinds are usually propagated by greenwood cuttings under glass in June (or in early spring from forced plants), by hardwood cuttings, by grafting and also by suckers and division, especially in the case of S. Chinensis, 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: fis. in panicles; calyx small, campanulate, 4-toothed; corolla salverform, with cylindrical tube and 4-lobed limb; stamens 2: ovary 2-loculed: fr. a leathery, oblong or oval capsule, loculicidally dehiscent, 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 Reider.

Forcing Lilacs. — Most of the Lilacs used by American commercial florists for forcing are imported. Care should always be taken to procure pot-grown plants, that is, plants that have been grown in pots the previous summer. The florist who wishes to grow his own plants should lift them in the field in April or before the growth starts and pot them without losing much root. Plunge them out-of-doors during summer and give them plenty of water. This treatment will insure a good growth and the
check the plants receive from lifting will induce them to form new flower-buds. These plants will force with the greatest certainty. It is well to allow five weeks for the earliest forcing. A strong heat is necessary, beginning at 60° for the first few days and increasing to 75° 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: anthers sessile, not exserted.
B. Panicules on leafy branches, usually terminal: Ivs. white beneath.
C. Stamens inserted near the middle of the tube
CC. Stamens inserted near the mouth of the tube
Bh. Panicules from lateral buds, without Ivs.: terminal bud of branches suppressed.
C. Under side of Ivs. grayish green, pubescent at the midrib when young
CC. Under side of Ivs. green, quite glabrous.
D. Lvs. truncate or cordate at base.
E. Shape of lvs. roundish or broadly ovate....
EE. Shape of lvs. ovate...
DD. Lvs. narrowed toward the base.
E. Shape of lvs. lanceolate...
EE. Shape of lvs. lanceolate.
AA. Tube short, little longer than calyx: stamens exserted: fls. white.
B. Base of lvs. usually narrowed.
BB. Base of lvs. usually rounded.
C. Plant a shrub
CC. Plant a tree

1. Josikaea, Jacq. Shrub, attaining 12 ft., with upright, stout, terete branches: Ivs. broadly elliptic to elliptic-oblong, acute at both ends, finely ciliate, dark green and shining above, glabrous or pubescent on the midrib beneath, 2½-5 in. long; fls. violet, short-pedicled or almost sessile, clustered, in rather narrow panicles 3-7 in. long; stamens inserted somewhat above the middle of the tube; sepals half-upright. June, Hungary. B.M. 3278. B.R. 29:1730. —Less handsome than most other species, but valuable for its late blooming season. Var. pallida, Hort., has pale violet fls.; var. rubra, Hort., reddish violet.

2. villosa, Vahl, not Deene, nor Hooker, nor Koehne. Figs. 2450, 2451. Dusky shrub, 8 ft. high, with rather stout, upright, terete and warty branches: Ivs. 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; stamens inserted near the mouth; sepals half-upright. May, June. China to Himalayas. The common form, var. rosea, Cornu (S. Brétschneideri,

3. pubescens, Turcz. (S. villosa, Deene., not Vahl. S. villosa, var. ovatifolia, DC.). Shrub, 6 ft. high, with slender, somewhat quadrangular branches: Ivs. roundish ovate to rhombic-ovate or ovate, shortly acuminate, ciliate, dark green above, 1½ 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: 5:266. B.M. 7004 (as S. villosa).—Free-flowering shrub of graceful habit, with handsome dark foliage.

4. obiata, Lindl. Shrub or small tree, 12 ft. high; Ivs. roundish ovate or reniform, often broader than long, cordate, short-acuminate, bright green, 3½-4½ in. across; fls. purple-lilac or purple-violet, in rather loose, pyramidal panicles, 3-6 in. long; pedicels about as long
as calyx. May. N. China. G.F. 1: 221. A.G. 22: 183. — The earliest of all to bloom and handsome, with its vinous red foliage in fall. Var. alba, Hort., has white flowers.

5. hyacinthiflora, Hort. (S. oblonga x 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 vars. have originated by re-crossing this form with vars. of S. 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: lls. lilac, blue, purplish or white, in large panicles. May. South-eastern Europe to Caucasus and Afghanistan; sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. M.D.G. 1899: 205. — The most important of the older original vars. are the following: Var. alba, Dietr., branches yellowish gray: lfs. white; buds yellowish green; blooms a week earlier than the other vars. A.F. 12: 1081. Var. cerasia, 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. Marieyensis, Hort., and Charles X. Var. violacea, Dietr. Fls. violet, in rather loose panicles. Var. pendula, Hort. With double lfs. There are several vars. with variegated lvs., but these are hardly worth cultivating.


TABEBUIA (Brazilian name). Bignonieae. Ornamental evergreen trees with opposite, long-petaled, simple leaves and showy flowers in terminal, few-fl.d. racemes. Only T. leucophylla 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 Te
coma, but, according to recent monographs, chiefly distin-
guished by the simple leaves and the irregularly splitting tubular calyx; formerly also species with digitate foliage were included, for which see Tecoma.

leucophyla, DC. (Bignonia leucophylla, Vell. B. pol-
lida, Lindl.). Evergreen tree or shrub; lvs. elliptic-
oblong to ovalate-oblong, obtuse or sometimes emargi-
nate at the apex, glabrous, dark green with distinct pale midrib, 4-7 in. long: fls. in few-fl.d. terminal ra-
cemes; corolla funnel-shaped, about 2 in. long, with

ALFRED REIDER.

TABERNAMONTANA (J. T. Tabernamontanum of Heidelberg, physician and botanist, author of Krauter-
bueh mit Kunstlichen Figuren; died 1590). Aposyndeces. A genus of more than 100 species of trees or shrubs widely scattered in tropical regions. Lvs. opposite, pinn.-nerved: fls. white or yellow, in terminal or some-
times apparently but not truly axillary cymes; calyx usu-
ally short 5-lobed or parted; corolla salverform; stamens
inserted on the corolla-tube, included: berries large and globose or small, oblong and recurved. See Gonioa
for distinctions of this genus.

A. Lvs. white.

A tender shrub, 6-8 ft. high: lvs. glossy green, oblong
to oblongate: fls. white, fragrant, 1-2 in. across, in
1-8-fl.d. clusters in the forks of the branches; petals
clipped on the margin, whence the common name.
Cult. in India but native country unknown. Var. flore-
pleno, with double, somewhat larger, very sweet-
scented flowers, seems to be far more common in cul-
—Cult. in the more southern states and in green-
houses. Also known as Adam's Apple and East Indian Rosebay.

AA. Lvs. yellow.

grandiflora, Jacq. A small, tender shrub: lvs. ob-
long-obovate, fully exposed to the sun. Only very
single, yellow, 1-2 in. long, in few-fl.d. clusters; corola-
lobes oval, obtuse, entire. Early fall. Carthagen,
Guiana. B.M. 5226.—Rarely cult. in the more southern portions of the United States.

T. Camassii, Regel. See Gonioa Kamassi.

P. W. BARCLAY.

The East Indian Rosebay, Tabernamontana coro-
naria, is one of the best ornamental shrubs for sub-
tropical gardens. This species and T. Camassii, re-
ferred in this work to Gonioa, 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 a sufficient supply of
cuttings for propagation. T. coronaria has larger
leaves than T. Camassii and the flowers are much like
those of the double white oleander, while T. Camassii
has solider, more spiny stamens. Both do well under
the same treatment. In order to enjoy the beauty of the East Indian Rosebay to its fullest extent, it must be
planted in rich, sandy soil, not too wet and not too dry,
and in places fully exposed to the sun. Only very
strong pot-grown plants should be set out in the gar-
den. This should be done during the rainy season.
Avoid breaking the ball in transplanting. It is use-
less 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
weakened Tabernamontana is usually killed outright by
even a slight frost. Just before Christmas all the plants
of this nature (bouhinias, ectrums, Poinciana regia,
Tristania conferta, yellow oleander, etc.) are banked about 18 inches to 2 feet high with earth, and they always come through without much damage. In
April or even earlier, the banking is taken away and the
plants cut back to sound wood. The Tabernamontanas
look best in groups by themselves or in front of other
glossy-leaved evergreens.

H. NEHRING.

TACAMAHAC. Populous balsamifera.

TÁCCA (Malayan name). Taccacea. A genus of 9
species from tropical regions. Perennial herbs from a
tuberous or creeping rhizome with large, radical, peti-
olated leaves and umbels of lirid brown or greenish
flowers in a dense umbel borne on a leafless, rigid scape.
The flower-cluster is subumbelate, formed by short, leaf-like or colored bracts, and intermixed with the
flowers are more or less numerous, long and conspicu-
sous, sterile, filiform pedicels, which usually droop be-
low the flower-cluster.

AA. Lvs. much lobed.

pinnatifida, Jack. Tender perennial herb, about 2 ft.
high: rootstock globose, becoming 1 ft. through: lvs.
large, usually 3-branched, the divisions pinnaately cut
or divided, the ultimate lobes sometimes irregular and un-
equal but usually ovate to lanceolate: fls. greenish, 8
lines across, many with the sterile pedicels purplish
berry nearly globular, 1 in. through. Afr., Ind. and
Australia. L.B.C. 7:692. B.M. 7299; 7306.—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.

cristála, Jack. (Atdecia cristála, Kunth). Rootstock
a short conic caudex, marked with leaf-sears: lvs. 1-2 ft.
long, oblong, acuminate, dark purplish green: scape
bearing a few flowers; pedicels about 1 in. long: fls.
about 1 in. long: involucral bracts 4, conspicuous,
the 2 inner elliptical, narrowed to a petiole, the 2 outer
revolute. Malay. B.M. 4589. F.S. 9:300, 861. Gn. 44:
p. 415; 49. p. 423.—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). Passifloraceae. From Passiflora, Tacsonia
differs in having a long-tubular calyx, styles 3, stamens
and petals 3 or 5, the latter never wanting, corona of
tubercles or very short threads, and in a short reflexed
crown near the base of the flower-tube. However, the
line of demarcation between the two genera is often not
well marked and Harms (Engler & Prantl's "Pflanzen-
familien") unites Tacsonia with Passiflora. Masters
lists (Trans. Linn. Soc. 27) 25 species of true Tac-
sonia, relegating the intermediate forms largely to Pas-
siflora. Other species have been discovered subse-
quently, making the total number in the genus above
30. The species are all South American, inhabiting the
Andes. They are tender-leaf-climbing vines or herbs, re-
quiring the treatment given Passiflora. Tacsonias are
cultivated freely in the open in middle and northern
California.
TACSONIA

2457.

Tacsonia Van Volxemili.

2

Central leaflet broader than common.

A. Fls. orange or rosy orange.

Pârrita, Mast. Lvs. deeply 3-lobed, glabrous above and pilose beneath, the lobes narrow and entire; stipules entire, subulate-acuminata: fl. with a long and slender tube, glabrous, swollen at the base; sepals winged and with points, rose-orange; petals oblong and flat, shorter than the sepals, orange; corona double, the outer row of tooth-like projections. Colombia. G.C. H. 17:323. I.H. 33:41. — Named for Senor Parra, through whom it was introduced.

AA. Fls. scarlet or rose-colored.

B. Bracts beneath the flower not united.

c. Lvs. simple or not lobed.

Insignis, Mast. Pilose: lvs. ovate-lanceolate, subcordate, dentate, rugose or blistered above and red-dowmny beneath, the stipules dissected: fl. about 6 in. across, violet, rose or crimson; tube cylindrical, swollen at the base, downy; sepals about twice longer than the tube, lance oblong, spurred at the end; petals similar in shape, obtuse; corona of one series of short threads, blue and white. Probably Peruvian. G. C. 1873:1113. F. S. 29:2083-4. B. M. 6066.

CC. Lvs. 3-lobed or divided.

d. Foliage glabrous at maturity.

Van Volxemili, Hook. Fig. 2457. Stems slender and slightly pubescent; lvs. cordate-ovate in outline, deeply 3-lobed, the lobes long-lanceolate-acuminata, serrate; fls. 5-7 in. across, bright red with short green calyx-tube that has a swollen base, the acute calyx-lobes green externally; corona an inconspicuous toothed rim. Colombia. B. M. 5571. G. C. 1866:171. — Probably the best known species and handsome, but less showy than some others.

TACSONIA

1765

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.

Exoniensis, Hort. (hybrid of T. Van Volxemii and T. mollissima). Fig. 2458. Lvs. hairy, 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 ¾ in. long, inflated and cleft at the base; corona double, the outer series composed of blue hairs. Colombia and Peru. B. M. 6129. — P. ignea, Hort., is a form of this species.

CC. 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. 3-4 in. across, rose-pink, the oblong sepals not equaling the green scarcely saccate 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 saccate, the stipules laciniate: fl. about 3 in. across, rose-color, the green tube exceeding the sepals and swollen at the base; corona a short rim. Andes. H. M. 4187. B. R. 32:11. F. S. 2:78. — 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 rosy-crimson fls. G. C. III. 12:704.

T. Buchnani, Lem. See Passiflora vitifolia, p. 1222. I. H. 14:519. — T. floribunda was once advertised in the American trade, but it was probably not the T. floribunda, Masters, of Colombia. — T. pisneudigera, Juss. Resembles T. mollisima, but the bracts are free; stipules pinnatisect: fls. rose-colored. Chile. B. M. 4062. B. R. 18:1586. L. H. B.
TAGETES (Tagetes, an Etruscan god). Compositae. Marigolds. 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 T. erecta and T. patula, both of which are native to Mexico. According to 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. T. erecta and lucida are of upright and somewhat open growth; while T. patula and signata are spreading and bushy, the lower branches lying close to the ground and often rooting. The French Marigolds, T. patula, are valuable bedding plants. Good garden forms are of even height and bushy, compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 ft. apart. This species also makes attractive specimens in small pots in a few weeks from seed. Mixed seed of the double sorts will give a large percentage of good double flowers, while the seed of special named double sorts is remarkably fine. Some of the single forms are very finely colored.

The African Marigolds, T. erecta, are not well suited to bedding purposes, the growth being too open, but for the mixed border or shrubbery they are excellent late-blooming subjects. This species should be grown with plenty of root room, air and rich soil from start to finish if the largest and most double flowers are desired. The African Marigolds are very useful as cut-flowers except under circumstances where their odor is objectionable.

For Pot Marigolds, see Calendula.

a. Fls. generally marked with red.

pulata, Linn. 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 T. erecta, pinnately divided; lobes linear-lanceolate, serrate; fls. smaller than in T. erecta and borne on proportionately longer peduncles. B.M. 150; 2830 (as T. corymbosa). — 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.

AA. Fls. not marked with red.

b. Lvs. pinnately divided.

c. Rays numerous.

erecta, Linn. AFRICAN MARIGOLD. Fig. 2460. A hardy annual growing about 2 ft. high, erect, branched, near the base, forming a compact, bushy plant; lvs. pinnately divided, segments lanceolate-serrate; fls. 2–4 times as large as in T. patula and of one solid color, the typical color, according to De Candolle, being a lemon-yellow. — The rays are sometimes rather twolipped and in one of the garden forms they are quilted. 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.

cc. Rays few, usually 5.

signata, Bartl. An annual branching species; lvs. pinnately divided into usually 12 oblong, linear, sharply serrate segments, the lower teeth awned: rays 5, yellow, roundish-ovate. Var. 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.

h. Lvs. lanceolate, simply serrate.

lucida, Cav. SWEET-SCENTED MARIGOLD. A tender perennial plant, entirely distinct from the foregoing annuals in the sessile, lanceolate lvs. and small, usually 2–3-rayed fls. In dense, terminal corymbs. The 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.

T. taccra is a species discovered about 1890 by T. S. Brandegee in Lowes, 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.


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 of equal name. Hooker places the 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 with a warmth in America, so far as I know. 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* deliquesce 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 c. 20 more in 2 or more whorls; stamens very numerous, in many series; ovaries indefinite, 2-ovuled, spiky 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.

*Talinum* 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., ovate-oblong, cuspidate or obtuse, leathery, glabrous; fls. solitary, terminal; sepals 3-5, purple outside; petals about 6' ft. 4-6 in. long; Himalayas. B.M. 7392. W. M.

**TALINUM** (possibly a native name in Senegal). *Portulacaceae*. A dozen or more species of fleshy 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 5, hypogynous, ephemeral; stamens 5-many; ovary many-ovuled; style 3 or 3-grooved at apex; capsule globose or ovoid, chartaceous, 3-valved; seeds subglobose or laterally compressed, somewhat kidney-shaped, shining.


**triangulare**, Willd. Lvs. alternate, oblong-lanceolate; cymes corymbose; pedicels 3-cornered (in T. patens they are filiform): fls. red or white. West Indies, Brazil, Peru. Var. *crassilobum*, Hort. (T. crassilobium, 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 succulent, but they become woody with age. The plant is allied to *T. patens* 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 capsules filled with an indefinite number of the small brown seeds. The fruiting plant is rather attractive, the blossoms of *T. patens*, however, are far more showy. *Talinum* may also be planted out during the summer.

W. C. STEELE.

**TALIPOT PALM.** See *Corophia umbraculifera*.

**TALLOW SHRUB.** Myrica cerifera. **TALLOW TREE.** Chinese. *Sapum selbeterum*.

**TALLOW WOOD.** Eucalyptus microcorys.

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**TAMARACK.** See Lariz.

**TAMARIND.** See *Tamarindus*.

**TAMARINDUS** (from Arable, meaning "Indian date"). *Leguminosae*. 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 everywhere in the tropics but its native country is uncertain, probably either Africa or India. As an ornamental 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 Fla. 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 3-4 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 simply pressed together into a mass. The Tamarinds of the Malayan Archipelago are considered better than those of India. They are preserved without sugar, being merely dried in the sun exposed to the tropical sun or in some other shady position. Tamarind may also be planted out during the summer.

2461. Tamarind — *Tamarindus indica* (× 1/3). Short-podded or West Indian form.
order to prevent fermentation, the first syrup, which is very acrid, 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 northerm commonly thinks of as typical of that 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 pellucid yellow. 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.). TAMARINDUS. Fig. 2461. Tender evergreen tree, attaining a height of 80 ft., with a circumference of 25 ft.; lvs. abruptly pinnate; fls. 20—20 opposite, oblanceolate, obtuse; fls. pale yellow, the petals veined with red. B.M. 4563. — The fs. are said to yield to white or pinkish.

W. Harris, E. N. Reasoner and W. M.

TAMARISK. See Tamarix.

TAMARIX (ancient Latin name). Tamariscaceae. 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 capsules. Fruits of the species are quite hardy north, but T. Odesa-Dahuria is hardy as far north as Mass. The Tamarisks are an all of graceful and distinct appearance, with light and feathery foliage and large, loose panicles of pink flowers. Some 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 counties of similar climatic conditions. They are also excellent for seaside planting. They grow well in saline and alkaline soil and thrive in the very spray of the salt water. Prop. by seeds, which are very minute, and should be only slightly covered, or usually by cuttings of ripened wood or greenwood cuttings and glass. About 60 species from the Mediterranean region to E. India and Japan. Shrubs or small trees, alternate, semi-deciduous, often amplexicaul or sheathing: fls. small, short-peduncled 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 dye-stuffs. The puncture is often the source of mannitola, cause T. mannitola to produce "manna."

T. Germanica, Linn., is now referred to the genus Myrtillea, which is chiefly distinguished by the 10 stamens connate one-third to one-half, and by the 3 sessile stigmas. Although their form may be variable, all shrubby or semi-deciduous, with the fls. in terminal, often panicled racemes.

T. Germanica, Desv., is a glabrous undershrub, 4—6 ft. high, with upright, wand-like branches: lvs. minute, bluish green, lanceolate, glandular-dotted: fls. light pink or white, 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. Indhurica, Ehrehb. (Tamarix Dahurica, Willd.), is very similar, but racemes usually solitary and stamens connate only one-third. Dahuria, Transbaikalia. The culture is the same as of Tamarix; they prefer sandy, moist soil.

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(s. l. refers to supplementary list.)

TAMARIX

Africana. 1.          Dahurica, see para.
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         Odesana, 6.
Arborea.                3.
         Pallasi, s. l.
Articulata. 3. s. l.
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Cardiaca. 1.
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Caspica. s. l.
         Plurinodis. 4.
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         Juniperina. 7.
         Tetrandra. 2.

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; lvs. ovate, acute, usually with very scarious at the apex when older: fls. pink, very short-peduncled, slender in racemes about 1 in. long, along last year's branches; petals spreading, persistent; stamens small, somewhat ovate; pistil small, style usually 3, much shorter than ovary. April, May, S. Eu., F.S. 9:898. R.H. 1855:401. — Often confounded with the following species, also with T. Africana and Gallica and cult. under these names. T. tetrandra, var. purpurea, probably belongs here.

2. tetrandra, Pall. Shrub or small tree, attaining 12 ft., with almost black bark: lvs. ovate-lanceolate, somewhat narrowed at the base, with diaphanous margin: fls. light pink or almost white, in racemes 1—2 in. long along older branches: disk pinnate, styles usually 4, about as long as ovary. April, May, S. Eu. F.S. 9:898. R.H. 1855:401. — With slender, upright branches: lvs. dull green; racemes longer and slenderer: fls. pink; disk obscurely and

4. juniperina, Boege (T. Japonica and T. plumosa, Hort.). Shrub or small tree, attaining 15 ft., with slender spreading branches: lvs. green, oblong-lanceolate, acuminate, scarious at the apex; fls. pinkish, in lateral racemes 1 1/2-2 1/4 in. long on last year's branches;

2463. Taney — Tanacetum vulgare (x 1-5).

pedicels shorter than calyx; sepals ovate-lanceolate, little shorter than the persistent petals; disk 5-lobed, with emarginate lobes. Japan, N. China. S.Z. 1:71 (as T. Chinenesis.)

5. Chinensis, Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches: lvs. bluish green, lanceolate, acuminate, keeled: fls. pink, in large and loose usually nodding panicles, pedicels as long as calyx; sepals ovate, much shorter than the persistent petals; disk deeply 10-lobed. China.

6. Odessana, Stev. Shrub. 4-6 ft. high, with upright, slender branches: lvs. lanceolate, subulate, decurrent: fls. pink; racemes slender, about 1 in. long on short, naked peduncles, spreading and disposed in ample loose panicles; pedicels about as long as calyx; petals slightly spreading; disk 5-lobed, with rounded lobes. July-Sept. Caspian region.


T. artiflitta, Vahl. Tree, attaining 30 ft. with slender, jointed branches: lvs. glaucous, minute, sheathing: fls. 5- merous, pink, sessile, in terminal panicles. W. Asia. Not hardy north.—T. Pullatii, Desv. Shrubby and very similar to T. Odessana, but panicles less spreading, with more upright racemes; petals purple; disk 5-lobed, with emarginate lobes. Aug. Sept. S. Russia and W. of C. Asia. T. Amurensis, Hort., is a form of this very variable species. T. Caspica, not seen in bloom by writer, may also belong here. Alfred Rehder.

TANACETUM (name of doubtful derivation). Com- posite. A genus of 30 species of annual or perennial herbs scattered about the northern hemisphere, of which 7 are native to North America. They are odorous plants with alternate, variously cut leaves and small to medium-sized heads of yellow flowers disposed in corymbs, usually solitary. Fl. heads heterogamous, disk-shaped: female fls. with 3-6-toothed, tubular corollas; akenes 5-ribbed or 3-5-angular, with a broad truncate summit, bearing a coroniform pappus or none. For culture, see Taney.

vulgaris, Linn. Taney. Fig. 2463. Stem robust, erect, 2-3 ft. leafy to the summit: lvs. plinutely di- vided into linear-lanceolate segments which are serrate or plinutely cut: fl.-heads 3/4-1 1/2 in. across, numerous, in a dense, flat-topped cyme. July-Sept. Europe. Ad- venture in the eastern U. S. Var. crispaum, 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. F. W. Barclay.

TANGIERINE. See Orange and Citrus

TANSCY PEA, Scarlet. Lathyris Tingitanus.

TANSY (Tanacetum vulgare, Linn.). Fig. 2464. A coarse-growing, 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 Tanacetus, immortality, an idea suggested to the ancient Greeks by the characteristic permanent possession it takes of the soil. Its annual, upright, usually unbranched stems, which rise about 2 feet from the perennial root, bear greatly divided, deeply cut, compound, bitter, aromatic leaves and rather dense corymbs of numerous small yellow flower-heads which appear in midsummer. The seed, which is small, is marked by 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 dropisia disorders is still recognized, though other medicines are more popular. In domestic prac- tice it played an early role as an anthelmintic and stomache and is still some- what popular as a local agent to relieve the pain of muscular rheumatisation, bruises and chronic ulcers. The wild plants usually satisfy all demands, but when no wild supply is at hand seem may be used to start the half-dozen speci- mens that a family should need. Easily started, read- ily transplanted or divided, Tansy requires no special care in cultivation except to keep it clear of weeds and to prevent its spreading and thus be- coming troublesome as a weed. It will thrive in almost all soils and situations that are not too wet. For botanical account, see Tanacetum.

M. G. Kains.

TAPE GRASS. Vallisneria.

TAPIOCA. See Manihot.

TARAXACUM (ancient name of doubtful origin, probably associated with supposed medicinal proper- ties). Compositae. Dandelion. 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 &
hooker would reduce them to about 6, and others would retain 22 or more. Taraxacums are distinguished by having large many-flowered ligulate yellow heads solitary on naked and hollow scapes; involucral with one inner series of erect narrow bracts and outer calyx-like spreading sometimes reflexed bracts; pappus simple and capillary, borne on a slender beak terminating a fusiform elongated akene; flowers opening in sunshine.

The common Dandelion is *Taraxacum officinale*, known also as *T. Deva-leonis*. See Dandelion. It varies immensely in stature and form of leaves, as shown in Figs. 2465-68. For history, see Sturtevant, Proc. 8th Meeting Soc. Prom. Agr. Sel., and Amer. Nat., Jan., 1886.

For an account of the red seeded Dandelion, *T. erythro-spernum*, see Fermald, Bot. Gaz. July, 1895:323. From the common Dandelion it differs in having smaller sulfur-yellow heads, smaller and very deeply cut leaves, outer involucral scales not reflexed and somewhat glau-<ref></ref>con; akene 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, TARIES. To the modern English farmer the word "Tare" means the common vetich, *Vicia sativa*, although Tare is also applied loosely to other species of *Vicia* and *Lathyrus*, particularly *Vicia hruruta*. The celebrated passage in Matthew xiii, 25, "His enemies 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 unwillingly. Recent investigations have proved that darnel seeds have no narcotic properties.

TARRAGON (Artemisia Dreanaeus, 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 this purpose. The essential oil is more often obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather and distill or infuse is when the first flowers begin to open, since the plants have then a larger percentage of oil than after. From 300 to 500 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated Tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for division is when the plants have just commenced to bloom in spring. Tenacious and wet soils should be avoided and only loams of medium texture and of proper quality in sunny places are 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 beioda, much like Tarragon in flavor and has been used as a substitute for it.

M. G. KAIS.

TASMANIA (after Abel Jansen Tasman, Dutch captain who discovered Van Dieman's Land or Tasmania). *Magnoliaceae*. This genus is included under *Drimys*, Poen, Bentham and Hooker. A small genus of tender evergreen aromatic, glabrous trees or shrubs, with simple, short-petioled leaves with transparent dots and terminal, borne in greenish yellow, rose or white flowers.

*Drimys aromatica*, E. Muell. (*T. aromatica*), is a shrub or small tree, in a few north-

F. W. Barclay.

**TAXODIUM (alluding to the similarity of the foliage to that of Taxus). Glyptostrobus, Schiedea. Conifera.** 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-

nating in long, horizontal roots. From these roots spring the peculiar cypress knees, pyramidal protruber-
ances composed of a very light, soft, spongy wood and spongy bark. These sometimes attain a height of 10 ft. and with age usually become hollow and white. From the base of the horizontal roots large anchor-roots are sent perpendicularly into the earth and help to anchor the tree firmly in the swampy yielding soil. The knees are believed by some to be formed for the purpose of strengthening this root-system, since they are chiefly found opposite to the anchor-roots, but their main pur-
pose is probably to bring air to the roots during the several weeks or months when the water stands firm with water. The knees always grow high enough to rise above the surface of the water (see, also, G.F. 3, p. 21, 22, 57).

The Bald Cypress thrives best in moist, sandy soil, but usually does well in drier situations. The habit seems to depend somewhat on the degree of moisture; in drier soil the head is more narrow-pyramidal, in moist soil broader and more spreading. Propa-
gated by seeds sown in spring and the varieties by grafting on seedling stock early in spring in the greenhouse; also by cuttings in sand con-
stantly saturated with water or grown in water alone, under glass.

Three species in North America and China. Lvs. alternate, linear, usually 2-ranked, falling off in autumn or the second year together with the short lateral branchlets: fls. monoecious, small; stamine fls. catkin-like, consisting of spirally arranged anthers, with 4–9 anther-cells and forming terminal panicles; pistillate fls. soli-
tary or in pairs at the ends of branchlets of the previous year, composed of imbricated scales bearing two ovoides inside at the base: cone globose or nearly so, maturing the first year, con-
sisting of spirally arranged woody scales en-
larged at the apex into an irregularly 4-sided disk with a nucre in the middle and toward the base narrowed into a slender stalk; 2 triangular, winged seeds under each scale; cotyledons 4–9.

The Bald Cypress is one of the most valuable timber trees of North America. The wood is brown, light and soft, close and straight-grained, but not strong: it is easily worked, durable in the soil and much used for construction.

**distichum, Rich. (Cypressus distichus, Linn. Schiedea disticha, Mirbel). BALD CYPRESS. DECIDUOUS CYPRESS.** Fig. 2469. Tall, deciduous tree, becoming 150 feet high, with a buttressed trunk usually 4–5 ft., but sometimes attaining 12 ft. or more in diameter, usually hollow in old age; bark light cinnamon-brown, flaky; branches erect or spreading, distich-
ously ramified, forming a narrow pyra-
midal head, becoming at maturity broad and rounded, with slightly pend-
ulous branches; lvs. narrowly linear, acute, thin, light green, ½–¾ in. long; panicles of the purplish staminate fls. 4–5 in. long; cone almost globose, rugose, about 1 in. across and desti-

Smaller tree, with slender upright or often pendulous branches clothed with spirally arranged, needle-shaped, more or less upright and appressed lvs. Occasionally found wild with the type and often cultivated. B.M. 5603. F. 1871, p. 60.

A great number of garden forms have been described,

**ALFRED REIDER.**

**TAXUS** (ancient Latin name of the Yew). **Conifer.** Yew. Ornamental evergreen trees or shrubs, with 2-ranked linear leaves, insignificant flowers and showy berry-like red fruits. There is a known species, **T. baccata**, which is hardy as far north as Rhode Island and northeastern 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 were formerly much used for fantastic topiary work (see e.g., G. C. II. 2:264, 265).

That the typical tree-like form of the Yew is nowadays not much planted is chiefly due to its slow growth, but the numerous mostly shrubby garden forms are popular plants for small gardens. The Yews thrive best in a moderately rich and 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 also often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow much slower than the parent trees and cuttings of the type rarely grow into trees but usually into low-spread ing shrubs (see M. D. G. 1898:565).

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; Ivs. linear, without resin-ducks, pale or yellowish green beneath, usually not veined; 2-ranked; fls. 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 almost inclosed by a fleshly cup-shaped 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.


TAXUS

In diameter: dark bright red; branches ascending; lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, 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, Hirt. (T. brevifolia, Hirt., 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 the fr. of T. baccata. As a ground cover (least usually). Newfoundland to Manitoba, south to Va. and Iowa. B.B. 1:61. V. 14:232. —In cultivation it becomes usually a more upright and less straggling shrub.


ALFRED REHDER.

TEA

United States, are facts sufficiently well known as to require no elaboration in the present article. The present condition of China and the fear that a devastating war may at any moment invade the tea-producing provinces, seriously threaten the Tea supply from that country. Again, friction among the world-powers may at some future time entangle the United States in war with a strong naval power, in which case it is easy to foresee that commerce with the antipodes might be arrested and our supply of oriental Tea cut off.

Or the outbreak of some such vegetable disease as that which not many years ago destroyed the coffee industry in Ceylon might readily sweep over the tea-gardens of Eastern Asia; and if wholly dependent upon them, the world might be deprived of its cup of Tea. It becomes, therefore, a question of national importance to provide against these contingencies.

To these advantages should be added the diversification of our industries, supplying easy and healthful occupation to thousands of needy people, especially women and children, who are well adapted for the generally light labor involved in the growth and manufacture of Tea; and converting countless acres of now idle land into blooming and remunerative tea-gardens. Where tea-gardens once were a dismal jungle, the home of the tiger and cobra, and full of deadly fevers, almost uninhabited by man and practically worthless, is now—thanks to the tea-industry—a fertile, comparatively 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 Pinehurst 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 percolation, or by artificial irrigation. The yearly rainfall in the Pacific Tea countries varies from 60 to 150 inches, and even more. Almost all of it occurs in the leaf-producing months; whereas here the aqueous precipitation, 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 tillage which shall absorb and yield to the soil a part of the moisture from 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 crops are largely planted on the tea-gardens on well-drained, flat lowlands or former pond-beds. Very recently special attention has been paid to the
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 plant-pruning 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 hillsides 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 tenth 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. 

The first tea plant in this country was set out by the French botanist, Michaux, about 1800, at Middle 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 1848, Mr. Junius Smith, of Greenville, S. C., being encouraged 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 trying difficulties, they were diligently prosecuted 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 call into active participation the ardor of many experimenters living in a climate particularly adapted for the outdoor cultivation of the Camellia Japonica, Azalea Indica, and many other subtropical plants. The Scotch botanist, Mr. Robert Fortune, was employed by the Government to gather and distribute in 1858 and 1859 throughout the southern states. The outbreak of the Civil War, shortly there after, seriously interfered with the prosecution of these
TEA

1775

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 introduction of tea, seems to constitute a most desirable quality for many consumers. It may be presumed, however, that this failure in pungency was largely due to defective curing and particularly to 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. Unhappily, the retirement from office of Commissioner Wm. G. Le Due, to whose 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 (Washington), 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 plantation that embraced the adjoining site of the later formed Pinehurst estate.

The Pinehurst 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 of the seed producers, a consideration of the adaptation of irrigation to some of the tea-gardens, and a well-trained corps of youthful tea pickers. When the gardens shall have arrived at full bearing, 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 flat 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 faring as well as the exceptions. The annual crop has gradually, but steadily, grown from less than one hundred pounds to 5,000 pounds of dry Tea. Several years of experimentation have developed a system of pruning in keeping with American needs. The hopefulness of the experiment was indicated on February 14, 1899, when the thermometer fell to zero, Fahrenheit—the lowest recorded temperature in 150 years of observation, but with comparatively 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 Pinehurst 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. 719.

2473. Assam-Hybrid Tea garden at Pinehurst, South Carolina.

TÉCOMA (abridged from the Mexican name Teecomaxo-chill.). Including Chamaespatha, Campsalium, Courválica, Pandorea, Stenolobium and Tecomária. Bignoniáceae.

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. Most 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 far north as Massachusetts, at least in sheltered positions. The closely allied T. grandiflora is somewhat more tender. The latter, as well as T. radicans, var. speciosa, 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 greenhouse and for the shade with a little frost: T. austrális, Cupenia, Jasminoides, mollis, Ricasolina, Smithii and stans. T. Amboinensis, filicifolia and leucopylon can be grown only in tropical regions or in the warm greenhouse. The Tecomás, 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 rooflets and clings firmly to its supports. 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; 1vs. odd-pinnate or digitate, opposite, estipulate; fs. In racemes or panicles; calyx campanulate, 5-toothed or irregularly 2-5-lobed; corolla funnelform, with 5 or rarely 4-lobed limb; stamens 4, 2 longer and 2 shorter; style slender; ovary 3-loculed,
surrounded at the base by a disk; fr. an elongated capsule, loculicidally dehisc. 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. Tecoma Smithii (X 3).
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 be lost. 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 the full sun. It usually requires a few years before it starts into a vigorous growth, and it rarely flowers before its fifth year; hence it has attained considerable size. In Florida, *T. Mackenii* should be planted on tall stumps, or on arbors and sheds by itself, never mingled with other species. This species is properly *T. Ricaso-

1. *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. Nehrling.**

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(Including some names from other genera. s. I. = supplementary list.)

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A. Habit upright.

BB. Foliole digitate: fs. pink.

CC. Plants few-fl:................. 1. *leucosolen*.

DD. Foliole pinnate: fs. yellow.

E. (Stenolobum.)

C. Lits. acuminate.

D. *L. papillosus*, 18.

DD. *L. spectabilis*, s. l.

DD. *L. radicans*, 7.

AA. *Valdiviana*, s. l.

BB. *Valdiviana* included.

CC. Pairs of lft: 2-5.

DD. *L. terminalis*, entire.

EE. *L. denudatus*, 10.

EE. *L. filicifolia*. (Compendium.)

CC. Pairs of lfs: 9-12.

### 1. *leucosolen*, Mart. (Bigênia leucosolen, Linn.)

Evergreen tree: lvs. long-petioled, digitate; lfts. usually 5, stalked, oblong - lanceolate, entire, glabrous, 1-2½ in. long, fs. terminal, in few-fl. racemes or solitary; corolla funnelform, with large spreading limb, ray pink, 2-3½ in. long; calyx 2-3 lipped: capsule linear, 6-8 in. long. W. Indies, Guiana.


4. *mollis*, Humb. & Bpont. (*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: fs. like those of the preceding, but little or not at all fragrant. Mexico to Chile and Peru.


7. *radicans*, Juss. (*Bigênia radicans*, Linn. *Ocumpis radicans*, Bur.). Trumpet Creeper. Trumpet Vine. Trumpet HoneySuckle. Figs. 2475, 2476. High-climbing shrub, clinging with rootlets: lvs. odd-pinnate; lfts. 9-11, oval to ovate-oblong, acuminate, serrate, dark green: panicles and pubescent beneath, at least along the midrib, 1½-2½ in. long: fs. in terminal racemes; corolla tubular-funnelform, with 5 broad spreading lobes, usually orange with scarlet limb, 2-3 in. long, tube almost three times as long as the 5-toothed calyx: fr. cylindric-oblong, keeled along the sutures, stalked.


8. grandiflora, Del. (T. Chinhinca, C. Koch, Big- nonia Chinhinca, Lam. Cucurbit. and Bry., Linn. CHINESE TRUMPET VINE. F. 2477 (adapted from Gardening). Climbing shrub, with few or no aerial rootlets: lvs. odd-pinna-tate; lfts. usually 7-9, ovate to lanceolate, serrate, glabrous beneath, 1½-2½ in. long: lfts. in terminal racemes, corolla funnel-form, campanulate, shorter and broader than that of the preceding species, scarlet, about 2 in. across; calyx 5-lobed to the middle, about as long as the tube of the corolla; fr. oblong at the apex. Aug., Sept. China, Japan. B. M. 1398; 3011. F. S. 11:1124, 1125. G. N. 27, p. 94; 33, p. 348; 47, p. 375. G. F. 3:393. F. R. 2:257. G. N. 4:195. — Less high-growing and sometimes shrubby, flowers when quite small and can be grown as a pot-plant, also suited for forcing. Var. atrosanguinea, Hort. With deeper scarlet fls. Var. Thunbergi, Hort. (T. Thunbergi, Sieb.). Fls. bright scarlet, with very short tube and reflexed limb. Often a var. of T. radicans, Hort., with an earlier name T. Thunbergi. There are probably also hybrids of this and the preceding species. Var. praecox is advertised.

9. Ambinoësia, Blume. Evergreen climbing shrub: lvs. odd-pinna-tate; lfts. 3-7, stalked, elliptic-ovate, acuminate, subulate or almost entire, puberulous beneath, 3-3½ in. long; fls. in lateral racemes, corolla tubular-funnel-form, with erect or slightly spreading 5-lobed limb, red, 3½-4 in. long. Ambosia.

10. Ricasoliana, Tanfani (T. Mackenni, W. Watson. Pindórea Ricasoliana, Baill.). Evergreen climbing shrub: lvs. odd-pinna-tate; 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 funnel-form, 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.


2477. Trumpet Vine — Tecoma radicans (× ¾).

2478. Tecoma grandiflora on a clothes post.
TELEDIA

(As G. Teede, German botanist, who lived some time in Portugal and died at Sarum.) 

Scrophulariaceae. Two species of South African plants, with pink to red flowers. They are tender. 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 species are dioecious, herbs, and have the rank herbaceous smell peculiar to henbauses when their foliage is bruised, and T. pubescens has the same sort of greasy pubescence. The plants hardly seem worth cultivating in northern localities, being tender. When they were new to cultivation they were supposed to be biennial herbs, but Bentham and Hooker call them annuals. Franceschi writes: "T. lucida acts like an annual in southern California. It is rather pretty but not showy. It seems to prefer half shade. The smell of the foliage is very objectionable."

Generic characters: calyx deeply 5-cleft; corolla-tube cylindrical; lobes 5, rounded, subequal; stamens 4, didynamous, included; anther-cells parallel, distinct: ovules numerous in each locule: berries subglobose, indehiscent.

Lucida, Rud. Glabrous: stem 4-cornered; lv. oblong-ovate, acuminate, 2 in. long, deciduous; petioles winged; panicles leafy, deciduous; fls. rosy pink: seeds many, small. S. Afr. B.R. 3:200. W. M.

TELANTHERA (name refers to the fact that all ten parts of the staminal cup are equally developed). Amanthus. Alternate. 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, whitish 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 holds 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 hotbeds, preferably in the houses at the North. The plants should be kept at 60° or 65° in 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 can be struck 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 hothed 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.

Amorea, Regel. Fig. 2478. Very dwarf: lvs. long-lanceolate or oblong-lanceolate, sometimes elliptic, acuminate, very short petioled, the under color mostly green but veined and blotched with red and orange: fl-heads sessile, single, in pairs or 3’s, and terminal. I.H. 12:447; 15:538.—To this apparently belong the garden names amabilis, spectabilis, sessiles, rosea, Reinhardi.

AA. Lvs. essentially spatulate.

Bettziahiana, Regel. (Alternanthera paronychioides, Hort.). Fig. 2478a. Lvs. narrow, spatulate, gradually narrowed into a long petiole, orange-red shaded with green: fl-heads sessile, single, in pairs or 3’s, terminal and axillary. I.H. 12:445.—To this species appear to belong the garden names picta, tricolor, aurea, aurea nana compacta, paronychioides, versicolor aurea and p. major Kuntzii, magnifica.

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: fl-heads sessile, single or in pairs. I.H. 12:440.—T. ficoides is probably to be referred here.

L. H. B.

2478. Spray of Telanthera amorea; also leaf outlines of (a) T. amorea, (b) T. Bettziahiana, (c) T. versicolor.

TELEGRAPH PLANT. Desmodium gyrans.

Telekia is referred to Buphthalmum. T. speciosa is B. speciosum.
TELFAIREA (Charles Telfair, 1778-1833, Irish botanist; died in Mauritius.). Cucurbitaceae. Telfaira pedata is a tall-growing climber from tropical Africa with digitate leaves, large, purple-fringed flowers of curiously oblong, and hinged petals which some times weigh as much as 60 pounds and contain 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 beautiful vining fles, are grown in separate pots. The species is too rampant for the ordinary conservatory. It was introduced into southern California in 1900, presumably for its economic interest. The seeds are rich in oil which are sometimes sweet to the taste, and are said to be as good as almonds. The negroes of tropical Africa boil and eat them. These seeds also yield an abundance of oil which has been said to be equal to olive oil. Telfaira has a stem 1 ½-3 ft. long and 8 in. wide. It is oblong in shape, has 10-12 deep furrows and is always green. Both male and female fles, are 5-lobed, copiously fringed and purple in color, the females somewhat brownish, with a circular green throat, while the males have a 5-pointed star in green in the middle. The male fles, are about 2 in. across, females 4 in. across, with an ovary 2 in. long. The foliage has an unpleasant smell when bruised.

Telfaira is a genus of only 2 species, both tropical African, and very much alike. The two species are distinguished by the venation of the Ivs.; T. pedata has平行veins, while T. graminifolia has its nerves originating near the base of the leaf. Generic characters: male fles, in racemes; corolla rotate; stamens 3, one of the anthers with 2 compartments, the others 4-celled; female fles, solitary; ovary 3-5-loculed; ovules in one series on the imperfect septa; seeds throug(cut). See Cogniaux, DC. Mon. Phaner. Vol. 3. p. 349.


TELLIMA (anagram of Mitella). Saxifragaceae. Tellima is a genus of 8 species of perennial herbs which are the western representatives of the Bishop’s Cap or Mitella familiar to lovers of wild flowers in the East. They have tuberous rootstocks. Most of their Ivs. are from the roots. Strong plants send up numerous stems one or two feet high, bearing racemes of small white, pink or red flowers. They are rare subjects for wild gardening, being valued for their tufted habit, pretty Ivs., and for the airy grace of their inflorescence. On close inspection the fles. are seen to be beautifully fringed or cut, suggesting a bishop’s miter. Tellima graminifolia is probably the most desirable of the species. It is practically the only kind known to European gardens. It has one-sided racemes about 6 in. long, containing as many as 30 fles., each a quarter of an inch across or more. It blooms in early spring and the fles. change from greenish to pink or red. It is not as showy a plant as Heuchera sanguinea. Tellima are supposed to be hardy in the eastern states. They require dense shade. A few kinds have been offered by specialists in native plants and are obtainable from western collectors. The plants are called “Star Flowers” in California.

Tellima differs from Mitella mainly in the capsule, while the calyx in Tellima, not beaked in Mitella. Calyx bell-shaped or top-shaped, is rarely inserted in the sinuses of the calyx, cleft or toothed, sometimes entire; stamens 10: ovary 1-loculed: seeds numerous.

A. Petals pinnately cut into long, thread-like segments.
B. Fles. not fragrant.

grandiflora, R. Br. FALSE ALUM Root. Height 1 ½-2 ½ ft.: Ivs. rounded, cordate or angle-lobed and toothed: fles. greenish, becoming pink or red; calyx inflatetell-shaped, nearly ¾ in. long; petals lanciately cleft, sessile. Calif. to Alaska. 32. 14: 1178.

BB. Fles. fragrant.

odorata, Howell. Height 1-2 ft.: Ivs. broadly cordate, obscurely lobed and cretantly toothed: fles. red. Wet places near Columbia river.

TELPOETONIA (Greek; see at a distance). Proteaceae. Telopea speciosissima is one of the showiest shrubs of New South Wales. It grows 6-8 ft. high and has dense terminal racemes of pink flowers. These have 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 important members of its family, for a horticultural account of 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 old “stoves” in which proteas thrived so wonderfully were crude affairs compared with the modern hothouse with its perfectly adapted climate and moist atmosphere. Such plants require too much room and are too long and uncertain in blooming ever to become popular subjects for northern conservatories, but there are splendid greenhouse plants. Braunton 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, without the usual cleft at the base of the lamina; hypogynous glands united into a short, oblique, nearly complete ring; fr. recurved, leathery follicle; seeds flat, winged. Closely related to Embothrium, being distinguished chiefly by disk and style. Flora Australiensis 5: 534 (1870).


-Hyloigne speciosa, Sally., is an older name for this plant.

W. M.

TEMPERATURE. See Conservatory and Greenhouse.

TEMPELTONIA (J. Templeton, botanist of Belfast, early part of nineteenth century). Leguminosae. The CORK BUSH of Australia, Temelptonia retusa, is a tall shrub with showy scarlet fles. 1-½ in. long. The flower presents a very different appearance from the paper or toboggan or sweet shrubs. They are rather narrow and about the same length, with the standard strongly reflexed. This plant was formerly cult. in European greenhouses, where it generally flowered at Easter or May. It was usually planted in the greenhouse border rather than in pots and was thought to prefer a compost of peat and loam. It was slowly propagated by cuttings and went out of fashion along with the Hawaiian shrubs. It has since been offered for outdoor cultivation in southern California, where many choice plants of its class are being culti- vated. T. retusa is probably the most desirable species of all.

Generic characters: shrubs or subshrubs: Ivs. when present alternate, simple, entire: fles. 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
sheath open on the under side; leaves alternately long pointed and short and versatile; pod sessile or stipitate, flattened, ovate-oblong or linear, completely desicent. Flora Australiensis 2:168 (1864).

rotula, R. Br. (T. glaeras, Sims). CORAL BUSH. Tall, glabrous or glaucous shrub: lvs. broadly obovate to lanceolate, sometimes all under 3½ in. sometimes all over 1 in. long, emarginate or mucronate, coriaceous: fls. red (or rarely white); calyx with 4 very short, broad teeth, the lowest longest: pod 1½-2 in. long. B.M. 2354; 2868. B.R. 3:363; 19:839. L.B.C. 6:5-6:11. TENNESSEE. W. M.

2479. Map of Tennessee, suggesting main horticultural features.

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, Juncos, raspberries, peaches, and blackberries. Of the nuts, chestnuts are most plentiful, especially in the hilly and mountainous sections. The chinkapin flourishes in East Tennessee. Black walnuts are exceedingly numerous. Peaches thrive in the low sections. Hazelnuts, and butternuts and white walnuts, are also plentiful.

The native seedling fruits are highly valued. This is especially true of apples, peaches and strawberries. Many wild American varieties introduced from 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 well established among practical horticulturists. It is only a few years since orchardists were planting varieties of winter apples originated in the North. After repeated failures to get first-class fruit of good keeping qualities, they have begun to use native seedling varieties. Some of them will doubtless be largely cultivated in the future. A few native varieties of winter apples have gained considerable popularity among commercial orchardists. The fruits of the sorts have commanded remunerative prices in competition with apples shipped from the North. Owing to the great diversity of soils and exposures in this state, it is very important to select varieties that are adapted to the conditions where the trees are to be planted. The fact that a desirable apple has been originated in East Tennessee is no proof that it will succeed well in all parts of this political division. On the contrary, it is likely to give good results only in certain soils and in certain exposures that are requisite for its proper growth and fruitfulness.

All of the classes of fruits commonly grown in the northern half of the United States are produced in Tennessee for home and commercial purposes. Strawberries are shipped more largely to distant markets than any other fruit. The area in peaches is increasing rapidly. Summer apples are shipped from several sections. Of the vegetables, tomatoes and Irish potatoes are the most important commercially. The following counties have been active in producing and shipping fruits and vegetables: Gibson, Carroll, Crockett, Madison, Haywood, Hardeman, Shelby, Hamilton. Tomatoes are grown largely in Perry, Humphreys, Benton, Decatur, Hickman and Wayne.

Many locations in East Tennessee are peculiarly well adapted to the culture of grapes. This is shown by the large exhibits of fine grapes made at the fall horticultural meetings. The local markets are well supplied with home-grown grapes during their season.

The following special crops are produced to some extent, and are promising for more extensive cultiva-
TENNESSEE

TEN-O’CLOCK. Ornithogalum umbellatum.

TEN-WEEKS STOCK. Matthiola 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 fls., but differs in not forming an ear, the slender jointed spikes being free from one another. By many botanists it is considered the original form of maize. It is known to catalogues as Redua luxuriants, Dur., but is properly Euchliena Mexicana, Schrad., for the botany of which see H. M. 6414, where the plant is called Euchliena luxuriants. The plant is pictured in Bull. 14, Div. of Agrost., U. S. Dept. of Agric., and in Farmers’ Bulletin No. 162, from which a few points are here abstracted.

Teosinte probably produces a greater bulk of fodder per acre than any other grass. At 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 2-8 ft. high, and usually sending 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 SCRIBNER.

TEPHROSIA (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 fls. about as large as sweet peas, yellowish, white, marked with purple. The plant grows in dry sandy soil over a wide range in the United States. It blossoms in June. The racemes are terminal and may contain dozens of fls. each ½-3½ in. across. This species is offered by collectors of native plants. In spite of the large size of the fls., the flowers are not very showy, 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 showier species is T. macrantha, a Mexican shrub 6-10 ft. high, which bears its large purple and white fls. 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 handsome addition to southern shrubberies.


TERATOLOGY: 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 monstrous phenomena. Malformations among plants and animals 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 expert study of the cause of malformations, 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 fixed in reaction and become characteristic of a race. Thus the cockshorn (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.
mon on conifers (especially Abies) and some deciduous trees. Similar deformations are sometimes due to insect agency, or to unknown causes. For example, a simple inflorescence may develop flower-clusters instead of single flowers, e.g., in the common pine (Pinus), or available.

3. Proliferation is continued growth of the axis or the development 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 strawberry it frequently continues 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 Composite; or by the development of branches in the axils of the petals and sepals, e.g., in cauliflower, or the rose shown in Fig. 2482. Some double flowers are made "extra doubles" 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 statement lacks confirmation and such an origin is highly improbable. 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 experimental 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. Sometimes spurs and nectarines do not develop. Figs. 2486-7.

II. ALTERATION OF FORM, INVOLVING NO CONSIDERABLE CHANGE IN NATURE OR FUNCTION OF THE ORGANS.

1. Fasciation in stems (Fig. 2483) produces a broadened and fluted form, often curved in crozier-like fashion. 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 severe 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 extraordinarily 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 much more widely separated. This is likely to be accompanied by transformation of the floral into green leaves, and sometimes by proliferation.

3. Unequal growth lengthwise produces apparently twisted stems, with irregular displacement of the leaves. Such displacement is especially noticeable when it affects whorled leaves, the whorls being stretched out into spiral or spiral-like structures. Unequal growth in two dimensions by the tissues of a leaf produces the "curly" or cripisate 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 particular region concerned, or more widely spread through the plant but forming reproductive bodies at the seat of the swelling, 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 deformities 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 malformations 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 hulges 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 globular 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 varied as the insects and plants concerned. Indeed, the same insect at different stages of its development may produce galls of different sorts on the same plant. All orders of true insects except the Orthoptera and Neuroptera may produce galls, but by far the larger number are due to the gall-flies and sawflies of the order Hymenoptera. The gall-apples of the oak, 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 deformations, of which the cone-like galls resulting from deformed buds of the willow and the goldenrod are best known. Plant lice (Aphide) are responsible for the large smooth red galls on the petiole of sumachs, and for the flatish serrated galls on elm leaves. The fusi-
form galls on stem of goldenrod and asters is caused by the larva of a moth. In addition to true insects, the mites produce almost as great a variety of galls, pouch-galls and leaf-rolling being especially conspicuous. The cause of these deformities is sometimes the chemical stimulus produced by the injection of substances ("poisons") at the time of egg-laying by the parent, in which case the gall develops around the egg; sometimes it is the mechanical stimulus due to movements of the 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 leaf-branchoing 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 "out-growth."
6. Peloria. When usually irregular flowers, such as those with some spurred or sacate 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 Linnæus 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 symporphic, occurs in many Composite 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. On the contrary, all spurs fall 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 retrogressively 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 fulness to such transformations, though other changes, may cooperate as noted above. Fig. 2488. Petals may develop as sepals, bracts, or even imperfect foliage leaves, while sepals and bracts frequently become foli-
o. 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. CONCRESENCE. 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. 592), 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, "Eléments de téréatalogie végétal," Paris, 1841; Masters, "Vegetable Teratology," London, 1869; Penzig, "Pflanzen-tératologie," Genoa, 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). Combretaceae. 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 polygam-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 Polyscia paniculata; 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 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, indehiscent, glabrous, with a hard shell, containing an edible meat. Asia, but widely cult. B.M. 3004.—Cult. in South Florida. Useful both as a street tree and for its filbert-flavored nuts. The nuts are eaten either raw or roasted. Foliage 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.

TERNSTRÖMIA (Christopher Ternstroem, Swedish naturalist; traveled in China, died 1745). Ternstroemiae. 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 leaves, 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: soppals 5; petals connate at the base; stamens numerous: ovary 2–3-loculed; locules 2-ovuled: fr. indehiscent. The following species is offered by importers of Japanese plants.


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 shrubs and trees introduced into this country from Japan and China. The Ternstroemia is a great asset 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. NEHRING.

TERRACE. Consult Landscape Gardening.

TESTUDINARIA (name explained below). Dioscoridaceae. The Hottentots' Bread, Tortoise Plant or Elephant's Foot, is a curious South African plant with a great globular yam-like bulb or rootstock 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-
The sive appearance of the same thing. From the top of the rootstock 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 base. It is a weak-looking growth to issue from such a mighty tuber.

The inner part of this "bulb" has been reserved to a turnip for texture and color. The Hottentots used to cut it in pieces, bake it in the embers and eat it. Old and inexperienced 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 African. It 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. diaeocious; male perianth bell-shaped, with a short tube and 6 subequal, oblaneolate segments; staminodes 6; female perianth smaller: ovary 3-loculed; ovules 2 in a locule, superposed; stigma 3, recurved, 2-lobed; capsule rigid, acutely trigonous. 


Elephantipes, Salish. Rootstock studded with angular woody protuberances: stems slender, glabrous, much branched; lvs. alternate, suborbicular, 1-2 in. broad, entire, bright green or glaucous, mucronate; fls. small, inconspicuous, in racemes, greenish yellow or whitish.


W. M.

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. canescens, 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 horticultural standing. For a full botanical account, see Gray's Synoptical Flora of N. A. 

TETRAGONIA (Greek, four-angled; referring to the usually 4-angled fruit). Ficoides or Mesembryanthemum. Herbs or sub-shrubs from the southern hemisphere and Japan. Usually decumbent; lvs. alternate, short-petiolated, somewhat fleshy; fls. yellow, green or reddish, axillary, apetalous; calyx 3-5-lobed. Only one species known in cultivation.

expansa, Thumb. 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 or longer ones 4-5 in. long by 2 in. broad; fls. small, yellowish green. New Zealand. B.M. 2202.

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 rich soil in a warm greenhouse 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 the latter stage, they are 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 a peck of greens will be produced once a week on 4 square feet from November to May inclusive. A crop may also be grown beneath the benches near the walks, as well as in the grapey borders. Space that cannot be used for other purposes may thus be utilized to very good advantage, 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.

H. C. Irish.
TETRAMICHA (Greek words, referring to the four small divisions of the anther, Orchidaceae. A genus of small terrestrial or epiphytic herbs of slender habit bearing racemose with few very few fleshy, produced in spring. The erect stems, which are not pseudobulbous, grow from a creeping rhizome and bear 1-3 fleshy linear lvs. and a slender but rigid, terminal raceme: sepals and petals nearly equal, spreading; labellum long, oblong, spreading or slightly curved, the middle lobe large, entire, contracted at base, column with 2 wide wings; pollinia 4 perfect and 2 imperfect. Six species in Brazil and West Indies. Culture as for Leilia (p. 572.)

bicolor, Hofre (Leptobee, Lind!.) Lvs. solitary on the short stem, semi-cylindrical, with a furrow in front, 3-4 in. long: raceme few-fl., shorter than the lvs.; sepals and petals white, linear-incurved, over 1 in. long; lateral lobes of the lip small, fusing over the column: terminal lobes oblong-lanceolate, bright rose, with white tip and margins. A pretty plant. B.K. 19:1625. A. F. 6:633. Var. glaucophylla, Hook. Lvs. glaucous. B.M. 3734. HEINRICH HANSELBRING.

TETRANEMA (name refers to the four stamens, Scrophulariaceae). A single little Mexican perennial herb, with many nodding purplish flowers, growing on the tops of cliffs, or scattered and growing under glass or in doors for its profuse bloom. True stem very short or almost none; lvs. crowded at the crown or opposite on the very short stem, obvate or oblong-obovate, or shallowly oblong or ovate, with lighter color in the throat; calyx 5-parted, the segments narrow and acute; corolla long-tubular, 2-lipped, the upper lip emarginate, the lower long; glands 2-4; stamens 4; anthers capitate: fr. a 2-valved capsule. T. Mexicanum, Benth., is the only species, known as the "Mexican Foxglove" and formerly as Pentstemon Mexicanus. The pretty flowers are borne in profusion on the summits of slender pen-stems 6-8 in. high. Although perfectly hardy, a summer bloomer, with good care it may be made flower most of the year. It is usually regarded as a greenhouse subject, but it is easy the plant and is easy the good plant and is easy the one to continue bloom year after year. Prop. by seeds.

L. H. B.

TETRATHECA (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 more-petalled pink flowers, which open during the day, but close at night. The lvs. are borne on slender pedicels and are solitary in the axils. This plant is cult. in S. Calif., having been introduced about 1900 by Mrs. T. B. Shepherd, who recommends it for outdoor culture and for pot culture in the greenhouse, and adds that the lvs. are pink or white, 34-24 in. across.

Tetraphis is the largest genus of the family Tremandraceae, of which a short account is given under Plantmphora. It is an Australian genus of shrubs with red or purple flowers. Eighteen species are discriminated in Flora Australisennis 1:129 (1863). They vary greatly in foliage, the lvs. being alternate, whorled or scattered, heath-like and entire, or flat and toothed, or reduced to minute scales. Generic characters: stamens apparently in a single series, the anthers continuous with the filament, 2-celled, or 4-celled with 2 of the cells in front of the lobe, more or less contrasted into a tube at the top; capsule opening only at the edges: seeds appended.

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 sand and watered carefully at all times. It is said that only soft rain water should be used. They are usually propagated by cuttings, but seeds are offered. ericifolia, S. This species is distinguished from its congeners by its lvs., which are mostly verticillate and linear with revolute margins. Heath-like, tender shrub, much branched and diffuse; sepals not reflexed; ovary with 2 succulent glands, bearing a small ovule ovate placed below the top of the locules. Very abundant about Port Jackson, N. S. Wales. W. M.

TEUCRIUM (Teucer was the first king of Troy). Labiatae. GERMANERAND. One hundred or more perennial herbs or undershrubs, mostly small, which are offered in the American trade. Lvs. opposite, entire or dentate: fls. mostly purple or pinkish, in whorls forming a terminal interrupted spike; corolla campanulate or tubular, rosy-purple, 10-lobed; corolla nearly with large lower lip, and the upper lip very small or split so as to appear to be wanting; stamens 4, in 2 pairs, exserted through the split or notch in the short upper lip. The Germanders are herbs, with aromatic foliage, suitable for the wild garden or rockwork. They are little known horticulturally.

a. Fls. in distinct 2-6-fld. whorls, forming a lax terminal inflorescence.

Chamädras, Linn. One to 2 ft. tall, from a decumbent base, branching, with age becoming woody below, pubescent or villous: lvs. ovate or oblong, pubescent or villous, incised-crenate, cuneate at the base, somewhat crenate beneath, the floral ones smaller and scarcely deciduous: fls., bright rose, with red and white spots, 3 in. long, rather showy, in many 2-6-fld. whorls. Europe.—A good border plant for late summer bloom.

AA. Fls. solitary or not more than 3 at a whorl, forming a long terminal spike.

Canadense, Linn. Erect, 1-3 ft. tall, sub-pubescent or canescent: lvs. oblong-ovate to lanceolate, sharply serrate: fls. purple or oblong-ovate to lanceolate, ½ in. long, the calyx crenate and the 3 upper lobes oblate. Low ground, eastern states, from north to south. Mm. 9:97. —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.

Trifrons, 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, blue, forming terminal or lateral clusters. Europe.—Recommended for dry places South. Has a long blooming season.

bicolar, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, oblong or lanceolate, obtuse, entire or incised, green: fls. blue and white, on axillary 1-fld. peduncles. Chile. —Offered in S. Calif.

L. H. B.

TEXAS HORTICULTURE IN. Fig. 2492. The climatic belts of the state are distinctly marked and extremely different in character, one from another. They may be designated as follows:


I. The Gulf Coastal Plain, extending out 50-75 miles from the Gulf of Mexico, varies in altitude from a few feet along the low sandy beach, to 50 and rarely 100 feet inland. Its surface in places is timbered with live-oak and pine, but mostly it is a level, black-sandy prairie. The streams are bordered in southeastern Texas with timber and undergrowth, including the groves of magnolia, holly, palms and many other beautiful flowering trees, shrubs and perennial herbs. The rainfall in the southwestern extension of this belt is much less than in the eastern part, where it averages above the 3 in. annually, and the growth and cultural conditions vary accordingly. In trucking, celery, cabbage, strawberries, tomatoes and melons are the leading items. On the southern end of Padre Island, near Laguna Madre, the access of olives, oranges and pineapples are grown to some extent. Figs flourish everywhere in the coast country. The canned-fish industry is developing and promises to become very profitable. Dewberries grow to perfection, and wild varieties are marketed in considerable quantities. The Le Conte, Keiffer and Garber pears do better in this region than elsewhere. Some of the Chinese Cing group of peaches,
also the Honey and Peer-to types, succeed well. Japanese plums, persimmons, and various American and foreign grapes also succeed, the latter requiring to be grafted on phylloxera-resistant roots, which are found in the numerous wild vines of the state.

Other fruit trees—apples, peaches, pears, and plums, though smaller in size than 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 leaves, and deciduous, evergreen, and perennial flowers, are very popular. Commercial plant and cut-flower growers do a good business in the cities of Galveston and Houston. During the winter holidays they collect from the woods great quantities of long ("Spanish") moss, holly, magnolia, mistletoe, palmetto, smilax, etc., and ship to northern cities for decoration purposes. In May and June they send to northern florists great numbers of cape jasmine and magnolia flowers.

2. The Great East Texas Forest Region lies just north of the eastern end of the Coastal Plain, the city of Beaumont being situated in its southern extremity. Extending westward to the Black River on the east to the Neches River on the west, over 150 miles, and northward to Red River about 300 miles, narrowing somewhat in its northern parts, is one of the grandest and richest forests in America. Three species of fine lumber trees—pines, alders, and maples—are abundant. Various oaks, elms, maples, beeches, white and black walnuts, gums, poplars, pecans, lindens, magnolias, holly, persimmons, sassafras, and numerous handsome shrubs and perennial flowers are found almost everywhere, but especially along the streams. The soil is generally very sandy, underlaid with red and yellow clay, and well adapted to fruits of almost all kinds. The altitude varies from 100 to 600 feet. The rainfall is ample; 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 lumber-mill 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. Railway facilities are growing, and alto-
gressing; railroads have a very 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 the East Texas region. Here apples flourish about 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 and better bottom. In the little cities of Texarkana, Paris, Sherman, Denison and Gainesville, in which are found many beautiful residences and gardens, 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 everywhere, are not at all clannish, but sociable and enterprising, with the northern types prevailing and not fully adapted to the almost general atmosphere of gardening, yet fine samples of the southern style are not infrequent.

Similar conditions prevail in some parts of the Trinity River Valley and Red River, especially about Fort Worth and Ft. Worth; and also on the Brazos at Waco, but more of the southern type. These three cities nestle in the heart of the next great division.

4. The Austin 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 to within 150 to 100 miles of the Gulf, a irregular arm of the East Texas region extending southwardly 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 grains, grasses and cotton, but not suitable for fruit trees, excepting the pear, peach and plum. Onions are largely grown in Collin county, of which McKinney is county seat. Most shrimping does well. The Bermuda grass flourishes in Texas wherever grass can grow and is used for hay. 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 Land Region, the homes being generally surrounded by corn-cribs, stock-pens, cotton-bins, and exposed farm machinery. There are splendid exceptions to these, demonstrating that very beautiful homes can be had in Texas, if the people will apply their mind to the general improvement 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 Hill Country. Here the rainfall varies from 20 to 40 inches, the 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 has a small orchard of mixed 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 1850, it was devoted to sheep on its east by the U.S. 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 vinifera varieties, planted on an experimental basis, some of which have been very profitable. 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 River to the Llano Estacado, devoted to goat, 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.
fall and the air is very pure, so that diseases are almost
unknown.
7. The Rio Grande Valley is much warmer in the
same latitude than the Pecos valley, otherwise the horti-
cultural conditions are pretty much the same.
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 job-
bine, 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
1883 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, dis-
tribution 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 that have originated in the state are given in the following lists.

T. V. Munson

SOME FRUITS THAT ORIGINATED IN TEXAS.

Apples.

Aaron Holt, Heidel.
Biedsoe, Jones (Jones’ Favorite).
Bruce (Bruce’s Summer), Lincoln.
Doyle, Rutledge.
Gray, Texas Red, Yellow Sweet.

Peaches.

Alice Haupt, Evening Star, People (People’s Cling).
Barnes, Family Favorite, Philip Horton.
Bell (Bell’s October), Ramsey (Ramsey’s Early)
Bessie Kerr, Joe Johnson, Raisin (Raisin Cling).
Bonanza, Lone Star, Red River.
Burnet, Old Abeade, Rogers.
Cabler (Cabler’s Indian), Orona, Rogers.
Carath (Carath’s Late), Orinon, Rogers.
Carman, Oronion, Rogers.
Chillow, Orinon, Rogers.
Clara Bruce, Oronion, Rogers.
Coleman, Orinon, Rogers.
Crinson Beauty, Orinon, Rogers.
Dallas, Orinon, Rogers.
Durley, Oronion, Rogers.
Early China, Oronion, Rogers.
Eldred (Eldrean Cling), Orinon, Rogers.
Eldre (Eldrean Cling), Orinon, Rogers.

Grapes.

America, Mrs. Munson, Muench.
Atoka, Perry.
Bailey, Presby.
Beacon, Rommel.
Bell, R. W. Munson.
Big Hope, San Antonio.
Brillian, W. B. Munson.
Carman, Wapannoa.
Champanel, Wapannoa.
Delago, Wapannoa.
Delicius, Wapannoa.
Dr. Collier, Wapannoa.

Pears.

Alamo,

Pera, Yates.

Plums.

African, Golden Beauty.
Beatoffal, Gonzales.
Caddo Chief, Hop.
Cabinet (Columbin), Heep.
Clara, Heep.
Clark, Heep.
Clifford, Heep.
Colette, Heep.
Crinson Beauty, Heep.
Iworth King, Heep.
Laclede, Heep.
Early Red, Heep.
Early Sweet, Heep.
El Paso, Heep.

Mulberries.

Spalding.

Parker Earle, Spalding.

Strawberries.

Parker Earle, Spalding.

Dallas, Blackberries.

Giant Pet, Spalding.

McDonald, Spalding.

Deuberries.

Austin-Mayes, Pink.

R. H. Price.

THALLIA (J. Thallus, a German naturalist, and author of Sylva Hercynia, a catalogue of the plants of the Harz mountains; died 1588). Scitaminaceae. 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. Flowers commonly 2 together in a 2-valved spathe; calyx minute; corolla tubular, with 6 divisions, of which the 3 interior are unequal; style thick, spirit; stigmas 2-lobed, the lower lip long and pendulous, capsule inflated, 1-loculed, 1-seeded.

A. Plant covered with a white powdery

diaphanta. Fras. Stemless; petioles 1-2 ft. long; ivy

canna-like, cordate, ovate, 6-9 in. long; scape terete, 3-5 ft. high; panicles erect; spikes erect. June-Sept.

Ponds and marshes, S. C. and west. B. M. 1690. B. B.

1:453.— A spine and stately spathes, all tall grown. It should be placed in shallow water or in wet soil.

AA. Plant not powdery.


—According to Reasoner Bros., this magnificent, native ornamental-leaved marsh plant thrives in garden soil with canna and like plants. Does well under cultivation in southern California.

P. W. Barclay.

THALICTRUM (ultimately probably derived from Greek thallos, to grow, but application doubtful). Rhamnaceae. Meadow Rue. Erect perennial herbs; lvs. ternately compound and do dumb; stem-lvs. alternate; flowers dioecious, polygamous, or perfect in some species, rather small, generally greenish white or sometimes purple or yellow, borne in a panicle or loose raceme; sepals 4 or 5, deltoid; petals wanting; stamens many, small; carpels usually few, 1-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 feathery heads of flowers, contrasting with their handsome stems and leaves, which are often of a purple 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 well and drain well.

The latest monograph of the entire genus was published in 1885, by Loceyer, in Bull. Soc. Roy. de Bot. de Belge, 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. 23:293-304, in which he recognizes 11 species and 4 varieties north of Mexico. His treatment is rather closely followed by Robinson in Gray’s Syn. Flora, 1895. Since that time at least 10 new species have been described—chiefly from Mexico—of which 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., 1900. Besides several native species, about 5 have been introduced to our gardens from other countries.

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A. Fls. perfect.

B. Filaments widened near the anthers; anthers ovate, obtuse.

A. Akenes sessile, in a head, oboe-angling. 1. petaloideum

B. Akenes striked, with spreading, straight along doran margin 2. spareaflorum

C. Anthers sessile; stigma dilated on one side of the short style 3. minus
THALICTRUM

1. petaloides, Linn. Stem round, nearly 1 ft. high, almost naked; lvs. 3-5-parted; lfts. smooth, ovate, entire or 3-lobed; fls. corymbose, perfect; sepals white, round; filaments pink; anthers yellow: fr. ovate-oblong, flattened, July. N. Asia. L.B.C. 9:891. Not yet in American trade lists but well worth cultivating.

2. sparsiflorum, Turez. Stem erect, sulcate, 2-4 ft. high, branching, usually glabrous; lvs. trifid, upper sessile, 1-flowered, or 3-lobed, round or ovate, variable in size and shape of base, round-lobed or toothed: fls. in leafy panicles on slender pedicels, perfect; sepals ovate, white, soon reflexed; filaments somewhat unequal; anthers very short: akeenes short-stalked, obliquely obovate, flattened, dorsal margin straight, 8-10-nerved; styles persistent. N. Asia, through Alaska to Hudson Bay, in mountains to Colorado and southern California.

3. minus, Linn. (T. purpureum, Schang. T. saxatile, Vill.). Stems round, sulcate, 1-2 ft. high: lfts. variable, acute or obtusely lobed, often glaucous; fls. drooping, in loose panicles, perfect; sepals yellow or greenish; fr. ovate-oblong, sessile, striated. Summer. Eu., Asia, N. Afr.—A polymorphous species in the variation of the leaflets.

Var. adiantifolium, Hort. (T. adiantoides, Hort. T. adiantifolium, Bess.). Lfts. resembling those of Adiantum fern.—A form much used and admired.


5. purpurascens, Linn. (T. purpureum, Hort.). A polymorphous species, allied to T. polygamum: stem 3-6 ft. high, branching above, leafy, pubescent or glabrous, sometimes glandular: lfts. larger than in that type; fls. in a long, loose, leafy panicle, polygamo-dioecious; filaments narrow; anthers long, taper-pointed; akeenes slightly stalked, ovoidal, glabrous or pubescent, with 6-8 longitudinal wings; style slender, persistent; stigma long and narrow. Canada to Fls., west to the Rockies. June-Aug.

6. polygamum, Muhl. Tall MEADOW RUE. Erect, 2-8 or more ft. high, branching and leafy, smooth or pubescent, not glandular: lvs. three to four times terminated or terminally pinnate; lfts. oblong to orbicular, bases variable, 3-5 apiculate lobes: fls. in a long, leafy panicle, polygamo-dioecious; sepals white; filaments broadened when young; anthers short: akeenes ovoid, dilated, 6-8-winged or ribbed, with stigmas as long, which become curled. July, Aug. Low or wet grounds, Canada to Fls., westward to Ohio.

7. aquilegifolium, Linn. Feathered COLUMBINE. Fig. 2492. Stems large, hollow, 1-3 ft. high, glaucous: lvs. once or twice 3-5-parted; lfts. stalked at 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; 2023 (as var. formosum). Gm. 47, p. 357; 50, p. 117.—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. diocum, Linn. Rather slender, 1-2 ft. high, glabrous: lvs. three to four times 3-parted; lfts. 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: akeenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Early spring. Woods, Labrador to Ala., west to the foot of the Rockies.

9. venulosum, Trelease. Allied to T. diocum: 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; lfts. 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: akeenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. Dak. westward and southward in the mountains.

10. Delavayi, Franchet. Slender, 2-3 ft. high, glabrous; lower lvs. on long, slender petioles, two to three times 3-5-parted; lfts. long-stalked, 3-5-lobed, base cuneate, rounded or cordate: fls. pendulous, dioecious; sepals purple or lila, ½ in. long, equaling to longer stamens, anthers linear: carpels 10-12: fr. winged at

2493. Thalictrum aquilegifolium (× ¾).

11. occidentale, Gray. Allied to T. diocatum, which it closely resembles, but it is more robust and taller: lvs. glandular-puberulent: akenes long, slender, thin-walled, 2-edged, ribbed, not furrowed.

12. Fendleri, Engel. 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: lfts. discoid, in rather compact panicles; stamens many, anthers long: akenes nearly sessile, obliquely ovate, flattened, 3-4 ribs on each face. July, Aug. W. Texas to Montana.


K. C. Davis.

THEAMCOXALAMUS. See Bamboo, p. 127.

THEAMNÓPERIS (Greek, bushy term). Polypondiaceae. 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 are united at the apex by a transverse intramarginal vein.

Nidus, Presl. (Asplenium and Thamnóperis Nidus-Avis, Hort.). Bird's Nest Fern. Lvs. bright green, growing in a crown, 2-4 ft. long, 3-6 in. wide, the midrib rounded and usually green. Japan, East Indies. T. strictum, Hort. (Asplenium 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.

THASPIUM (name a play upon Thapsia, another genus of the same family). Umbellifera. 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.

atremum, Nutt. Stem branched, 1½ ft. high: root-lvs. mostly cordate; stem-lvs. ternate; lfts. ovate to lanceolate, serrate; fls. yellow. June, July. Var. triflorum, Cott. & Rose, with crenate lvs. or lfts., is a common western form. Var. atropurpureum, Cott. & 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. atropurpureum, make attractive specimens.

F. W. Barclay.

THEOBRMA. Commercial Cacao or "Cocoa" is produced by trees belonging to the Linnaean genus Theo- broma. The estates devoted to its culture are usually known as "cocoa plantations" and are largely on the increase in all suitable climates, owing to the increased demand for the manufactured article in the different forms in which it is now prepared for consumption. The larger proportion of commercial Cacao is produced by Theobroma Cacao. Other species native to central America and the West Indies are T. pentagona, T. spe-
Theobroma cacao, it is sometimes referred to as a native, but does not appear to have been recorded by writers for Central America and the West Indies.

Theobroma pentagona is a species which in vigor of growth and productive capacity resembles to a very large degree the more cultivated varieties of Cacao, but it differs in the flowers, in the size of the pods, and especially in the shape of the pods. The beans are larger in size than those of T. Cacao, fully equal if not superior in flavor, and are capable of being worked up in the same way as the commoner species. This kind is known on the mainland as "Aliigatour" Cacao, from the fancied resemblance of its skin to the hide of an alligator. The outside of the pod is soft and easily broken, and does not afford such good protection to the interior as the harder shell possessed by T. Cacao. In Nicaragua T. Cacao and T. pentagona are grown together, and the produce is mostly a mixture of the two species. From the presence of T. pentagona, it is possible that hybridization has taken place between two species. It has been noted that the pods of T. Cacao produce much larger seeds or beans in Nicaragua than in countries where this species is not grown in company with T. pentagona, and the chances of the two species are almost impossible to distinguish when cured together. The production of Nicaraguan plantations also requires much less time for fermentation than the produce of Grenada, Trinidad or Venezuela, some forty-eight hours being the usual period, while more than four times that number of hours will be required for the proper fermentation of the produce of the last mentioned countries.

Theobroma speciosa 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 corrugated, warty, and of a dirty brown color when ripe.

Theobroma biocol 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 oblong 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 is white, and has a somewhat nutty flavor. They are used in sweetmeats in the same way as almonds, but cannot be made into commercial Cacao, suitable for the manufacture of chocolates. This species, though without doubt a true Theobroma, is very distinct from the varieties of T. Cacao which produce commercial Cacao. The produce of T. biocol is known in some parts of Central America by the names of "Wariba," "Tiger," and "Pastab" Cacao.

Many names have arisen for the varieties of Theobroma cacao which are in cultivation, as many as forty having been listed by a Trinidad cultivator of large experience. Looking at the matter from a practical point of view, all that are most straing of the one species, produced by natural cross-fertilization of the older types. According to Hart's "Cacao," Trinidad, 1908, there are but three major strains or classes of T. cacao, respectively, "Criollo," "Forastero," and "Calabacillo." The type of the first is found indigenous in Trinidad and various places on the mainland, its distinctive character being its bottle-necked pod, with a thin skin and finely ribbed exterior, together with its white or whitish seeds or beans, which are mild in flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corrugated pods, large, the white or black seeds, of a purplish color. It is a tree having greater vitality than "Criollo," and gives a much larger crop. "Forastero" means foreign, and this type is said to have been found on the mainland of South America, whence it was introduced into Trinidad by the Fathers about 1757. (De Verteuil, History of Trinidad, 1884.)

"Calabacillo" is the third form, its chief characteristics being the vigor of its growth and its small flat and strongly flavored beans. By some it is considered as a distinct 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 uninterrupted cross-fertilization which has taken place. Still, each country appears to maintain certain characters more permanent than others, and thus secures for itself a name upon the markets of the world. It is probable that this is due, in a measure, to the unconscious preference taken by some to distinctive features of the produce by the continuous cultivation of a fairly fixed strain which has arisen. It may also be due in some measure to the influence of climate and environment. Certain it is, however, that there are 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 Premos, who recently traveled in Cacao-producing countries on behalf of the German government.

These different brands are bought by manufacturers and blended to suit their particular market, but there are certain kinds possessing special flavor which are readily sold at high 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 cultivators grow Cacao for seed without regard to the best rules of selection, the quality must deteriorate. What mitigates this fact is that all the Cacao world has, up to a recent date, followed the same practice. The process of grafting, to which the Cacao tree readily submits, as 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
the larger proportion of the original fat retained, while the so-called "Cocoa" preparations are the same material in fine powder, sweetened by a small proportion of the Cacao fat extracted. This fat, when clarified, is a pure white substance, almost as hard as beeswax, and is used in many pharmaceutical preparations. Chocolate and Cocoa are both fruits of the genera Theobroma Cacao and T. pentagyna, and only differ in the method of preparation.

The word "Cocoa" is a market corruption of the old Spanish "Cacao," which was adopted by Tournefort as a generic name but has since been displaced by the Linnean Theobroma.

J. H. HART

THEOPHRASTA (Theophrastus was a Greek naturalist and philosopher, 370-285 B.C.). Myristiaceae. According to Bentham & Hooker, this genus has but a single species, T. Jussieui, of San Domingo. J. Decaisne, in Annales des Sciences Naturelles for 1878 (ser. 6, Boll. 2) contrasts three species. 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 Theophrasta according to either of the above authorities. This is T. Jussieui. Three of them are to be referred to the related genus Clavija, and one (T. imperialis) is now regarded as a species of Chrysophyllum. Species of Clavija are generally used as flavoring for confectionery. Clavija is a finely septa, the corolla tube, platt still one, with short style and capitate stigmas. Fr. fleshy and apple-like, many-seeded. The species referred to Theophrasta in the American trade are hardly large foliage plants for greenhouse culture. An allied genus is Jacquinia, which see.

The following cultural note is probably applicable to the various species cultivated under the name of Theophrasta: According to T. Balansa, plants of a "Theophrasta" have been cultivated during a winter temperature of 45° without injury but making the best growth with 70° night temperature and 10° rise during the day. It has the objection of being almost impossible to root from sprout that has been too long allowed to have part of the top cut off and all the buds removed from the stem down to within a few inches of the ground, which operation causes the plant to sprout from the base. One only of the sprouts should be left; when it is well started the old stem may be cut down and after waiting until a little more growth has been made the plant should be taken from the pot, and be cleaned of soil and dead roots and repotted.

A. Juice milky.

imperialis, Linden (properly Chrysophyllum imperialis), oblong-oblong, 3-5 ft. long on large plants; fls. yellowish green, small, in pedunculate clusters on the lower branches; fr. 5-angled, nearly globeral, 1-2 in. thick. Brazil. B. M. 6840. Lvs. 2 ft. long. This has been cultivated since the middle of the nineteenth century as Theophrasta, but upon flowering in European gardens was found to belong to Chrysophyllum, a genus of the family Sapotaceae.

AA. Juice not milky.

b. Corolla mostly shallow, deep: fr. many-seeded (Theophrasta).

c. Trunk or stem not spiny.

Jussieui, Lindl. Lvs. linear-spatulate, about 15 ft. long and about one-sixth as wide, obtuse, strongly spinose-dentate, with black-tipped teeth, the midnerves very strong and the secondary ones confluent at the margins: indorsement racemose, the racemes axillary and long pedicilled, pedicellate, the calyx-lobes ovate and crosse-dentate, the corolla tubular, campanulate, white, the corolla anular and entire. San Domingo. G.C. III. 2:429.—It is not known to the writer whether this plant is in cultivation in this country under this name belongs to this species or one of the two following.

fusca, Decne. (T. Jussiéui, Hort.). Stem simple, with ash-gray bark: lvs. linear or linear-spatulate, 18 to 20 in. long and about 2 in. wide; varying in nearly entire repand-denticate to strongly spinose, midnerves strong and tawny red at the base, the secondary nerves confluent at the leaf-margin: indorsement paniculate to racemose, the racemes short and densely fls.: fls. slender pedicels, bracteolate, the calyx-lobes orbicular and ciliolate, the corolla urceolate-campanulate, dull brown, the corona 5-lobed. Probably West Indian, but the species founded on cult. specimens. —The name T. fusca is not known to occur in the American trade.

cc. Trunk spiny.

densiflora, Decne. Stem with black spines, the bark brownish: lvs. linear-oblong, 14 to 16 in. long and 2-2 1/2 in. wide, coarsely spinose-dentate, the secondary veins numerous and crowded, the principal veins in the indorsement terminal and corymb-like, compact, the branches 5-6-fl.; fls. short-pedicelled, campanulate and white, the calyx-lobes ovate and somewhat ciliate and equaling the corolla-tube. San Domingo. B. M. 4239 (as T. Jussieui). — The name T. densiflora is not known to occur in the trade.

bb. Corolla mostly shallow and deep-lobed: fr. often 1-2 few-seeded (Clavija).

c. Leaves obtuse.

macrophylla, Hort. (properly Clavija grandides, Decne.). Lvs. large, arcuate, obovate-spallate and obtuse, entire or subacute-rend.; petiole thick and dark violet, the petiole and leaf spreading. Lvs. orange-yellow, in thick, erect racemes; calyx-lobes orbicular and nearly glabrous, the corona 5-lobed. Brazil. B. M. (as Clavija macrophylla) 5239.

cc. Lvs. acute.

longifolia, Jacq. (properly Clavija ornata, D. Don.). A tender tress, often 20 ft. high; lvs. crowded, suberose, long-spatulate to lanceolate, narrowed at the base, mucronate, spinose-dentate, 1-1 1/2 ft. long, about 9 in. wide: racemes 4-10 in. long, usually pendulous: fls. fragrant, saffron-colored. Peru. B. M. 4922. B. 21:1764.

15. Willd. (properly Clavija latifolia, K. Koch.). A tender tress: lvs. oblong, petiolated, narrow at both ends, mucronate-serrate: racemes erect. W. Indies. —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 axilar 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. tabaea and T. rhombifolia, which spread extensively by the root, but in general the better way is by seed, although the seed is rather slow to germinate and should be seen as soon as ripe or in the spring with the heat.

A. Pod strongly recurved.

THERMOPSIS

AA. Pod straight or only slightly curved at the apex.
B. Plant 2–5 ft. high.
Carolíniána, M. A. Curtis. Stem stout, smooth, simple; lvs. long-petiolate; lfts. obovate-oblong, 1–3 in. long; pods long, large, clasping; raceme 6–12 in. long, erect, rigid, many-fl.: pod 2 in. long, erect, villous and hoary. June, July. Mts. of N. C.

DD. Plant 1–3 ft. high.
C. Stipules longer than the petiole.
montána, Nutt. Plant 1½ ft. high, somewhat silky-pubescent; lfts. oblong to oblong-lanceolate; racemes 7–11 in. long, many-fl.: pod 2 in. long, erect, pubescent. May, June. Western states. B.M. 3611. B.R. 15:1272 (both erroneously as T. labacea). Sometimes called "Buffalo pen" in the west.

CC. Stipules shorter than the petiole.
D. Racemes axillary.
labécas, DC. Resembles T. montana and has possibly been confused with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

DD. Racemes terminal.

T. Cusablanda, Hort. Sarn. does not appear to be known to botanists.

J. B. KELLER and F. W. BARCLAY.

THESPÉSIA (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 stigma and many-ribbed pods of about 7 in. long, 2–4 in. long. May–July. Va. and North Carolina.

DIAGRAM: T. C. laus. and T. m. barl. are both about 3 ft. high with a lot of leaves and few flowers.

THEVÉTIA (André Thevet, 1592–1599, a French monk who traveled in Brazil and Guiana and wrote a book on French Guiana in which the plant is mentioned). Apocynaceae. A cosmopolitan genus of about 120 species of trees or shrubs with alternate, 1-nerved or lightly penivellied leaves and rather large yellow flowers in terminal few-flowered cymes.

Thevetia peruviana, a native of South America, is a handsome evergreen shrub of Florida gardens, 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 out right on February 18, 1895, when the thermometer went down to 18°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 3 in. wide
nitida, DC. A tender shrub: lvs. oblong-lanceolate, acuminate, margins revolute: fls. rather large; corolla white, with a yellow throat. West Indies; cult. in southern Calif.

AA. Lvs. 5–6 in. long, less than ½ in. wide
nerifólia, Juss. Known locally in Florida as "Trumpet Flower" and incorrectly as "Yellow Oleander." A tender shrub; lvs. shining, margins revolute: lfs. 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. NEHRING.

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 tendency of a plant to fruit 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 through 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 realize that the fruit depends upon the leaves most directly 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 fine 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 looked upon 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 other means of reducing the number 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. It may be performed on grape vines, for example, 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 till the severities of winter have passed, so that the amount of bearing wood which is taken off may be varied in proportion to the likelihood of latibuds 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. It is, therefore, best to reduce the amount of bearing wood before the blossoms open, as much as can safely be done.

Perhaps a method of thinning orchard fruits by treating the open blossoms with some spray mixture may eventually be perfected. This would give the fruit the advantage of an increased food supply from the time the blossoms opened. It is known that such treatment may prevent the setting of fruit. It remains to demonstrate whether by a judicious use of this method the setting of fruit too abundantly may be prevented. If this can be done successfully, much fruit produced by picking off immature fruit might be thus avoided.

To avoid the extra labor which would be required by thinning immediately after the fruit sets, it is customary to defer the work till the weaker fruits drop.
Very often the mistake is made of deferring it too long. The labor spent in late thinning is usually wasted so 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 fruits 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 burdened 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.

THINNING FRUIT

Fig. 2497 shows the improvement in size attained by thinning the Burbank. Those plums which at their best produce very large fruit, such as Baldwin, Concord or Guin, usually give better returns for thinning. With all kinds of fruit, thinning may be expected to return most profit when practiced on varieties well adapted for fancy trade.

An exceedingly heavy crop of fruit may so exhaust a tree that it either fails to fruit 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 respect. 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 commercial fruit plantation, along with the maintenance of soil fertility, tilage, pruning and spraying. It is a mistake to depend on thinning alone for results which may with difficulty be obtained by all these methods combined. In some careful experiments vigorous and productive varieties, on which the fruit had been systematically thinned annually, bore no more regularly than corresponding trees on which the fruit was not thinned. 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.
Plate XLI. Prominent American Horticulturists
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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 1865 or 1866 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, 1830) of "Laurie Todd, or Settlers in the Woods." Thorburn left a most interesting autobiography, which was published in New York in 1832. He died in New Haven, Conn., January 21, 1863, at the age of 96. The portrait in Plate XL is reproduced from his autobiography.

L. H. B.

THORN. See Crotantheus. Christ's T. is Paliurus Spina-Christi. Jerusalem T. is Paliurus Spina-Christi; also Parkinsonia aculeata. Swallow T. is Hippophae rhamnoides.

THORN APPLE. Datura Stramonium; also Crotantheus.

THORN BROOM. Ulex Europaeus.

THOROWGROWTH. Eupatorium perfoliatum.

THRIFT. Armeria.

THRÎNAX (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 long; axis clothed with tubular sheaths; papyro-coriaceous, split: fls. on rather long, slender pedicels, the pedicel with a caducous base at the base; fr. the size of a pea. For the new Porto Rico 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 Anchinthros Chuco.

A. Under surface of leaves green.
B. Leaf-base with a blue fringe at the middle .......................... 1. radiata
BB. Ligule bluntly deltoid .......... 2. parviflora
BBB. Ligule obsolete, truncate .......... 3. Barbudensis
AA. Under surface of leaves silvery or glaucous.
B. Leaf-segments connivent at base. A. argentea
BB. Leaf-segments connivent for one-third their length ............ 5. excelsa
BBB. Leaf-segments connivent for one-half their length ............. 6. multiflora

1. radiata. Lodd. (T. elegans, Hort.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; segments united to one-fourth or one-sixth their length; ligule bluntly deltoid, ½ 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 concave, semilunar, crosse. West Indies.

5. excelsa. Lodd. Lvs. pale green above, hoary-glau- cous beneath; segments united one-third; ligule bluntly deltoid; sheath densely buff-lanate. Jamaica, British Guiana.

6. multiflora. Mart. (T. graminifolia, Hort.). Stem medium, 6–8 ft. high; sheaths ragged, fibrous, irregularly reticulate, tomentose; young lvs. white woolly-tomentose; blade equaling the petiole, lanceate; segments united one-half their length, ensiform- acuminate, rather stiff, glaucous beneath; ligule transversely oblong, sinuate, 2-lobed. Haiti. I. H. 31:352.

T. crînata, Grisch. & Wendel, Cuban. No description available. Only one plant known. Cult. by W. C. Wilson, of Arostia, N.Y. T. elegansissima. Hort., seems to be unknown to botanists. —T. Môrrisseti, Wend. A native of Anguilla, grows 1–2½ ft. high, and has lvs. which are glaucous beneath. Segments free for about two-thirds or three-fourths their length. Lately offered in Fia. G.C. III. 11:119. JARED G. SMITH.

THRYTÎMÔNE (Greek word said to refer to the low heath-like appearance of the plant). Myrtîaceæ. About 18 species of heath-like shrubs from Australia, with opposite leaves and small or minute flowers, which are solitary in the axils or fascicled.

Mitchellîana, F. 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 Tuuya.

THUÎJOSPEIS. See Thujeopsis.

THURÎBERGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnaeus; died 1828). Anchinthros. Mostly tall perennial greenhouse climbers producing flowers in great profu-
above are easily raised from cuttings or layers in summer. T. erecta is not a climber but has a somewhat straggling habit. It has small, dark green lvs. and large, deep purplish blue gloxinia-like lvs. which are white at the base in a southern variety of it. It blooms all summer and autumn. It is readily raised from cuttings during the rainy season.

H. NEHRING.

INDEX.

a. Fls. axillary, solitary
b. Lvs. entire
cc. Petalos winged
d. Color of fls. white: corolla-tubes truncated and sinuate-toothed at the apex

9. Myosorensis
aa. Fls. in terminal or axillary racemes
bb. Color of fls. yellow

1. affinis, S. Moore. A rambling shrub, 10-12 ft. high, smooth: branches angular: lvs. short-petioled, elliptic, acute, entire: fls. 2 in. across, deep purple-blue, with a yellow throat. Summer. Tropical Africa. B.M. 6975. G.C. III. 2:461. G.M. 32:291.—This plant is closely allied to T. erecta, from which it differs by its entire lvs. and larger fls., which are about twice the size of those of T. erecta. When grown in a pot the plant forms a compact shrub, but when given more room it is a rambling climber.

2. alata, Boj. Fig. 2500. Stem square, climbing-hairy: lvs. opposite, triangular-ovate, hastate, repand-toothed, rough-pubescent, tomentose beneath; petals winged, about as long as the lvs.: fls. solitary, on axillary peduncles; calyx very small, surrounded by 2 large inflated bracts; corolla-tube somewhat longer than the involucre, dark purple within; limb rotate, oblique, of 5 rounded segments, buff or cream-colored. S.E. Africa. B.M. 2391. P.M. 2:22. B. 5:238 (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. fragrans, Roxb. Stem slender, climbing: lvs. lanceolate to triangular-ovate, coriaceous or subcoriaceous, mostly angularly toothed on each side of the base, rough on both sides, petiolate: fls. white, axillary; corolla-tube narrow; limb spreading, 1/4 in. across, somewhat truncate and repandely toothed at the end. Summer.
THUNBERGIA

Var. Davis, Clarke, is glabrous. B. M. 1881. L.B.C. 20:1913. Var. vestita, Clarke, is more hairy and the flowers are not fragrant.


6. grandiflora, Roxb. Fig. 2501. Stem tall, climbing; lvs. broadly ovate, angularly cordate and toothed or lobed, somewhat roughened on both sides, petiolate: fls. solitary or in short, stout racemes in the leaf-axils, bright blue, becoming whitish in the throat; corolla tube bell-shaped; limb 3 in. across, of 5 large, spreading rounded lobes. Bengal. B. M. 2366. P. M. 7:221. L.B.C. 4:324. B. 2:76. B.R. 6:495. Gn. 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 variety.


6. Mysorensis, T. Anders. (Hexaæctnris Mysorensis, Wight). Climbing shrub, with long, slender branches; lvs. opposite, petiolate, oblanceolate, acuminate, entire or somewhat distantly toothed; racemes long-pendulous: fls. yellow, 2 in. across, the tube enclosed by the spathe-like bracts; limb 4-lobed, the upper lip concom, with reflexed side lobes, lower lip of 3 subequal, spreading lobes. India. B. M. 4786. F.S. 15:177. S.M. 2, p. 130. — A tall greenhouse climber which flowers, according to treatment, at all seasons.

9. cocinea, Wall. (Hexaæctnris cocinea, Nees). A very tall climber; stem much branched, 4-angled; lvs. short-petiolate, variably-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, 1¼ ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B. M. 5124. L.B.C. 12:1195. F.S. 23:2447. R. H. 1890, p. 197.

HEINRICH HASELBRING.

THUNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the 18th century). Orchidaceæ. A small genus of which only 5 species are known. These are tall plants with annual leafy stems terminating in a raceme of showy flowers. The genus was formerly united with Phaius, from which it differs by the terminal inflorescence. Sepals and petals similar, spreading; labellum convolute over the column, spurred, ornamented with several crests consisting of lines of fleshy hairs; pollinia 8: fls. subtended by large membranous bracts.

The species of Thunia occur in northern India, Burma, and in the S. Himalaya region, growing to a height of 6,000 ft. The culture of the Thunias is very simple. They begin growth naturally at the end of February or early in March. As soon as new growth is visible the plants should be given new material, consisting of fibrous peat or fern-root and sphagnum mixed with loam and some sand and potsherds for drainage. In their native home the plants are said to be epiphytic, and when treated as terrestrial orchids their native habit may be imitated by setting them well above the pot, which should not be too large. For the first 4-6 weeks until the young roots have made good growth, it is necessary to apply water sparingly. Thunias are very rapid-growing orchids and may be liberally supplied with liquid manure until the end of the flowering season, which occurs about the middle of August. Soon after this the leaves fall. The old stems wither in this condition and serve as food reserves for the young growth of the next season, but although they remain on the plant two years they form no leaves the second season. During the resting period they should be kept in a rather dry atmosphere, given occasional water, in order to prevent the stems (pseudobulbs) from shrivelling. This is one of the few orchids which can be profitably propagated by cutting the old stems into lengths of about 6 in. and rooting them in a greenhouse. When rooted the young plants may be potted in the usual way. A temperature of 60°-65° is favorable during the growing season.

Thunia alba, Reichb. f. (Phaius dibus, 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-fl.; lvs. white, 3-4 in. actin., when fully out, is white, yellowish-ange-lolate, segment shorter than the segments, not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wide and finely crisp. The color of the labellum was white in the plants, 3-9 purple or yellow fringed keels. Wings of the column entire. April-Aug. Burm. and S. Himalaya region. B.M. 3991. B.R. 24.3; P.M. 3:125. F.C. 3:125. R.H. 1874:450. G.T., p. 455.


THURBER, GEORGE (Plate XXI), 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 Union Classical and Engineering School of Passaic, N. J. Afterwards he entered 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 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 commissary of the United States, 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 border lands. His herbarium collected there comprised a large number of species new to science, some of which have been named after their discoverer, Cereus Thurberi 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 Nova Thurberiana," published by the Smithsonian Institution. 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 strong sympathies with Gen. John C. Fremont, who 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 being asked for a contribution to the Bunker Hill monument, he inquired: "Is this an invitation or a demand?" He was informed that it was a demand, and at once tendered his resignation. During the following three years 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, 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 1863 to accept—the on the urgent invitation of American Agriculturist, which he held to within a few years of his death, when falling health prevented him from continuing his valuable labors. In this position he found his most congenial work and the real mission of his life, for which his previous training, his vast

THURBER, 1801

2592. Thunia alba. (X 54)
his contributions to horticultural literature consisted in editing, revising and bringing out the horticultural and agricultural books of the Orange Judd 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 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 Thryia, an ancient Greek name for a resinous tree or shrub). Also spelled Thuja or Thryia. Including Biota. Comixera. Arborvitea. Ornamental evergreen types of narrow pyramidal habit, with much ramified branches, the branchlets 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 taken late in summer and kept during the winter in a cool greenhouse or frame; also by grafting on seedling stock in summer or early in spring in the greenhouse. The vars. of T. gigantea and T. orientalis are usually grafted, since they do not grow readily from cuttings, except the juvenile forms of the latter, as var. deputata and Medulosisa. Consult Botanica.

Five species occur in N. America, E. and Cent. Asia. R. sinuferous trees with short horizontal, much ramified branches; the branchlets flattened and frond-like ar-

2503. Typical form of Thuya occidentalis (X 3/4).

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.

A. Cones pendulous, with thin scales, apiculate below the apex; seeds winged, compressed: branchlets ramified more or less horizontally, with a distinct upper and under side.

B. Lvs. yellowish or bluish green beneath: usually 2 pairs of fertile scales.

occidentalis, Linn. COMMON ARBOVITE. Eronomerously but commonly called WHITE CEDAR (which is properly Chamaecyparis). Figs. 2500-5. 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 or green beneath, changing in winter usually to dull brownish green: cones oval to oval-oblong, about 1/4 in. long, brownish yellow: seeds 1/6 in. long. New Brunswick to Manitoba, south to N. C. and Ill. S.S. 10:522.—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-spica, Beissn. Var. Queen Victoria, Hort.). Tips of young branchlets white. Var. argentea, Carr. (var. albo-variegata, Beissn.). Branchlets variegated silvery white. Var. aures, Nichols. Broad bushy form, with deep yellow foliage; also var. Burrel, Douglas’ Golden and Meehan’s Golden are forms with yellow foliage. See also var. lutea. Var. aureo-variegata, Beissn. (var. aurea maculata, Hort.). Foliage variegated with golden yellow. Var. conica densa,

2504. Seedling of Thuya occidentalis (X 3/4).


**2507. Thuya occidentalis, var. ericoides** (X 3/4)


**bb. Les. 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.** ( *Biota*.)

**orientalis**, Link. ( *Bööa orientalis*, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches; branchlets thin; lvs. rhombic-ovate, acute, bright green, with a small gland on the back; cones globose-ovate, 5/1 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. *aethro-taxoides*, Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. R.H. 1861, p. 230. Var. *aurea*, Hort. Low,
THUYA


THYME

THYME, WATER. See Elodea.

THYMUS (classical name of doubtful origin, perhaps from the Greek for incense). Labídita. THYME. Probably about 50 species, although more have been described, all natives of the Old World and chiefly of the Mediterranean region. They are low, half-shrubby perennials, although usually herbaceous or nearly so in the North. Lvs. small, opposite, simple and mostly en-

2508. Creeping Thyme — Thymus Serpyllum (×%)

câtata, Hort., and var. internímedía, Carr., are intermediate forms between this var. and the type. Var. pyramídlis, Endl. Of pyramidal habit, with bright green foliage; one of the tallest and hardiest vars. Var. sempérauréscens, Veitch. Dwarf, globose; the golden hue of the foliage remains throughout the whole year. Var. Sibéldi, Endl. (var. Japónica, Sib., var. nánà, Carr. var. Zuccarínàna, Veitch. var. ompedóta, Beissn.). Globose, compact, low form, bright green. ALFRED REHDER.

THUYOPSIS (Greek, Thuya-like). Conifer. Evergreen ornamental pyramidal tree or shrub, with spreading branches, the branchlets arranged in a froud-like fashion, much flattened and clothed with scale-like glossy green foliage. Thuyopsis is one of the most beautiful Japanese conifers, and is well adapted for planting as a single specimen on the lawn wherever it can be grown successfully. It is hardy as far north as Mass., but usually suffers from summer drought. It thrives best in a sheltered and shaded position and in moist loamy soil, and seems to grow to perfection only in cool and moist climates. Prop. by seeds, also by cuttings and by grafting like Thuya. Plants raised from cuttings usually grow into bushy, round-headed plants. Plants grafted on Thuya are said to be short-lived. Seedlings are therefore to be preferred. The genus contains only one Japanese species, closely allied to Thuya and chiefly distinguished by the 4-5 ovules under each scale. The yellowish white, close and straight-grained wood is very durable and is used in Japan in boat-and bridge-building.

dolóbráta, Sib. & Zucc. (Thuya dolobrátà, Linn.). Pyramidal tree, attaining 50 ft. or sometimes shrubby: branchlets irregularly, whorled or scattered, horizontally spreading and often nodding at the ends: branchlets one-fifth to one-fourth in. broad: lvs. glossy green above, marked with a broad white band beneath, those of the upper and under side obvate-oblong, obtuse, adnate except at the apex, the lateral ones spreading, ova-te-lanceolate and curved (hatchet-shaped), obtusish: scales of stamine fls. 6-10, much thickened at the obliquely pointed apex, the middle ones fertile and with 3-5-winged seeds under each scale. Japan. S.Z. 2:119, 120. G.C. II. 18:556.—Var. nanà, Sib. & Zucc. (T. la-tévenius, Lindl.). Dwarf form, with more slender and narrower branchlets of a lighter green. Var. variégata, Fortune. Tips of branchlets creamy white. T. boreális, Hort.=Chamécyparis Nutkaënsis.—T. Stándishi, Gord.=Thúja Japonica. ALFRED REHDER.

THYME. See Thymus.

VUGARIA, Linn. Common THYME. Plant erect, the base sometimes decumbent, 1-2 ft., the branches stiff and woody, usually white-pubescent: lvs. sessile, linear to ovate-lanceolate, acute, the margins more or less revolute: fls. small, lilac or purplish, in terminal interrupted spikes. S. Eu.—An old garden plant, being grown as a sweet herb. The leaves and shoots are used for seasoning. It is well to renew the plants from seeds every two or three years. There are varieties with broad and narrow leaves.

Serpyllum, Linn. Fig. 2508. Mother of Thyme. Creeping Thyme. Creeping, wiry-stemmed, slightly pu-
bentsent: lvs. small, seldom ⅜ 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. Temperate 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 seasoning, as those of T. caput- bigotis. The nodes are short, making it a very leafy plant. Var. lanuginosus, has larger lvs. and longer, somewhat ascending branches. Var. lanuginosus, Hort. (T. lanuginosus, Schk.), is a form with small roundish lvs., and a pubescent-gray covering, making it a handsome plant for edgings. Var. aureus, Hort. Foliage golden, particularly in spring. Var. argentatus, Hort. Lvs. variegated with silvery white. Var. variegatus, Hort. White-variegated. var. cocinea, Hort. Fls. numerous, scarlet. There is a form with white lvs. (see Gt. 45, p. 108). All forms are hardy.

Corsican, Pers., is properly Calamintha Coriscia, Benth. Prostrate, small, glabrous or nearly so: lvs. very small, 2 lines or less long, nearly orbicular, petiolated: fls. small, light purple, in whorls, the floral leaves similar to the others. Corsican. —A good little plant for edgings, with very aromatic herbage.

L. H. B.

THYRSACANTHUS (Greek, thyrse and flower). Acanthaceae. 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 thyrse. Calyx short, 5-parted; corolla long-tubular, the limb 4-lobed, slightly 2-lipped; stamens 2; staminodia 2, at the base of the filaments: capsule oblong; seeds 4 or fewer by abortion.


F. W. BARCLAY.

Thyrsacanthus Schomburgkianus 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 umbrella-like habit and pendulous grace of its long sprays of slender, red, tubular flowers. Like many other aca-
thuds, it becomes leggy and woody in older plants when 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 has suggested to some gardeners the use of this plant for hanging planters and brackets.

ROBERT SHORE.

THYRSOSTACHYS (Greek, thyrse and spike). Gramineae. T. Siamonis 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 in Mifflin's Bamboo Garden, its horticultural status is uncertain. It is easier to handle, but the plant is rather tender at Santa Barbara. The genus belongs to a subtribe of bamboos of which Dendrocalamus is the type. This subtribe is distinguished by having 6 sta-
mens, a 2-keeled palea and the pericarp free from the seed. For generic characters of Thyrostachys, see the Flora of British India 7:397 (1897).

Thyrostachys is a genus of 2 species of arboreous bamboos native to Upper Burma and Siam. The stems are long, thin and persistent, with a long, nar-
row blade. The lvs. are small or moderate-sized. As nearly as may be judged from the only available descrip-
tion, 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.

Siamesis, Gaik. A tender, decumbent, "giant bam-

W. M.

2509. Thyrsacanthus Schomburgkianus (X ½).

TIARELLA (Latin, a little tia or turba; in ref-
erence to the form of the pistil). Saxifragaceae. False Mertwezorek. 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, Lind. Foam Flower. Fig. 2510. A hand-
some 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. Gn. 22, p. 21; 32, p. 1; 51; 53, p. 456; 55, p. 40; V. 11:35.—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 (X ¼).

BB. Petals filiform, inconspicuous.

unifoliata, Hook. Hardly perennial; lvs. thin, rounded or triangular, 3-5-lobed, the lobes crenate-toothed; stem-lvs. usually only 1, rarely 2-3: panicle loose; petals small. W. Amer.—The lobing of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

Aa. Lvs. 3-foliolate.

Trifoliata, Linn. Resembling T. unifoliata except in having 3-foliolate lvs. Ore. to Alaska. Also northwestern Asia.

F. W. BARCLAY.

TIBOUCHINA (native name in Guiana). Melastomáceae. 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 obovate, 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. Phaner. vol. 7.

Semidecéandra, Cogn. (Lasidendra macrantha, Linden & Seem. Pleróma macranthum, 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 foxtail, 5-nerved or 3-nerved; bracts broadly suborbicular, somewhat rounded at the apex and shortly apiculate, margin not translucent: fls. reddish purple to violet, often 5 in. across, solitary and terminal or 1 ft. terminal and 2 in the upper axils on the branchlet; stamens purple; style setulose. Brazil. B.M. 5731; 4419 (as P. Kunthianum). F.S. 25:3480. Gn. 44:921. 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. Lasidendra, or Pleróma splendens, Hort., should be compared with this. T. semidecéandra 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.

Elegans, Cogn. (Pleróma elegans, Gardn.) Tender shrub, 3-6 ft. high; lvs. rigid, fragile, oblong or ovate-oblong, 3-nerved: fls. purple, 1½ in. across; calyx more or less armed with rigid spreading bristles which are thickened at the base. Brazil. B.M. 4262. P.S. 15:27. F.S. 12:1212 (as Lasidendra elegans).—Once cult. by John Saul.

F. W. BARCLAY.

TICKSEED is Coreopsis.

TICK TREFOIL. Refer to Desmodium.

TIEDEMANNIA rigidia, Cour. & 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 Coulter and Rose's monograph of the North American Umbelliferae (contrib. U. S. Nat. Herb. vol. 7, No. 1, p. 194), 1900; also Gray's Manual, and Britton and Brown's Illustrated Flora.

TI-E5. Lucema Rivieca.

TIGER FLOWER. Tigridia.

TIGER LILY. Lilium tigrinum.

TIGER'S JAW. Catalogue name for Mesembryanthemum tigrinum.

TIGRIDIA (tiger-like; referring to the peculiarly marked flowers). Iridaceae. Eight or ten species of cormous plants ranging from Mexico to Peru and Chile.

2511. Tibouchina semidecéandra (X ¼).

and making very showy summer-blooming plants. Bulbs tunicated. Stem erect, unbranched, a few inches to 2½ ft. tall, with a few narrow plicate leaves at the
TIGRIDIA

base and 2 or 3 smaller ones higher up: spathe 1 or 2, leaf-like, each bearing one or few blossoms. Fig. 2516. A spiral blade, orange or purplish, variously spotted, often very showy; perianth wide-spreading, with no tube, the segments 6, in two dissimilar series, convolute into a broad cup at the base; stamina 3, filaments united into a long cylindrical tube, including the style; pistil with 3-loculed ovary, long style with three 2-parted branches. Tigrillia Pavonia, from southern Mexico, was in cultivation in Europe in the sixteenth century. L'Obel described it in 1578. The younger Linnaeus referred it to the genus Ferraria, and some of the Tigrillias 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 Tigrillias are fugitive, lasting only for a day. See Baker, Rrdees, 67 (1892).

Tigrillias 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 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 cormels and seeds. Best colors are got in warm weather.

A. Fls. large (often 4 in. or more across); the two rows of perianth-segments very dissimilar; stigmas deciduous. (Tigrilla 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, all marked, with a cup-shaped or saucer-shaped center and wide-spreading limb formed by the obovate outer segments which are bright red on the limb, purple, yellow or red-spotted on the claw; inner segments panduriform (diddle-shaped), about half the length of the outer ones, the blade ovate-acute, orange-yellow and cokopiously spotted. Mex. and Guatemala. B.M. 532 (as Ferraria Tigrilla). I.H. 38:142. Var. conchillora, Hort. (T. conchillora, Sweet), has bright yellow flowers. Var. Wathkonsonii, Hort. (var. atena, Hort. T. conchillora Watkinsonii, Puxt.). Raised from seeds of var. conchillora pollinated by T. Pavonia, before 1840, by J. Horsefield, Manchester, England. Horsefield 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. conchillora, the female parent; the large outer sepals, however, are of a very deep yellow, inlining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free a bloomer, and as easy to cultivate and increase as T. Pavonia, whereas T. conchillora 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 immaclulata, Hort., is a spotless white variety, a sport from var. alba. G.M. 49, p. 361. Var. flava, Hort., has pale yellow fls. with red-spotted center. G.M. 50:1674. Var. Camellia, Hort., is also a pale yellow-dio form, but named as if an inhabitant of the Canaries. Var. lotea immaclulata, Hort., has pure yellow spotless flowers. Var. rosea, Hort., has rose-colored fls., with yellow variegated centers. Var. lilac, Hort., has lilac fls., with spotted center. G.M. 45:355. 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 larger than themselves and brighter colored, G.M. 45, p. 263. Identical with this, or subtypes of it, are the forms known as Wheelers, cocinea, splendens. Most of the marked departures in Tigrilla 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-
2513. A young Linden tree, five or six years old.

2180

TILIA (the classical Latin name). Tiliææ. LIME. LINDEN. BASSWOOD. WHITEWOOD. Trees distributed generally throughout the northern temperate zone, with soft, light, white or light green wood, tough fibrous inner bark, serrate alternate petiolar, mostly coritate Ivs, and caduceus stipules: inflorescence cymose, the peduncle attached to, or adnate with, for about half its length, a ligulate membraneous bract: Ivs, small, yellowish; sepals 5; petals 5; stamens many, with long filaments nectariferous: fr. globose, nut-like. In some species, small petiolar 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 bast 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 layer 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 until they root, when they are 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 very few of these species have been sent to this country under the name of T. Europaea.

INDEX

1. petiolaris, DC. (T. Americana, var. pendula, Hort. T. argentea, var. pendula, Hort. T. diæba, var. pendula, Hort. T. pendula, Hort.). SILVER LINDEN. WEEPING LINDEN. A medium-sized species with slender somewhat white-pubescent branches, soft, very finely tomentose underneath, 3-5 in. long; petiole slender, as long as the blade. July. E. Europe. B.M. 6737. Gm. 5:210. — An elegant species and one of the best of the European kinds, holding its foliage throughout the season.

2. Mandshurica, Rupr. & Maxim. Tree, attaining 50 ft., with spreading, often somewhat pendulous branches: Ivs, large, 5-8 in. long, orbicular to broadly ovate, coriaceous or truncate at the base, rather coarsely and remotely serrate with spreading teeth: floral bract adnate almost to the base of pedicule: fr. globose, thick-shelled, with 5 furrows and a slight cavity at the insertion of the pedicle. E. Asia. — A variety has the Ivs. edged with yellow or yellowish brown: fr. thin, slightly glossy.

3. tomentosa, Moench (T. argentea, DC. T. diæba, Waldst. & Kit., and probably Ait. T. diæba, T. diæba, var. spectabilis and T. diæba, var. pyramidalis, Hort.). WHITE or SILVER LINDEN. This is the larger "White Lime" of Europe. Tree, 40 ft. high with upright or ascending branches forming a pyramidal rather dense and compact head: Ivs. suborbicular, 3-5 in. across, usually coriaceous, serrate, densely white-tomentose beneath; blade 2-4 times longer than petiole; fr. tomentose and slightly ribbed. Very variable in time of flowering. Eastern Europe. — This is a very distinct and striking species.

4. heterophylla, Vent. (T. diæba, Michx., not Ait.). Tree, attaining 70 ft.: Ivs. very large, 5-8 in. long, smooth and shining above, whitish and tomentulose beneath: floral bract short-stalked: fr. globular, not...
TILIA
ribbed. July. Alleghanies. S.S. 1:27.—This has been sent out as *T. macrophylla*, a name that properly belongs to a long-leaved var of *T. americana*.


7. *Americana*, Linn. (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 stalked base: fr. ovoid, tomentose. July. E. N. Amer. S.S. 1:24. Mn. 6:153.—This is our most common American species and the one most frequently planted. Variable in habit, size and shape of leaves, and in 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 it is now largely manufactured. The 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. *pandula*, is a form of *T. petiolaris*.

8. *Monogyla*, Maxm. A slender tree with very small oblittely or obovate lvs., truncate at the base, usually 3-lobed, cuspidate, 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. *grandiflora*, 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 6, sericeous, cordate, thick-shelled. This is the species most commonly sold here as *T. Europaea*, 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 young rbra., very red; *rubra_, with yellow bark on branches; *lacinata_ and *lacinata_ rubra_, with deeply cut leaves and reddish young bark; *sulphurea_, probably the same as aurea; *vitifolia_, the vine-leaved Linden with lobed leaves.


11. *uglaria_, Hayne (T. *Europaea*, Hort., in part). This species grows nearly as large as *T. platyphylos*, has large unequal or oblique cordate lvs., smooth and shining on both sides: tufts of hairs in the axils of veins whitish: fr. globose or oval, tomentose, stem thick, June, July. Eu. G.F. 2:256.—This is said to be the celebrated spcies of Berlin and is often sold in this country under the name of *T. Europaea*. It is believed to be a *T. platyphylos*, and about the same number of days earlier than *T. americana*.


JOHN F. COWELL.

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 in the latter part of the century just closed that the real reasons for tilling have come to be popularly understood in this country. Even now there are many persons who believe that the object of tillage is to kill weeds. The modern conceptions of tillage probably date from Jethro Tull’s book on “Horse-Hoeing Husbandry,” which reached the second and full edition in 1736, in England. This book awakened so much discussion that the system of “horse-hoe husbandry” recommended by it was called the “new husbandry.” There had been tillage of land before Tull’s time, but his writing seems to have been the first distinct effort to show that tillage is necessary to make the soil productive rather than to kill weeds or to open the ground to receive the seeds. He contrived various tools whereby grain crops could be sown in rows and afterwards tilled. The tillage of the land in early times was confined very largely to that which preceded the planting of the crop. In the vineyards of southern Europe, however, Tull observed that tillage was employed between the vines during the season of growth. Such vineyards prospered. He made experiments and observations on his return to England and came to the conclusion that tillage is of itself a very important means of making plants thrifty and productive wholly aside from its office of killing weeds. He supposed that tillage benefits plants by making the soil so fine that the minute particles can be taken in by the roots of plants. Upon the same hypothesis he planted his own garden experiments. Such vineyards prospered. He made experiments and observations on his return to England and came to the conclusion that tillage is of itself a very important means of making plants thrifty and productive wholly aside from its office of killing weeds. He supposed that tillage benefits plants by making the soil so fine that the minute particles can be taken in by the roots of plants. Upon the same hypothesis he planted his own garden experiments.
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 results are also secured when the surface is made fine and loose by means of frequent shallow tillage. The capillary connection between the surface soil and the under soil is thereby broken. This surface soil itself may be very dry, but it serves as a blanket or mulch to the soil beneath and thereby keeps the under soil moist. In many instances this conservation of moisture by frequent shallow tillage is the chief advantage of the tillage of the land during the growing season.

Tillage that is well tilled has different chemical relations from that which is neglected. Nitrification, decomposition and other chemical activities are hastened. The stores of plant-food are rendered available. The soil is made more productive.

The first requisite for the growing of the plant is to have the soil in such condition that the plant can thrive in it. It is only when the land is well tilled and prepared, or when its physical condition is nearly or quite perfect, that the addition of concentrated fertilizers may be expected to produce the best results. The fertilizing of the land, therefore, is a secondary matter; tillage is primary.

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 riddled so that unneccessary parts are removed; and most of it is brought into condition that the plants can utilize. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage in the bottom of his pots or boxes. Often the gardener will produce a hundred of soil as a farmer will produce from a bushel.

L. H. B.

TILLANDSIA (Elias Tillsand was professor of medicine at the University of Abo, Sweden; in 1673 made a catalogue of plants of the genus Tillandsia. There are many species, but the genus is most commonly represented by the epiphyllums and all natives of America. They are allied to billbergias, rhipsalids, guzmania, pineapples, and the like. Many species are described in horticulature literature as having been introduced into cultivation, but many of these are 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 of most bromeliaceous genera, are ill defined. By different authors a given species may be placed in any one of a half dozen genera. Lately, Tillandsia and Vriesia 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 the trade should consult Baker's "Handbook of the Bromeliaceae," 1889, or Mez's "Bromeliaceae" in DeCandolle's "Monographia Plantarum," 1896. The latter work, which regards Vriesia as a separate genus, admits 245 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 the 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. tenuifolia, T. fimbriata, T. ustulata. 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 ucturillarias 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 rolled in the stem, 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 ligules at the base of the petals on the inside, the petals of Tillandsia are elongate; 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. zebrina, 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 painted or blotted. Many of the species are very 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. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept dry, and not overly dormant. 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 cuttings, or by seeds. See Biltbergia. Other bromeliaceous genera described in this book are Bromelia, Anthurium, Karatas, Cryptanthus, Ananas, Pitecaruma, Puya, Guzmania.

2515. Cryptanthus zonatus, commonly known as Tillandsia zebrina (× 24).
**TILLANDSIA**

A. Plant-body slender and hanging; fls. solitary in leaf axils.

unsinoides, Linn. *Spanish, Florida or Long Moss.* Figs. 2316, 2317. 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. 4888. F.S. 3:221.

2316. Spanish Moss—Tillandsia unsinoides. (Much reduced.)


**spikes, long and much exerted but not spreading petals purple. Var. *picta,* Hook., has the upper lvs. and bracts scarlet. S. Fla. to Venezuela. B.M. 4888. F.S. 3:221.


**cc. Stem not prominently swollen.**

b. Stamens shorter than the petals.

c. Fls. few in the cluster.

recurrata, Linn. (T. Bbritrami, Ell., at least in part). A few inches high, tufted, with scurfy terete or filiform recurved 2-branched lvs.; fls. 1-3 on a spike that is sheathed at the base but naked above, the corolla blue and exceeding the calyx. Florida to Argentina and Chile.

**cc. Fls. many, distichous.**

anceps, Lodg. (Vriësia anceps, Lem.). Erect, the flower-stem 6-12 in. tall and bearing a spike with large distichous green bracts from which small blue fls. emerge: lvs. short, about 1 ft. long, dilated and striped at the base: fls. 2 in. or less long, blue or purplish, the perianth much exceeding the calyx. Costa Rica, Trinidad. L.B.C. 8-771.


2516. Spanish Moss—Tillandsia unsinoides. (Much reduced.)

b. Stamens longer than the petals.

c. Stem thickened and bulb-like at the base.

bulbos, Hook. Small scurfy 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

**polystachya, Linn. (T. angustifolia, Swartz. T. parvispica, Baker). Lvs. rostrate, lepidote or scurfy, 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.

tenulifolia, Linn. (T. cespitosa, Lecente, not Cham. & Schlecht. T. Britrami, 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. Fls. to Brazil.

DD. Lvs. gradually narrowed from a broad base.

fasciculata, Swartz. (T. bracteata, Chapm. T. glaucophylla, Baker. Vriësia glaucophyllo, Hook.). Tall, strong species with stem 2 ft. tall: lvs. 1-1½ 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-tinged bracts: fls. narrow, exserted, blue. S. Fla., West Indies and Central Amer. B.M. 4415. F.S. 5:432.—Very variable.

urculata, Linn. Plant 2-3 ft. high: lvs. glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base 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. 9:749 (as T. flexuosa, var. pallida).—For full description of this species, together with plate, see Trelease, 5th Rept. Mo. Bot. Gard. (1894).

T. bicvittata, Linden, is Cryptanthus bicvittatus. See p. 484. T. farinosa, Hort., is Bilbergia pyramidalis. See p. 183. T. Lacciflora: "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, fibroso soil mixed with sphagnum." (Siebrecht.) T. muscica, Linden, is properly Guzmania muscica, Mez. It is asacculus; lvs. 20 or less in a rosette, lorate 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. 6675. I. H. 34:268 (as Caraguata muscula). It is an excellent plant, with broad lvs. 3 ft. long. In the American trade. This plant is sometimes known as a Massangea (see p. 902).
T. muscoides, Hort., is Pitearia muscosa. P. muscosa, Hook., B.M. 4770, is Pitearia Beycealma. The name T. muscosa has occurred but the plant is known to the writer. —T. Wilsoni, Wats., has been introduced spuriously to cultivation, but does not appear to be in the trade. It was discovered by Dr. W. P. Wilson, of the University of Pennsylvania: "Stem simple, very short (about ½ inch); lvs. numerous, 1 to 3 or 4 inches long, gradually tapering from the clustering base to the long-stalked, rather slender apex, channelled above, more or less hoary, with minute appended, peltate, brown-centered scales; peduncle very slender, largely exceeding the lvs. 2 distinct bracts probably 1-3-ftd.; fls. and capsules not seen." This is Sereno Watson's original description, 1888. See Mn. 2, p. 130, and 6, p. 152, Beccari, Fl. C. A. S. 1888. T. Pinula, H. E. Wilson, is probably T. muscosa Zahnii, Hort., probably is Guzmania Zahnii, Mez. Tufted, branching from the base, glabrous throughout: lvs. 1 ft. long, about ⅓ inch wide. Name is not recognized by this species; T.Захни, Hort., is properly Guzmania Zahnii, Mez. Tufted, branching from the base, glabrous throughout: lvs. 1 ft. long, about ⅓ inch wide. Name is not recognized by this species.

The following names are accounted for under Triaea: carina, tenuifolia, gattuta, hieroglyphica, psittacina, Sauerweissi, splendens, tesselata, zebrina (in part).

L. H. B.

TIMOTHY. Phleum pratense.


TIPUANA (name apparently Latinized from a Brazilian name). Leguminosae. A genus of 3 species of handsomc South American trees with odd-pinnate lvs., numerous alternate ifts. and showy yellow or purplish fls. in loose, terminal panicles. Here belongs the plant recently introduced to southern Calif. as Machravini Tipu, which Franceschii says yields one of the rose-woods of southern Brazil.

speciosa, Benth. (Machairian Tipu, Benth.). Temp. regions. Ifts. 1½ ft. long; obtuse, emarginate, entire, 1½ in. long; veins somewhat parallel; standard broadly orbicular; wings very broadly ovate, much larger than the keel; pod very sin. A. M.

TIPULARIA (Latin, Tipula, 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 long after the flowering season: fls. in a long, loose, terminal raceme, green, nodular petals, spreading; labellum 3-lobed, produced into a long spur behind; 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.

TOCÓCA (Tococo is the native name of T. Guianen- sis). Melastomaceae. A genus of 38 species of tropical shrubs native to the northern part of South America, including several handsome, branching plants with hot colors. Their beauty is similar to that of the well-known Cyanophyllum, for which see Micorna. The lvs. are usually ample, petiolate, membranous, rarely leath- hammer, entire or dentate, usually 5-nerveed: fls. rather large, borne in terminal or subterminal axillary panicles, white, red or rosy, 5-merous, rarely 6-merous; stamens 10: ovary 3-loculed, rarely 5-loculed.

platyphylla, Benth. (Sphärzygne latifolia, Naud.). Short-stemmed plant with succulent, somewhat tortu- ous stem: lvs. broadly ovate, minutely dentilulate-cili- ate, 7-nerveed: fls. rosy or red: ovary 3-loculed. Colom- bia, Venezuela, Costa Rica. — Cogniaux puts this species in a section characterized by having the lvs. desti- tute of vesicles and the calyx not winged. In this section it is unique by reason of its herbaceous branches with long bristles, especially at the nodes; the other species of the section have shrubby and glabrous habits. It is a very beautiful plant, but considered to be difficult to grow.

Toecoa requires a warmhouse temperature, with shady and fairly moist place. Use leaf-mold mixed with fibrous loam, and provide ample drainage. It is best propagated from what are called split joints, or eyes with the leaf rolled up, and inserted in thumb-pots in fine sand with worm-wood mixed; then insert pots in sand or cocoa fiber, with bottom heat of 75-80°. Cover with bell- glass or other inclosure to exclude air and to keep a fairly moist (but not wet) condition. In about two months the cuttings will have rooted. The wood for propagating should be well ripened.

H. A. SIEBKREIT.

TODDÁLIA (Kaka Toddæi, Malabar name of T. acu- leata). Rubiaceae. About 8 species of trees, shrubs and climbers native to the Old World tropics and the Cape. In the trade: ifts. toothed, 1-3-fld. Fruits glutinous, finely veined, glandular-dotted, with a waxy vein inside the margin: fls. small, copious, in dense panicles; sepa- cals 4-5, minute; petals 4-5, valvate or imbricate; sta- tipes matron, or twice as many, as petals: ovary 4-5- loculed; stigma peltate: fr. small. In Toddalia proper the petals are valvate, and the stamens as many as the petals; in the subgenus Vepris (name altered from Vepréea, brambles) the petals are imbricate and the stamens twice as many as the petals.

lanceolatâ, Lam. (Vepria lanceolatâ, A. Juss.). Small tree or large shrub, erect, without prickles, entirely glabrous: petioles 1-2 in. long; lfts. oblong lanceolate, 2-3 in. long, acuminate, entire, or rarely toothed. In Todalia a broad: panicles axillary and terminal, thyrsoid: petals a line long, imbricate; stamens 8, in the male fls. ex- cised: fr. the size of a pea, 4-lobed, fleshy, gland- dotted. Mauritius, Mozambique, Cape. Int. by Rea- soner Bros., 1891.

TODÉA (Tode, a German botanist). Osmundaceae. GRAFT FERN. A genus of ferns related to Osmunda but with the sporogonia borne on the under surface of the leaf. There are three species, although frequently united with Todea, more properly form a distinct genus Lep- topteris, 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.

bárbara, Moore (T. Africana, Willd.). Lvs. in a crown rising from a short caudex, 3-4 ft. long; 9-12 in. wide: pinne erect spreading, sometimes 2 in. wide: sorii closely placed, often covering the whole under surface at maturity. South Africa to New Zealand.

a. 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 pinne about as long as the others: racemes mostly naked. New Zea- land.

supéra, Col. Lvs. 2-4 ft. long from a woody caudex; pinene often crisped, the lower gradually reduced; racishe densely tomentose. New Zealand.

b. Lvs. bipinnate.

Fráseri, Hook. & Grev. Lvs. 1-2 ft. long, from an erect woody caudex 18-24 in. high, lowest pinne nearly as large as the others: racishe narrowly winged, naked. Australia.

L. M. UNDERWOOD.

TOLMIÉA (Dr. Tolmie, surgeon of Hudson Bay Co., at Puget Sound). Saxifragaceae. A genus of one spe- cies, 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 rose-tinged flowers. The berries seem to have been cult, abroad, and twenty years ago it was cultivated in the eastern U. S. for western collectors. It is probably hardy and doubtless requires some shade.

The generic characters are: airds, 5-lobed, the tube in age longitudinally split down one side; petals 5, threadlike, inserted in the sinuses of the calyx, recurved, persistent; stamens 3; ovary 3-loculed, with 3-5 small placentaes. This plant has been described under Tiarella or Hemias, but it resembles in foliage and inflorescence. It seems to be the only plant of the Saxifrage tribe that has 3 stamens.

**Menziesii, Terr. & Gray.** Perennial herb, 1-2 ft. high, with slender creeping rootstock and some summer runners: lvs. round-cordate, more or less lobed and crenately toothed, slender -stalked, all alternate, those of the stem 2-4 in number; raceme ¾-2¾ ft. long: fls. and capsule nearly ⅓ in. long, greenish or tinged purple. Forests of Mendocino Co., Calif., to Puget Sound.

- Propagates naturally by adventitious buds, produced at the apex of the petioles of the radical lvs. and rooting when these fall to the ground.

**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, however (see Bull. 61, 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. 2518-30. The flat angled and wrinkled Tomatoes (Fig. 2526; 1834, 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. 1388, Vol. II).

The Tomato requires a warm soil and climate, a sunny position, and plenty of air. It is usually started in hotbeds or glass houses, being transferred to the open as soon as settled weather comes. The plants are usually set from 4-5 feet apart each way and care is given to grow them strong on the ground. For home use, however, the plants are often transplanted, 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 viney type may be allowed to lie on an inclined trellis or rack. This rack training keeps the plants from the ground and thereby allows the individual fruits to develop perfectly and also checks the spread of the fruit-rot, but it 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 on weather when the fruit is ripening. It is apparently worst on plants that cover the ground thickly with foliage and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop before the fruit is ripe, and if the plants are brought into bearing early and are kept in thrifty condition for subsequent bearing, the percentage of total injury is greatly reduced. The Tomato is tender to frost. The planting when fruits kept in the ground 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 constant qualities 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 they are maintained properly. If tomatoes are to be grown for home use, a sunny position is especially important, and any protection from cold winds or other exposure that may injure the plants or force them to develop abnormally is desirable. The soil must be rich and well-drained, and as deep as possible. It should be light and as fine as possible, and should not be kept too dry, especially during the fruiting period. The best results are obtained by growing the Tomatoes in hoophouses or other protected places, and by providing ample protection from cold winds.

**TOMATO**

![2518. The modern type of large, round, "smooth" Tomato.](image)
leads to a method of culture which differs somewhat from that usually recommended. We plant the seed in flats placed in a greenhouse or hotbed, some forty to fifty days before we think the plant can 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 cold-frames, 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 deep bed of mellow, friable soil. We begin cultivating the day after the plants are set, the ridge or furrow of soil to the east of the track and the furrow of soil to the west of the track. We give the crop 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 previous 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 setting the plants the first week of June. The seed is sown very early so that, although growth is kept in check by crowding and scarcity of water, the plants have set the first cluster of fruit, which is sometimes early in July before the full growth of the vine has set. When 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 in groups of two and 5 or 6 or more, 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 fruiting period 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 cross-walk. This facilitates the distribution of the empty and filled boxes 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 pickling, 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 only 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 size and quality, from the Optimus 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 Prize; or if one is interested in producing the Acme through the Beauty to the later Buckeye State. If one prefers the dwarf-growing plants, we have the popular Dwarf Champion, a dark red 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.
shipped long distances almost as readily and safely as the apple and more so than the peach, and which, picked and stored on shelves, will prolong the season of fresh Tomatoes from one's own garden till Christmas time. And to please the eye we have the Golden Queen, of clear yellow with a beautiful red cheek, or the White Apple—nearly white—or the Peach, covered with bloom and as beautiful in color as peach. For picking we have the Red Plum and Yellow Plum, the Red Pear-Shaped and the Yellow Pear-Shaped, the Red Cherry and the Yellow Cherry, and the cherry-like exquisite-flavored Burbank's Preserving. Every season there are new and more or less dissimilar tinted varieties added to the lists; and very truly of the making of new varieties of Tomato, like the making of books, there is no end.

Tomatoes Under General Field Conditions.—Tomatoes should be started in hotbeds. To make the beds, select a sheltered place on the south side of a bank 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, 8 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 just 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. 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 4-6 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 soil 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 mound, dip the plant into it, then put the plant in the box. One can leave them 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 mark it off 4 x 5 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

2520. The old-time and new-time forms of Tomatoes—the angular and the "smooth."
gros decent, 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 will wither and die, though if fertilized too liberally, especially with nitrogenous matter, it runs to vine at the expense of fruit and is subject to excessive inroads from bacterial and fungous diseases. Similar results follow from warm seasons too heavy soil, while drought or insufficient nourishment cut short the harvest. To steer a middle course between these extremes is difficult. It is, on the whole, safer to underfertilize than to overfertilize it. Moderate and kindly_looted fertilizer, mulmans last season, and with but a light application of fertilizer, or none at all for 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 doubled, amount of 1,000 lbs. per acre with safety on a well-selected soil if applied sufficiently early in the season. Such an application should produce a yield of 300 bushels per acre in a normal season with a yield of the order standard, even.

Varieties. — All things considered, the following short list presents for the South the best of half a century's effort in development: Crimson Cushion, Stone, Panaderoos, Freedom, Ache, Trophy, Paragon and Perfection. The medium-sized, smooth, round, red, uniform, solid fruit represented by Stone and Achee, 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 and preference must ever differ with this as with all other soil products.

Frise, Golden Queen or Yellow Achee is incomparable, but it is valueless for cooking by reason of the mushy taint developed thereby. Fruit of the Ponderosa type is too large, gross and frequently too unsymmetrical for successful shipping; it finds a readier sale in local markets. Extra earliness in maturity seems to be more or less a chimera, little real difference appearing (on careful test) between most varieties. Early ripening is rather a matter of soil, manipulation and local environment.

Color is apparently a secondary consideration, tastes in this particular varying greatly. Some markets prefer the crimson shade of the Achee type, while others demand the bright Naples shade of the Cushion.

Vigor of growth, productiveness 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) | 10 |
| Productiveness | 16 |
| Shipping quality | 14 |
| Shape | 12 |
| Size | 11 |
| Earliness | 10 |
| Color | 5 |
| Flavor | 4 |
| Cooking quality | 100 |

Cultivation.—Whether grown on a large or small scale, the young plants are started under glass from January to March, according to isotherm, and in about 30 days from the seed are ready for "pricking out" or transplanting in the open ground, the lower lands, farther north into boxes or "Neponet's" pots. The latter, constructed of paper, admit 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 hedging on the fertilier drilled in continuous rows—though compost is usually set on the manured soil. If any residue of fertilizer used 6 x 4 ft. is not too great. When trellised with 3 ft. posts, at intervals, and one strand of No. 12 wire, either 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 heel scrapes"—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 phishing back weak or inconsequent laterals is necessary. All lower laterals when stake-training is employed must be pruned until a main stake is established, or trained spirally around the stake and secured with raffia, after which laterals are still shortened from time to time, as occasion requires. This is an ideal, and also a practical system, and should be used whenever it can be generallv justified by the results. With the trellising system two or three strings are allowed to grow, although 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 spray-pump. It is certainly the most economical form of cultivation everywhere, at least to our knowledge.

Without his spray-cart and fungicide the tomato-grower is lost—and knows it! The grower has hence become an invariable and indispensable adjunct to the truck farm, by means of which most of the fungous and bacterial affections of the plant may be, if not altogether prevented, at least held in hand and damage reduced to a minimum. But it must be kept going resolutely and continuously from the first—the earlier sprays to consist of Bordeaux mixture admixed with one pound of a barrel of Bordeaux mixture to hold in check insect sedicators, later sprayings to be made with Bordeaux only.

Cord Crop.—A pecular advantage of the Tomato over other transplanted truck crops is its ready disposition to grow from cuttings, thus obviating the necessity for re-seeding for a second or fall crop, as with the cabbage. The cuttings afforded by the pruned laterals strike root vigorously, and thus afford a ready means for filling vacancies in the plat immediately upon their occurrence; and, since the plants from cuttings begin to fruit as soon as they start growth, a continuous succession may be obtained from them and plants are cut short by frost in the fall—an economic consideration of vast importance.

Marketing. — While no particular state or section of the South altogether monopolizes the northern markets, and many trucking centers from low to high, Texas and Florida to Norfolk and Memphis successively forward their shipments in greater or less quantity, the Florida crop is probably the earliest, largest and best known, through the many shipment centers from lower Louisiana and Mississippi, while the middle and eastern states are supplied, after the Florida shipments have ceased, by the truckers of Savannah, Charleston, Wilmington and Norfolk in turn. The early season and shipment are as many and as diverse as the local centers of production. The Florida crop, dominating the early market, is usually shipped stark green, each fruit paper-wrapped in the regular "six-basket carrier" used for Georgia...
peaches, and forwarded by "ventilated fast freight." This meets the early spring demand, but the fruit ripens unevenly and is frequently unsalable 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 cannery 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 it 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 satisfactorily strained out by the soil as the liquid filters through. The ammonia of copper, and even celeste, are not liable to this objection, and may be used as remedies with fairly satisfactory results.

Leaf curl, *cedema*, 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 droopy due to too much soil moisture, unbalanced food formulas or excessive pruning—one or all. Cessation 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 *Macrosorium* — 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.
pests should, as a primary procedure, be eradicated, as far as possible, from the Tomato plot. This at once 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 solanaceous crops, and finally the importation of seed (for all solanaceous plants as well as small Tomatoes) from districts known to be exempt from the blight.

**Insect Pests.**—While these are relatively numerons, their ravages are much less of a menace to the grower than either the fungous or the bacterial types. Only the more important are here mentioned.

First, the boil worm, Heliotrobus solanacearum. 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 be left in their hands for discussion, but for the fact that the loss to the trucker is not confined to the direct depredation of the worm itself, but a pathway is thereby made for the subsequent invasion of the blight bacillus, as stated. It is on this account that the trucker’s interest in the “boll worm” is paramount. Unfortunately no adequate remedy beyond hand-picking, the use of crawlers as a“trap plant,” and the destruction of wormy fruit has ever been suggested.

Of the various cut worms and wire worms almost the same might be said, omitting the interest of the cotton planter. Remedies are equally illusive. Except the stereotyped “sunrise worm hunt” with a bit of shingling, and cabbage leaves or dough poisoned with Paris green and deposited at night about the plant, nothing of value has ever been suggested.

Hand-picking for the great, green, sluggish tobacco worms, Phthorimaea operculella, usually proves effective, in combination with the process of poisoning followed by tobacco growers by means of a solution of borax and sugar deposited each morning about the dust, in the corolla of the Jimson weed, Datura stramonium, which the tobacco moth frequents.

The flea beetle, Phyllotreta citata, pinholing the foliage in clammy, cloudy weather and thereby assisting the invasions of fungi and bacilli, is sometimes repelled though not destroyed by Bordeaux mixture.

Nematode galls, Fig. 2144, p. 1545, caused by the “vinegar eel,” Heterodera rovidicola, which affect cotton, peas and certain other garden plants, frequently do much damage to the Tomato. They can be avoided only by rotation of area and preventing the contiguity of any of their host plants—particularly corns.

After all, the chief injury brought 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 flea beetles, and other forms readily pass themselves, for this reason, a serious menace. Were their complete extinguishment possible, the commercial prospects and possibilities of the Tomato plant would be infinitely improved.

**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, it is used 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 of the second set that matures when the days are long, from April on, is much heavier and the fruits are considerably larger. Nearly all the heavy yields and large specimens that are reported in the public press are secured in the later crops.

Many Tomatoes have crops from two sets of plants. One set of plants produces a crop in midwinter or somewhat later, and the other set comes into bearing in April or May. These crops may be grown in separate 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 months or more.

The Tomato requires a uniform and high temperature and is very subject to losses 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 to be made from it when the price falls below thirty cents, and, perhaps the limit of profit, taking all things into consideration, is not much below forty cents.

Tomatoes are now 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 exercised to grow them in this way and the expense is also 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 stocky and well grown and about 6 or 8 inches high when they are placed in the beds.

Sometimes the old plants are bent down at the base and one or two flower stems from near the crown 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 a support in the roof. The system of training the plants may stand 2 feet apart each way or even less. The side shoots are pinched out 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 persons prefer to start the plants 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 enriched with old short manure 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 are 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 daily 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 oedema, or dropsy. This disease manifests itself in brown elevations on the stems and in the curling of the leaves. The preventive is to keep the houses well ventilated and relatively dry in spells of dark weather. This caution applies particularly to the duller and damper parts of the houses.

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 long slender tube should be used 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 pollination should be done freely and with great thoroughness, as upon this operation depends the chance of securing a full and good crop. One may 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 pruned to a single stem. Similar plants fruited in April or May would produce considerably more than this. As soon as the fruit clusters begin to get heavy, they should be supported by cords secured to the main stem (Fig. 2335).

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 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 may be 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 undersides of the leaves and also in check by spraying with Bordeaux mixture or other fungicide. There are several forms of blight which operate as 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 blackening 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 of the fruit is often serious in Tomato houses. The cause of this rot is not definitely known. After the rot has proceeded to a certain stage, filamentous fungi develop, and these were formerly considered to be the cause of the trouble. The only remedy so far known for rot in houses is to provide a light in the root.
Dray Plough, which is good to be used for mlery Clays in Winter; but is not so proper to be used in Clays when they are hard.

No. 5. The Figure of a sing'ld Wheel'd Plough, used in Sussex.

"No. 6. The Figure of the Herfordshire Wheel Plough, which is of the easiest Draught; proper for any Grounds, except mlery 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, Mould Board, Furrow Board, Shield Board, E the Sheeth, F the Share Iron, G the Culter, H the Plough Pin and Collar Links, I the Plough Pillow, K the Wheels."

L. H. B.

TOO ART TREE. Eucalyptus gomphoeapha.

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 alter'd to be drawn by one Horse, instead of a Yoke of Ozen. '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. A Figure of the common Plough, being the most usual, which is to be amended in each Country as the Grounds and Clays require."

TOOMASINIA (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. Involucres none; involucel many-leaved; margin of carpels dilated; fla, 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-dilate, 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.

TOMATO. Husk T. is Physalis pubescens. Strawberry T. is Physalis Aitkeni and pubescens.
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 tillin the land, as plows, harrows, rollers, cultivators, weeders, 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, Insecticides, Fungicides.
4. Tools or vehicles for transporting, as carts, barrows.

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 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. 2526. 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 more 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 it 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 story of plowmaking is a romantic 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 tillage tools, used in 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 Tull, before the middle of the eighteenth century. Tull 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,” 1859 and 1869. Useful handbooks illustrating various farm devices are “Farm Conveniences” and Martin’s “Farm Appliances,” both published by the Orange Judd Company.

The spike-tooth and spring-tooth hoes.

**TOOTHACHE TREE.** See Xanthoxyllum.

**TOOTHWORT.** English-made name for Dentaria.

**TORCH LILY.** Kniphofia

**TORRÉNIA** (after Olaf Toren, clergyman; traveled in China 1750–52 and discovered T. Asiatica). Scoropocarya. 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-flowered racemes. The species are mainly from tropical Asia and Africa. Calyx tubular, plicate or 3–5 winged, obliquely 3–5-lobed at the top; corolla-tube cylindrical, usually much wider above; posterior lip erect, broad, concave, notched or more deeply cut; lower lip large, spreading, with 3 nearly equal lobes; stamens 4, perfect: capsule oblong; seeds numerous, small.

Torenia 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. flava. The plants are easily raised from seed, but may also be grown from cuttings, which root quickly.

**aa.** *Fls. mainly blue or white.*

**Asiatica**, Linn. Annual, erect or diffuse; stem quadrangular; lvs. ovate or ovate-lanceolate, long acuminate, serrate, obtuse, not ciliate at the base, rough to the touch; peduncles axillary, single-flowered: corolla large; tube dark purple; limb 4-lobed, of a delicate pale purple-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4249.

**Fournieri**, Linden (T. edentula, Hort., not Benth.). Fig. 2534. Low, bushy, usually annual, becoming nearly 1 ft. high; stem 4-angled; lvs. petioled, ciliate-lanceolate, 1½–2½ 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 purple-blue, the anterior lobe marked with a yellow blotch. L.H. 23:249. R.H. 1876, p. 465. B.M. 6747.—Var. Alba, Hort. (var. White Wings) has pure white flowers. A.P. 5:401. G.M. 36:87. Var. grandiflora has somewhat larger fls., and is more free-flowering. In the neighborhood of Philadelphia, self-sewn seed sometimes germinates in the spring; also seeds of T. flava.

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 among the old plants from self-sewn 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. 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 where there is shade and moisture. It can grow 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. Nehrling.

**TORNILLO.** See Prosopis paludosa.

**TORRÉNIA** (after Dr. John Torrey, one of the most distinguished of the earlier American botanists: 1796–1873). Syn., Támion, Caryolzona. Conifer. Ornamental evergreen trees, with spreading, usually whorled branches, clothed with yew-like, two-ranked, dark green foliage; cones often quite large; fruits and drupe-like and about 1 in. long. The Torreyas are but little known in cultivation and rarely seen in a flourishing condition. The southern
Tumion

T. laxifolia survives the winters in very sheltered positions in the vicinity of Boston, but T. Californica is not hard north. The Japanese T. nucifera is probably the hardest and most desirable species, but seems not yet to have wintered well. Torreyas will probably grow best in shaded and sheltered positions and in a 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 cions, terminal shoots should be selected.

There are 4 species in N. America and E. Asia. Trees, rarely shrubs: lvs. 2-ranked, linear or linear-lanceolate, with 2 narrow glaucous lines beneath, becoming fulvous with age; when bruised the foliage emits a disagreeable odor: fls. diocious, rarely monoeious; staminate fls. ovoid or oblong, composed of 6-8 whorls of stamens, surrounded at the base by bract-scales; pistillate fls. 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 Tumion has recently been taken up as the proper name for this genus, since the name Torreya 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 ½ in. broad or less.
B. Length of lvs. ¾-1½ in.

taxiloba. Arnott (Tumion taxilobum, Greene). Fig. 2335. 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, 1½-3 in. long. Pla. S.S. 10:512.

BB. Length of lvs. 1-3½ in.


AA. lvs. lanceolate, one-sixth in. broad or somewhat less.

nucifera. Sieb. & Zucc. Tree, usually 20 ft., but occasionally 80 ft. high, with spreading branches, forming a compact head, sometimes shrubby; bark bright red: lvs. lanceolate, acuminate, rigid and spiny pointed, very dark green above, with 2 white lines beneath, ¾-1½ in. long; fr. ovate, oblong or oblong-ovate, dark green, streaked with purple, 1½-3 in. long. Japan. S.Z. 2:129. R.H. 1873, p. 315.—The Chinese T. grandidis, Fort., is very similar in foliage, but said to lack the disagreeable odor of the other species. R.H. 1879, p. 173. G.C. II. 22:681.

ALFRED REDEK.

TORTOISE PLANT. Testudinaria Elephantipes. TOUCH-ME-NOT. Impatiens aurae and biflora.

TOURENFORTIA (Jos. Pitton de Tournefort, 1656-1708; one of the earliest systematic botanists). Borragiaceae. A large genus comprising possibly 100 species widely scattered throughout the warmer portions of the world. Mostly trees and shrubs, rarely subshrubs, with alternate simple leaves and small flowers in terminal cymes.

heliotropoides. Hook. Properly Heliotropium anchoisafolium, 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 fls.: calyx 5 lobed, hairy; corolla-tube yellow, the limb 5-lobed, lilac. Buenos Ayres. B.M. 3096.—Self-sows and comes up in the garden spontaneously. Not popular North, but a good shrubby plant in the South.

F. W. BARCLAY.

TOWNSENDIA (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). Compositae. About 17 species of low, many-stemmed herbs, nearly

TOXYLON 1823

(Toxon, from the Greek). Urticaceae. Onagraceae. Onagraceae. A 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
are voracious feeders and rapidly deplete the soil. Hardy as far north as Massachusetts. A tree with deciduous, simple, alternate, petioled, entire leaves and milky sap: branches, particularly the lower, beset with numerous straight, axillary spines 2–3 in. long: fls. minute, dioecious, apetalous, axillary, appearing in May to June, the staminate borne on the short spur-like branchlet is a strong-growing year, racemose, pendulous; petals 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 inscribing the small ovary: ovary solitary, oval, solitary: fr. a dense aggregation of enlarged, fleshy calices into a globular syncarp with a mammillate surface, light green or yellowish in color: syncarp 4–8 in. in diameter, falling as soon as ripe in the autumn.


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 tops 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 and double row. The double 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, is good 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 overrich for the Osage Orange. Top and double row in fair condition will give a growth more tractable to form a good hedge than a rank growth from rich soil.

When dug the Osage plants have very long roots, and the roots of the shoots cut off without disadvantage. If the plants are held in bunches 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 in the first year. By fall a good growth should have been 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. Overgrown plants in the first growth will kill the roots 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 the growth in the spring and before breaking out 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. Of late years a system of planting the Osage Orange directly to the railroad or the one for the road 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 way as usual, and this probably appears to the 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. See Hedgerow.

JOSEPH MEHEAN.

TRACHELOSPERMUM (Greek, tracheleos, neck; from its supposed efficacy in diseases of the throat). Campanulaceae. Throatwort. A genus of 4 or 5 species of perennial herbs or low shrubs with usually somewhat simple stems and terminal panicles of small blue flowers. The species are native to the Mediterranean region of Europe. Calyx 5-lobed; 5, narrow; corolla tubular; stamens free from the corolla; capsule nearly globose: seeds many-ovulate.

caroleium, 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. 1817, p. 47. 4. 1818, p. 184. 1822, p. 47. 5. 1824, p. 298. A flowering perennial suited to culture as an annual. According to G. H. 28, p. 181, the species is fairly hardy in England, but young plants are more floriferous than old ones. Seed may be sown in March. The plant is easily propagated by cuttings. According to An. 47, p. 303, plants from cuttings are dwarf and seedlings.

F. W. BARCLAY.

TRACHELOSPERMUM (Greek, referring to the fact that the seed has a neck). Apocynaceae. Trachelospermum is a genus of 8 species of climbing shrubs native to Europe, Asia Minor, and Madeira. It is white or purplish fleshy, in lax cymes. Generic characters: calyx 5-parted, glandular or sealy within: corolla salver-shaped; mouth constricted: lobes oblique, the upper half attached to the tube, the tube inserted above the middle of the tube; anthers connivent over and adhering to the stigma; cells spurred at the base: disk annular or of oblong glands: carpels 3, distinct, many-ovulate.

T. Jasminoides, the Star Jasmine, is a tender, evergreen, shrubby climber from China, with fragrant, white, 5-lobed flowers. It is a favorite in the South, where it is grown out of doors and known as the "Confederate Jasmine." In northern conservatories it is generally known under its synonym, Rhynchospermum. Handsome specimens may be grown in large tubs, making dense bushes 3 or 4 ft. high and as much in diameter. In May such specimens are covered with flowers and filled with 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-pinnate white ginned petals (or rather corolla-lobes) are rolled back. See Fig. 2357.

"Rhynchospermum" is a most satisfactory greenhouse subject for families without greenhouses. It requires no special treatment, except that the plants should be kept on the dry side during the winter.

It requires several years to work up a good-sized specimen. Young plants should be given greenhouse treatment and encouraged to grow. Large, well-established specimens thrive in a greenhouse. During sum-
mer the pots may be plunged outdoors in a partially shaded position. The species is propagated by cuttings of half-ripened wood taken with a heel in spring. The Star Jasmine is one of the many good old standard greenhouse plants that are too little seen nowadays. The writer knows of two large specimens trained to a bush form that are the chief shrubbery ornaments of a cool greenhouse from late April to early June. Every year they are loaded with flowers throughout the month of May. The specimens require considerable room, and the gardener is sometimes compelled to keep them in a cold pit until the chrysanthemum season is over, although this treatment is not to be advised.

Jasminoides, Lem. (Rhynechospermum Jasminoides Lindl.) Star Jasmine. Also called "Confederate," "Malayan" or "African Jessamine," Fig. 2537. Tender, evergreen, climbing shrub described above; lvs. short-stalked, ovate-lanceolate, acute, glabrous; peduncles much longer than lvs.; calyx-lobes reflexed; corolla-tube contracted below the middle; several jagged scales at base of corolla; 5 large glands at base of ovary, 2 united, 3 free. Southern China. B.M. 4737. On. 5:132. Gn. 41. p. 507. E.-Var. variegatum Hort., has lvs. of green and white, tinged red. ROBERT SHORE and W. M.

Star Jasmine (Trachelospermum Jasminoides) is a very choice and beautiful woody climber for the South. Being a native of the southern part of China, it is well adapted to the climate of the extreme South. It comes to bloom early in April and the last flowers can be enjoyed late in May. Even in October and November one may find numerous scattered flower-clusters. When in full bloom the plant seems to be covered with a white sheet, the flowers almost hiding the dark green foliage and filling the air for many yards away with a peculiar and most delicious fragrance. The Star Jasmine is beautiful even without flowers. It is not easily propagated and therefore it is not a common plant in gardens. Even small plants with good roots require a great deal of intelligent care, and it is no easy matter to bring transplanted specimens into a flourishing condition. It should be transplanted into the garden in November or December, pot-plants always being preferable for this purpose. The soil should be kept moist all the time, and especially during the dry spells in April and May. If the soil is not naturally rich a moderate amount of fertilizer should be applied. When once established, the plant does not need any more care than the Carolina Jasmine (see Gelsemium). In summer, during the rainy season, a mulch of grass and fresh cow manure is exceedingly beneficial. It is best grown on a trellis of two, three or even four posts about ten feet high, with strong galvanized wire all around; or strong laths can be used instead of wire. If the specimen is a strong and healthy one it will soon cover the trellis in a dense tangled mass and the new shoots will gracefully protrude to all sides. The propagation is best affected in Florida by layering, and strong plants can be raised in this way in about two years.

H. NEHRLING.

2538. Fortune's Palm—Trachycarpus excelsus (or T. Fortunei).

The leaves finally become 4-5 feet across.

and western parts of England. In some sheltered spots in these favored regions it has flowered regularly year after year. It is also favored in the colder regions of the Far East. It is a member of the Chamaerops group, which grows outdoors the year round in the southern

2538. Fortune's Palm—Trachycarpus excelsus (or T. Fortunei).

The leaves finally become 4-5 feet across.

TRACHELOSPERMUM

TRACHELOSPERMUM (Greek, rough or harsh fruit). Palmaeae. FORTUNE'S PALM, known under many technical names, is of unique interest to the horticulturist, as it is the hardest of all palms. It is a spineless fan-palm which grows 30 ft. high. It is slightly harder than Chamaerops humilis, the only palm native to Europe. Fortune's Palm is the only trunk-producing palm which grows outdoors the year round in the southern

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TRACHYCARPUS

Horticultural View of Trachycarpus.

A. Trunk clothed with old leaf-sheaths.
   Himalayan species.
   b. Tips of leaf sheaths: ves. very glaucous beneath.
      Martianus
      Khasyanus
   AA. Trunk not clothed with old leaf-sheaths.
   Chinese and Japanese species.
   b. Tips of leaf pendulous: Fortunei
   bb. Tips of leaf straight: excelsus

Following is the Latest Botanical View of Trachycarpus.

Martianus, H. Wendel. (T. Khasianna, H. Wendel. T. Griffithii, Decne.). Trunk for the most part naked, annulate; female fls. solitary, sessile; drupe oblong, equally rounded at both ends; seed grooved throughout its entire length; embryo opposite the middle of the groove. Himalayas. R.M. 7128. R. H. 1879, p. 212.

excelsus, H. Wendel. (T. Fortunei, H. Wendel.). Fig. 2303. Trunk clothed throughout, with the old leaf-sheaths; fls. clustered.

2359. Three kinds of Wandering Jew.

A. Tradescantia fluminensis: tender, sheaths hairy at top; flowers white. B. Zebrina pendula: tender; sheaths hairy at top and bottom; flowers rose-red. C. Commelina nudiflora: hardy; sheaths glabrous; flowers blue.


Trachycarpus Fortunei is not a popular florist's palm for three reasons: First, it is not as beautiful as Litschiana Chinesis; 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 shiny, and in texture decidedly tough. In a young state it bears much resemblance to Litschiana Australia, though the latter is more spiny and has longer footstalks.

TRACHYMENEE (Greek, rough membrane; alluding to the fruit). Umbellifera. A genus of 14 species, 12 of which are American annual, biennial or perennial herbs, usually hisute, with ternately divided leaves and blue or white flowers in terminal umbels. Calyx-teeth minute; petals entire, obtuse, imbricated; fr. compressed. Flora Australiensis, Vol. 3.

caricela, R. Graah. (Didiscus caricela, DC.). An erect annual about 2 ft. high, somewhat hairy; lvs. 1-2-

TRADESCANTIA

triparted, with linear, acute, 3-cut lobes; peduncles long, bearing an umbel 2-3 in. across of very numerous hollow-based flowers; calyx-teeth obsolete; petals unequal, the external being longer. July-Oct. Australia. B.M. 2875. B.R. 15:1225.

F. W. Barclay.

TRADESCANTIA (John Tradescant, gardener to Charles I.; died about 1638). SPIDERwort. Thirty-six species are admitted by C. B. Clarke, the latest monographer, 1881 (DC. Monogr. Phaner. 3). This enumeration does not include T. Reginae and other recent species. They are all American perennial herbs, ranging from Manitoba to Argentina. In habit they are various, ranging 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 fleshy. The leaves are alternate, arising in 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 straight or a 3-lobed dehiscent capsule. The genus Zebrina, usually confounded with this by gardeners, differs, among other things, in having a tubular perianth.

To herbiculturists, Tradescantias are known as hardy herbs, coolhouse plants and warmhouse plants. T. Virginica is the best known of the hardy species, withstandning the climate of the northern states. The Wandering Jew of greenhouses and hanging baskets, usually known as T. triflorus, is partly T. fluminensis and partly Zebrina pendula. T. Reginae is perhaps the best known warmhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The glasshouse species are essentially foliages 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. manduca and T. albiloba, Kunth. T. vepens, vepens vittata, viridis, viridit vittata, prostrata, prosoenches, strizah, Hort. T. tricolor, Hort., in part). WANDERING JEW in part. Figs. 2356-1. Zebraslabras, with shining stems and leaves; nodes conspicuous, trailing, or the ends of the shoots ascending; lvs. ovate-acute, without distinct petiole, ciliate at the very base, the sheaths 1/2-3 in. long; fls. white, hairy inside, the 3 stamens all alike, homogamous, but 2-3 together in a sessile cluster subtended by 2 unequal lvs. or braets, 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 Viridis. There are forms with lvs. striped yellow and white, but these colors usually do not hold unless there is abundance of sunlight. In light places, the lvs. become a rich red, purple beneath. Very easily propagated by cuttings or pieces of shoots at any time of the year. The plant needs plenty of moisture in order to grow vigorously. Three species are known as Wandering Flower or Trades-Jew, and although they belong to three genera, it is not easy to tell them apart when not in flower (Fig. 2359). These plants are Tradescantia fluminensis, sheaths hairy or ciliate only at the top, frs. white; Zebrina pendula, sheaths hairy throughout or at least at base and top, lvs. red or yellow beneath, hairs always colorless above, frs. rose-red; Commelina nudiflora, sheaths glabrous, frs. blue. The two first are tender to frost; the

2350.
last is hardy in the open ground in central New York. All of them are used for baskets and vases. The two first are best known and are the plants commonly known as Wandering Jew. All of them may have striped 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.

I. sessile, All.

Dichorisandra, Warscewicziana, Anier. Wandering cluster.

Ivs. are having species. and crowded

EE. E. R.B.

I. of light

H. R.

blue-purple, at the edge

Lind. R.H.

blue-green

19:113.

I.

6

of

H.

Now referred to Fyrrebing, being the only species.

cc. Stem evident, usually branching.

D. Lvs. distichous (in 2 rows).

Regine, Lind. & Rod. Stiff-growing upright plant: lvs. lanceolate-acuminate, sessile, set closely on opposite sides of the stem and spreading nearly horizontally, about 6 in. long, the center purplish crimson, with feathered border, the space towards the margins silvery, the very edge of the leaf darker, the under side purpl. Peru. I.H. 39:147; 40:173 (3); 41: p. 14. G.C. III. 11:299; 13:477. R.B. 12:193.—Intro. into Belgium from Peru in 1870. Named for the Queen of the Belgians. Perhaps a Dichorisandra.

DD. Lvs. not 2-ranked.

e. Stamens all equal and similar.

Warscewicziana, Kunth & Bonché (Dichorisandra Warscewicziana, Planch.). Fig. 2542. Dichorisanda-like, having a stout caudex or trunk, marked by leaf-sears and finally branching: lvs. green, stiffish, 1 ft. or less long, clustered at the top of the stem, recurvating, lanceolate-acuminate: fls. lilac-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5188. R.H. 1860, p. 136.

2541. Wandering Jew—Tradescantia fluminensis.

Natural size.

EE. Stamens unequal,—2 long and 3 short.

longata, 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 sepals green. Tropical Amer.

bb. Species grown as border plants for their flowers: native kinds.

c. Umbels sessile.

Virginiana, Linn. COMMON SPIDERWORT. Erect, branching, 1–3 ft., glabrous or nearly so: lvs. conduplicate, very long linear-lanceolate (6–15 in. long), clasping: umbels several-fl., terminal, the pedicel recurving when not in bloom: fls. violet-blue, in various shades, 1–2 in. across, produced freely near all the base. N.Y. to S. Dakota, Va. and Ark. B.M. 105; 3546 (as T. carici- folia). L.B.C. 16; 1513 (as T. elata).—An exceedingly variable plant. Var. occidentalis, Britt., is in the trade. It has much narrower lvs. and smaller fls. and is usually dwarf. There are several horticultural forms. Var. alba has white fls. B.M. 3501. Var. arosanguinea has dark red fls. Var. cocinea has bright red fls. Var. carnea has bright blue fls. Some of the forms would better be regarded as species. See Rose, Contr. Nat. Herb. 5:204.

brevicaulis, Raf. Villous, 1 ft. or less high, sometimes nearly acaulescent: lvs. mostly from near the ground, linear-lanceolate, more or less ciliate; fls. about 1 in. across, blue or rose-purple. Ky. to Mo.

cc. Umbels peduncled.


L. H. B.

TRAGOPON (Greek for goat’s beard). Composites. 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 beak; involucral cylindrical or nearly so, with approximately equal bracts in a single row. The Tragopongs are mostly weedy plants with a tap-root. They are native to northern Europe, northern Africa and 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.
TRAGOPOGON

porrifolius, Linn. SALSIFY. VEGETABLE OYSTER. OYSTER PLANT. Figs. 2328, 2343. 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.

AA. Flowers yellow.

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.

L. H. B.

TRAILERS. See Vines.

TRAILING ARBUTUS. Epigaea repens.

TRAILING BEGONIA. Cissus discolor.

TRAINING. See Pruning.

TRANSPARISON 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 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 transpire over 120 or 130 tons of water into the air during the course of a season, and an acre of hawthorn 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 may be raised more than a yard in height growing in a pot may be used. Set the pot on a square of oil-cloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporating except from the plant as prepared 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 the water into the pan, and the scale will show 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 this function. The interior of the leaf is made up of a great number of loosely arranged cells which evaporate water into the air between them. The air in the leaf communicates with the atmosphere through small circular openings called stomata, which are generally placed on the lower side of the leaf. Consequently the watery vapor diffuses 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.

Some 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.

TRANSPANTING 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 in a growing condition, as in early spring. 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 least of attention given 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 thoroughly moistened and prepared to enable it to reestablish itself; part of the top usually should be removed in order to lessen transpiration, and with succulent and growing plants some shade should be provided for a time. The deeper and finer the soil, and the greater the quantity of mineral salts, 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 in arid regions.

In the more arid parts of the country transplanting is performed as little as possible, whereas in the eastern part great quantities of annual and other garden plants are often transplanted from the field to the greenhouse.

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 oper-
tion. Herbaceous or growing plants that are relatively short and stocky and 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 open air, and they probably also have more recuperative power than long-rooted plants to and from the earth. 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 loose, 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 firmly closed 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, such as leaves, one inch deep, of litter, sawdust, or coarse manure. When practicable the water may be saved by keeping 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 be best done at nightfall. The water should be applied in a hole or depression not the plow width 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 remove with great difficulty. In these cases the special skill which is born of experience with these particular plants must be invoked for successful transplanting. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and the hickories. In these instances the plant may be prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust under the crown. In other cases the difficulty is the inability of the plant to make new feeding roots quickly, as in some of the asimilas or paws. 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 plant is to be removed. In other cases the inability to be transplanted is probably due to excommunication from the foliage. In these instances cutting back severely, and providing shade may contribute to success. In some instances the difficulties are so great as to practically prohibit transplanting.

2544. A dibber. One of the most useful implements to aid in the transplanting of small plants is the dibber. It is dropped into a hole made by the dibber; this hole is closed by inserting the dibber at the side and moving it against the plant.

the excessive rate of transplanting. In these cases cutting back severely and providing shade may contribute to success. In some instances the difficulties are so great as to practically prohibit transplanting.

2554. A transplanting box, especially designed for melons. It is made of a "flat" or splint 14 in. long and 3½ in. wide, bevel at four corners and held in place by a tack. It has no bottom.

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. 5244. 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 bevel or slope of the pot allows the ball of earth to be "knocked out" readily. See Potting. Special transplanting boxes are on the market, to be used instead of 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. 2445. 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 to 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 already 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 properly large size, among which are elms, maples, pin oak, basswood; 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 admit 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 circumference, and 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. 2517, 2518.

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 caved 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 lath 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 to within 4 to 8 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 2 to 3 feet. 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.

2547. A large tree removed from its place. The roots are now to be wound in burlaps or other material.

While the tree is horizontal, it may be most conveniently pruned. Th. outside should be cut back 1 to 3 ft. top interferes with slats, and the remaining twigs thinned out about one-third. Hardwood trees and trees with few roots need the most severe pruning.
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 most prevalent prejudice that moving large trees is an ultimate failure, or that small trees quickly overtake them, arises from moving trees 1 to 2 feet 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 all 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 constantly transpiring, 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 haws, 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 not as transplanting, but with care the canvas will hold balls of sand or gravel. Root-pruning, one or more years pre-

2548. The roots wrapped, and the tree being moved on skids.

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.

Every tree 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 about Chicago differs 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 thriving. 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 silt in new soil between the fine ball-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 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 tamp 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 counter check 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.

TRAIPA (name explained below). Ongroideae. Trapa natans, the WATER CHESTNUT or WATER CULTROPS, 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 spineless angles. It is roasted and eaten in some parts of Europe like the common chestnut. The Indian species, T. bispinosa, is said to yield very large and sweet nuts which are commonly sold in the East under the name of Singshara Nut. The name "Trapa" is derived from catteltrape, which is the same as cattlops, an instrument of war used to impede the progress of mounted warriors. It had 4 spine-like projections, like the fruit of the Water Cultrops.

Generic characters: "fls. small, axillary, solitary, short-peduncled; calyx 4-parted; the segments persistent, sometimes spineless; petals and stamens 4; ovary 2-loculed; ovule solitary, long, pendulous, attached to the septum; fr. top-shaped, leathery beneath; fr. 4-spined, but the 2 lateral ones shorter. Et., Orient. Gr. 24, p. 557. G.C.II. 10:212. B.R. 3:259.

bispinosa, Roxb. SINGHARA NUT. Petiole of floating lvs. 4-6 in. long, wolly: blade 2x3 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 aquaria, pools, ponds or tub culture. Its beautifully mottled or variegated foliage is very attractive. The flowers are white, small and inconspicuous. The fruits are very large in comparison with the flowers and leaves, but they are hidden beneath the foliage until they ripen, when they drop off. They are good to eat raw, like chestnuts, and are sweeter and more 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. Tricker.

TRAUTVETTERIA (Trautvetter, a Russian botanist). Ranunculaceae. A genus of but two species of North America and eastern Asia. Tall, erect, perennial herbs: lvs. broad, palmately lobed; fls. white, small, corymbose-paniculate; sepals 3 to 5, caducous; petals none; carpels many, forming 1-seeded akenes. Very hardy, thriving in ordinary or rich soil. Propagated by division of roots. Offered by dealers in native plants.

Carolinensis, (Vall. (Hydrothallis Carolinensis, Walt. T. paludata, 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. 1653 (as Cimicifuga paludata).

grandin, Nutt. (Actea paludata, Hook. A. grandis, Dietr.). Much like the above species. Lvs. membranaceous, more deeply lobed, often to the base, thin, sparsely hairy beneath along the ribs; reticulations less distinct: styles longer and somewhat curled. Wash., Idaho, Brit. Col.

K. C. Davis.

TRAVELER'S JOY. Clematis vitalba.
TRAVELER’S TREE

TRAVELER’S TREE. See Ravenata.

TREASURE VINE. Name proposed by J. L. Childs for Hidalgoa Wercklei or Childsia Wercklei.

TREE. Candelabrum, or Chandeller 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 algae 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 gigantea 35 feet, in Taxodium distichum 30 feet, and somewhat less in Adansonia digitata.

2551. A pasture elm.

The age attributed to many of the tallest trees is based more or less on speculation, and opinions often differ widely. Dracaena Draco is believed to reach 6,000 years of age, Adansonia digitata 5,000, Taxodium mucronatum and Platanus 4,000, Cupressus sempervirens and Taxus baccdla 3,000, Castanea sativa, Quercus pedunculata, Sequoia gigantea and Cedrus Liboni 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 more. The Sequoias are of more majestic and gigantic appearance than the Eucalyptus on account of its massive trunk (see Sequoia, p. 1669). Pseudotsuga Douglasii and Pinus Lambertiana occasionally attain 300 feet. A number of other conifers, chiefly American, grow to a height of 150 to 300 feet. Some deciduous trees, as Platanus occidentalis, several species of oak and Iriodendron Tulipifera exceed 150 feet in height. The jequitiba of Southern Brazil (Couratari legalis, one of the Myrtaceae) is also a gigantic tree (see Bot. Gaz. 31, p. 352).

The greatest diameter has been observed in Castanea vesca, of which a tree with a partly decayed trunk at the foot of Mt. Etna in Sicily measures more than 60 feet in diameter. After this the greatest diameter observed is in Taxodium mucronatum, about 40 feet, and in Platanus orientalis about the same, in Sequoia
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 Hardy north. None of the larger orders contains trees only, but there the trees, which consist exclusively of woody plants and include a large proportion of trees, as Conifera, Cupulifere, Salicaceae, Juglandaceae, Magnoliaceae, Sapindaceae, Elaeagnaceae, Ulmaceae, Hamamelidaceae, Lauraceae, Anacardiaceae, Ebenaceae, Styracaceae 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 waterflow, 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 sylviculture 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 him 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 cee planted, and often not by him-

tion which are hardy in the northern and middle states. About 240 of them are American, almost 200 from eastern Asia, about 100 from Europe and 70 from western and central Asia. About 40 natural orders are represented, of which the most important are the Conifera, Cupulifera, Salicaceae, Rosaceae, Leguminose, Juglandaceae, Sapindaceae, Ulmaceae, Magnoliaceae and Oleaceae. The number of all the cultivated varieties and garden forms is, of course, considerably larger than that of the botanical species and may be estimated at about 3,000. Comparatively few horticultural varieties are found in American nurseries as compared with European, but this need not be regretted, as horticultural varieties are mostly merely curious or monstrous forms. In planting, one must rely chiefly on the types and use the horticultural varieties sparingly, for restfulness should be the prevailing character of the masses and groups of trees.

The fundamental purposes of trees in landscape gardening are to furnish the great masses of foliage which form the background, and partly constitute the views and landscape pictures, to emphasize the elevations of the ground, to vary the sky-line, to screen or block out unsightly objects, to enhance the beauty of buildings,
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 intended 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, 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 hardness 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 rubrum (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 Souchangana (fls. white to purple).
Prunus Avium and other cherries (fls. white).
Prunus Americana and other pinks (fls. white).
Prunus Davidiana (pink, also white, the earliest of all Prunus).
Prunus pendula (fls. pinkish, branches pendulous).
Prunus Pseudocerasus (fls. white to pink).
F. baccate and other species (fls. white to pink).
Salix (stamine plants with yellow catkins).

B. Blooming late in spring after the leaves.

E. Hippocastanum and other species (fls. white or red).
Catalpa speciosa (fls. white).
Cladrastis tinctoria (fls. white).
Cornus Kousa (fls. white).
Crataegus (fls. white).
Fraxinus Orinus (fls. white).
Laburnum (fls. yellow).
Magnolia hypoleuca (fls. white).
Pierostyrax (fls. white).
Robinia (fls. white or light pink).
Syringa vulgaris (fls. white to pink).
Tamarisk parviflora (pink).

AAA. Blooming in summer and autumn.

Aralia Chinensis and spinosa (fls. Aug. and Sept.).
Castanea Americana (fls. white; July).
Gordonia pubescens (fls. white, Sept., Oct.).
Koibreuteria paniculata (fls. yellow; July, Aug.).
Oxydendrum arboresum (fls. white; July, Aug.).
Rhus semialata (fls. white; Aug., Sept.).
Robinia Neomexicana (fls. light pink; Aug.).
Sophora Japonica (fls. white; Aug.).
Syringa Japonica (fls. white; July).
Tamarisk (frigida (fls. pink; Aug., Sept., if severely cut back).

2. TREES WITH SHOWY FRUITS.

Acer rubrum (fr. bright red in May and June).
Alnus glutinosa var. erythrocarpa (fr. red).
Cornus floridana (fr. scarlet).
Crataegus coccinea and allies (fr. scarlet or red).
Hippophae rhamnoides (fr. yellow).
Ilex opaca (fr. red).
Magnolia hypanthes (fr. scarlet).
Magnolia tripeta (fr. pink).
F. baccata and allied species (fr. yellow or scarlet).
Rhus Cotinus (ample feathery panicles).
Rhus triphylla (fr. red).
Sassafras officinalis (fr. dark blue with red stems).
Sorbus Americana and Aucuparia (fr. red).
T. baccata (fr. scarlet).

3. TREES VALUED FOR FOLIAGE EFFECTS. (See also Section 5, EVERGREENS, below.)

A. With colored foliage.

Acer Negundo, var. argenteo-variegatum (the most effective of hardy variegated trees).
Acer Negundo, var. aureo marginatum (fls. yellow).
Acer palmatum, var. atropurpureum (fls. purple).
Acer platanoideae, var. Reitenbachi (fls. becoming dark red in summer).
Acer platanoides, var. Schneideri (fls. bright red in spring).
Acer Pseudoplatannus Woreli (fls. yellowish).
Betula alba, var. purpurea (fls. purple).
Fagus sylvatica, var. purpurea (fls. purple).
Populus alba, var. nivea (fls. white beneath).
Populus deltoides, var. aurea (one of the best yellow-leaved trees).
Quercus pedunculata, var. atropurpurea (fls. purple).
Quercus pedunculata, var. Cordicord (fls. yellow).
Salix alba, var. argentea (fls. silver white).
Tilia tomentosa (fls. white beneath).
Ulms campestris, var. argenteo-variegata (fls. white).

AA. With large, bold foliage.

Acer insigne.
Acer macrophyllum.
Aralia Chinensis and spinosa.
Asimina triloba.
Catalpa speciosa.
Magnolia macrophylla.
Magnolia tripeta.
Paulownia imperialis.
Quercus dentata.

AAA. With small narrow or finely cut foliage.

Acer palmatum, var. dissecatum.
Acer platanoides, var. Lorbergi.
Acer saccharinum, var. Wieri.
Alnus glutinosa, var. imperialis.
Betula alba (cut-leaved).
Ceanthus argenteo-folia.
Ceanthus purpureo-folia.
Salix nigra.
Salix nigra, var. laciniata.
Tamarix Gallica, etc.
Taxodium distichum.

4. TREES WITH BRILLIANT AUTUMNAL TINTS.

Acer rubrum (scarlet).
Acer saccharum (scarlet and orange).
Cornus florida (scarlet).
Cercidiphyllum (yellow and purple).
Crataegus (mostly scarlet and orange).
Fraxinus Americana (yellow or violet-purple).
Liquidambar (scarlet).
Liriodendron (bright yellow).
Nyssa sylvatica (scarlet).
Oxydendrum arboreum.
Quercus alba (vino purple).
Quercus cocinea, palustris (scarlet).
Rhus (mostly scarlet).
Sassafras (orange and scarlet).

5. EVERGREEN TREES

A. Conifers (see also Vol. 1, p. 358).

Abies.
Chamaecyparis.
Juniperus Virginiana.
Picea.
Pinus.
Pseudotsuga.
Thuja.
Tonga.

AA. Broad-leaved evergreens (only fls opaca and Rhododendron hardly north).

Ilx opaca.
Magnolia grandiflora (not fully green as far north as it is hardy).
Magnolia grandiflora.
Picea Caroliniana.
Pinus Contorta.
Quercus Virginiana.
Rhododendron maximum.
6. DECIDUOUS TREES VALUED FOR THEIR WINTER EFFECTS.

Acer Negundo (branches light green).
Acer Pennsylvanicum (striped bark).
Betula nigra (flaky reddish brown bark).
Betula papyracea (smooth, silvery white bark).
Crataegus viridis (red fruit).
Eugenia sylvatica (keeps its dead leaves).
Gleditschia (large, flat pods).
Hippophae (yellow berries).
Ligustrum (orky branches).
Pyrus prunifolia (scarlet or yellow fruit).
Quercus alba, pedunculata and tinctoria (keep their leaves).
Quercus macrocarpa (orky branches).
Rhus typhina (scarlet fruit).
Salix vitellina (yellow branches).
Sophora Japonica.
Tilia americana and Aucuparia (scarlet fruit).

7. VERY TALL TREES.

Glechischa 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 nigrum, var. monumentale.
Betula alba, var. fastigiata.
Carpinus Betulus, var. fastigiata.
Chamaecyparis Lawsoniana.
Chamaecyparis Nutkaensis.
Juniperus communis, var. Squamata.
Juniperus Virginiana (especially var. pyramidalis).
Liriodendron Tulipifera, var. pyramidalis.
Picea (most species).
Populus alba, var. Bolleana.
Populus nigra, var. Italica.
Quercus pedunculata, var. pyramidalis.
Taxodium distichum (especially var. Imbricatum).
Taxus baccata, var. Fastigiata.
Thuja.
Ulmus campestris, var. monumentalis.
Ulmus scabra, var. fastigiata.

9. WEEPING TREES.

Acer saccharinum, var. Wleri.
Betula alba, var. pendula.
Fagus sylvatica, var. pendula.
Fraxinus excelsior, var. pendula.
Fraxinus parvifolia, var. Pendula.
Prunus pendula.
Prunus aerotina, var. pendula.
Quercus pedunculata, var. Duovessel.
Salix vitellina, var. pendula.
Salix Babylonica.
Salix blanda.
Sophora Aucuparia, var. pendula.
Tilia petiolaris.
Ulmus scabra, var. pendula.

10. CITY TREES (See also No. 11).

Alianthus glandulosa (pistillate tree).
Carpinus.
Crataegus Oxycanthus.
Fraxinus Americana.
Fraxinus excelsior.
Ginkgo biloba.
Gleditschia triacanthos.
Platanus orientalis.
Populus deltoides.
(usually attacked by borers).
Populus nigra, var. Italica.
Prunus serotina.
Robinia Pseudoacacia (often attacked by borers).
Sophora Japonica.
Ulmus Americana.
Ulmus monestria.
Tilia imbricata.

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 trees are good avenue subjects:

Acer platanoides.
Acer rubrum.
Acer saccharinum.
Acer saccharum.
Eucalyptus carnea.
Eucalyptus Hippocastanum.
Catalpa speciosa.
Celtis occidentalis.
Fagus intermedia and F. sylvatica.
Liquidambar styraciflua.
Liriodendron Tulipifera.
Quercus alba.
Quercus coccinea.
Quercus imbricaria.
Quercus palustris.
Quercus Phellos.
Quercus rubra.
Tilia Americana.
Tilia dysenterica.
Tilia imbricata.

12. TREES FOR SEASIDE PLANTING.

Alianthus glandulosa.
Crataegus Oxycanthus.
Eucalyptus angustifolia.
Hippophae 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.
Eucalyptus angustifolia.
Fraxinus pubescens.
Pteleodendron Amurensis.
Pinus ilicifolia.
Pinus rigida.
Pinus sylvestris.
Quercus coccinea.
Quercus rubra.
Quercus Primus.
Quercus velutina.
Ulmus effusa.

14. TREES FOR WET SOIL.

Acer rubrum.
Acer saccharinum.
Alnus glutinosa.
Alnus maritima.
Betula alba.
Betula nigra.
Chamaecyparis Spheroidea.
Hicoria laciniata.
Nyssa sylvatica.
Picea alba.
Picea nigra.
Pinus rigida.
Populus (most species).
Quercus alba.
Quercus bicolor.
Quercus palustris.
Quercus Phellos.
Salix (most species).
Taxodium distichum.

ALFRED REHDER.

1. DECIDUOUS TREES. Acer saccharinum (A. dacryanum) 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. — Catalpa. Valuable as an early spring-flow- ering tree. — Celtis. One of the most distinct trees: an excellent shade tree. — Catalpa. Seldom planted.
TREES

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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. astilbe* or Apple Haw. - *Chitonopsis saligna*, known as *C. linearis*, is one of the best for dry soils. The typical species produces lavender-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. Adapt itself to nearly all soils. There are many forms varying both in the foliage and size and shape of fruit. - *Fagus turriginea* 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. - *Frexinus excarnata* and *F. pubescens*. Both thrive best in rich soils and are very desirable for street planting, being seldom attacked by insects. - *Ginkgo* or *Salixbria* 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. - *Gleditschia 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. - *Halesia tetraphylla*. 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 *Carya*. 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 myristiciformis* is scarce, but its foliage is more attractive than that of any other species. *Heliantus dulcis*. The foliage and the fleshy 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. - *Karreutaria paniculata*. Very desirable for its pinnate foliage and panicles of yellow flowers, which are succeeded by bladder-like fruits. - *Lagerstromia Indica*. The Crape Myrtle is one of the most characteristic features of southern homes. It has become almost naturalized south. If trained 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. Fraseri*, Ear-leaved Magnolia or Wahoo of the western North Carolina mountainers, 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. Soulangeana* 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

2553. A pasture maple, in autumn, showing the strong framework.

and economic trees and is extensively planted for avenues. The Persian or English walnut and its many forms are being more largely planted than of old, but are often injured by late spring frosts following a warm
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 Stubbins from the discoverer, produces enormous crops of large, rich vinous fruit. This and the Hicks and Multicaulis (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.* Only desirable in landscape work for the brilliant red tint of its autumn foliage.— *Oxydendrum.*

**2555. Apple, one of our most picturesque trees.**

*Arboreum.* Desirable for its flowers and highly colored autumn foliage.— *Parkinsonia aculeata.* Retoma or Horse bean of southern Texas. A small tree with green bark, feathery foliage and yellow flowers. Valuable for shrubbery.— *Paulownia 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.— *Peach.* 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 Chicasaw 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 hortulana* is the best purple-leaved tree for the South, as it retains its color during summer.— *Pinckneya pubens.* 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.— *Prunus serrulata.* One of the most desirable trees for street planting.— *Pomulus.* The variety which is of greatest value for street planting is *P. deltoides* or monilifera, commonly known south as cottonwood. It is of rapid growth and grows in nearly all soils that are not too arid. All southern nurseriesmen catalogue the Carolina Poplar, but the stock is not always true to name.— *Pterocarya fraxinifolia,* 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 all species of oak are sometimes planted for shade, and are found more or less abundant in the middle South, but the most valuable purely southern species are as follows: *Q. photia,* or Willow Oak, with lanceolate leaves; *Q. laurifolia,* or Oak, perennial, oblong and obtusely lobed. Both are largely planted for streets and shade, as they grow very rapidly and in almost any soil. *Q. tatea,* or *Q. luteolaria,* *Q. Phellos* and *Q. Muhlenbergi* 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 when planted in avenues.— *Sapindus marginatus.* The glossy yellow berries are retained during winter. Berries when dried, produce a somewhat unpleasant fluid.— *Sebisa.* Naturalized on the coast of Georgia and South Carolina. The acuminate rhomboidal leaves give the tree a unique appearance. Requires rich soil and is valuable in landscape work.— *Sycamore.* Common. Could be available for shrubbery.— *Tilia 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 *Maclura,* 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, green fruit. The wood is valuable for posts and takes a beautiful polish.— *Ulmus americana* is perhaps more largely planted for streets and avenues than any other deciduous tree.— *Viburnum prunifolium* (Black Haw or Duncan 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 the bush form, they be single stems and attain a height of 20 or more feet in the coast region, where they have found a congenial soil and climate. The typical single red variety, a tree of which is growing in Charleston, S.C. and under the name of *C. rubra,* which was 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.— *Cinna- momum camphora.* In southern Louisiana and 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 orange tint in winter. blossoms in January, and if not frost-killed are 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 start tree formed only in shallow swamps or turfy soils. The roots spread almost entirely near or upon the surface of the ground, which makes it difficult to transplant trees taken from the woods. *G. lasianthus,* and *G. Unguicularia* are difficult to transplant, but a rich moist soil is necessary to their growth.— *Ilex.* *I. opaca* and *I. dohoun* are among the most valuable evergreen trees, the former being the best where a large supply is required. Shrubbery that would 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 just considered the glory of the southern broad-leaved evergreen trees. There live stems from 100 feet and upward. Their size and shape of the leaves and the flowers. The superb white flowers, which are seen from May until August and occasionally upon some trees as late as October, vary from 4 to 12 inches in diameter. This tree is found north as Washington, Idaho, and Montana. _M. glauca_ has white flowers 2 to 3 inches in diameter and delightfully fragrant. —_Osmanthus fragrans_, var. _rubra_ and _O. Aquifolium_, var. _ilexfolius_, can be cultivated under great trees. The flowers of the first are delicately fragrant and produced twice a year. — _Persea Carollinensis_. Planted for shade in houses and for ornamental purposes. — _Photina serrulata_, or Chinese Evergreen Thorn, has white flowers and dark red autumn foliage. — _Pterocarpus Carolineae_. 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 1860 and many large trees are 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. —_Salix Nutella_ 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_. An admirable tree and of rapid growth, 40 to 50 feet. _C. Atlantica_. 25 to 30 feet. — _Cunninghamia Sinesis_. Foliage resembles an Aralia. — _Cypressus_. _C. sempervirens_ has many forms, from the compact, spiral or column-like shape to spreading habit. _C. Jusitanica_ or Cypress of Goa, has numerous forms with foliage of an ashy green and pendulous branches, to others of a more dark tint and rigid form. Of _Chamaecyparis Lawsoniana_ there are endless forms, from a compact, erect habit and rigid green foliage to those of open or pendulous shape and with glaucous or golden foliage. _C. taxifolia_ has varied less in its seedlings. — _Juniperus_. The Irish Juniper is of fine pyramidal form, and reaches a height of 15 feet. _J. excelsa_, _Chinensis_ and _thunbergii_ differ in the tint of their foliage and are all of tall growth. — _Labrodrus 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. _P. flexilis_, or Bhotan Pine, is undoubtedly the best adapted to the middle South of all kinds. — _Retinispina_ is a group of Japanese Cypress, but with the exception of _R. obconica_, _Pusillus_, _plumosa_ and _squarrosa_, the tree has the same habit. — _Thuja_. The Asiatic section is better adapted to the middle South than the American species. Of the former the best forms are _Chamaecyparis Pyramidalis_ and var. _aurea_, reaching a height of 15 to 15 feet. _B. Japonica_, var. _filiciformis_ (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. These forest 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 elms, hackberry, mulberry, three ashes, wild apple, four or five hawthorns. Junecreeper, wild cherry, choke cherry, wild plum, coffee bean, honey locust, red-bud, sycamore, two species of buckthorns, buckeye, one maple, box-elder, sumach, two species of walnuts, five or six hickories, nine or ten oaks, ironwood, bine beech, and some holly. 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 buckeye, 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 trees must be kept down. Where a mass of woodland adjoins an open prairie, fire guards should be made so that the fire will not sweep into the forest growth. The greatest destroyer of the forests of the Plains is the fires in the past has been fire, as it sweeps 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, where the attempt is made to preserve unimpaired 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 made so 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 have an opportunity for growing into usable timber. Care should be taken to preserve 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. This 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. There is 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 weeds which spring up, while unsightly, will serve the purpose of sheltering the little trees, and eventually the trees will rise above, and choke them out. Grass, however, forming a tough sod, 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 near the natural forests. Where there are natural belts of forest 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 of the slopes, this should give us a hint as to what we must do. Wherever a depression is filled with a few acres is secured it will not be difficult to extend the forest far up the hillside slopes. On the western side of the Plains similar positions should be taken under the irrigation ditches. 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 Hills region the list grows smaller, and may be limited to the oak, elm, and finally the ash and hickory. On the western Plains, especially in the section 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
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 quickly-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. The silver maple and buttonwood are occasionally planted with good success. The species which are most largely used for wind-breaks for orchards and other plantations are common cottonwood, willow (a variety of *Salix alba*), silver maple and box elder. The first mentioned, 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 (*Elaesagnus*), 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 sustain life may be obtained. On the extreme eastern border the Norwegian spruce and eastern balsam fir have proved valuable. Among deciduous trees the white elm holds 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 midland belt of quick-growing deciduous and evergreen 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 midland 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 nurserymen. Several of the species mentioned in this list are not described in this Cyclopaedia, 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. *Pinus radiata*.

The relative abundance of the succeeding species is only approximately indicated by their sequence.

4. *Robinia Psuedacacia*, 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. *Acacia nasalekson*.
9. *Acacia mollissima*.
10. *Mopane grandiflora*.
12. *Washingtonia robusta*.
13. *Cordylines australis* and other species.
14. *Araucaria Bidwillii*.
15. *Araucaria excelsa*.
16. *Grevillea robusta*.
17. *Juglans Californicae* and app. way.
18. *Ulmus racemosa* and *U*.
19. *Acer Negundo* and var. *Californiae*.
20. *Salix Babylonica*.

2559. Two types of conifers — pine and spruces.
TREES

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 ....................... 30.43
3. Eucalyptus viminalis ......................... 15.00
4. Pinus radiata ................................ 4.07
5. Molla Acresch, var. umbraeformis ......... 2.75
6. Phoenix Canariensis (Fig. 2365) .......... 2.71
7. Aceracia melanoxylon ....................... 2.30
8. Acacia mollissima ........................... 1.70
9. Robinia Pseudacacia ......................... 1.65
10. Magnolia grandiflora ....................... 1.65
11. Acer saccharinum ............................ 1.43
12. Juglans Californica ......................... 1.14
13. Acer Negundo, var. Californicanum ...... .89
14. Populus deltoids Carolinensis ............. .81
15. Ulmus Americana ............................ .81
16. Betula alba .................................. .81
17. Washingtonia filifera ...................... .65

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.

1. For Subtropical Effect.—That there is in California strong appreciation of subtropical effects in gardening is shown by the great demand for dracaenas 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, cyranas, fuchsia, Gunnera scabra, pampas grass, veratrums, agaves, yuccas, aloes, Woodwardia radicans and Hodyera podophylla, together with such shrubby plants as bamboos, giant reed, the choicer varieties of castor-bean, Senecio grandifolius, Polygonum Scutellarensis and P. Sieboldii.

A. Small Trees or Tall Shrubs.
Acanthopanax richilinfolium .................. Erythrea armata
Aralia Chinensis ............................... Fatsia Japonica
Aralia Chinensis, var. ........................ Fatsia papuifera
Mandshurica ................................. Musa Esseta
Aralia spinosa ................................... Pennus Lauromescus
Arundinaria falenta .................. Chamaerops humilis
Dicksenia antarctica .......................... Dicksonia australis
Eriobotrya Japonica .......................... Erubotrya Japonica

AA. Larger Trees.
Catalpa bignonioides .......................... Juba spectabilis
Catalpa ovata ..................................... Livistona australis
Catalpa speciosa ......................... Magnolia grandiflora
Cordyline australis ......................... Pandowlia imperialis
Cordyline Bankii ............................... Phoenix Canarieuxis
Cordyline diversa .................. Phoenix dactylifera
Cordyline striata ............................... Phoenix reclinata
Corncuspus lavigna ............................. Phoenix sylvestris
Erythrea edulis ................................. Phytolaca dioec
Eucalyptus calophylla ....................... Trachycarpus eckelsis
Eucalyptus Rotoflia ..................... Triostanotis conferta
Fiens Carica ................................. Washingtonia filifera
Fiens macrophylla .............................. Washingtonia robusta
Gymnocladus Canadensis

Eucalyptus Globulus can also be used effectively if cut down periodically when the fructe 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.
2. Trees with Ornamental Flowers.—In making the following grouping, arranged according to relative hardness, 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 to a temperature of 25° Fahr.:

- Eucalyptus calophylla
- Eucalyptus ficifolia
- Jacaranda ovatifolia

AA. Susceptible to heavy frost.
The following are not likely to stand a temperature of 20° Fahr. Some of them may succumb at 25° Fahr., particularly while young:

- Acacia Baileyana
- Acacia cyanophylla
- Acacia clara
- Acacia falsata
- Acacia longifolia
- Acacia mollissima
- Acacia nodiflora
- Acacia pendula
- Acacia salicina, etc.

AA. Hardy.

- Acacia pycnantha
- Acacia carnea
- Acacia Hippocastanum
- Althaea Julibrissin
- Catalpa bignonioides
- Catalpa ovata
- Catalpa speciosa
- Ceris Canadensis
- Ceris Siliquestrum
- Crataegus mollis
- Crataegus monogyna (vars. Paulii, punicea, alba plena, etc.)
- Koelreuteria paniculata
- Laburnum vulgare
- Liriodendron Tulipifera
- Magnolia acuminata
- Magnolia grandiflora
- Magnolia kobus

3. Trees with Colored Foliage.

A. Glaucescent.

- Acer Baileyana
- Acer davidii
- Acer glauceseeds
- Acer salicina
- Erithya armata
- Eupatorium Globulifloru (pallidum to produce suckers)

BB. Hardy.

- Cedrus Atlantica, var. glauca
- Cedrus Deodora, var. glauca
- Picea pungens, var. glauca
- Picea pungens, var. globose

AA. Purple or bronze.

BB. Susceptible to 25° Fahr.

- Rhus Californiensis

BB. Hardy.

- Acer platanoides, var. Reiten-bachi
- Acer platanoides, var. Schwederi
- Betula alba, var. atropurpurea
- Fagus sylvatica, var. purpurea

4. Wide-spreading Trees for Shade, Mostly with Rounded Outline.—It frequently happens that the owner of a garden desires a wide-spreading tree in the back or one corner of his domain, under which to swing a hammock on a hot day; such trees are also useful in the school yard, affording welcome shade in which the children can eat their lunch.

A. Deciduous, all hardy.

- Populus alba
- Robinia Pseudacacia
- Ulmus Americana
- Ulmus racemosa

B. Growth rapid or medium.

C. Suckers likely to be troublesome.

cc. Suckers not troublesome.

D. Requiring a great deal of water.

- Acer saccharinum
- Acer saccharinum, var. Wieri
- Carpinus oliviformis
- Prunus Americana
- Prunus velutina
- Quercus lobata
- Quercus pedunculata
- Ulmus campesiastri

BB. Growth somewhat slow.

- Acer pseudoplatanus
- Fraxinus americana
- Quercus coccinea
- Quercus Kelloggii
- Quercus lobata
- Quercus macrocarpa
- Quercus rubra
- Sophora japonica
- Tilia Americana
- Tilia Europaea

AA. Evergreen.

B. Growth rapid; trees susceptible to 25° Fahr.

- Acacia mollissima

BB. Evergreen.

- Cupressus sempervirens
- Cupressus sempervirens, var. fastigiata
- Juniperus communis, var. Hibernica
- Taxus baccata, var. fastigiata

AA. Outline conical or spiral, usually pointed.

BB. Conifer, with mostly narrow leaves.

C. Deciduous: hardy.

- Larix decidua
- Larix leptolepis
- Taxodium distichum

CC. Evergreen.

D. Susceptible to severe frost (probably about 20° Fahr.).

- Agathis robusta

- Araucaria Bidwillii
- Araucaria Brazilian
- Araucaria Cookii
- Picea canadensis

DD. Hardy.

- Abies balsamea
- Abies Celphalonica
- Abies concolor
- Abies nobilis
- Abies Nordmanniana
- Picea pungens
- Cedrus Atlantica
- Cedrus Deodora
- Cedrus Libani
- Cedrus Libani
- Cephalotaxus drupacea
- Cephalotaxus Fortunei
- Chamaecyparis Lawsoniana
- Cryptomeria Japonica
- Cryptomeris Japonica, var. elegans
- Cunninghamia Sloensis
- Cupressus Gowaniana
- Cupressus macrocarpa
- Guadalajaraensis
- Libocedrus Chilensis
- Libocedrus decurrens
- Picea Ajansenis
- Picea alba
- Picea Engelmanni

BB. Foliage broad.

C. Deciduous: hardy.

- Betula alba
- Betula lenta
- Betula linnea
- Betula papyrifera
- Betula populifolia
- Ginkgo biloba
- Quercus Carris
- Quercus nigra
- Sorbus Aucuparia
TREES

cc. Evergreen.
D. Susceptible to severe frost (probably 20° Fahr. and even less).

Cinnamomum Camphora,
Corynocarpus Iwahtgas,
Cryptocarya Miersii,

Grevillea robusta,
Sterculia diversifolia,
Triastis conferta.

DD. Hardy.

Acacia melanoxylon,
Cerasus Lucitaniae,
Ilex Aquifolium,
Lagunaria Patersonii,

Laurus nobilis,
Pittosporum crassifolium,
Quercus Suber,
Umbellularia Californica.

AAA. Outline more or less rounded, but trees not as wide-spreading nor as shade-giving as in class 4.

B. Deciduous.

1844

C. Susceptible to frost (25° Fahr.).

Phytolacca dioica.

cc. Hardy.

Eucalyptus globulus,
Fraxinus Americana,
Fagus excelsior,
Gymnocladus Canadensis,

Juglans Californica,
Juglans nigra,
Koelreuteria paniculata,
Paulownia imperialis,
Robinia Pseudacacia.

BR. Evergreen.

C. Probably susceptible to severe frost (30° Fahr. or less).

Acacia cyanophylla,
Aletris taxifolia,
Bursaria spinosa,
Eucalyptus calophylla,
Eucalyptus cornuta,

Eucalyptus ficifolia,
Eucalyptus Globulus,
Eucalyptus maculata var.
Eucalyptus nitens,
Eucalyptus robusta,

C. Hard.

Acacia pycnantha,
Eucalyptus amygdalina,
Eucalyptus Gunnii,
Eucalyptus leucophylla,
Eucalyptus obliqua,

Ficus Juba spectabilis,
Phoenix Canariensis,
Phoenix reclinata,
Phoenix sylvestris,
Pittosporum Eujenoides,

AAA. Drooping trees.

Br. Deciduous.

Acer saccharinum, var. Wieri
Betula alba, var. pendula elegans,
Betula alba, var. pendula lazialtata,
Betula alba, var. pendula lazialtata,
Fraxinus excelsior, var. aurea pendula,

Fagus sylvatica, var. pendula,
Fraxinus excelsior, var. aurea pendula,
Juglans regia, var. pendula,
Laburnum variegare, var. pendula,

AAA. Drooping trees.

Amur corynocalyx,
Corylus americana, var. pendula,
Fraxinus excelsior, var. pendula,
Juglans regia, var. pendula,
Laburnum variegare, var. pendula,

Cupressus sempervirens,

Morus alba (Teas’ Weeping),
Populus grandidentata, var.
Prunius fruticosus, var. pendula,
Quercus lobata,
Salix Babylonica,
Salix Babylonica, var. Lickii,
Sorgha Japonica pendula.
Sorbus Aucuparia, var. pendula,
Thuya Americana, var. pendula,
Tilia Europaea, var. pendula,
Ulmus americana, var. pendula,
Ulms campestris, var. pendula,
Ulums glabra, var. pendula,
Ulums montana, var. pendula,

BB. Evergreen.

Schinus Molle.

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, sewer-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 sightly condition is minimized and the result much more pleasing.

For town streets not more than 10 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-spreading 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-spreading 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 acaucas 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 straggling trees, of which perhaps not more than two are of one kind, re-calling Professor Waugh’s apt simile of “nine monstrous 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
TREES

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 papyracea, Betula populifolia, Catalpa bignonioides, Catalpa ovata, Catalpa speciosa.

DD. Growth slow.

Crataegus mollis, Crataegus monogynia.

CC. Evergreen.

D. Growth rapid or moderate.

Cordyline australis (Fig. 2563), Cordyline indivisa, Cordyline stricta, Erythrina edulis.

EE. Evergreen trees other than palms and arborescent Liliaceae.

Acacia Baileyana, Acacia cyanophylla, Acacia facelata, Acacia littoralis, Acacia longifolia.

DD. Growth slow.

Alcetrony excelsum, Burzaria spiralis, Cinnamomum Camphora, Eucalyptus fieolfa, Ilex Aquifolium, Lagerstrea Patersoni, Hicoria Pean.

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, Hicoria Pean.

DD. Growth slow.

Gleditschia trinacantha, Liviodendron Tullifera, Sophora Japonica.

CC. Evergreen.

D. Palms and bananas.

Erythria edulis, Livistona australis, Musa Ensete.

DD. Evergreen trees other than palms and bananas.

Acacia elata, Acacia melanoxylon, Acacia pycnantha, Angophora intermedia, Angophora subvelutina, Eucalyptus amygdalina, var. angustifolia, Eucalyptus calophylla, Eucalyptus coromiana.

BBB. 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 Jubaea).

AA. For country roads.

B. Deciduous.

**TREES**

Melia Azedarach, var. unbracteiformis, is found unsatisfactory in the immediate vicinity of the coast; as a seaside tree it is exceedingly unsightly when losing its leaves, and is also much subject to scale insects.

*Acacia melanoxylon* is generally debarked from the Citrus belt, as a breeder of scale; when mature it is often killed 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.

*Ficus macrophylla* is another tree injurious to sidewalks.

*Eucalyptus Globulus*, and in fact almost all species of the genus, are frequently debarked by town ordinances from growth within 60 or even 70 feet of a sewer, on account of the remarkable length and penetrating power of their roots.

*Paulownia 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.

*Grevillea robusta* 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 *Pho-nix* and *Jubaea* should be avoided on account of their low, widespread 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.

*Atlantis glandulosus* has a bad reputation on account of its disagreeable odor, but as this is only found in the staminate 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.

A. **Tolerant of strong "black" alkali (Sodium carbonate).**

The most alkali-tolerant of those yet tested is *Koefereria paniculata*, a small species 15 to 30 feet high, with feathery, pinnate leaves and ornamental yellow blossoms.

**AA. Tolerant of medium alkali (chiefly "white" salts).**

*Acacia melanoxylon*, *Atlantis glandulosus*, *Albizia lebbeck*, *Cassanea equisetifolia*, *Eucalyptus amygdalina*, *var. angustifolia* (apparently the least sensitive of the Eucalyptus).

**AAA. Only fairly tolerant.**

*Acacia macrophylla*, *Acere Negot}. var. Califor-nicium.

**AAA. Tolerant to alkali.**


**AAA. Tested and found unsuitable.**

Most of those trees of the humid regions, e. g. eastern states and N. Europe, which have been tried on alkali soils, have been found unsatisfactory to remain dwarf and stunted. This is particularly true of *Liriodendron Tulipifera*, *Quercus alba*, *sativa* and species of *Tilia*.

Since writing the above, the following additional information has been brought to light through the investigations of Dr. R. H. Longbridge 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 are growing, expressed in tons per acre:**

- *Koeftereria paniculata*: 32
- *Platanus orientalis*: 21
- *Eucalyptus amygdalina*: 20
- *Eucalyptus angustifo-lia*: 20
- *Washingtonia filifera* (specimens not stated): 7
- *Phoenix dactylifera* 5
- *Cinnamomum Camphora*: 35
- *Jos. Burt Davion*

**IV. TREES FOR SOUTHERN CALIFORNIA—Street Trees:**

- *Sterculia diversifolia*, Australian Bottle Tree; *Acacia Melanoxylon*, Blackwood *Acacia*; *Cinnamomum Camphora*, Camphor Tree; *Sterculia acerifolia*, Australian Flame Tree; *Eucalyptus robusta*, Swamp Mahogany Gum; *Grevillea robusta*, Silk Oak; *Acacia dealbata*, Black Wattle; *Jacaranda ovalifolia*, *Ligustrum Japonicum*, Japan Privet; *Pinus 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. One deciduous tree is much used—*Melia Azedarach*, var. unbracteiformis, the Umbrella Tree. Though less known or used, *Eucalyptus calophylla* is less a light street or sidewalk tree than *E. robusta*. Very few conifers other than those noted do well in this climate. Any extension of the above list must be made almost entirely.
through palms, eucalypti and acacias, among which there is plenty of room for preference.

*Law and Shade Trees: Araznacea excelsa, Norfolk Island Pine; Araucaria Bidwillii, The Buca-Bunya; Jacaranda ovalifolia; Cinnamomum Camphora, Camphor Tree; Ficus Macrophylla, Rubber Tree; Sterculia acerifolia, Australian Flame Tree; Magnolia fistida, Bull Bay; Sequoia gigantea, California Big Tree; Cedrus Deodara, Deodar.*

The above list contains ten of the best ornamental trees. It might be extended indefinitely if all our good trees were included. The ornamental eucalypti and acacias would at least treble this list, and the palms alone would easily double it. **ERNST BRAUNTON.**

**TREE TOMATO.** See Cyphomandra.

**TREFOIL.** See Clover, Trifolium.

**TREVEŠIA** (after the family Trevesiæ of Padus, patrons of many). Abundant. About species of small trees or shrubs from 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 panicled spikes: petals 8-12; valvate, somewhat thick; stamens 8-12; ovary 8-12-loculed; fruit large, ovoid. Greenhouse subject.

**palmata,** Vis. (Gastdnia palmata, Roxb.). A small tree, with panicles of variegated leaves and the young parts tormentose: lvs. crowded at the ends of the branches, 1-1/2 ft. across, palmately 5-lobed to below the middle; petioles 1-1/2 ft. long; panicles long-peduncled: umbels 6-9 through, long-peduncled; fls. 1 in. across, greenish white. Himalayas. B.M. 7008.

F. W. BARCLAY.


**TRIAITERA.** Error in a nursery catalogue. See Triarea.

**TRICYCLIS** (Greek, tripl̄e calyx; true of some species). Rubicaceæ. Here belong the two shrubs from Natal which are cult. in S. Fl. under the name of Kraussia. When Kraussia was written for this Cyclopaedia the undersigned treated it in the manner suggested by Bentham and Hooker, index Kewensis and Phipps Cyclopedia. Since then this name has had a lucky flight 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 Triaclysis characterized by calyx 4-6-lobed; petals 4-6; stamens 4-6; other species have a truncate calyx- limb which is entire or nearly so. Tricyclus 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. Fl.

Generic characters of Triacyclus: calyx-tube in many species gilt 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; anthers 2-loculed, rarely 3-loculed. *Kraussia lanceolata* is here removed to Triacyclus and Hiern is cited as the author of the combination *Kraussia lanceolata,* though the combination has probably never been formally made previous to this occasion.

A. **Lvs. lanceolate, acuminate.**

**lanceolata,** Hiern (Kraussia lanceolata, Sond.). Shrub 3 ft. or more, acuminate: calyx 5-toothed: throat of corolla densely bearded; stigma deeply 2-lobed, lobes revolute: fr. globose, the size of a pea. Natal.

**TRICHOCENTRUM** (Greek, hair and slender; alluding to the long, slender spur). Orchidaceæ. A small genus allied to Rodriguezia (Burlingtonia). The plants grow in the more mesophytic situations very small, each bearing a broad, fleshy leaf. Inflorescence a few-fl. raceme on which usually only one flower opens at a time: sepals and petals free, spreading; labelium larger, spurred, with 2 lateral lobes and a 2-parted mid- dle 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.

*culo-purpureum,* Reichb. f. Lvs. oblong-lanceolate, 3 in. long, tufted: fls. on short peduncles, 2 in. across; sepals and petals obvate-lanceolate, inside maroon-brown, with brownish tips, outside pale greenish yellow; subquadrate, white, with a large purple spot on each of the lateral lobes. Brazil. B.M. 5908. A.F. 6:609.

*tigrinum,* Lindl. and Reichb. f. Similar in habit to the preceding: lvs. oblong, obtuse, speckled with red; fls. pendulous, nearly 3 in. across; sepals and petals broadly yellow, yellow, speckled with red; labelium creamate-obovate, emarginate, white, rose toward the disk. May. Cent. Amer. B.M. 7380. I.H. 24:232.

**TRICHOCÉLENA** (Greek, trichos, hair, ehkaina, or in Latin, torma, a mantle; referring to the covering hairs on the spikelets). Solanaceæ. 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,
TRICHOPILIA

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. fragrans, var. nobilis). F.M. 1872:21 (as T. fragrans). - This has larger, stouter pseudobulbs and shorter broader lvs. than T. fragrans. The labellum is larger and the petals shorter compared with the size of the flower.

tortilis, Lindl. Pseudobulbs oblong, compressed, somewhat curved, 2-4 in. long; lvs. solitary, oblong, acute, 6 in. long; fls. solitary, on decumbent stalks shorter than the lvs.; sepals and petals linear-lanceolate, 2 in. long, spirally twisted, brown with yellowish margins; labellum forming a tube around the column, upper portion expanded, 4-lobe, white with crimson spots, becoming entirely crimson within. Fls. profusely in summer and sometimes again in winter. Mexico. B.M. 5739. B.R. 22:1863. F.C. 5:101. B. 3:122. -Var. albida is advertised.

suavis, Lindl. Fig. 2568. Pseudobulbs thin, compressed, 2 in. long; lvs. broadly oblong, 8 in. long; scape pendent, about 3-ftd.: 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 erenate. May, June. Cent. America. B.M. 4854. F.S. 8:201. R.H. 1899, pp. 220, 221; 1887, p. 454. Gn. 4. p. 511; 31, p. 428; 38, p. 185; 98, p. 79; 51, p. 371. R.B. 23:255. G.M. 38:284. - Var. alba, Warner. Fls. white with a yellow spot in the throat of the labellum.

marginata, Hemfr. (T. cocconea, War. T. crispa, var. marginata, Hort.). Pseudobulbs clustered, oblong, compressed; lvs. broadly lanceolate, suddenly acuminate, subauriculate at the base; scape about 3-ftd.; fls. large, whitish outside, reddish purple within; sepals and petals linear-lanceolate, margined with white, the former slightly twisted; labellum trumpet-shaped, with a large,


TRICHONEMA. See Romulea.

TRICHOPILIA

1849

2568. Trichopilia suavis (X ½).
TRICHOPILIA

which is sometimes classed as a variety of T. crispa.

The following description is taken from Watson's Orchids. Pseudobulbs ovate, flattened, 2-3 in. long, dark green, 1-lvd.; Ivs. leathery, 6-8 x in., keeled, acute-pointed; flower-spikes basal, drooping, short, 3-8-fl.; Ivs. with pedicels 2 in. long; sepals and petals spreading, 3/4 in. long, ovate-lanceolate, twisted, brownish yellow; lip folded over the column, spreading in front, 1/4 in. across, colored deep crimson with a white margin. May, June. Costa Rica. HEINRICH HASSELBRING.

TRICHOSANTHES (Greek, hair and flower; alluding to the fringed edge of the petals). Cucurbitaceae. Snake Gourd. About 40 species of climbing herbs, annual or perennial by tuber-like roots, natives of southeastern Asia and Australia. They are tender plants with usually large, roundish, lobed leaves and white axillary flowers. The male Ivs. are usually in racemes, while the female are nearly always solitary. The fruit is often ornamental and highly colored. In T. Arguina 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 filibrate; stamens 3 (in the male flower). D. C. Mon. Phaner. 3:351. The plants flower in July from seed sown in March. They may be treated as tender annuals.

A. Dractas small or none of the racemes of male Ivs.
   Fruit ovod.
   c. cucumeroides, Maxim. Roots fleshy, tuberous: stem slender, 12-15 ft.; Ivs. ovate in outline, 4-6 in. long, more or less palately 3-5 lobed, margin crenulate; peduncle bearing the male Ivs. 4-10 in. long, 8-15-fl.; petals about ¾ in. long, oblong, acute, longly fringed; fr. oblong, shortly rostrate, nearly 3 in. long, vermilion-colored. Japan. Offered by importers of Japanese plants.

BB. Fruit oblong.

Anguina, Linn. (T. columbrina, Jacq.). Serrara or Snake Gourd. Stem slender, tall-growing; Ivs. nearly circular or oblong-lanceolate, 5-7 in. across, 3-7 lobed; lobes round; margin undulate or wavy; peduncle bearing the male Ivs. 4-10 in. long, 8-15-fl.; body of petals oblong, less than ¾ in. long, fringes ¾ in. long; fr. slender, conforted, often exceeding 5 ft. in length. India. B.M. 722. B.R. 32:18 (as T. colubrina). R.H. 1850, p. 555.

AA. Dractas large on the male raceme.

B. Calyx-segments entire.

C. Levs. lobed.

Kirilowia, Maxim. (Epippon vitiolus, Naud.). Perennial root tuber-like: stem annual, high climbing, 20-30 ft.; Ivs. nearly circular in outline, 3-8 in. across, deeply 3-7 lobed, the lobes oblong, acute, coarsely serrate; racemes 4-6 ft. long. India. Barely only 1-fl.; petals triangular-wedge-shaped, deeply cut and the segments much cut and longly filibrate, ovod, somewhat acute; base shortly attenuate, yellowish brown, about 4 in. long, 2½ thick. Mongolia.

CC. Levs. not lobed.

cordata, Roxb. (T. patmatia, Wall.). Root tuberous: stem robust, high climbing: Ivs. wide, ovate-cordate, acute or shortly acuminate, 5-8 in. long, rarely somewhat angled or obscurely lobed; margin slightly dentate; peduncle bearing male Ivs. 5-8 in. long, 4-8-fl.; calyx-segments finely dentate; fr. globose, red, orange-streaked, not acute at the apex. India.

BB. Calyx-segments toothed.

bracteata, Vogt (T. patmatia, Roxb.). Stem stout, climbing to 30 ft. Ivs. broadly ovate in outline, scabrous above, usually deeply 3-7 lobed; lobes acute; margin dentate; peduncle bearing the male Ivs. 4-8 in. long, 5-10-fl.; fr. globose, red with orange stripes about 2 in. long. India. F. W. Barclay.

TRICHOSMA (Greek, hair and ornament). Orchidaceae. Sepals and petals similar, erect-spreading, the lateral yellow-green in contrast with the speckled, finely granulat- ing foot of the column; labellum 3-lobed. The lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges: stems slender, 2-lvd.; inflores- cence racemose. Resembles Coleogyne.

suavis, Lindl. Ivs. lanceolate, undulate, 3-4-nerved; fls. few in a terminal raceme, white, yellowish or pur- plish, fragrant; sepals ovate-lanceolate; petals oblong; labellum ovate-oblong, streaked with purple; disk yel- low, middle lobe with several crenate ridges. Himalaya. R.K. 26:21.

T. albo-marginata of the trade is unidentified.

HEINRICH HASSELBRING.

TRICHOSTEMA (Greek, hair and stamen; referring to the filaments). Labiatae. BLUE CURLS. A genus of 8 species of American plants, mostly low, aromatic, an- nual or perennial with entire, ovate, coarctate, 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 5-cleft.

lanatum, Benth. A perennial shrubby plant with rosemary-like leaves and cymes of fls. in a naked ter- minal thrys: Ivs. narrow linear, 1-nerved, sessile, er- gins revolute: calyx and corolla covered with dense violet or purple wool; corolla ½ in. long. S. Calif. A very handsome shrub. Known as "Rancho.

AA. Calyx oblique, 2-lipped.

dichotomyum, Linn. BASTARD PENNYROYAL. Low, viscid annual: Ivs. oblong or lanceolate-oblong, obtuse, short- petioled; corolla pale or pink, sometimes white. Sandy fields, Mass. to Ky., Fl., and Texas. F. W. Barclay.

TRICYRTIS (Greek, three convolutions; referring to the nectar-bearing sacs at the base of the three outer perianth-segments). Liliaceae. "TOAD-LILIES," as the Japanese call them, are autumn-blooming perennial herbs with heart-shaped Ivs., which are more or less drooping, and of whitish color, spotted with purple. They are very distinct members of the lily family by reason of their season of bloom, quantity of flower, and the prominent nectar sacs 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. kita, var. nigra. T. kita is perfectly hardy and has more fls. and larger ones than the other species, and with good management it blooms in Sep- tember. Sometimes, however, it blooms so late that its flowers are prematurely destroyed by frost. For this reason some gardeners prefer to 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 later than the type nigrum. Offered by lovers of choice hardy plants, but with one reserva- tion: 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 divi- sion to spread into a solid mass in the course of a few seasons. Such a mass is much more desirable than one plant 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 ex- pert, W. Goldring, has suggested as a companion to the Toad Lilies, either Lady Slippers (Cypripedium spec- tabile) or Wood Lilies (Trillium 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.

Tricyrtis is a genus of 6 species native to Japan, China, and the Himalayas. The plants range 2-3 ft. in height and have numerous green on both sides and with many parallel nerves. Fls. bell-shaped, then spreading: perianth-segments lanceolate, acute: ovary sessile, 3-celled; ovules crowded, superelevated: fr. oblong or lanceolate, 2-lipped: calyx several crenate ridges. One of the aberrant types of the lily family. It is placed by Bentham and Hooker in the Uvularia tribe.
TRICYRTIS

In which it is the only genus with a sepalsic capsule. Monographed in Latin by J. G. Baker in Journ. Linn. Soc. 17:483 (1880). In this account the lvs. of T. macroplea are said not to be stem-clasping, but in B.M. 5355 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, purplish 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, oblanceolate, wedge-shaped at the base: fls. few, in a lax corymb, whitish purple, scarcely spotted. Formosana—Unique by reason of its lvs. not being stem-clasping.


TRIENTALIS (Latin for the third of a foot; referring to the height of the plant). Primulaceae. Star Flower. Chicweed-Wintergreen. A genus of two species of low, glabrous, barely perennial herbs: stems simple, with small, scarious, and waxy scale-like cluster of larger, nearly sessile leaves at the summit, from the axils of which in spring the star-like white or pink flowers are borne singly on slender peduncles. Sometimes grown in wild garden borders

A. Lvs. acuminate at both ends.


AA. Lvs. obtuse (acute in var. latifolia).

Europaea, 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: corollos white. Var. latifolia, Torr. Stem naked below the cluster of 4-7 oblong-obovate, or oval, mostly acute lvs.: corolla white to rose-red. Woods, western California to Vancouver's Island.

F. W. BROWN.

TRIFOLIUM (name refers to the three leaflets). Leguminosae. Clover. Trifolium is a large genus, comprising between 200 and 300 species, most abundant in the warm temperate zone. They grow low herbs, or digitally 3-foliate (rarely 5-7-foliate) 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 2 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 indehiscent pod. The flowers are usually in shades of red and running into white, rarely yellow.

The Clovers are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops or green manures. See Clover, p. 387. For the rôle of Clovers as nitrogen-fixers, see Legumes, p. 897. The species described below are offered mostly as forage plants. Many Clovers are perennial, although they are of relatively short life, so that frequent resowing is necessary if plants are to be kept in robust condition. Some of the species are annual, and these tend to become weeds. All are propagated readily by means of seeds; but as the seeds are small and oily, they may not germinate well in dry, hot soils. Three annual yellow-flowered species are weeds in some parts, particularly in the East, where they have been introduced from Europe: T. ageratum, Linn., with oblong-obovate sessile lfs.; T. procumbens, Linn., Low Hop Clover, more spreading, lfs. obovate and the terminal one stalked; T. dubium, Sibth., with lfs. truncate or emarginate at the terminal stalked. A silky-pubescent white-flld. annual species, from Europe, T. arvensis, Linn., is the Rabbit-foot

529. Tricyrtis hirta (x 1/2).
Clove of fields and waste places. The T. odoratum of some seedsmen is evidently Melilotus. Allied genera are lespedeza, medicago and melilotus.

**A. Flowers in a long spike.**

*incarnatun*, Linn. Crimson or scarlet clover. Fig. 499. Vol. I. Annual, erect, 1-3 ft. high, soft-hairy: lvs. 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: fls. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. Now much used as a cover-crop in orchards. See Cover Crops. It is very showy when in bloom. If seeds are sown at midsummer or later, the plants may be expected to survive the winter and bloom early in spring.

*rubens*, Linn. Perennial, 20 in. or less tall, in clumps, the stems erect: lvs. short-stalked, the lfts. obovate-oblong-lanceolate and strongly dentilicate, the stipules long-lanceolate: heads usually in pairs, becoming 3-4 in. long: fls. purplish red, showy. —Eu. Attractive ornamental species. The heads become silky after flowering. There is a white-flowered form.

**AA. Flowers in globose or oval heads.**

*b. Corolla yellow.**

*filiforme*, Linn. Yellow suckling clover. Annual, of diffuse growth: lvs. obovate or oblongate, somewhat dentilicate, the terminal one stalked, the stipules broadly ovate: peduncles long and filiform, bearing sessile yellow fls. in umbel-like heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing.

**BB. Corolla white or ochroleucous (yellowish white).**

*Alexandrinum*, Linn. Egyptian clover. Annual, with few appressed hairs, the stems tall, erect or ascending and branching: lvs. numerous, the lfts. oblong or lanceolate and somewhat dentilicate, the stipules lanceolate-subulate and partly free from the petiole: head stalked or sessile, ovate, becoming oblong-conic in fls. ochroleucous. 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 ovate-oblong stalked: fls. pale yellowish white or creamy yellow. Eu. Asia.—Handsome plant for the border; also recommended for forage.

*repens*, Linn. White clover. Fig. 2570. Low creeping glabrous perennial: lvs. long-stalked, the lfts. obovate and obscurely toothed, the stipules small and scale-like: heads long-peduncled from the ground, small and loose: fls. white, fragrant. Eu. and thought to be native in the northern part of the U. S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some parts prized for pasture. There are forms with red and purplish foliage. This is 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.

**BBB. Corolla rose-tinted or red.**

*hybridum*, Linn. Alsike or Swedish clover. Ascending or nearly erect, 1-3 ft. high, branching, glabrous: lvs. long-stalked, the lfts. obovate or oblongate, the stipules ovate-lanceolate and thin: heads small and loose, nearly globular, long-stalked: fls. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very Hardy. Perennial.

**cc. Individual fls. sessile.**

*pretense*, Linn. (T. pretense perennis, Hort.). Common red clover. Pea-vine clover. Cow-grass. Fig. 2571. Ascending and somewhat hairy, 1-1 1/2 ft.: lvs. long-stalked, the lfts. oval or oblong and sometimes notched at the end and the blade marked with a large spot, the stipules broad but with a bristle point: heads globular ovate, sessile: fls. red-purple. Eu., but everywhere introduced, and much grown for pasturage hay, and green manuring.

*median*, Linn. Mammoth or zigzag clover. Stouter and less erect: lfts. oblong and entire and without spots: heads usually stalked, and fls. rather deeper colored. Eu., and introduced, and much grown by farmers.

**DD. Plant annual.**

*resupinatum*, Linn. (T. resupinatum, Willd.). Annual, diffuse or trailing glabrous plant: lfts. obovate and serrulate and as long as the petiole, the stipules lanceolate-acuminated: heads globose, with rudimentary involucres: fls. purple. Greece, Egypt to Persia.—Grown for ornament.

L. H. B.

**TRIGONELLA** (Latin, a little triangle; probably referring to the shape of the fls.). 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 clover and allied plants mainly by the fact that the lvs. are pinnately trifoliolate, 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 several sections, of which fenugreek and others form a section characterized by having whitisubsessile fls. and a thick, oblong or linear pod which has a long beak and obliquely longitudinal veins.

**FORUM-GRECUM**, Linn. Fenugreek, which see. White-flowered 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 pilose: pods flat, twice as long as the beak. Eu., Orient.

W. M.

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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 true vanilla in commerce (see Vanilla). Trilisa is a genus of two species
TRILLISA

closely related to Liatris. The species are autumn-blooming plants 2-3 ft. high, with numerous small flower-heads of purple or white. They differ from Liatris as follows: The roots are fibrous (those of Liatris being tuberous); the inflorescence is panicky instead of racemose or spike-like, and the showy bracts are in only 2 or 3 series, while those of Liatris in 4 series. Trillisa is not so well known to gardens as the Blazing Star. Although a native of the low pine barrens from Va. to Fla. and La., it is perhaps hardly twenty years ago it was advertised by a Massachusetts dealer in native plants. It is mentioned in some English books as a hardy plant, thriving in light soil and prop. by division or by seeds sown in autumn. It is fully described in some native botanicals.

odoratissima, Cass. (Liatris odoratissima, Michx.). VANILLA PLANT. Also called Carolina Vanilla, Dog's-tongue, etc. Rather stout, glabrous, perennial herb, 2-3 ft. high; lvs. thick, entire or sometimes dentate, obtuse, 4-10 x 1-1.5 in., oblong, ovate or oval; flower corymbose paniculate; fl.-heads about 3/4 in. long, Aug., Sept. B B 3:319.-The other species (T. paniculata, Cass.) has a similar range and is distinguished by its viscid-pubescent stem and thyridoid-paniculate inflorescence.

TRILLIUM (Latin, tripium, triple; leaves and floral parts in threes). Lilieceae. WAKE-ROBIN, BIRNAMOAK. WHITE WOOD 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 genera and species and none of the others are in the trade in this country. The stem is simple and erect, 3-leaved near the summit and bearing one flower with 3 green sepals, 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. Amer. Acad. Arts & Sci. 14 (1879).

Trilliums are amongst the characteristic flowers of American woods. The best known species is Trillium 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 wood moss and a deep-seated, perpendicular tuber or rhizome (Fig. 2572). It is customary to transplant Trilliums from the woods when in bloom. This is because the plants can be found readily at that time and because the desire to grow them is strongest when the plants are visible. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous season. After flowering, the plant stores energy for the succeeding season. 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 deep, rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums thrive well. See Forecing. Plants may be propagated by seeds sown as soon as ripe. Blooming plants may be expected in two or three years. Trilliums are among the choicest of all early spring plants, and they should be more common in gardens. They can be made to thrive well in borders about city yards. They may also be colonized in grass where the lawn mower is not used. Best results will be had only when they are planted alone in masses. Trilliums are amongst the relatively few plants that are very showy and yet not coarse.

2572. Vertical rhizome of Trillium (X 34).

TRILLIUM

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A. Ovary 3-angled, not winged.
1. nivea, 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 pedicel, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Fla. and Ky. to Minn. and Iowa. B. M. 6449.

2. undulatum, Wild. (T. erythroleucum, Michx. T. ple- tum, Pursh). Of medium to large size, 1 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. white, large, white, on a short but slender erect or inclined pedicel, the petals oblong-to-linear, wavy, 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.

AA. Ovary 6-angled, often winged.
2. Flowers sessile (and mostly colored).

G. Leaves sessile.

3. sessile, Linn. Strong-growing, 1 ft. or less high; lvs. broadly ovate or rhomboidal, acute, more or less spotted: fl. sessile in the whorl of lvs., small, purple or greenish, the petals narrow and acute. Woods, Pa. to Minn., Ark., and Fla. B. M. 40. L. B. C. 9:375. F. S. 22:2311. —Variable.

Var. giganteum, Torr. (var. Californicum, Wats.). Much stouter, the lvs. often 6 in. long and spotted, and the petals sometimes 4 in. long: fls. purple, rose-color or white, the petals rhombic-ovate or narrower. Calif. and Ore. G. F. C. 3:211.

Var. angustipetalum, Torr. Similar to Var. giganteum, but the lvs. somewhat petiolate and the petals narrower. Calif. and Ore. Apparently not in the trade. This and var. giganteum appear to be the only Trilliums native to California, except T. ovatum.

R. rubrum, Hort. A form of Var. giganteum with fls. deep red-purple.


Nattallii, 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. lancelatatum, Boykin (T. recurvatum, var. lanceo- latum, Wats.). Plant often more than 1 ft. tall: fls. lanceolate, sessile: fls. dull or brown-purple, an inch or more long, narrow - lanceolate or linear, the petals ascending or somewhat reflexed, the filaments usually exceeding 1/4 in. in length. Ga., Ala. —Little known in cult.

CC. Leaves stalked.

5. recurvatum, Beck. Strong-growing, usually 1 ft. or more high: lvs. ovate or ovate-oblong, tapering to both ends, or short but slender petioles: fls. brown-purple or dull-purple, about 1 in. or more long, the
petals narrow and erect, the sepals narrow and reflexed. Woods, Ga. to Minn., 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 1–3 in. long and narrow-ob lanceolate, the sepals erect. Idaho, Ore., and Wash. Little known in cult.
TRILLIUM

BB. Flowers stalked.

c. Pedicel longer than the flower: lvs. nearly or quite sessile.

7. grandiflorum, Salisb. Figs. 584 (Vol. II), 2573, 2574. Stout, 1 ft. or more high: lvs. broad-ovate or rhombic-ovate, narrowed to both ends, often wavy; fls. erect or nearly so, pure white, changing to rosy pink as they fade, 2-3 in. long, the petals broadly oblanceolate and spreading and much longer than the sepals. Quebec to Minn., Fla. and Mo. B.M. 835 (as T. erythrocum), L.B.C. 14:1349. G.n. 29, p. 257; 36, p. 394; 40:221. G.M. 33:131. Mn. 4:17. A.G. 1.7:243. Gnr. 3:935; 6:101.

2575. Trillium erectum (X 3/4).

Sporting forms are not uncommon. Sometimes forms occur with petiolate lvs. A.G. 1892:206. T. grandiflorum is the best and handsomest species for cultivation.

8. ovatum, Pursh. 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: lvs. 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.

c. Pedicel generally not exceeding and usually shorter than the flower.

d. Fl. declinate under the lvs.

10. cervinum, Linn. Plant 1 ft. or more high: lvs. very broadly rhombic-ovate, nearly or quite sessile; fls. white, the petals 1 in. or less long, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 954. Mn. 10:49.

11. stylisum, Nutt. (T. nervosum and T. Calederi, Ell.). Slender; 18-24 in. high; lvs. ovate-lanceolate, narrow at each end, short-stalked: fls. rose-color, the petals oblong, obtuse or acute, curved, undulate, sometimes 2 in. long. N. C. to Fla.

TRIPHASIA

12. psalliunum, Michx. Small, usually not 1 ft. high; lvs. 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 obtuse sepals.

T. Goeniiatum, Wall. A species of temperate Himalaya, little known and described by Hooker as follows: "Lvs. shortly petioled, ovate or ovate-cordate, acute; sepals sub-ovate, narrowly linear."—T. obovatum, Pursh. Founded on a Canadian plant, which has been referred to T. erectum. Maximowicz keeps it distinct, however, confining its range to Kamtschatka and Japan. It is the T. erectum, var. Japanicum, Gray. According to Watson, the Japanese plant "is distinguished by a somewhat produced connective [between the anther-cells] and very short stigmas." Maximowicz says that the plant differs from T. erectum in the petals being broader and much more obtuse and longer than the calyx, the fls. nodding from the first, and the lvs. broader than long, sessile, not attenuate at the base.—T. Smilacifolium. Maxim. One of the T. erectum series (T. erectum, var. Japanicum flore piano, Gray). Japan. Fls. smaller than those of T. obovatum (2 in. across), deep tawny red, the petals not exceeding the sepals, nearly orbicular or obovate.—T. Technosin, Maxim. Abont 1 ft. tall; lvs. sessile, broad-ovate or orbicular, somewhat rhombic, acuminate; fls. dull purple, 1 in. or less across, the petals oblong-lanceolate. According to Hooker, this differs from T. erectum chiefly in the longer filaments." Himalaya to Japan.

L. H. B.

TRIOSTEUM (same shortened by Linnaeus from Triosteosperrum, which is from Greek for three bony ascor). Cupreifolium, Freyn. Horse-Eye, or Yellow-eyed. A genus of 3 species of coarse perennial herbs, of which 2 are American and 1 Himalayan. Stems simple: lvs. rather large, pinnately veined, entire or sinuate: fls. dull colored, sessile, or in small clusters in the leaf-axils, followed by orange or reddish fruits.

perfoliatum, Linn. Stem 2-4 ft. high, stout: lvs. ovate, short-stalked, ovate-oblong, if any, nearly or quite sessile, narrowed below into connate-perfoliate or simply connate base: corolla dull brown-purple. Rich soil, New England and Canada to Ill. and Als. B.B. 3:234.—Is occasionally offered by collectors. It is a weedy plant of very easy cultivation.

F. W. BARTLEY.

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: lvs. alternate, sessile, dark, evergreen, trifoliolate: fls. small, ovate to ovate-cordate, and much larger obovate central leaflet: thorns slender, about 1/2 in. long, one or two in the axil of each leaf: fls. white, about 1/2 in. long, solitary, or in 3-fl. 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 1-3-seeded berry: seeds oblong, exalbuninious, immersed in mucilage; testa coriaceous, embryo often with unequal plano-convex cotyledons. Only one species.

baurantiola, Lour. (T. triplicata, 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

2576. Trillium erectum.
in greenhouses. Produces an abundance of elliptical or nearly globular, gland-dotted red berries about $\frac{3}{4}$–1 in. across. They are sweet and agreeable and are said to be delicious when preserved. In trade catalogues the names *Triphasia aurantiola* and *T. triloliata* are sometimes erroneously applied to the hardy trifoliolate orange (*Citrus trifoliata*). In the U. S., little known except in S. Fla. It withstands some frost.

H. J. WEBBER.

**TRIPSSACUM** (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 in many places furnishing considerable native fodder. Fls. mucronous, in the same spike, the staminate 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 glume form a nearly cylindrical mass. At maturity the pistillate spikes separate into the joints.

**dactyloides**, Linn. (*T. violacea* and *T. Dactylis* of the trade). *Gama Grass*. *Sesame Grass*. Culms in bunches, 4–7 ft.; spikelets 2–3 at summit and often single from the upper axis. Moist soil, Conn., III., Kans., 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 *Stephanolirion*. *Lilidaceae*. A genus of 3 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 5: ovary sessile, 3-loculed, ovoid. Fall-blooming bulbs.

**nivella**, Poepp. (*Milla nivella*, 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. narroisoides*, Benthi. & Hook., does not appear to be in the

2578. *Tritania conferta* (X 4%).

**TRITELEIA** (three and complete; referring to the 3-merous fls.). *Lilidaceae*. *Triteleia* has been referred to *Milla* and *Brodiaea*; but when the group is restricted to the South American species, it seems to be advisable to keep it distinct. In *Brodiaea* the proper pedicels are articulated at the apex; in *Milla* and *Triteleia* they are not articulated. In *Milla* the stamens are inserted in one series in the throat of the perianth; in *Triteleia* they are distinctly in two series in the tube of the perianth. See *Brodiaea* and *Milla*.

About 16 *Triteleia* species are known (see Baker, G.C. III. 26, p. 458). 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 half-hardy, useful for planting in the border or for spring blooming in pots. Sometimes the odor is unpleasant.

TRITELEIA
narrow-linear, 1 ft. or less long; scape 8 in. or less tall, bearing a bract-like spathe towards the top: fl. 1 (rarely 2), 1 1/2 in. across, pale lilac or pale blue, with pointed segments violet-streaked through the center. Argentia. B. R. 23:1911. B. M. 3327. R. H. 1859, pp. 359, 351. Gng. 2:238.—Hardy in most of the northern states, although it does not persist long. Usually grown chiefly as a pot-plant for spring bloom. Var. carulea, 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.

TRITRINAX (apparently triple Thrinax; application not obvious). Palmaeae. Four species of South American fan palms, one of which was offered for cult. in Fla. in 1889 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; styles long, distinct, terminal in fruit.

T. brasiliensis is a little-known palm. It seems to have been confused in the trade with Thrinax Chuceo, which is referred in this work to Acanthaea. 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 leaves being composed of a fibrous mass which are at first parallel and longitudinal, then obliquely intercrossed and finally plaited at right angles like the mats of pandanus in which the coffee of the Antilles and Bourbon is exported. At the summit these narrow strips unite and form a series of very long, robust, recurved spines which are evidently designed to protect the fls. and fruits against climbing animals.

Brasilënis, Mart. Trunk slender, 6-10 ft. high, 2-3 in. thick; leaf-segments 22-27, linear. free for two-thirds their whole length. Bii. Brazil. L. H. 2:239.

W. M.

TRITICUM (old Latin name for wheat). Gramineae. The genus as now limited comprises two sections, Aeglops, 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 speltts, that are referred by Hackel to 3 species. Annual grasses with flowers in a terminal spike. Spikelets 2-5-fl. placed flatly on opposite sides of a spikelet axis; empty glumes ovate, 3-many-nerved, these and the fl. glumes more or less awned; grain free. The three species of our cultivated wheats are:

monococcum, 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. monococcum, 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) Speltts (T. spelta L. 4-sided; spike 6-fl.)—rather coarse; late, hard; susceptible to wheat rust (T. caroleum, Schrank). Spike very dense, laterally compressed, 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) Emmer (T. dicoccum, Schrank). Spike very dense, laterally compressed, rachis articulate at maturity. This species has a history similar to Spelt and its cultivation is now confined to certain 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 Wheats (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. compitum, Linn.), having branched spikes, which originated as a sport. (2) Hard or Flint Wheats, Macaroni Wheats (T. durum, Desf.). 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 10-20 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 wheats. (4) Common Wheats (T. vulgare, 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 chalk”). Spring wheats are planted in the spring and winter wheats in the fall, the former group of varieties being grown in the northerly regions.

A. S. Hutchcock.

TRITONIA
1857

TRITONIA (name explained as follows by Ker-Gawler, its author: “Name derived from Triton, in the signification of a vane or weathercock; in allusion to the variable direction in the stamens of the different species”). Including Montbretia. Iridaceae. BLAZING STAR. A genus of South African bulbs (plants really cormous), allied to Crocosmia, Acidanthera, Sparaxis and Gladolius. Baker admits 31 species (Handbook of the Iridaceae, 1892). Few of them are in general cultivation, although many of the species have been introduced at one time or another. Those of the Monthetria class are showy, hardy summer-flowering bulbs, to be handled like Gladiolus; or they may be left in the ground perma.
TRITONIA

Fig. 1. 4.

Most nently ally far segments.

ing perianth-tube, the simple low base, or many sword-shaped lvs., and loose, more or less dis- tichous racemes: fls. 2 in. across, orange-crimson, with a slender curved tube nearly or quite equaling the oblong unequal ascending segments, the stamens about half the height of the limb. "Natal, Transvaal, etc." B.M. 6722. G.C. III. 7:301, showing how the coronas form one above the other.

crocosmaeflora, Lemoine (T. Pottsi x pollen of Crocosma aurea (Fig. 352, Vol. 1)). Fig. 2581. Slender, much branching, erect plant 3-4 ft. high, with several stiffish or sword-shaped leaves. Corms small, covered with strongly reticulated sheaths or tu- nics. The perianth is tubular, with a spread-

2580. Tritonia Pottsi (X 1/4).

ing limb of obovate or oblong, nearly equal segments. The stamens are 3, inserted in the perianth-tube, with mostly ver- satile anthers and filiform fila- ments. The pistil has a 3-locu- led ovary, filiform 3-branched style, ripening into a 3-valved capsule.

A. Perianth-segments obovate.

crocata, Ker-Gawl. Slender, simple or branched from near the base, bearing few fls. in loose 1-sided racemes: fl. about 2 in. across, tawny yellow or orange-red, the stamens one-third the length of the perianth-limb. Cape Colony. B.M. 184 (as Ixia crocata). Gn. 54:1181. Var. miniatu, Baker (T. min- iata, Ker-Gawl.), has light red fls. B.M. 609. There are color varieties, as purpura, coecina, aurantica. These plants are usually treated as greenhouse bulbs in the North.

2581. Tritonia crocosmaeflora (X 1/4).

AA. Perianth-segments oblong.

rosea, Klatt. Tall and branched, with short linear lvs. and loose 6-15-fld. racemes: fl. bright red, with oblong segments (the three lower ones yellow blotched at the base) as long as the tube; the 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, and are usually safer if taken up.

Pottsi, Benth. (Montbretia Pottsi, Baker). Fig. 2580. Strong, branching plant 2-4 ft. tall, with several lax ra-

cemes, and few or several firm narrow lvs.: fl. about 1 in. long, bright yellow tinged red, the tube broadly funnel-form and twice longer than the oblong unequal ascending segments, the stamens about half the height of the limb. Natai, Transvaal, etc. B.M. 6722. G.C. III. 7:301, showing how the coronas form one above the other.

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Pottsi, Benth. (Montbretia Pottsi, Baker). Fig. 2580. Strong, branching plant 2-4 ft. tall, with several lax ra-
TROLLIUS

1859

TROLLIUS


Var. albiflorus, Gray. (T. Americana, Hook.) Much like the type but usually lower, more slender: lfts. usually 5: lvs. pale or white; petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

acaulis, Lindl. Plant only 3 or 4 in. high: lvs. as in the above, or only 5-parted: lfs. lemon-yellow, spreading, on stems hardly reaching from the ground; sepals 9, nearly lanceolate, acute, sometimes toothed; petals spatulate, shorter than the stamens. Northern India. B.R. 29:32.

Europaeus, Linn. (T. globulosus, Lam.). Stems erect, 15 in. or more high, often branching; lower lvs. petioled, others sessile; lfts. only 5-parted, lobed, cleft and toothed, those of the root-leaves on short petioles; lfs. of a lemon-yellow color, solitary or in twos, 1-2 in. across, globular in form; sepals 10-15, ovate; petals spatulate, often longer than the stamens: fr. much as in T. laxus. Wet upland meadows of N. Eu. May-July. G. 40:816. — Var. Loddigesii, Hort., has deep yellow lfts.

Asiaticus, Linn. Fig. 2582. Plant much like T. Europaeus, often taller, the smaller bronze-green lvs. more finely lobed and cleft, lfs. a rich orange color with sepals spreading. May. Siberia. B. M. 235. — The blooms of this are well suited for cut-flower purposes. The plants thrive best and produce richest colors if partially exposed to the sun. T. giganteus, found in garden lists, is a very tall form of this species. T. Japonicus, Hort., with large orange lfs. in early spring, is by some referred to this species. K. C. Davis.

TROPÉCULUM

1559

TROPÉLÖM (from Greek word for trophy: the leaves are shield-shaped and the flowers helmet-shaped). Geraniaceae. NASTURTIUM. About 40 species of soft-grown herbs, mostly climbing, of South America, chiefly of the cooler parts of Peru and Chile. They are grown for their showy old flowers. The common species, T. minus and T. majus, are also grown for their young pods and seeds, which are made into pickles. The peppery-tasting leaves are sometimes used like cress, in salads, wherefore the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly T. tuberosum, pro-

duce edible subterranean tubers. The flowers of Tropéolum are very irregular: sepals 5, conulate at the base, the posterior one produced into a long slender spur: petals 5 (sometimes fewer by abortion), usually narrowed into distinct claws, the two 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 indehiscent carpels (the carpels constitute the "seed" of commerce). The flowers yellow or orange, rarely blue or purplish, alternate and usually though often deeply lobed or even usually pellate: stipules none or very small species climb by means of the collars. For references to recent botanical literature on Tropéolum, see F. Buchanan in Engler's Bot. Jahrb. 26. 580.

Tropéolums 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. Lobelianum, 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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amureum, 1. Lobbianum, 11. speciosum, 5.
brachyceras, 4. majus, 12. tricolor, 2.
camarienses, 8. minus, 10. tricolorum, 2.
embriatun, 11. pentaflorum, 6. tuberosum, 10.

A. Flowers blue.

1. aireum, Miers. Very slender glasshouse climber: lvs. peltate, 5-parted nearly or quite to the base, into narrow-obovate or oblong-obovate divisions: lfs. small, the calyx and short spur green, the wide-spread corolla azure-blue, the petals 2-lobed or emarginate. Chile.
TROPÆOLUM


AA. Fls. red or yellow.
B. Petals small, protruding from the constricted mouth of the calyx.

2. tricolorum, Sweet (T. tricolor, Lindl.). Fig. 2583. Perennial from a fleshy or tuberous root, half-hardy, climbing; lvs. peltate, orbicular, divided into 6 oblong villous leaflets; fls. about 1 in. long, somewhat cornucopia-shaped, the calyx being the conspicuous part; main part of the calyx vermilion, the short lobes purplish, the small petals yellow. Chile. B. M. 3169. B. R. 23:1935. F. S. 4:369. P. M. 2:123.—Very choice half-hardy plant and probably the best known in this country of the tuberous-rooted kinds. Usually grown indoors. Its growth is very delicate.

3. Jarrattii, Paxt. Much like T. tricolorum, but more robust, the fls. larger, more brilliant in color, the upper part of the calyx with bright spots of yellow, the two upper petals pencilled with brown. Chile. P. M. 5:29.

BB. Petals conspicuous and mostly wide-spreading.
C. Spur not as long as the calyx-lobes.
4. brachyceras, Hook. & Arn. A very slender climber, resembling T. tricolorum in habit; lvs. peltate, nearly orbicular, deeply parted into 6 or 7 oblong or obovate oblong obtuse lobes; fls. small, on short pedicels, the calyx green and very short-squarred, the corolla with spreading yellow petals. Chile. B. M. 3581. B. R. 23:1926. F. S. 4:368. P. M. 4:53.—Half-hardy perennial.

CC. Spur much longer than calyx-lobes.
D. Lvs. parted nearly or quite to the base, or distinctly compound.

E. Blossoms essentially red.

2585. Tropæolum majus, the common Climbing Nasturtium. (×½.)

6. pentaphyllum, Linn. 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 1½ in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B. M. 3190. B. H. 22:73.—A half-hardy species, showy because of the great number of bright yellow flowers.

EE. Blossoms yellow.

7. polypophyllum, 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. 20:2906. G. C. II. 20:241. Gn. 45, p. 138.—It is a tuberous-rooted species, the stem naturally prostrate.

8. Leichtlinii, Hort. Hybrid of T. polypophyllum and T. edule (see suppl. list), raised by Max Leichtlin, Baden-Baden. Much like T. polypophyllum, but the fls. of brighter color, and the lvs. larger.

DD. Lvs. lobed, the divisions usually not extending much, if any, beyond the middle, and the sinuses usually broad.

E. Petals fringed.

9. peregrinum, Linn. (T. Canariense, Hort.). Ca- NARY-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.

2584. Tropæolum peregrinum—the Canary-bird Flower (×½).
TROPACOLUM

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-orbicular, 5-lobed nearly or quite to the middle; fls. rather small, the calyx and long spur red, the petals yellow, small and nearly erect and little exceeding the calyx. Peru. B.M. 5714. F.S. 5:432. P.M. 5:49. R.H. 1853:341 (tubers). J.H. II. 39:386. Plant stands some 2 feet. In Peru, the tubers are eaten, and the plant is sometimes cult. in Europe for the tubers. It appears in the Amer. catalogues of European dealers. The tubers are usually boiled.

DDB. Lvs. entire or only undulate.

E. Plant pilose.

11. Lobianium, Veitch. Annual, climbing, hairy all over except under the 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. Columbia. B.M. 4997. F.S. 2:67. P.M. 11:271. Var. fimbriatum, Hort., has the margins of the leaves finely undulate and undulate-angled; the lower petals fringed at the edges. 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 fringed on the claws. Peru. B.M. 23:3375 (var. atrosanguineum). F.S. 12:1286 (var. atropurpureum nanum). P.M. 1:176 (var. atrosanguineum). There are double-fld. forms. G.C. II. 11:605. These appear to have been introduced into this country about 1855 or 6. There are also dwarf forms. – This species has been in cult. in Europe since 1864. It is the foundation of the common climbing Nasturtiums. Thus some of these garden forms are probably the offspring of hybridization with T. Lobianium.

TROPICAL FRUITS

B.M. 98. – Very likely blended with T. majus by hybridization, in garden forms.

T. digitatum, Karat. Climber, with root fibrous; lvs. petalate, 5-7-lobed; fls. yellow, 1 in. in diam., the spur long and red, the petals filibrate. Venezuela. – T. fulvum, Paxt. Climber; lvs. orbicular, with 3 or 5 narrow lfts.; fls. in shape like those of T. majus, but smaller, yellow. Produces tuberous red-blu-begonia. Chile. P.M. 9:127. – T. hederiformia is offered by A. G. Hume in 1901. – T. Lindeni, G. Wall. Beauti-ful climber with large, peltate, undulate-lobed lvs. that are pur-ple beneath and beautifully veined with white above; fls. on long pedicels, the long tube red and the calyx-lobes green. Co-lombia. L.H. 41:367. L.H. B.

TROPICAL FRUITS. Trav-ellers 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 ex-periences in language where praise is not stinted. Some, on the other hand, are doubtful, and disdain and cannot be persuaded to taste, and if eventually persuaded, only to confess them after they have been ingested. This is due to the fact that in some quarters tropical fruits should be held in high esteem, and in others be considered of doubtful value. That good tropical fruits do exist is beyond doubt, 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 10° 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 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 gives (when the class of plant grown has been well selected) fruit excellent in appearance, large in size, and possessing a fine flavor. If such fruit is grown for export, it must of necessity be packed at seasons of the year when our tropical atmosphere is charged with humidit)y to within 15 per cent of the saturation point, and this fact constitutes an important difficulty often overlooked by beginners in the export trade. Such difficulties can, however, be overcome by careful methods of packing and preparation, and by selecting fruit which ripens in the “dry season” when packing facilities are as good as those of a temperate climate. It is a very doubtful, however, whether subtropical fruits grown in a humid climate can ever equal in their keeping qualities those produced in a lower temperature and drier clime. It has been proved that fruit can be safely trans-ported to long distances if properly handled, but the treatment to be undergone differs considerably from that which the fruits of temperate climates require. Many tropical fruits are nothing more than what should be called wayside morsels, that is to say, although edible, they are seldom of a quality suitable for dessert and are consumed mostly by children and wayfarers. By selection and cross-breeding these same fruits are being much improved, and strains will probably be pro-duced which in the future will be largely sought after, as there are good indications of success in varieties which have already appeared. This is work which must be systematically adopted to sustain a regular export trade in tropical fruits, and a good start has been made from several points.

2586. Tropaeolum majus.

13. minus, Linn. Fig. 2587. Dwarf annual, not climbing, smaller in all its parts; lvs. apiculate at the ends of the veins; fls. with narrow apiculate petals. Peru.
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. Mangos 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, Per Louis, and Mango d'Or are varieties which are worthy of the table of 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 Departments of Agriculture and Education in the West Indies.

Many fruits practically unknown in northern latitudes are available in tropical countries, but insufficient to maintain a paying export trade. If they were grown in larger quantity and in uniform quality, there is no serious obstacle to their being regularly placed upon the northern market. Figs. 1497 and 1388. The number 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 Mango-steen, Gavania Mangostana, native of the Straits Settlements. This has been fruiting in Java and Trinidad, 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 of the finest flavor 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.

Writing 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

5. Mangosteen, Gavania Mangostana. Fig. 893.
6. Sapodilla, Acharis Sapota. 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.
14. Guava, Psidium Guajava. Fig. 2008.
15. Pomme Cythere, Spondias dulcis.
17. Water Lemon, Passiflora tarvolia.
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 mere grafts, grown as the cashew. 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 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 (Persea) is a fruit which carries well, and is usually 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.

Bananas, 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 lees, it being considered by many as the best of all the fruit flavors for this purpose. It could be easily
The site might be exported if preserved. The part used is the large aril or seed attached to the seed, and it is served as a relish with meat dishes. The governor's plum is a fruit the size of a green-gage and makes fine jelly. The cashew is useful when preserved. The large seeds, roasted and bottled for preservation, 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 made in lime Cythere is an excellent and well-flavored table fruit. The granadilla makes excellent ices, and the water lemon is much used as dessert, having the appearance and flavor of a huge ripe gooseberry though generally somewhat sweeter. Melicocca bijuga, or the genip, is children's fruit, it is seldom seen at table. Like all similar fruits there has practically been no selection, and a large amount of variation appears. This is very prominent in the genip. 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 citrus 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 trouble to eat. When a mango is described as "all top and turpentine," the writers were writing truly of the ordinary "out of season" mango, but all-the-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 prized, but not exported to any extent, are mangoes, grapes, star-apples, naseberry or sapodilla, avocado pear, granadilla, cherimoya, sweet sop and mangosteen.

There are between 20 and 30 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 from Jamaica is almost entirely of one particular variety, which goes under various names, "Jamaica," "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, Java, Straits Settlements, etc., and have been sent out from time to time to the Botanic Gardens of the West Indies.

The 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. There is also a special disease known as "Black Pinia" or "Black Ramo," a fungus which attacks the petiole of the leaf. It has not done much harm, and in fact has not attracted any notice except in Trinidad. Insects do not interfere with the plant or fruit. Nematode worms are known in other countries to have caused great destruction, but no cases are reported from any part of tropical America.

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 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 2,500 feet. A native hybrid between the sweet orange and the tangierine 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 Garden 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 Pheopodes. 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 Acosta, in his "Natural and Moral 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 Spaine... The best [pines] are those of the Islands of Barlovento [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.

Coconuts.—There is a large export of coconuts in the shell from the W. Indies, and in Jamaica there is a factory for making coconut 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 West Indies coconuts 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 grafted 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 bud 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, coca-plum, star apple, granadilla, soursop, etc., are all valuable items in the tropical markets.

**TROXIMON**

The banana, citrus fruits, cocoonat, man-gosteen, carambola, bilimbi, Nilgiri blackberry, tamarind, pomegranate, grape, akee, bread-fruit, and jack-fruit are introduced from other countries.

The akee, bread-fruit, jack-fruit, cho-echo (Sechium 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 exporters who will stamp as "pass" those lots as well-packed, 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:

Barbados Cherry is *Mulippia glabra*, which see. Nilgiri Blackberry is *Rubus racemosus*. Ochra is another spelling for *Okra*. Pomme Cythère is *Spondias dulcis*, described below. Pomme d'Or is *Passiflora laurifolia*. Spanish Plum. Consult *Spondias purpurea*, below. Sweet Cup is *Passiflora edulis* and *P. maliformis*.

The genus *Spóndias* of the family Anacardiáceæ 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 fls., 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. polyga- num; fruits 4-5, free at apex. The following are widely cult, in the tropics.

**AA. Locules of the eichinata nut distant, connected only by the common base.**


**BB. Racemes panicled, often exceeding the lvs.: lvs. yellowish white.**


**purpurea, Linn. (S. Móbim, Linn., not Jacq.). Spanish Plum. Low tree: lvs. deciduous: Hts. 16-21, ellip- tic-oblong, bluntness, usually serrate: fr. obovoid, 1 in. long, yellow or tinged purple. American Tropics.**

**TRÓXIMON** (Greek, edible; which does not apply). *Composita*. A genus of 15 species of mostly perennial, nearly stemless herbs native of North America except possibly 2 species which are South American. The spe-

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2590. Papaw tree—Carica Papaya. A tropical fruit of secondary importance. (See also p. 246.)

This picture shows a specimen grown in the open in southern Florida; Fig. 263 shows one grown in a northern greenhouse.
cites are generally low-growing, hardy plants with clusters of sessile, radical leaves and simple scapes bearing a head of yellow or purple flowers in summer.

cuspidatum, Pursh. Root thiek: lvs. entire, linear-lanceolate, thickish, 4–10 in. long; scape about 1 ft. high: its, yellow: akene not beaked. Prairies of Ill. and Wis. to Dakota. B.B. 3:278.—Cultivation easy in any soil, very ornamental. It has rather large, dianthus-like heads of flowers in late summer. Offered by collectors.

P. W. B. A. R. C. Y. L.

TRUE LOVE. Paris quadrifolia.

TRUFFLES. See Vol. II. p. 1045.

TRUMPET CREEPER. Tecoma, especially T. radiata.

TRUMPET FLOWER. Consult Bignonia.

TRUMPET HONEYSUCKLE. Lonicerā semprevirens.

TRUMPET VINE. Tecoma radicans.

TSUGA (its Japanese name). Conifera. HEMLOCK SPRUCE. 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 only 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. Hookeriana is almost as hardy. T. Mertensiana and T. Brachyphylloides 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. Mer

T. Hookeriana is the most vigorous species and is more graceful than the Canadian Hemlock, but tenderer. T. Hookeriana is noticeable for its light bluish green foliage and the more narrow pyramidal habit. The Japanese species have very hard, almost dark green glossy foliage, but are of slow growth. T. Canadensis bears pruning well and is well suited for tall hedges (see Gns. 2:298). 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 Conifera, 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 differs little in the structure of the fls.: the cones are very similar to those of the larch, but the lvs., though 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. Sieboldii, 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." The "Hemlock" of the ancients is a poisonous umbelliferous herb described in this work as Comium maculatum.

TSUGA 1865

albo-spatha. 4.
Araucaria. 1.
argentea. 6.
Canadensis. 4.
Caroliniana. 3.
compacta. 4.
diversifolia. 2.
globosa. 4.

INDEX.
globularis. 4.
heterophylla. 5.
Hookeriana. 6.
Mertensiana. 5.
Petasites. 4.
Sieboldii. 4.

A. Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½–1½ in. long.
B. Margin of lvs. entire: apex of lvs. usually emarginate, sometimes obtuse.
C. Scales of cones suborbicular.
D. Branchlets yellowish brown, glabrous

BB. Margin of lvs. finely dentate, at least towards the apex: apex of lvs. obtuse or acute.
C. Cones pubescent: scales almost orbicular, glabrous.

CC. Scales sessile: scales oval, slightly puberulous outside.

D. Branchlets reddish brown, pubescent. 2. diversifolia

AA. Lvs. small, not pinnatipartite on both sides, flat or con vex above, spirally arranged: cones 2–3 in. long (Hesperopeuce). 6. Hookeriana

TSUGA HEMLOCK SPRUCE (X 3/4).


2. diversifolia, Mast. (Abies diversifolia, Maxim.). Tree, very similar to the preceding, chiefly distinguished by the reddish leaf-cushions: lvs. linear, emarginate or obtuse, shorter and narrower, broader at the middle or toward the base: cone smaller, 3½–4¼ in. long: peduncle not exceeding the bud-scales: bracts truncate, crenulate, not or slightly bladd. Japan. G. F. 10:493. 10:492.

3. Caroliniana, Engelm. CAROLINA HEMLOCK. Tree, attaining 70 ft., of more compact habit and with darker green foliage than the following: young branchlets light reddish brown, finely pubescent or almost glabrous: lvs. linear, obtuse or emarginate, dark green
and glossy above, with 2 white lines beneath; 5/4-7 in. long; cones obovate, 1-1/4 in. long, pendulous; scales oblong, with 2 white lines beneath; Var. &. S. S. 10:266. G. C. II. 26:780. — More graceful than the next.

4. Canadensis. Carr. (Abies Canadensis, Michx.). Common HEMLOCK. Fig. 2591. Tree, attaining 70 and occasionally 100 ft.; young branches yellowish brown, puberulous at the base, becoming, on the sides, dark brown and obscurely grooved above, with 2 white lines beneath, 3/4-5 in. long; cones ovoid, 3/4-5 in. long, pendulous; scales almost orbicular. New Brunswick and W. Va. (see Strotheria). Carr. HEMLOCK yields the lumber most commonly used in the East for framing and cladding of buildings. It is not used for finishing lumber. A number of garden forms have been raised. The following are the most important: Var. albo-spica, Nichols. Type of the acutish bristle white. Var. compacta, Séndel. (var. compacta aduna, Beissan). Dwarf conical pyramid with numerous short branchlets clothed with small leaves. Var. globo, Beissan. (var. globulifera erecta, Kunkler). Dense globoso, much branch formed with numerous upright branches nodding at the ends. Var. gracilis, Gord. (var. microphylla, Hort.). Slow-growing form with slender branchlets, spreading more or less drooping at the ends; lvs. very small, about 3/4 in. long. Var. nana, Carr. Dwarf and depressed form with spreading branches and short branchlets. Var. Pendula, Beissan. Lvs. very small, 3/4 in. long or shorter; branches closely set and numerous. Var. pendula, Parsons (var. Sargentii pendula, Hort., var. Sargentiana, Kent.). Flat-topped form with spreading branches and drooping branchlets. G. C. II. 32: p. 263; 3: 2591. G. C. I. 10:267; 368, 421. Very distinct and desirable form.

5. Mertensiana, Carr. (T. heterophylla, Sarg.; T. Albertiana, Séndel). Tree, attaining 200 ft., with short slender usually pendulous branches forming a rather narrow pyramidal head in older, but rather broad in young trees; young branches pale yellowish brown, pubescent; lvs. linear, obtuse or acutish, distinctly grooved and dark green above, with 2 white lines below, 5/4-7 in. long; cones obovate-ovoid, sessile, 3-4 in. long; scales oval, slightly puberulous beneath. Alaska to Calif., west to Mont. S. S. 10:605. G. C. III. 12:11.


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 magazine during the period of its greatest glory— from Jan., 1839, to Jan., 1845. The statement, on page 501 of this Cyclopedia, that the younger Downig *"founded 'The Horticulturist,'" is inexact, he having been the salaried editor, while the enterprise was Tucker's alone. To Downig, 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 inter-

TULIPA. See Tulipa.

TULIPA (originally from Persian tolbon, turban; which the inverted flower resembles). Liliaceae. Tulip. Plate XLIV. Bulb tunneled, the outer tunic often hairy or woolly on the inner face: stem 3-30 in. high, usually 1-ft., rarely 2-3- or 4-ft.; lvs. linear or broad: fls. erect, rarely nodding, short; perianth deciduous, campanulate or slightly funneled; segs. distinct, often spotted or blotched at base, without peltate nectar-styles; stamens 6, hypogynous, shorter than perianth-segments; filaments longer or shorter than anthers, attenuate or dilate; anthers dehiscing laterally; ovary sometimes narrowed at collar, rarely into a distinct style; stigmae adnate; seeds numerous, flat. Differs from Fritillaria in the absence of neetariferous pits and usually erect (never pendulous) fls., and from Erythronium in its erect, broader perianth-segments, erect ft., and usually 1-ft. stems. Native of Oriental countries, Siberia, Asia Minor, China and Japan, and naturalized in N. & S. America. S. S. 10:907. The name Tulip now includes 83 species, only about half of which are in cultivation at present. The latest monograph is Baker, "in Gardener's Chronicle," for 1883. Solms-Lauber is the author of a monograph on Tulipa, 1889, which now includes 15 genera, under which name it is now treated. See Burbridge, G. S. 9, 1900.

GILBERT M. TUCKER.
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 cannot offset a deficiency of roots.

For outdoor cultivation the bulbs should be set in September to November. 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, and enriched with leaf-mold and well-rotted cow manure. Fresh manure and other fertilizers should never be used near bulbs of any sort. On heavier soils Tulips can be successfully raised if extra care is given to insure perfect drainage. Drainage is important under all conditions. The bulbs 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 bulb) 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 cushion of sand allows the water to drain away rapidly and at the same time insures the presence of an easily penetrable subsoil for the young roots. Care should be exercised to place all the bulbs at the same depth, as otherwise they will not all bloom at the same time. When the ground begins to freeze, cover the beds to a depth of several inches with leaves, dry forest litter or other light material.

After danger of heavy frosts is past in spring the beds should be uncovered, and if the work of preparation and planting has been well done there will require little or no further care. In England many of the beds of choice and delicate varieties of Tulips are protected when in flower from heavy rains and hot sun by means of light cloth screens, and are thus kept in good condition for some time.

For pot culture, a mixture of fine garden loam, two parts to one of well-rotted manure (cow manure composed for two years is best), mixed with such 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 into the soil, thus bringing the base in close contact with the soil particles. Cover the bulbs to the tip and press the soil firmly about them. Water once freely and cover the pots entirely with soil, leaves or litter, so that they will be out of reach of frost, or place them in a dark cold (not freezing) cellar in winter. This first few days at least the temperature should be moderate and the bulbs should not be allowed to become 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 their dormancy is broken in the first few days at least the temperature should be moderate and the bulbs should not be allowed to become 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 their dormancy is broken in the first few days at least the temperature should be moderate and the bulbs should not be allowed to become 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 their dormancy is broken in the first few days at least the temperature should be moderate and the bulbs should not be allowed to become 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 their dormancy is broken in the first few days at least the temperature should be moderate and the bulbs should not be allowed to become too dry. Water freely but not to excess. Some

Propagation.—Tulips may be increased by the side offsets, but these are not as constant as new bulbs produced within the outer tunic by means of cutting the old bulbs. Fig. 2592 shows a section of a bulb with a new inner bulb and offsets about to form. The new bulb is completely inclosed in a sac which afterwards becomes the outer dry, membranous tunic. The pubescence, if any, may be found on the inside of this sac even in the earliest stages of growth. The new bulb is attached to the base of the flower-stem, immediately above the root-crown from which the former proceeds directly upward. Each new bulb-tunic (including the outer sae) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 2592 shows the separated leafy bulb-scales, and indicates the homology of tunics and leaves. Sports among the offsets are at present mainly depended upon for the production of new varieties. These have been found susceptible to the "breaking" process, though perhaps slower to respond than the seedlings. Seed production is now practised only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is 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 Gesneriana, but this is an explanation which does not explain. It merely means that in 1753, the year which is usually but arbitrarily taken as the beginning of systematic botany, Linnaeus grouped all the garden Tulips he knew under the name of Tulipa Gesneriana. But the Tulips of that day had been cultivated for two centuries by Europeans, and previously for an indefinite period by the Turks, from whom, of course, we have no exact records. Fig. 2593. One might study wild Tulips in their native places and compare them with descriptions without being certain of the original form which the Turks brought from the wild, simply because of the lack of records at the beginning. It is necessary to have some scientific name for the garden Tulips. The most one dare say is that the garden Tulips are chiefly referable to T. Gesneriana and T. suaveolens, with the distinct understanding that these names do not represent an original wild stock.

Tulipa suaveolens requires explanation. This name, which dates from 1797, 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 run wild. In 1799, it was distinguished from the other Tulips then known by the fragrance of the flowers, the earliness of bloom, slightly greater size and pubescent scape. From the early records it appears that there were fragrant, early-blooming flowers among the first Tulips received

TULIPA

2592. Three leafy bulb-scales from young bulb, exhibiting the homology of leaves and bulb-scales (x 5).

At the right an old Tulip bulb, showing formation of new bulb at base of leaf-clamp and flower stem attached directly to root-crown.
from Turkey. This is one of the main reasons for believing that T. suaveolens is not native to southern Europe. At all events it is clear that T. suaveolens has played an important part in the evolution of the garden Tulip, the Duc van Thol class being generally credited to this source. The distinctions between T. suaveolens and 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 T. suaveolens are shorter and broader than those of T. Gesneriana. This character also fails. All grades of pubescence are present. Some pubescent plants have long leaves and odorless flowers. Others have short, glabrous leaves and fragrant flowers.

For practical purposes it may be said that most of the common garden Tulips, at least the late-flowering ones, are T. Gesneriana, while many of the early-flowering kinds, e.g., the Duc van Thol class, are supposed to be derived from T. suaveolens. It is impossible to press much nearer the truth, as botany is not an exact science and the prototypes of the old garden favorites cannot be known completely and precisely.

Early History. — The first Tulip seeds planted by Europeans were sent or brought to Vienna in 1554 by Busbequius, the Austrian ambassador before the Sultan of Turkey. Busbequius reported that he first saw the flowers in a garden near Constantinople, and that he had to pay dearly for them. After the introduction of seed to Vienna the Tulip became rapidly disseminated over Europe, both by home-grown seed and by new importations from Turkey. In 1559 Gesner first saw the flower at Augsburg, and it is mainly upon his descriptions and pictures that the species T. Gesneriana was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated Tulips on a rather large scale. 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 he 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, culminating in the celebrated "tulipomania" which began in 1634. The excitement continued for four years. Thirteen thousand florins were paid for a single bulb of Semper Augustus. Governmental interference was necessary to put an end to the ruinous speculation. After the craze subsided, the production of varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the Tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected by the rich for the many new plants from America. For a 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 Europe preferred the rounder form (Fig. 2595). 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 flowers colored were considered common and undesirable in the European gardens and all effort was made to the production of the rarer white-grounded varieties with finely and distinctly marked petals. In 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). In order to produce 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, 1578, Clusius, 1593, Do- dona, 1678, and Besler in 1613, no round-petaled forms are found. Besler's work, "Hortus Eystetten- sium," contains no engravings; copper plates, the first in any book on plants. In many 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 Parkinson's "Paradisus Terrestris," 1629, many are figured with inner segments reflexed and outer acute, but none vice versa (so far as could be seen), though that form is mentioned in the descriptions. The broad, rounded, eyelash-like 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 rounder form practically unknown among our common garden forms; so much so that the extreme typical one has been referred to a separate species (T. acuminata, Fig. 2596). 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

2593. A sixteenth-century Tulip.
From the work of Clusius published in 1576. One of the oldest pictures of Tulips. Same size as original plate.
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to be monstrosities, and were pictured as such. According to Solms-Laubach, no traces of them are to be found in the old Dutch books. They were evidently developed in Holland, which did not disdain the yellow and red forms, in which these belong, to such an extent as did the Hollanders. At one time they were made a separate species, \textit{T. Turleia}, and later said to be hybrids, by one author between \textit{T. aurea} and \textit{cristata} (E. S. \textit{Arnold}, Jr., 1873), by another between \textit{T. Gesneriana} and \textit{suaveolens} (Mrs. Loudon, 1841). That the Parrot Tulips are hybrids is perhaps true, but to state with certainty the parents seems impossible, for as early as 1661, 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 today exhibit more or less laciniation, so that it is probable that “Parrot” strains might be developed from them by simple selection.

Double Tulips seem to have made their appearance at an early date. In Hortus Eystettensis (1661), 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 “\textit{Tulipa intea} wallfollia, le monstre jaune double.” Flowers with as many as 200 petals are mentioned. A double form of \textit{T. sylvestris} was known in 1701, and at the beginning of the nineteenth century a double form of \textit{T. sylvestris} was described.

\textbf{ARNOLD V. STUBENRAUCH.}

\textbf{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 alone which 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 Aura, Cayuga county, N. Y., grew from seed of some of the finest Tulips, both as regards size, colors and markings, ever shown in this or any other country at that early date, which was nearly 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, and exhibited the flowers at the first spring exhibition of the 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 it cannot flourish profitably only grown 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 reddish brown, while those grown in a heavy soil are smaller and of a dingy 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 sandy being almost ideal 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 deep. In very sandy soils, 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 this Tulip will not endure as much frost as any hardy perennial—for it will—but nearly all bulbs make certain preparations for spring 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 with a fine rake 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 *aurea* must be practiced but not revealed. The great secret in Tulip propagation is now open to the world, though not popularly understood.

Propagation is affected by offsets, from the fact that varieties will not reproduce themselves from seed. The seed produces only "selfs" or Mother Tulips, 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,—nature’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 beds; 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.

It is a matter of great regret that the key used below is based upon a fictitious botanical character of no interest to the horticulturist, but it seems to be impossible to group the species according to the color and shape of the flowers.

**SUMMARY OF GROUPS.**

I. *Outer bulb-tunic glabrous inside*...Species 1–2

II. *Outer bulb-tunic with a few appressed hairs inside towards the top*...Species 3–12

III. *Outer bulb-tunic with scarring appressed hairs all over inside*...Species 13–20

IV. *Outer bulb-tunic pubescent inside, densely so at apex*...Species 21–23

V. *Outer bulb-tunic pilose inside*...Species 24–26

VI. *Outer bulb-tunic*...Species 27–30

VII. *Outer bulb-tunic everywhere woolly inside*...Species 31–32

VIII. *Outer bulb-tunic around root crown, and usually with a few scarring hairs above but sometimes without them*...Species 37–42

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**GROUP I.**

- *Outer bulb-tunic glabrous inside*...Species 1–2

**AA.** *Perianth crimson tinged with yellow outside*...

- *fragrans*...1

**GROUP II.**

- *Iragrana, Munby.* Height 6–12 in.: proper lvs. 3, crowded at middle of stem, linear or lorate; fls. yellow, greenish outside; perianth five-infundibular—campanulate, 1 1/2 in. long, 3 in. across, slightly fragrant; segments all acute; petals usually at base inside, at base: ovary slightly narrowed at collar; stigmas small. Algeria. Gn. 45:465, — Allied to *T. sylvestris,* differing in position of the leaves and segments uniformly wide.

**GROUP II.**

- *Hageri, Hold.* Height 6 in.: lvs. 4–5, lorate acute, not undulate; fls. chiefly red, about 2 in. across; perianth broad-campanulate, 134 in., inodorous; segments acute, red, with a large, green or purple-black base blotched magined with yellow; stamens purple-black; filaments linear, bearded at base: ovary narrowed at collar; stigmas small. Hills of Paratas range in Attica. B.M. 6242. F. 2596. The open spreading form of Tulip (X 3/4).
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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. Kolpakow- skiana sometimes obscurely pubescent).
B. Lvs. ovate or broadly lanceolate.
C. Filaments bearded at base. 5. Kolpakowskiana
CC. Filaments not bearded.... 11. Ostrowskiana
CC. Filaments not bearded .... 12. Sprengeri
BB. Lvs. linear or linear-lanceolate.
C. Filaments bearded at base.10. sylvestris
CC. Filaments not bearded .... 11. Ostrowskiana

3. Greigii, Regel. Height 2-8 in.; lvs. usually 4, obscurely downy, much undulate toward cartilaginous border; perianth campanulate, 3-3 1/2 in. long, 5 in. across, spreading abruptly from about the middle, bright crimson with a large dark basal blotch, margined with yellow; segments uniform, obovoid, cuspidate or emarginate; anthers yellow; filaments black, glabrous; ovary narrowed at collar: stigmas yellow, twice as broad as neck of ovary, reflexed. Turkestan. B.M. 6177. F. S.S. 21:2201. F. 1876:217. — Early-blooming.

4. Eichleri, Regel. Height 6 in.; lvs. 12-15 in. long, lanceolate acuminate, margin plane and smooth; perianth broadly campanulate, 2 3/4-3 1/2 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; filaments black; stigmas very thick, undulate, pale yellow. Georgia in Asia. B.M. 6191. F. 1877:169. — Allied to T. Greigii.

5. Kolpakowskiana, Regel. Height 12 in.; lvs. 3-4, obscurely ciliate on margin; bud nodding; perianth campanulate, 2-2 1/2 in. long, 4 1/4 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; anthers dark purple; ovary large, stout: stigmas large, crisped. Turkestan and Central Asia, 1877. B.M. 6710. G.S. 60. p. 182.— A near allied of T. Gesneriana, which it bids fair to rival in beauty and variety under cultivation.

6. pulchella, Pendl. 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 plicate at base; filaments linear; ovary oval-shaped; stigmas larger than ovary-diameter. Alpine region of Cilician Taurus, 1877. B.M. 6304.— A dwarf species near to T. Hageri.

7. violacea, Boiss. & Ruehse. 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 rosy crimson flushed with purple, varying to white with a slight flush of red outside, with a large black or brown basal blotch, usually bordered with white; segments uniformly oblong, subacute; stamens black or purple; stigmas small. Persia. Int. to cult. 1890. B.M. 7440. G.M. 30:390.— Allied to T. Hageri and pulchella.

8. carinata, Hort. Krelage. Lvs. 3, 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. suaveolens 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.

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, 3 in. long, deep 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.

10. sylvestris, Linn. Fig. 2601. Height 9-15 in.: lvs. usually 3, at base of scape, channelled, linear-lorate: peduncle sometimes 2-2 1/2 in. in cultivation; bud nodding; perianth funnelform-campanulate, 1 1/4-2 in. long, yellow; segments all acute, inner narrower: ovary bladder-formed (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-odorous, 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 Turkestan in 1881. B.M. 6895. G. 45:965.— Allied to T. Occlusus-solis.

12. Sprengeri, Baker. Height 10-18 in.; lvs. 4, close together, long, linear-lanceolate, stiff: peduncle wiry, tinged with deep crimson: 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;

Group III. Outer bulb-tunic with scottering 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, purplish or bluish black basal blotch. 14. maculata

AA. Stem glabrous

B. Lower lvs. lorate or linear-lanceolate. 15. Kesselringi

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 picotee," which has larger lvs. and white flowers edged with rose, and without basal blotch. "Probably a hybrid between T. acuminata and suaveolens."

14. maculata, Hort. Height 12-18 in.; lvs. 3-4, lorate-lanceolate; perianth campanulate, 2-2½ in.; segments obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small. -"A well-marked garden race" (Baker).

15. Kesselringi, Regel. Lvs. 4-5, crowded at base of stem, lorate-lanceolate, channelled; peduncle sometime obviously puberulent; perianth campanulate, 1½-2 in. long, bright yellow, flushed with red and green outside; inner segments subobtuse, outer acut; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diameter. Turkistan. B.M. 6754.

16. saxatilis, Sieber. Height 12 in. or more; stem usually branched low down and bearing 2 fls.: lvs.

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2600. A pan of Murillo Tulips, one of the few double varieties that are really desirable (X⅓).

usually 3, sometimes lowest 12 in. long; perianth oblong-funnelform, 2-2¼ in. long, 3 in. across, light mauve-purple, at base bright yellow; segments pubescent at base, inner obvate, outer oblong; anthers blackish; filaments bright yellow: ovary prismatic: stigmas small. Crete, 1878. B.M. 6374. Gm. 56:1234.

17. Korolkowi, Regel. Height 6-9 in.; lvs. 2-3, falcate, much crisped; perianth campanulate, red, with a distinct black basal blotch; inner segments oblong, outer obvate; filaments lanceolate; stigmas small. Turkestan, 1875.

18. Kaufmanniana, Regel. Less than 12 in. high; lvs. 2-3; perianth subcampanulate, 2-3 in. long, 2½-3 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 lemon-yellow, linear, filaments bright orange, linear flattened; ovary pyramidal: stigmas small in campanulate form, but described as large. Turkestan, 1877. B.M. 6887.

19. Billietiana, Jord. & Four. Lvs. 3-4, undulate, not ciliate on edge: perianth open-campanulate, 2 in. long, 4/5 in. across, somewhat hairy, 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; outer segments reflexed; stamens same color as basal blotch: ovary narrowed at collar; stigmas larger than collar-diameter, white. 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, acuminata: perianth campanulate, 2-2½ in. long, 4½ in. across, somewhat hairy, 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; outer segments reflexed; stamens same color as basal blotch: ovary narrowed at collar; stigmas larger than collar-diameter, white. Savoy, Italy. B.M. 6639. -Var. Mauritiana, 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. Jutta, DC. A cultivated form: peduncle 6½ 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 striations: 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 long, linear and acuminate..................21. acuminata

AA. Perianth segments oblong, all uniform and acuminate .............22. retrolaxa

AAA. Perianth segments all narrowly oblong; inner acute, outer rounded at top ...............23. Dammanni

21. acuminata, Vahl. Figs. 3602, 3603. Height 12-18 in.: lvs. 4, lowest lanceolate, all undulated at margins: peduncle shining: perianth very open, light yellow spotted with red lines; segments sometimes 4½ in. long, 1½ in. wide, rolled; anthers purple; filaments glabrous: stigmas yellow: filaments flattened, glabrous: ovary prismatic: stigmas very large, yellow, not undulated. Turkey (1).

22. retrolaxa, Hort. Lvs. long-lanceolate, sometimes linear-lanceolate, slightly ciliate on edge, otherwise glabrous: peduncle somewhat shining: bud nodding; perianth open funnel-campanulate, yellow, a shade darker at base—a trace of a very obscure basal blotch; segments uniform in width, linear-lanceolate acuminate, 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 within middle of stem, linear-lanceolate, recurved, obscurely bristle-like, ciliate on margin, otherwise glabrous: peduncle glabrous: perianth spreading, star-shaped, purplish or reddish with an oblong-lanceolate black
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blotch without yellow border; segments narrowly ob-long; filaments filiform, glabrous; stigmas broader than ovary-diameter. Mt. Lebanon, 1889. Gt. 38:1300. —Allied to T. linifolia and Maximoviczii.

GROUP V. Outer bulb-tunic plicate inside.

A. Lower lvs. lanceolate.
B. Lvs. slightly or not at all undulated.………….24. Armena
BB. Lvs. very much undulated.….25. platystigma
AA. Lower lvs. linear.…………..26. Maximoviczii

24. Armena, Boiss. Lvs. 5, crowded at base of stem, falcate, glaucous and glabrous, slightly undulated, long, ciliate on edge all around, longer than fls. 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. Giseniana, 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 obovate-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
29. montana
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, white 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.

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 oblanceolate and slightly wider; anthers pinkish; pollen gray; filaments bluish black; ovary pyramidal; stigmas very small, yellowish white. Bokhara.

29. montana, Lindl. Height 4–8 in.; lower lvs. ob-long-lanceolate, acuminate, undulated, very glaucous; peduncle glabrous; perianth campanulate, 1½–2 in. long, 2 in. across, deep crimson, paler outside; segments ovate or oblanceolate, flat, acute, the inner often obovate to obovate; filaments purplish; ovary prismatic; stigmas small. Mts. of Persia. B.R. 13:1106. —Var. Julia, K. Koch. Dwarf, from Caucasus. Not more than 3–4 in.

2601. Tulipa aysviesiris, known also as T. Florentina, var. odorata (×3/4).

TULIPA

1873
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 obovate-ovate, obtuse, sometimes deeply incised on the edge near the top; filaments linear, terete, yellow; ovary elliptic-oblong, compressed, trigonous; stigmas coroniform. Eastern Bokhara, 1889. Gt. 38:1367. G.C. III. 19:759. —One of the early Tulips.

2602. One of the acuminate-petaloid forms — the old Turkish-garden ideal (×3/4). No. 21.

GROUP VII. Outer bulb-tunic everywhere woolly inside.

A. Filaments bearded at base.
B. The filaments flattened.………31. biflora
BB. The filaments cylindric.……32. Clusiiana
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 mixed with yellow.………….34. Oculius-solis
35. praeox
BBB. Perianth with outer segments rich, bright purple or purplish-red broadly marigined with white; inner segments yellowish white.………….36. Leichtlini
TULIPA

31. TULIPA. Linn. Height 3-6 in.; stem glabrous or slightly pilose; leaves 2-3-fld., rarely 4-5-fld.; 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. 7:335. B. M. 6518.

32. CLUSIANA. Vent. Height 12-18 in.; stem slender, glabrous; lvs. 4-5, very long and narrow and folded double, linear-acuminate, pendant; peduncle slender, tinged with brown; filaments very slender, 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 hirsute on edge; stamens yellow; filaments cylindrical, densely bearded at base; ovary pyramidal; stigmas small, tinged with red. Portugal, through Mediterranean region to Greece and Persia. B. M. 1390.

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, 2½ 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 green; 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, 2½-3 in. long, 4½ 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 P. Gesneriana).—Var. LORTETI, Baker. A slight variety, the basal spot oblanceolate and black. Marseilles. VAR. LYCICA, Baker. Stem 6-8 in. long; lvs. crowded; perianth-segments all acute, inner oblanceolate-oblong; apex subdeltoid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. VAR. ALEPICA, Baker. A form with lvs. considerably smaller than W. European type, with a smaller black basal blotch. Asia Minor, Syria and Palestine.

35. PREOCH. Tem. Height, 12-18 in.; stem slender, glabrous; lvs. 3-5, lorate-lanceolate, acute, undulated at margin; perianth campanulate, 2½-3 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, obtusely cuneate; anthers yellow; filaments long, dark purple; ovary prismatic; stigmas pubescent, reddish. Italy and Southern France; also Algeria, Greece, Syria, Palestine and Persia. Very closely allied to last, and in B. R. 3:294; 14:1143; 17:1419.—One of the oldest known species.


GROUP VIII. Outer bulb-tunic always hairy at base inside, and root-crown always covered, and usually furnished with a few scattering hairs above, but sometimes without them.

A. Stem and lvs. pubescent ............. 37. suaveolens
AA. Stem and lvs. glabrous.

b. Leaffy only at base of stem ........ 38. australis

C. Lvs. lanceolate ..................... 39. viridiflora
CC. Lvs. linear or obovate ............. 40. fulgens

b. Leaffy to middle of stem or above.

C. Perianth uniformly dark scarlet;illet with a bright yellow basal blotch .................. 41. macropesilla

CCC. Perianth variable, but rarely with a bordered dark basal blotch. ............. 42. Gesneriana

37. suaveolens, Roth. EARLY GARDEN TULIPS. Height 3-6 in.; lvs. 3-4, mostly at base of stem, lowest lorate-lanceolate and broad: perianth campanulate, 1-2½ in. long, erect, fragrant, bright red or yellow or variegated; segments all acute; filaments prismatic: ovary prismatic; 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. 639.

38. australis, Link. Height 12-18 in.; stem slender; lvs. 2-3, crowded together at lower portion of scape, channelled: bud nodding; perianth 1½ in. across, funnelform-campanulate, yellow, outside reddish; segments ob lanceolate-oblong acute, at apex slightly puberulent; anthers yellow; filaments flattened, bearded at base; ovary narrowed at collar. Savoy, France, Spain, Portugal and Algeria. B. M. 7171. Gn. 45:965.

39. viridiflora, Hort. (1). 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 ciliate near base; fl. large, soft green, edged with yellow or white. Gn. 32:625.—Garden form. Bears some resemblance to a Tulipa clusiana.

40. fulgens, Hort. Garden form. Height 8-18 in.; lvs. 3, lanceolate or ovate, very wavy; perianth-segments all oblong ovate, acute; anthers yellow; pollen yellow; filaments white, flat ended; glabrous: ovary prismatic: stigmas small, not wavy.

41. macropesilla, Baker. A supposed hybrid of unknown origin: height 10-18 in.; lvs. 3-4, long and narrow, lowest long lanceolate, flat, pendant; peduncle wiry; perianth campanulate, slightly funnelform, emitting a heavy, sweetish, unpleasant odor, bright crimson to carmine red; with a distinct, bright, deep scarlet basal blotch broadly margined with yellow or yellowish white at top: segments obtuse or outer sometimes acute, outer reflexed, inner erect; filaments dilated at base, blackish brown or striate above; glabrous: ovary prismatic, creamy white: stigmas same color, large, slightly undulated.

42. Gesneriana, Linn. COMMON OR LATE TULIPS. Figs. 2594-2600. Height 6-24 in.; stem erect; lvs. 3-4 or more; lower lorate-lanceolate; ovate-lanceolate, often undulated, glaucous, pubescent variable: peduncle erect; perianth campanulate, 1-2½ in. long, in odorous, bright red or varicolored, when bright red, with only a faint obscure brown blotch or striate above; glabrous: ovary prismatic, creamy white: stigmas same color, large, slightly undulated.
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.
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. 6130 (as T. Schrenkii). Darwin tulips (Fig. 2507) between a recent strain of long-stemmed, late, self-colored tulips.

**TULIPA**

2094. Tunica Saxifraga. *Flower about natural size.*

**Var. Dracontia**, Baker (Fig. 2599). **PARRROT TULIP.** Similar in habit: perianth usually yellow and red striped and splotched; segments deeply cleft and linearly dentate. F.S. 21:2211 (as T. Terecica).

**Var. spathulata** (T. spathulata, Bertol.). This differs from the type in its larger fls., of a brilliant red color, with a large purplish black blotch at the base of each of the segments. Italy.—Probably the largest of the wild Tulips. Catalogued by many bulb growers as "T. G. Vera."

**Var. Strangewaysiana**, Rebul. Very large, brilliant, dark scarlet flowers, with a handsome dark basall blotch. One of the naturalized Tulips found without disposition to vary in fields near Florence, Italy. F. 1880:63.

**Var. Albo-oculata**, Krelage. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a distinct white basall blotch; inner segments obtuse, outer acute; filaments white.

*T. flava*, Hort., Krelage, 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. laurata*, Regel. Dwarf fl. large, goblet-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*, Agrdah, a Nigeria 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. Breyelliana*, Linna, the proper name of which is *Besometa Comnellaria*, Sallab. *Besometa* is a monotypic genus native to South Africa. There are no true Tulips in South Africa. The important generic distinction between *Besometa* and *Tulipa* lies in the dehiscence of the capsule; that of the former is septifixed, of the latter loculicidal. *Besometa* is figured in B.M. 757 as *Molanthus* uniflorum. 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 native of the Cape, the plant is supposed to be hardy.

**ARNOLD V. STUBENRAUCH.**


**TUNA.** Opuntia Tuna.

**TUNICA** (Latin, a tunic or coat, from the imbricated involucrum). Caryophyllaceae. 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 *Tunica* being a cluster, 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*, Seep. (Fig. 2594), apparently the only species in cultivation in this country, is a tufted spreading hardy species suitable for rockwork and blooming in summer and fall (see bottom p. 737). It is a wiry-stemmed perennial, growing 6-10 in. high; fls. small, with rosy white, blue 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.**

**TÖPA.** See Lobelia.

**TUPÉLO.** 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 black light-fleshed roots that are usually more or less flattened and 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-fleshed 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 tendency 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 European or Asian in origin. Characteristic tubers of these two plants are contrasted in Figs. 2605 and 2606. The former is commonly known here as "flat turnip" and the latter as rutabaga or merely "baga." According to Vibomirin, 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.
TURNIP

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 main-season crop, whereas the Turnip may be sown very late for winter use or very early for late spring or summer use. Usually the flat Turnip is not grown during the hot weather of summer. In the northern states it is sown from the middle of July to the middle of August for late crop, or on the first approach of spring in order that tubers may be had for the early winter use. The late or winter crop is ordinarily used for storing in cellars and also for feeding, whereas the early crop is often sold in bunches in the open market, and later by the basket or bushel.

Turnips and Rutabagas are hardy; that is, the young plants can withstand some frost. They are cold weather plants and demand loose, moist soil. Usually the seeds are sown in drills which stand from 10 to 20 inches apart. In the drills the plants are thinned when 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 thinnings are necessary. The seeds of Turnips and Rutabagas are of similar size, two or three pounds being required for broadcasting to the acre. When sown in drills one-half or one-third this amount may be sufficiently. 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 maggots, which is the larva of a small fly, and the flea beetle. The maggot may be killed by injecting bisulfide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, maggot control is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea beetle may be kept in check by sprinkling the plants with land-plaster, or perhaps better by sprinkling them with Paris green diluted with land-plaster (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 also more prized for stock-feeding. They yield heavily, are rich and nutritious, and keep well in ordinary cellars.

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 parsnips the roots should not be left in the ground to freeze if they are to be used.

L. H. B

TURNIP, INDIAN. Arisaema triphyllum. TURNIP-ROOTED CELERY. See Celeriace.

TURPENTINE TREE. Syncarpia latifolia.

TURPANIA (Pierre J. F. Tarpin, a French botanist and author). Celastraceae. About 8 species of trees or shrubs forming the hot weather region 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 5-celled, perianth entire; petals 5, suborbicular; stamens 5; ovary sessile, 3-lobed, 3-loculed: fr. subglobose indehiscent.


F. W. BARCLAY.

TWISTED STALK

TURRÆA (Turra, 1607-1688, botanist of Padua, Italy). Meliaceae. 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; staminal tube 4-5-toothed; disk none: ovary 5-10 or 20-loculed: ovules 2. In each locule, 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 imperfectly diagnosed and should be known as T. floribunda, as explained in the Flora of Tropical Africa.

A. Fls. solitary or in pairs, axillary.

heterophylla, Sm., not Sonder. Lvs. more or less ovate-cuneate, 3-lobed above, varying to subentire: fls. 5½-6½ in. long. Upper Guinea. B.R. 30:1 (as T. lobata).—Not cult.

AA. Fls. clustered at ends of branches.

floribunda, Hochst. (heterophylla, Sond.). Shrub: foliage falls away before flowering season: lvs. ovate, sometimes with alternate, stalked, entire or divided or 3-lobed; fls. clustered at ends of branches; peduncles and calices silky tomentose. Natal.

W. M.

TURTLE-HEAD. Species of Chelone.

TUSSILIAGO (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 saucer-shaped yellow flower-heads composed of rays, but the scapes are scaly and the heads are smaller, lighter colored and borne in early spring before the "main crop" of dandelions. Also the flowers close up in the hot sunshine in the middle of July, 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 angular. They are covered with a soft downy matting which diminishes toward the end of the season. The Colt's foot 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 hardy and is used for wild garden operations. It grows naturally in moist places and thrives on steep raw banks in the stillest 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. Tusstlago fragrans, the "Winter Heliotrope," is a Petasites, which see. The leaves of the Colt's foot 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 Taraxaca. For generic description, see Gray's Manual and Britton and Brown's Illustrated Flora.


Var. variegata, Hort., has lvs. margined and more or less blotched with white or yellow. G.n. 37, p. 435. Lowe 56.

W. M.

TUTSAN. Hypericum Androsaemum.

TWAYBLADE. Liparis Illitocris.

TWISTED STALK. Streptopus.
TYDEA. Now included in *Isoloma*.

**TYPHA** (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 monococious 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.

**TYPHA**

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**TYPHA**

*TYPHA* 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. Stamine and pistillate spikes separated.


F. W. BARCLAY.
ÜLEX (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 hardy 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 bear 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 30 species, native of W. and S. Europe and N. Africa, closely allied to Cytisus and chiefly distinguished by the deeply 2-lipped calyx. Very spiny shrubs: lvs. mostly reduced to scales, only vigorous shoots near the ground bearing fully developed lvs.: 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 lfs. yield a yellow dye.

U. Europaeus, Linn. FURZE, Gorse. Fig. 2608. Much-branched, very spiny and rigid shrubs, 2–4 ft. high; branchlets striped, villous when young: lvs. scale-like, or narrow lanceolate, pubescent: fls. axillary, 1–3, crowded at the end of the branches and forming racemes; corolla bright yellow, about ⅛ in. long, fragrant; calyx yellow, pubescent; pod oblong, ⅛ 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 l.—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 REHDER.

ULMARIA (derived from Ulmus; alluding to the resemblance of the foliage of the common European species to that of the elm). Syn., Filipendula. Rosocea. MEADOW SWEET. Hardy herbaceous perennials with rather large pinnate or palmately lobed 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 fibrous or tuberous rootstock; lvs. stipulate, interrupedly odd-pinnate, the terminal leaflet 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. Ulimaria has usually been united with Spirea, but is very distinct in its herbaceous habit, pinnate, stipulate lvs. and indehiscent 1-seeded akenes.

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A. Lfs. numerous, almost alike, small, pinnately lobed.

1. Filipendula. Hill. (Spira filipendula, Linn. Filipendula hexapetala, Gilib.). MEADOW SWEET. DROPPORT. Fig. 2609. One to 3 ft. high, with tuberous rootstock, glabrous; radical lvs. 6–20 in. long; lfs. sessile, oblong, pinnately lobed and serrate, 1 in. long; fls. in loose corymb, white, about ⅛ in. across, with usually 6 petals: akenes about 12, pubescent, semi-cordate. June, July, Europe, W. Asia and Siberia.—Var. flore pleno has double flowers, and is common.

(1878)
ULMUS

Ivs. Ivs. the! _,;,

Campestris, forced. Aug.

Terminal ptndna R.B.

Gans, few, Manchuria, underneath:

2-3 fls. Hort.

The Ivs. 5.

3.

F. Hort.

Alb., 2609. Umlaria Filipendula (plant about 2 feet high).

Commonly known as Spiraea Filipendula. One of the plants called Meadow Sweet.

3. palmata, Focke (Spiraea palmata, Pall. Filipendula palmata, Max. Spiraea digitata, Willd.). Height 2-3 ft.; ivs. whitish tomentose beneath or glabrous; terminal Ifts. 7-9-parted; stipules large, semi-cordate; fls. pale pink at first changing to white; akens 5-8. July, Siberia, Kamschatka and Sakhalin.—This species is but rarely cult.; the plant common under the name Spiraea palmata belongs to F. purpurea.

BB. Lateral Ifts. none, or few and ovate.

4. Camtschatica, Rehd. (Spiraea Camtschatica, Pall. Spiraea gymnata, Hort. Filipendula Camtschatica, Maxim.). Height 5-10 ft.; ivs. glabrous or villous beneath, often with rufous veins; terminal Ift. very large cordate, 3-5 lobed, with broadly ovate, doubly serrate lobes; lateral Ifts. usually none; stipules large, semi-cordate; fls. white; akens usually 5, ciliate. July, Manchuria, Kamschatka.

5. purpurea, Rehd. (Spiraea purpurea, Thunb. Filipendula purpurea, Maxim.). Height 2-4 ft.; Ivs. glabrous or villous beneath; terminal Ift. very large, cordate, 5-7 lobed, with oblong, acuminate, doubly serrate lobes; lateral Ifts. none or few, oblong-ovate; stipules narrow; fls. carmine or deep pink, in large paniculate cymes with crimson peduncles and stems; akens usually 5, ciliate. June-Aug. Japan. B.M. 5726. I.H. 15:577. F.S. 1S:1853. Gn. 17:36. —This is undoubtedly the finest species of this genus. It is also sometimes grown in pots and forced. Var. albica, Hort., has white fls. and var. eleagnos, Hort., white fls., with red stamens and usually several lateral Ifts.; the latter is said to be a hybrid. R.B. 4:7.

6. pentapetala, Gilib. (U. palastris, Moench. Filipendula Ulmacea, Lindl. Queen of the Meadows. Height 2-6 ft. Ivs. glabrescent and green on both sides or whitish tomentose beneath; terminal Ifts. 3-5 lobed, 2-4 in. long, terminal Ifts. smaller, ovate, coarsely doubly serrate; fls. white, in rather dense paniculate cymes; akens about 15, oblong-cordate, almost glabrous, twisted. June-Aug. Europe, W. Asia to Mongolia; naturalized in some places in the eastern states. B.B. 2:245. Var. aries variagata, Hort., has the lv's. variegated with yellow. Var. flore pleno. Fls. double.

U. angustifolia, Rehd. (Spiraea angustifolia, Turcz. Filipendula angustifolia, Maxim.). Similar to F. lobata: fls. white; ivs. glabrous or whitish tomentose beneath. Dahuria, Manchuria.—F. vestita, Rehd. (Filipendula vestita, Maxim. Spiraea vestita, Wall.). Similar to F. Camtschatica, but only 1 ft. high and lv's. grayish tomentose beneath; fls. white. Himalaya. B.B. 27:4 (as S. Kamschatca, var. Himalensis).

ALFRED REHDER.

ULMUS (ancient Latin name of the Elm). Urticaceae, tribe Ulmeae. Elms. Ornamental deciduous, rarely half-evergreen trees, sometimes shrubby, with alternate, short-petiolate, serrate lv's. and with inconspicuous, generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy north, but U. alba, Maxia. and U. americana are tender. U. parviflora and U. serotina are of doubtfully hardy character, 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. Americana, which is the finest 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 wide-spreading head, borne usually at a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American Elm several other species are used as avenue trees, as U. tenuifolia, cernosua 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. Helicia, Ducae and Pitteeri. In the southern states U. serotina, crossifolia and alata 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 narrow columnar head; U. scabra, var. horizontalis, with horizontal limbs forming wide-spreading tiers; U. scabra, var. pendula, with long,pendulous branches. U. campestris, var. striata and var. alata are densely covered with rough, 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 Elm. One of the most destructive is the elm leaf-beetle, which destroys the foliage. The Canker-worm is also serious; to keep it from doing damage, band the trunks a few feet above.


2611. Fruit of Ulms Americana. (X 2.)

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 Elm. One of the most destructive is the elm leaf-beetle, which destroys the foliage. The Canker-worm is also serious; to keep it from doing damage, band the trunks a few feet above.
ULMUS

the ground with cloth covered with a sticky substance, which prevents the ascent of the wingless female. Spray. A borer, *Saperda tri dentata*, sometimes does considerable damage to the wood. The Elms grow best in rich and rather moist soil, rather than the American Elm. The American Elm generally requires such a soil to attain its full beauty, but some species, as *U. racemosa* and *U. alata*, do well in drier situations. Elm trees are not difficult to transplant, and rather large trees may be moved successfully if the work is done carefully. They bear pruning well, but generally do not need much attention of this kind.

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. Fences raised from layers are said to bear seed less early and less profusely and are therefore especially recommended for street trees, as the foliage of trees that fruit slightly or not at all is larger and more abundant. Dwarf forms of *U. 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 the *var.* are propagated by suckers. In some species, most of the *var.* 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 *scabra* are used for stocks.

About 18 species of Ulmus are known, distributed through 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 watery juice: *lvs.* short-petioled, usually unequal at the base, with caducous stipules: *fls.* perfect or rarely polygamous, apetalous, in axillary clusters or racemes; calyx campanulate, 4-5-lobed, with an equal number of stamens (*Fig.* 2010): ovary superior, with a 2-lobed style, usually 1-loculed and with 1 ovule: *fr.* a slightly compressed dry nutlet, with a singly membranous wing all around. *Fig.* 2311-16. 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. pumila* is used medicinally and that of some Chinese species is made into meal and used for food. The tough inner bark of some species furnishes a kind of bass which is sometimes woven into a matting, especially that of *U. campestris*, *var. laciniata*, in Japan.

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**1. Americana, Linn. (U. dubia, Rafn.). White Elm.**

**2. pedunculata, Fong. (U. laevia, Pall. U. effusa, Wid., U. cithita, Ehrh. U. racemosa, Borkh., not Thomas). Tree, attaining 100 ft., with spreading branches, for broad open spaces.**

**3. racemosa,**

**4. alata.**

**5. fulva.**

**6. scabra.**

**7. campestris.**

**8. pumila.**

**9. parvifolia.**

**10. crisafolia.**

**11. serotina.**
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. CORK ELM. ROCK ELM. Fig. 2612. Tree, attaining 100 ft., with short spreading branchlets, 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 obovate, with a shallow notch at the apex, pale, pubescent, 2/3-5 in. long.

Quebec to Tennessee, west to Nebraska. S.S. 7:312.

4. alata, Michx. W. HOOE OR WOODY ELM. Fig. 2613. Tree, attaining 90 ft., with spreading branchlets forming an oblong, round-topped or rather open head; branches usually with 2 opposite very broad wings; branchlets almost glabrous; buds acute, pubescent: lvs. ovate-oblong to oblong-lanceolate, often falcate, acute or acuminate, doubly serrate, subcoriaceous, glabrous above, pubescent beneath, 1 1/2-2 1/2 in. long; fls. in short, few-fl. racemes; stamens usually 5: fr. elliptic-ovate, with narrow wing and with 2 incurved horns at the apex, villose, 1/4 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 hardly north.

5. filva, Michx. (U. raphra, Michx.). SLIPPERY ELM. RED ELM. Figs. 2614, 2615. Tree, attaining 70 ft., with spreading branchlets, forming usually a broad, open, flat-topped head; branchlets pubescent: lvs. obovate to oblong, very unequal at base, long-acuminate, doubly serrate, of firm texture, very rough above, pubescent beneath, 4-7 in. long; fls. in dense clusters; stamens 5-9: fr. orbicular-ovate, little notched at the apex, 1/4 in. across. Quebec to Fla., west to Dakota and Tex. S.S. 7:314. Em. 2:334.—The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding. An allied species similar in foliage and fr. is U. elliptica, Koch (U. Heijderi, Späth. U. Sibirica, Hort.), native of western Siberia, Turkestan and Persia, with longer and larger lvs. and grayish pubescent buds.

6. scabra, Mill. (U. montana, With. U. glabra, 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 obovate to oblong-obovate, abruptly acuminate or somewhat rounded at the base, sharply and doubly serrate, rough above, pubescent beneath, 3-6 in. long; fls. clustered; stamens 5-6, little exserted: fr. oval or roundish obovate, little notched at the apex, with the seed in the middle, 3/4-1 in. long. European and North American species of some of which many forms are cultivated; the following are some of the most important: Var. atropurpurea, Späth. With dark purple foliage. Var. belgica, Hort. Of vigorous growth, forming a broad pyramidal head. Turkestan lvs. dark green. Var. crispa, Loud. (U. asplenifolia, Hort.). A rather slow-growing form with narrow oblong curved lvs. incisedly serrate with twisted teeth, giving the margin a fringed appearance. Var. Dumpeili, Koch. Similar to var. fastigiata, but with slender branchlets, smaller and lighter foliage. Var. Dampier Wredel, Hort. Differs from the foregoing by its yellow young leaves. M.D.G. 1896:160. Var. Dovai, Hort. Of vigorous growth and upright pyramidal habit. Var. fastigiata, Loud. (U. pyramidiUla, Hort. U. Ezo- niensis, Hort.). Of columnar habit with strictly upright branches and somewhat twisted, broad dark green leaves. Var. horizontalis, Kirchn. With horizontally spreading limbs and more or less drooping branches. Gn. 17, p. 539. M.D.G. 1901:163. Var. Incimata, Trautv. Lvs. broadly obovate, 3- or sometimes 5-lobed at the wide and doubly serrate green: branchlets little pubescent, light-colored. E. Asia. Var. nana, Hort. Dwarf form. Var. pendula, Loud. (U. Camperdoven, Hort.). Camperdown pyramidal head. Gn. 40, p. 158. Var. fittearius, Hort. Pyramidal tree of vigorous growth and laterally spreading branches, 3-5-lobed at the apex, light-colored. E. Asia. Var. heterophylla, Koch. With double serrate lvs. often purplish when unfolding. Var. purpurea, Koch. Lvs. purplish when young, changing to dark green. Var. superba, Hort. Of vigorous growth, with large and long, dark green leaves. Var. tricuspis, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green. Var. tricerrata, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green. Var. tricerrata, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green. Var. tricerrata, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green. Var. tricerrata, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green. Var. tricerrata, Koch. (U. tricerrata or tridentis, Hort.). Lvs. ovate, 3-lobed at the apex, acuminate, dark green.
ULMUS

above, pubescent beneath, 1-3 in. long; fls. with 5-6 stamens; fr. obovate to oblong-obovate.

Var. major, Planch. (U. major, Smith, not Reichb. U. sativa, Mill., U. latifolia, Hort.). Large tree; lvs. rather long-petioled, ovate to ovate-orbicular, when unfolding, usually glabrous and smooth or sometimes slightly rough above, pubescent beneath, 2-5 in. long; fls. with usually 4 stamens; fr. broadly obovate.

2618. A Feathered Elm—Ulmus Americana.

Var. levis, Spach (U. sitens, Münch. U. glabra, Mill., not Huds. U. carpinifolia, Lindl.). Tree without suckers: branches spreading, sometimes pendulous, not corky; lvs. ovate or obovate, dark-green, glabrous and smooth above, pubescent on 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. O.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. campestris; it may prove to be a distinct species.

The following are the most important horticultural forms: Var. Antártica, Arb. Kew. Shrub or small tree, with slender often pendulous branches; lvs. slender-petioled, obovate, incised doubly serrate, somewhat curled, 1-2 1/2 in. long. Var. Antártica suba, Hort. (U. Rózalecsí, Hort.). Similar to the preceding but with yellow lvs.


8. Sibírica, Linn. (U. microphylla, Pers. U. Sibirica, Hort.). Small tree or shrub, with slender pendulous, sometimes pendulous branches; lvs. oval-elliptic to elliptic-lanceolate, short-petioled, acute, firm, dark green and smooth above, pubescent when young beneath, 3/4-2 in. long; fls. short-pediciled; stamens: fr. obovate, with the nutlet somewhat above the middle, incision at the apex reaching about half way to the nutlet. Turkestán to Siberia and N. China.—A graceful small hardy tree. Var. péndula, Hort. (U. parvifólia péndula, Hort. Plórera vénpsi, Hort.), has slender, more pendulous branches. U. pinnato-rámosa, Dieck, with the slender branches very regularly pinnately branched, is probably only a form of this species.

9. parvifólia, Jacq. (U. Chinésis, Pers.). CHINESE EL. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obovate or oblong, very short-petioled and little unequal at base, acute or obtuse, subcoriaceous, glabrous and glossy above, pubescent beneath when young, usually glabrous at length, 3/4-2 in. long; fls. short-pediciled in clusters; stamens 4-5, much exerted: fr. oval to elliptic, notched at the apex, with the seed in the middle, 3/4-5 in. long. July-Sept. N. China, Japan.—Has proved hardy near Boston.

10. crassifólia, Nutt. CEDAR EL. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished with older with 2 opposite corky wings: lvs. short-petioled, ovate to oblong-oblong, usually very unequal at the base, obtuse or acute, cleft or cutely and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath, 1-2 in. long; fls. in few-fld. very short racemes; stamens 5-8, little exerted: fr. oval-elliptic, pubescent, notched, 3/4 in. long. Aug. Miss. to Ark. and Tex. S. S. 7:212. Tender.

11. sérótha, Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular corky wings: lvs. oblong to obovate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2-3 in. long; fls.

2619. Camperdown Elm—Ulmus scabra. var. pendula.
in %\text{-}1 in. long pendulous racemes; calyx 5-6-parted to the base: fr. elliptic, deeply notched, densely ciliate, %\text{-}1 in. long. Sept. Tenn. to Ga.; sometimes planted in avenues in Ga.; has proved hardy at the Arnold Arboretum, Boston.


\section*{UMBELLULARIA (from Latin \textit{umbella}, a sunshade; having reference to the form of the inflorescence). \textit{Lauraceae}. \textbf{California Laurel}. A monotypic genus, comprising a single Pacific coast tree with alternate, simple, exstipulate fr.: fr. small, greenish, in simple pedunculate umbels, which in the bud are surrounded with an involucre of 6 caduceous bracts; petals none; stamens 9; filaments with an orange-colored gland at base; anthers opening by uplifted valves: fr. a sub-globose or ovoid drupe with hard endocarp. Propagated by seeds.

\section*{UROMUS, CALIFORNIA CHICKEN JUICE.}

\section*{UMBRELLA LEAF. \textit{See Diphylleia.}}

\section*{UMBRELLA PINE. \textit{Sciadopitys.}}

\section*{UMBRELLA PLANT OR UMBRELLA PALM. \textit{Cyperus alternifolius.}}

\section*{UNGNAEDIA (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). \textit{Supinacea.} A genus of one species, the \textbf{MEXICAN BUCKEYE}, a small tree closely related to the horse chestnut but with foliage like a hickory, the frs. being alternate and pinnate, and rose-colored frs. are borne in small lateral clusters or simple corymbs, appearing with the frs. in early spring. The seed, or "bean," 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 frs. are about \% of an inch across, polygamous, 4-petaled, and the staminate ones have 8 stamens. For fuller account, see Sargent's \textit{Silva.}}

\section*{UPLAND OAT (\textit{Avena} var. \textit{Saratoga}).}

\section*{UNIONA (an ancient Latin name of some unknown plant, derived from \textit{unio}, one, and said to have been applied by Linnaeus to this genus on account of the union of the glumes). \textit{Graminae.} Perennials with creeping rootstocks. Species 5, all American. Spikelets broad and very flat, in loose panicles, and some with some of the lower glumes empty; glumes keeled, nerved, pointed, but awnless. Cultivated for the ornamental panicles, which are suitable for dry bouquets.

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\section*{URANIA \textit{Lauraceae}. \textit{Umbellularia California (X 3/4).}}

\section*{2620. California Laurel—\textit{Umbellularia Californica (X 3/4).}}

\section*{California Laurel. \textit{Umbellularia 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; frs. containing a highly aromatic and volatile essential oil, and burning vigorously in the camp fire, even while green; frs. fragrant; drupes at first yellowish green, becoming purple when ripe. Dec. to May.—One of the most abundant and characteristic of Californian 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 crowds 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 shorn 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 jaws, bits, cleats, cross-trees, etc. The branches are occasionally used for poles for chicken-roosts, as the strong odor, pervading the wood and bark as well as leaves, is said to keep away lice. The leaves are used for flavoring soups and blanmansages but are too strong to give an agreeable flavor as those of \textit{Laurus nobilis} or \textit{Prunus Laurovora}. The tree is sometimes cultivated for ornament in south European parks and gardens. Professor Sar-

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URARIA

crowded with 200 or more pea-shaped fls, each 3½ 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 x 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 Malacc and the Malay Islands to Timor Laut, but not Australia and not indigenous in Ceylon. B.M. 7377.

W. M.

URCEOLINA

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 of each of its parents is shown in Fig. 2922. The hybrid gets its name from Urceocharis, 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 perianth has 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 Panaratum 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 5 of these, including Eucharis and Urceolina, have broad and petioled lvs, and the ovules are superposed. 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 Clibrani; 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.

URCEOLINA (Latin, pitchery; alluding to the pithy 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 scaphe 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.

3 species of Urcolina 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.

miniata, Benth. & Hook. (Penituddia miniata, Herb.). Bulb about 1½ in. through: lvs. produced after the fls., short-petioled, about 1 ft. long, 1½ in. wide, narrowed at both ends: scape over 1 ft. long; fls. 2-6, bright scarlet. Areas of Peru and Bolivia. B.R. 25:68. R.B. 23:49.—Offered by Dutch bulb-growers.

2621. Unioia latifolia (X ¾). (See page 1888.)

URCEOCHARIS (hybrid name, suggesting that the plant is a hybrid between Urceolina and Eucharis). Amaryllidaceae. The only species, Urceochareis Clibrani i see Fig. 2922. 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
URCEOLINA

AA. Fls. yellow.

pendula. Herb. (U. aurea, Linne. 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. 4-6, bright yellow tipped with green. Andes of Peru. B.M. 5446. G.C. III. 12:211.

F. W. BARCLAY and ROBERT CAMERON.

URÈBA (meaning not obvious). Urticaceae. About 13 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.

alcefoliá, Gaud. (Urtica Caracasiana, Jacq.). Tree or shrub: lvs. broadly ovate, acuminate, basal sinus wide and open, crenate-dentate: fls. dienceous, in regularly dichotomous cymes; male cymes 4-6 times dichotomous, stinging or not, rose-colored; female fls. many times dichotomous, the fls. solitary or in 3's. Trop. America.

W. M.

URGINA (from the name of an Arabian tribe in Algeria). Liliaceae. The Sea Onion, known to drug stores by the name of Squill, and to gardens as Urgina maritima, is a bulbous plant native to the Mediterranean region, which grows 2 or 3 ft. high and has a long raceme of small, white, 6-petalled flowers. The raceme is often 1½ ft. long and contains 50-100 or more fls. each ½ in. across. It has the same style of beauty as Ornithogalum pyramidale but unfortunately it is only hardly. As an ornamental plant it is little known in America. The name seems not to appear in American catalogues, but the Dutch bulb-growers offer the bulbs in at least 5 sizes. A plant erroneously called Sea Onion is Ornithogalum caudatum. There is considerable difference of opinion as to when the Sea Onion blooms, but the plant is generally considered an autumn bloomer, and it is clear that the leaves appear after the flowers. In England the plant is said to have flowered as early as July and August. Baker writes that the lvs. appear in winter. Some English cultivators say the lvs. appear as early as October and November; others say not until spring. The plant grows near the seashore and the fls. in dry sandy places from the Canaries to Syria. It is also found in South Africa, which is unusual, as the North and South African species of any genus are not usually identical.

The proper name of the Sea Onion is Urginea Scilla. The plant is closely related to the genus Scilla, but in the opinion of the undersigned it is much closer to Ornithogalum, especially in habit, inflorescence and color of flowers. The seeds of Urginea are numerous in each locule (in the Sea Onion 10-12), strongly compressed and winged; in Ornithogalum and Scilla they are not compressed or winged and in Scilla they are solitary or few in each locule. Urginea is a genus of 40 species of bulbous plants native to the eastern Mediterranean region, particularly the species have narrow or lorate lvs. which follow the fls., and racemes of numerous whitish, rarely pale yellow or rosy fls., each segment of which is keeled with green or purplish. Monographiae lyvii C.B. Thunberg in Journ. Linn. Soc. 15: 215 (1873). At that time Baker recognized a total of 24 species, but in Flora Capensis 6:462 (1806-97) he describes 27 species from South Africa alone. The bulbs of Urginea are collected in large quantities in the Mediterranean region for the drug trade. They sometimes attain a maximum weight of 15 pounds. The bulbs contain about 22 per cent of sugar and are used in Sicily in the manufacture of whisky. Squilla have emetic and cathartic properties. Syrup of squalls is a popular group medicine. The bulb, as it appears in the wholesale drug market, has been deprived of its outer scales and cut into thin slices, the central portions being rejected. 60.

B.M. 918 (as Ornithogalum Squilla).

URSINA (John Ursinus, of Regensburg, 1608-1666; author of "Arboretum Biblicum"). Compositae. Here belongs the hardy annual known to the trade as Sphenogyne spectabilis. It grows about a foot high, having cut foliage and yellow or orange flower-heads 1¼-2 in. across. The heads have about 22 rays. Both yellow and orange-colored flowers are sometimes found on the same plant. When well managed it blooms all summer. It is supposed to be a native of the Cape of Good Hope, but it has been in cultivation since 1836 but was not correctly described until 1887. It is much praised by connoisseurs, though it is not known to the general public. It seems to have enjoyed a longer continuous period of cultivation than many other showy composites, in which the Cape is wonderfully rich, particularly in subshrubby kinds. In Flora Capensis, vol. 3 (1864-65), Sphenogyne and Ursina are treated as separate genera, the distinctions between the two as follows: the skene is cylindrical in Sphenogyne, but obovate or pear-shaped in Ursina, distinctly tapering to the base: the pappus is uniseriate in the former, biseriate in the latter, the pappus consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursina.

Ursina is a genus of about 60 species, all native to S. Africa. One species, U. annua, is also found in Abyssinia. The species are annuals, perennials or subshrubs: lvs. alternate, serrate, pinnatifid or usually pinnatisect; rays the same color on the lower side, orange or purplish; involucre hemispherical or broadly campanulate; achenes often 10-ribbed. For further particulars, see Flora Capensis, vol. 3. There are said to be many other desirable species besides the following:

pilcrora, N. E. Br. (Sphenogyne speciosa, Knowles & Wate.). Annual, 1-2 ft. high, with lvs. binnately

W. M.
URTICA (Urticaceae) is the genus containing the net-tles. For *U. Caracassana*, see *Ureca. U. nicea* is Ramie or Silver China Grass, properly *Bohemia nicea*, which see. As Ramie is a horticul-tural subject, it is not fully treated here, the student being referred to the publication of the office of Fiber Investigations, U. S. Dept. Agrie., Washington, D. C.

**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 harder peaches giving a fair number of crops as com-pared to the number 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-tumn 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-grow-ing. 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 alluvial 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 to conduct the water on to much land that might otherwise be profitably used for fruit. Artesian wells supply water to the river lands to which the water waters 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 land which had previously grown nothing but a grass and sage-brush have changed into irrigated 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 in-dustry.

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 "cañon winds," become very important 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 clockwork. They come from the cañons and blow with such force as to necessitate stock wind-breaks to protect all orchards within a mile or two of the cañon’s mouth. But gradually they spread out over the lower lands in a fan-shaped area, their force lessening as the distance from the cañon increases, though still sufficiently strong to prevent the crop and 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 cañon winds have gone 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 the question of the supply of water.

Another factor which has contributed in the past toward restricting the areas devoted to fruit is the manner 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 strictly farming districts of the state the peo-ple lived in villages and grew 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 corn crops. It is only in those 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 from them. 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 assuredly be a fair one, but its mountain climate seems to give a superior 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.

F. C. SEARS.

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 these are protected during the winter by being covered with earth and covered with earth. Even with this protection the vines are badly damaged by freezing, as is indicated by large, eoryky swellings often called black knot of the grapes. Sweet cherries and native grapes do very well in certain localities in this section. There are a few hardy almond trees near Ogden. Further south, at Provo, there is at least one vineyard of Vignera grapes in which the vines are planted 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 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 corner 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. Vignera 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). Lentibulariaceae. 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 stagnant water. They are fewer in the marsh-inhabiting 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 widely different families. 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 specie propagate themselves by seeds and also by winter-buds. (A winter-bud of another aquatic plant is figured under Biola, p. 226.)

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, Endressii and longifolia, 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 1½-2 in. across. In general, such plants are grown in warm houses, U. Endressii 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 fls. 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 axes of the leaves. These bromeliads are themselves often epiphytic, growing on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the leaf-axes of Vriesia and other bromeliads we may cultivate Utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which
1888

UVULARIA

A. Habit aquatic: foliage dissected into numerous thread-like segments: lv. floating...

AA. Habit terrestrial or epiphytic: foliage entire, erect.

B. Color of fls. white, with a yellow palate...

BB. Color of fls. purple, violet or lilac, with a yellow palate...

CC. Shape of lvs. reiformis...

DD. Fls. rose-colored...

EE. Fls. pale blue or lilac...

FF. Fls. pale blue or lilac...

GG. Fls. pale blue or lilac...

H. Fls. rose-colored...

I. Fls. pale blue or lilac...

J. Fls. pale blue or lilac...

K. Fls. pale blue or lilac...

L. Fls. pale blue or lilac...

M. Fls. pale blue or lilac...

N. Fls. pale blue or lilac...

O. Fls. pale blue or lilac...

P. Fls. pale blue or lilac...

Q. Fls. pale blue or lilac...

R. Fls. pale blue or lilac...

S. Fls. pale blue or lilac...

T. Fls. pale blue or lilac...

U. Fls. pale blue or lilac...

V. Fls. pale blue or lilac...

W. Fls. pale blue or lilac...

X. Fls. pale blue or lilac...

Y. Fls. pale blue or lilac...

Z. Fls. pale blue or lilac...


montāna, Polr. Tropical American epiphyte, with clusters of tubers 3/4-3/4 in. long, minute, deserted, useless bladders and larger white lvs. and yellow palate, the fls. 1-4 on a scape, each 11/2 in. across. Lvs. 4-6 in. long, elliptic-lanceolate. Trunks of trees, West Indies and S. Amer. B.M. 5923. P.S. 19:1912. 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, 1-2 in. long: fls. yellow, with an orange pale, 3/4 in. long, 5-6 in a raceme: pedicels drooping in fruit. India, Malayas, China, Japan, Philippines. B.M. 6689.—Once cultivated at Kew.

janthina, Hook. Epiphytic Brazilian species growing in the leaf-axils of a bromeliad (Vrieseia), with kidney-shaped lvs. and beautiful pale blue or lilac fls. 11/2 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 transverse, oblong, entire. B.M. 7466.—Int. by Sander, 1867.

"Janthina" is the same as "janthina," meaning violet-colored.

reniformis, A. St. Hil. Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 5 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. 3/4-1 ft. long and scapes 11/2-2 ft. high.

Humboldtii, Schomb. Guiana species, with long-stalked, cordate or obcordate, mostly solitary lvs. and dark purple-blue fls. 21/2 in. across, with a triangular lower lip. Scapes about 5-fld. P.S. 13:1390.—One of the showiest species. Commonly cult. in Eng., apparently not in America.

Endresii, Relchb. Epiphytic Costa Rican species, with tubers about 7/4 in. long, solitary lvs. and pale lilac fls. 11/2-2 in. across, with a yellow palate: lvs. 1-3 in. long, narrowly elliptic-lanceolate; scape about 5-fld. B. M. 6566. Var. majus, Hort., was offered by Pitcher & Manda, 1895.—A deciduous species found at altitude of 2,000 feet.

longifolia, Gardn. Fig. 2624. A Brazilian species, the typical form of which is rare in cultivation. U. Forgetiana, 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. 32:1132 (adapted in Fig. 2624) under the erroneous title of U. latifolia. It has beautiful violet-purple fls. nearly 2 in. across, with a yellow palate. Lvs. lanceolate, erect: scapes 12-20-fld. and fls. last well. G.C. Ill. 15:713. W. M.

UVULARIA (Latin, uvula, palate, referring to the hanging flowers). Liliaceae. BELLWORT, "Wild Oats" in some parts. A genus of two species of very gracefully 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 mainly above. The foliage is of a delicate green, which with the terminal, narrow, bell-shaped, drooping flowers make the plants elegant though not showy. The species are perfectly hardy and easy of cultivation in any light, rich soil and a shady situation. They do well north of a wall in a well-prepared border and in such a position they far exceed the plants of the woods in luxuriance. Strong roots may be slowly forced for spring flowering. For distinction from Oakesia, see that genus, to which some of the plants commonly known as Uvularias are referred.
VACCINUM (classical Latin name of the European Whortleberry; etymology uncertain). Ericaceae, including Bilberry, Blueberry, Huckleberry, Whortleberry. General Information. Branching shrubs, creeping vines or small trees, sometimes epiphytes; lvs. alternate, evergreen or deciduous, coriaceous or membranaceous; ils, small, white, pinkish or reddish, in lateral racemes or terminal clusters, sometimes solitary in the axils, mostly nodding on slender 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, cylindrical or urn-shaped, rarely subglobose, 4-5-toothed or cleft; 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-lobed ovary, which is glabrous or hirsute. 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 circles to the tropics, and is most common in North America and the Himalayas. With very few exceptions (e.g., V. erythrina in Java and Emiridensia 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 "Bilberry" and "Whortleberry" usually mentioned as "common names" by American writers are seldom known among the common people in this country; while "Huckleberry" is often used indiscriminately for plants of this genus and for the Gaylussaciaceae. In the central states the term "Huckleberry" is usually applied to V. corymbosum, while "Blueberry" is given to the low-growing species, like V. Canadensis and Pennsylvanicum. In New England, "Huckleberry" is reserved for species of Gaylussacia, while "Whortleberry" is applied to the lower growing species as above, and "High-bush Blueberry" to V. corymbosum. The red-berried species are, in general, referred to as "Cranberries."

Among the plants which have an important value in the landscape in October and November by reason of their brilliant 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 many deciduous plants. Of the naturally occurring species none are more strikingly beautiful late in the autumn than the common High-bush Blueberry, V. corymbosum. When well grown it is a stout, thick, spreading bush 8-10 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, rivalling the sunach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden. V. Pennsylvanicum also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an 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 of the various types of vegetation, but ornamental shrubs specially suited for densely shaded situations. It has the peculiarity of never forming a true flower-bud, the blossom being open from the first. V. arboreum forms a lovely shrub too, but is much less valued and struggling to be of value except in masses at the South. V. hirsutum is as beautiful in its autumn coloring as is V. corymbosum and, like that species, retains its foliage late in the season. V. Vitis-idaea and uliginosum, with their shining box-like foliage, are effective as edging for the shrubbery border.

In the wild state the Blueberry was originally worth more notice than the blackberry, raspberry or currant, but the natural supply is so abundant that little attention has been given to garden cultivation. At the Maine Agricultural Experiment Station systematie work is in progress, and several instances of successful amateur experimentation are recorded from Massachusetts. The plants of some species are very susceptible of improvement under good cultivation; the best is in order of merit being V. corymbosum, vacillans and Canadense. The High-bush Blueberry, or Swamp Blueberry, or "Huckleberry" of the middle west, is of firm texture, good size and excellent flavor. The shrub is easily transplanted and will grow rapidly on any good soil, and more than any other species shows a marked tendency to vary in the size, shape and quality of its fruit. It is the natural starting point in attempts to add the Blueberry to the list of cultivated fruits. During the past few years it has received considerable attention as a garden fruit, especially in New England. The other species named grow mostly on uplands, but V. Vitis-idaea, the so-called dry sandy "barrows"—and form the bulk of the Blueberry crop as seen in the cities or at the canning factories.

In many of the northern and eastern states—particularly in New England, New York, New Jersey, Michigan 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 a host of Blueberry bushes, alders, poplars, gray birches and spires. 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 management of such lands has been systematized and Blueberry canning has become an important industrial operation. In some cases the whole business is under 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 and expense of transplanting and rearing the plants, and who, after the berries are gathered, receives as rental one-half cent per quart for all fruit gathered. Pickers receive 1½-2½ cents per quart. Those who lease the land and haul the fruit to canning factory or station for shipment receive 3½-4½ cents 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. The best time for burning is on the 15th of March. V. Pennsylvanica hundred acres of Blueberry plains have thus been ruined. 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 incendiary torch or mill-lamp. He then retraces his steps and follows over the burned area, setting new fires in the portions which have escaped and back-firing if there is danger of spreading unduly or along the courses which it is desired to leave unburned. A device occasionally used consists of a piece of 3½-inch gas-pipe, bent near 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
VACCINIUM

calities. In some cases these are albino forms; in others the color is due to a fungus. Albino forms of V. Myr-}

nellia, corymbosum and vacillans. It is probable, however, that many other species exhibit this treatment. No special reason can be assigned for this difference in color. The white 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 black cheek, or even to be of a scarlet color. The al-

bin forms must, however, be carefully distinguished from the "white berries" caused by the presence of a fungous growth (Sclerotinia baccarum).

Propagation.—In the past one chief drawback in the dissemination of the Blueberries has been the difficulty, or supposed difficulty, of propagation. The few nur-

ersmen 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 disappointing, and the Blue-

berries, 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). In the Blueberries, grafting is easily performed, and in this way specially choice individuals may be perpetuated. Full-grown, for purposes, however, seedlings or divisions may be used. Propagation by seed naturally presents the cases, care and skill, but is entirely feasible. The method fol-

lowed at the Arnold Arboretum, and at the Maine Agri-

cultural Experiment Station, where for several years seedling Blueberries have grown, is essentially as follows: Seed-pan or boxes about 4 in. deep are half filled with potsherd and covered with a layer of sphagnum. After which is put in a compost consisting of one-third each of fibrous peat, well-rotted sod and fine sand, is the whole firming with the hand or with a maltel. The seed, 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 50° and a range of 10° higher by day. As the young seedlings appear, the sphagnum is gradually removed and a quantity of compost sifted in among the plants. The young like seedlings are then put in a large scale and handled about twice during the first season. After Sept. 1 they are hardened 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 of the plants to prevent bearing 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 stored even when given the best care, will seldom germinate until the second year. The low Blueberry (V. Pennsylvanicum) 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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2626. "Buckboard" used in Maine to carry Blueberries from the fields to the cannery.

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 burn," 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 cranberry rake in use on Cape Cod, and may be likened to a dust-pan, the bottom of which is com-

posed 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, how-

ever, 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 fanning mill to eliminate leaves and twigs before being sent to the high-bush factory. At the factory they are again submitted to a much stronger winnowing. This is the only preparation required for market.

The financial importance of the Blueberry business is very difficult to estimate at the present time. In Maine the canning of Blueberries is largely in the hands of a few packers. The largest of the factories has a daily capacity of 700 bushels and the average annual output is 8,300 cases of 2-dozen cans each, representing 6,250 bushels of fresh fruit. The average price per case for the canned fruit is $1.90. The value of the annual product of this one factory is not far from $15,000. The total canned product of Maine's "Blue-

berry barrens" in 1899 was about 50,000 cases and the price per case was $2.20, making the value of the Blue-

berry crop in this one small section considerably more than $100,000. In northern Michigan the annual ship-

ments are from 3,000-5,000 bushels. In New Jersey, Pennsylvania and West Virginia large quantities of the fruit are gathered from the plains and mountains, but the work is not systematized.

White or pinkish fruits, instead of the usual deep blue-colored berries, are not uncommon in certain lo-
VACCINIUM

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. Oxyccocus

DD. Stamens stouter, with ascending branches........ 2. macrocarpon

BB. Stamens included.

C. Filaments glabrous or pubescent.

D. Corolla commonly 4-labeled: stamens 8........ 21. uliginosum

DD. Corolla commonly 5-labeled: stamens 10.

E. Plants dwarf, a foot or less high.

F. Branches not angled.10. caespitosum

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. ovalifolium).

G. Length of leaf 2-1 inches........ 16. ovalifolium

OG. Length of leaf 3-4-5 inches........ 4. parvifolium

CC. Filaments pilose.

D. Twigs red. Here probably belongs........ 22. erythrinum

DD. Twigs not red.

E. Stamens 10; ovary 5-loculed.

F. Branchlets pubescent........ 23. ovatum

FF. Branchlets glabrous........ 20. crassifolium

EE. Stamens 8; ovary 4-loculed........ 3. Vitis-Idea

AA. Ovary 10-loculed (sometimes imperfectly so).

B. Anthers with 2 awns on the back.

C. Stamens included........ 24. arboreum

CC. Stamens exerted........ 25. stamineum

BB. Anthers awnless.

C. Foliation evergreen, coriaceous.

D. Calyx-teeth roundish and very dense........ 6. nitidum

DD. Calyx-teeth acute........ 7. Myrsinates

CC. Foliation deciduous (sometimes tardily so in southern forms).

D. Corolla cylindraceus.17. virgatum

DD. Corolla short and usually broad.

E. Branchlets hirsute.14. hirsutum

EE. Branchlets glabrous or glaucous (except in V. Canadense).

F. Lvs. glaucous and pale beneath.

G. Fruit blue........ 8. vacillians

GG. Fruit black........ 12. nigrum

FF. Lvs. strongly pubescent both sides........ 13. Canadense

FFF. Lvs. glabrous, often hairy on midrib beneath.

H. Berry blue, glaucous........ 18. corymbosum

HH. Berry black, not glaucous.19. atroccoccus

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. Stamens slender, trailing: lvs. evergreen.

D. Apex of leaves acute........ 1. Oxyccocus

DD. Apex of leaves obtuse or retuse........ 2. macrocarpon

CC. Stamens stout or twisted, not much elongated.:

E. Branches erect, tufled........ 3. Vitis-Idea

CCC. Stamens erect, much taller, 2-10 ft.

D. Lvs. small, 1/4-1/2 in.

long.

EE. Lvs. large, 1 1/2-3 in.

long.

DD. Lvs. deciduous.

E. Surface of lvs. glabrous.

F. Lvs. pale beneath, not shining above. (See also No. 12. Here might be sought the larger, glaucous, var. pallidum, No. 18.)

FF. Lvs. not paler beneath, shining, at least above. (Exceptions: No. 12 always paler beneath; No. 11 rarely paler beneath.)

G. Lvs. solitary in the axis.

H. Branches sharply angled........ 9. Myrtillus

HH. Branches not angled........ 10. cespitosum

GG. Fils. 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.

airy.

F. Ovary and fr. glaucous........ 13. Canadense

FF. Ovary and fr. hirsute........ 14. hirsutum

CC. Plant taller, 1-12 ft spreading.

D. Fils. solitary in axis.

E. Lvs. sharply serrulate.15. myrtilloides

EE. Lvs. entire or slightly serrulate........ 16. ovalifolium

DD. Fils. in racemes or corymbos.

E. Racemes elongated on naked branches........ 17. virgatum

g. Margin of lvs. hairy-serrate........ 11. Pennsylvanicum

gg. Margin of lvs. entire or at most ciliate.

h. Berry blue, glaucous........ 18. corymbosum

hh. Berry black, not glaucous.19. atroccoccus
1. **Dryococcus**, Linn. Small Cranberry, Cranberry of the Old World. Slender creeping plants with flat, ellipsoid stems 4-10 in. long: lvs. ovate acut...
2630. Vaccinium Pennsylvanicum — Low Blueberry (X%)

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-cylindric, short; berries large, globose, bluish black with bloom, sweet, the earliest to ripen north. N. Amer. B. M. 3434. B. B. 2:578. Em. 2:456. Rep. Me. Exp. Sta. 1898:171.—Var. angustifolium, Gray. A dwarf form, with more deci-
dedly lanceolate lvs. Lake Superior and northward.—This species is extremely variable in size and shape of fruit and flowers, but with the exception of the vari-
ety noted with it, which is set off as V. nigrum, the varia-
tions do not appear sufficiently constant to warrant mak-
ing separations. In general, the plant is of low, semi-
prostrate habit, is extremely prolific and thrives on dry, sandy hills. It furnishes the bulk of the Blueberries found in the eastern markets. When mown down or burned, the new erect shoots produce, the following year, a long, spike-like mass of bloom and fruit which may be stripped off by handfuls. Because of its charac-
ter and early-ripening habit, it is known on the Blue-
berry plains as “Early Sweet” or “Low Sweet.”

12. nigrum, Britton. Low Black Blueberry. Low shrub, similar to V. Pennsylvanicum; and often asso-
ciated with it: lvs. oblong-lanceolate to obovate, 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. 2:579. Rep. Me. Exp. Sta., 1898:171.—This species is dis-

13. Canadense, Richards. Canada Blueberry. Erect shrubs, 1-2 ft. high, the crowded branches down-
pyriform; lvs. oblong-lanceolate or elliptical, entire, downy on both sides; corolla short, open, not swampy, lig-
cellate. Recommended by Warren H. Manning for the rock

14. hirsutum, 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 campanulate corolla, the calyx and the dark blue glbose fruit, hirsute. Very local in N. C., Ga. and Tenn. G. F. 2:565.—This species, discovered about 1840, was lost sight of for half a century until rediscovered by Sargent and transferred to the Arnold Arboretum. It is readily distinguishable by the hairy flower and fruit. The fruit is described as freely as large as that of Gaylussacia rivosa, black, and of an agreeable flavor. Under cultivation not so densely hairy as in the wild state. Given promis-
se of being valuable under cultivation as one of the latest of its kind to ripen in the Arnold Arboretum the best period of fruitage being the middle of August, berries remaining into September.

15. myrsilloides, Hook. An erect, branching shrub, mostly glabrous throughout, the twigs slightly angled: lvs. obovate, oblong or oval, acute, serrate, membranous, green on both sides but not shining, 1-2 in. long: calyx entire; corolla depressed-globular, yellowish or green-
ish white; berries large, oblate, black, rather acid. Lake Superior westward. B. M. 3447. The berries are large, 5/8 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, glaucous, green above, glaucous beneath: fls. solitary, on short, re-
curved pedicels; corolla glbose-ovoid: berry large, 5/8-5/ in., bluish purple, with bloom. Woods, Quebec to Mich., Ore. and Alaska. B. B. 2:577.—This species is very abundant in the northwest and is a large part of the undergrowth along the southern coast of Alaska (Funston). The berries, rather larger than peas, are collected in great quantities by the Indians, who use them fresh and dried for winter use. 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, Alt. A shrub 2-12 ft. high, with slender green branches, the young twigs puberulent. Lvs. narrowly ovate-oblong, acute, often mucronate, entire or minutely serrulate, green and glabrous above, pale or glaucous beneath, 2-4 in. long: fls. in short racemes on naked twigs appearing before the lvs., oval to nearly cylindric, white or pink: bracts small, decidu-
ous: berry black, with or without bloom. Swamps, southern Va. to Fla. and La. B. B. 2:577. B. M. 3522. B. R. 4:305 (as G. Virgatum). 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 re-
duced to varietal rank.

Var. tenellum, Gray (V. tenellum, Alt., not Pursh). A low form, mostly less than 2 ft., with smaller lvs. and nearly white fls. in short, close clusters. Southern Va. to Ark., Fla. and Ala.—Probably a distinct species.

18. corymbosum, Lind. High-bush Blueberry. Swamp Huckleberry. Fig. 2631. A tall, straggling shrub, 4-12 ft. high, with yellowish green warty branch-
VACCINIUM

Iv. calyx fls. Ivs. L sometimes oval branched or oval-cylindrical, white or pinkish: berries blue-black, with much bloom, of excellent flavor. Moist woods or swamps, N. Amer. Em. 2:454. American Agriculturist 1888:364. B. B. 2:577. — Exceedingly variable, and numerous gradations unite the several varieties. V. corymbosum 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. amicum, Gray (V. amicum, Alt.). 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. 5:400. B. M. 3433 (as V. corymbosum).

Var. pallidum, Gray (V. pallidum, Alt. V. albitrum, Hook. V. Conostylis, Gray). A pale and glaucous or glaucously green form, with or without some pubescence: ovary more completely inferior, generally lower, otherwise resembling var. amicum. Common in mountainous regions southward. B. M. 3428. B. B. 2:579.

Var. fusatum, Gray (V. fusatum, Alt.). A tall form with the mature and entire ivs. fuscous-pubescent beneath: fls. virgate, somewhat specked on the naked flowering twigs. Ala. and Fla. to La. and Ark.

19. atroecicum, Heller (V. atroecicum, var. atroecicum, Gray). Black Blueberry. A branching shrub with sharply ciliate leaves. V. corimbosum: Iv. 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, Andr. Slender, trailing shrub: stems 2-3 ft. long, glabrous: ivs. small, ¼-½ 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 bogs, N. C. to Ga. B. M. 1152. — Useful for the shrubbery border south.

2531. High-bush Blueberry — Vaccum corymbosum. (spray × ½).

21. uliginosum, Linn. Bog Blueberry. A stiff, much-branched shrub ½–2 ft. high; ivs. thick, ovate or oval, obtuse or retuse, ½–1 in. long, nearly sessile; fls. 2–4 together, or sometimes solitary; calyx 4-parted, sometimes 5-parted; corolla urn-shaped, 4- or 5-lobed, pink; stamens 10–15: berries bluish black, with bloom. N. Amer., Eu. Asia. B. B. 2:570. — 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, 3–8 ft. high, with pubescent branchlets: ivs. very numerous, thick, shining, ovate or oblong, acute, serrate; fls. numerous in short, axillary clusters, followed by deep dark purple fruit of agreeable flavor. Vandercook's Island to Monterey, Calif. B. R. 16:1354. — A distinctly western species, and one of California's most beautiful hedge plants. Its fruit is not very well known, and is very tenacious of life and bears pruning well; propagated by suckers, cuttings and seeds, which last it bears freely.

24. arboreum, Marshall. Farkleberry. Sparkleberry. Spreading shrub or small tree, 6–25 ft. high, with glabrous or somewhat pubescent branchlets: ivs. thin, coriaceous, smooth and shining above, ovate, to oblong, entire or obscurely denticulate: fls. profuse, axillary and leafy racemose; corolla white, 5-lobed: berries, globose, rather astringent. Sandy soil along river banks. Fla. and B. B. 19:1885. B. M. 1607 (as V. diffusum). B. B. 2:580. — It forms an irregular shrub too diffuse and struggling to be of value except in masses, for which purpose it is useful. It is useful at the greenhouse in a medium of leafy-bracted racemes: corolla 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. 2:580.

Var. melanocarpum, Mohr. Southern Gooseberry. Shrub, 2–3 ft. high, branched from near the base: ivs. as in the type: fls. in loosely 4–8-fld. elongated racemes: berries twice the size of the typical form, shining black, with a julep purple pulp, sweetish, with slightly tarry flavor. S. States. — Probably a distinct species. Will thrive on any good, well-drained soil and is a valuable shade-enduring ornamental shrub.

VAGARIA (meaning obscure). Amaryllidææ. 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-fld. umbels on naked scapes about 1 ft. high; perianth-tube, funnel-shaped at the apex; segments equal, lanceolate, stamens inserted on throat of tube; filaments quadrate: ovary globose, 3-loculed, with 2–3 ovules in each locule. paviflora, Herb. Bulb globose, about 1½ in. through: fls. white. Offered by European bulb-growers.

VALERIAN. See Valeriana. Greek V. is Polemonium. Red V. is Centranthus.

VALERIANA (Latin valeo, to be, in allusion to medicinal uses). Valerianææ. A large genus (probably more than 2,000 species) of herbs, mostly of the northern hemisphere. Less than a dozen species are North American. The Valerianas are erect-growing, mostly tall perennials, with strong- smelling roots, and bearing many small white, pink or rose-colored flowers in terminal cyosmes or cyme-pauci- culate clusters. Corolla tubular or trumpet-shaped, the limb nearly equally 3-toothed or lobed, the tube usually unequal to the base; stamens 3: ovary 1-loculed (by abortion), bearing an erect or eruciform style, rising into an akene: calyx of bristle-form lobes; ivs. opposite, various.

Valerianae in the American trade are hardest per- ennials of easiest culture. Only V. officinalis is well known. This is one of the characteristic plants of old gardens, being prized for the spicy fragrance of its numerous flowers in spring. It spreads rapidly from
suckers arising from the roots, soon forming large colonies. The common species are often grown from seeds. V. alba and V. rubra of the trade are no doubt Centranthus ruber.

A. Rootstocks horizontal or ascending, with small fibrous roots.

B. Stem-leaves (at least the lower ones) pinnate or pinnately lobed.

Officinalis, Lind. 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.; Ivs. all pinnate, with several to many lanceolate to linear acuminate, toothed or notched leaflets: fls. numerous, whitish, pinkish or lavender, very fragrant. Europe, N. Asia. — The medicinal valerian is obtained mostly from the roots of this species.

Pha, Linn. Glabrous, usually 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.

Dioica, Linn. Marsh Valerian. About 1-2 ft.: root-lvs. oval, elliptic or spatulate and entire, long-stalked; stem-lvs. mostly pinnate with entire leaflets or divided to the terminal leaflet oval 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.

Sichéncis, Bong. A foot or less, the rootstocks thick and ascending: root-lvs. ovate or oblong, simple or somewhat lobed; stem-lvs. mostly 3-5-foliolate, the divisions or leaflets orbicular to oblong-ovate: fls. white, very fragrant, in contracted cymes, the corolla about 5/4 in. long. Rocky Mts. to Alaska. G.F. 9:515.—A very early bloomer.

BB. Stem-leaves not compound nor lobed, but sometimes dentate.

Montana, Linn. Usually one ft. or less high, glabrous or nearly so: root-lvs. oblong, oval or orbicular-oblong, usually obscure, somewhat dentate; stem-lvs. lanceolate-acuminate, dentate or nearly entire: fls. bright rose, dicous. Eu. L.B.C. 4:317.

AA. Rootstocks perpendicular, branching below.

Édulis, Nutt. Two-4 ft., glabrous or nearly so: root-lvs. oblanceolate or spatulate with margined petiole, entire to pinnatifid; stem-lvs. few, sessile, reduced to linear or lanceolate divisions: fls. white, in an elongated panicle, more or less dicous. Ohio to Arizona and British Columbia, in wet or moist lands.

The roots are eaten by Indians. The leaves are thickish and strongly veined.

The African or Algerian Valerian is Valeriana officinalis, Gaertn. (Valeriana officinalis, Linn. V. officinalis, Cornucopiae, Loll, V. officinalis, Linn. V. officinalis, Linn. Valeriana officinalis, Gaertn. V. officinalis, Loll). 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, 15 ft. or less high; Ivs. oval-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 not allowed to suffer for water. B.H. 2:315.—V. officinalis, Linn., of Europe, appears to have been offered in this country, although little known here: about 1 ft. tall, glabrous: radical Ivs. oval or cordate, dentate: stem-lvs. with 3 leaves or lobes, the terminal one larger: fls. rose-colored, polygamous.

L. H. B.

Valerianella (diminutive of Valeriana). Valeria
dees. Including Corn Salad or Fetticus. A genus of nearly 50 species of annual, dichotomously branched herbs, with a basal rosette of entire Ivs. and small white, bluish or pinkish fls. borne in terminal cymes, which form compact globular or flattish clusters. Corolla nearly regular, 5-lobed; stamens 3: fr. 3-loculed. Some of the locules being empty. These plants are mostly native to the Mediterranean region. V. oii
toria is the common Corn Salad and V. aromatica the Italian Corn Salad. To the account given in this work at page 276, the following may be added:

Corn Salad is both a salad plant and a pot-herb, chiefly the former. The name "Corn Salad" is probably derived from the fact that the plant grows spontaneously in the grain fields of Europe, large quantities of it being gathered in early spring. It is rather tasteless compared with lettuce, and is little known in America. Abroad it is prized as a fall and winter salad. It is a cool-season crop, grown like lettuce and matures in 6-8 weeks. Plants should stand about 6 in. apart in the row. An ounce of seed should give 2,000-3,000 plants. The following description of the varieties is derived from Vilmorin's Vegetable Garden.

Olistoria, Meinch. Corn Salad. Lams's Lettuce. Fetti
cus. 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. Plants are not dense and give a very good flavor. This is often used as a salad, and is known as the "Fall Salad." It is an annual of Europe, and is generally grown as a fall salad.

Round-leaved variety has much shorter Ivs. 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 than the common type and the seeds are nearly twice as large, marked with numerous secondary veins. Much grown in Holland and Germany. The Etampes variety has very dark-colored Ivs., which are often undulate or folded back at the margins. The plant is annual, prominently veined, thicker and more fibrous than the other
kinds and specially suited to cold weather and long distance shipment. The cabbage type 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.

ericaarpa, 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.

VALLONÉRIÀ (Antonio Vallisneri, 1601–1730, Italian naturalist). *Hydrocharidaceae.* About 4 species of aquatic plants, including the well-known Eel-grass. Tape-grass. This is found in fresh water all over the world. It is a submerged plant with linear lvs. 3/4–6 ft. long, depending on the depth of the water. The lvs. originate in a tuft at the bottom of the water, and the plant spreads by runners sent out from these tufts. Eel-grass is usually found in quiet waters. It has no horticultural rank, except as an aquarium plant. Like many other aquarium plants, it has special interest for students of botany. The pistillate fls. are borne on very long spiral threads and come to the surface as shown in Fig. 2634. The staminate fls. are borne on very short stalks near the bottom of the water. At the proper time the staminate fls. break away from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pistillate fls., and in this haphazard way the blossoms are fertilized and seed is produced. Both kinds of fls. are very small, and they are borne on separate plants. Eel-grasses 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. THICKER and W. M.

VALLÓTA (Pierre Vallot, French botanist; wrote an account of the garden of Louis XIII in 1623). *Amaryllidæs.* The SCARBOROUGH 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, 6-lobed 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 in the flower borders with over 50 flower trusses, each truss bearing an umbel of 4–9 fls., the individual fls. being 3–4 in. or more across. Vallota is a genus of bulbous species and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the flower is longer than in the typical Hippeastrums and at the base of each perianth-segment is a cushion-shaped callus some-what different from the minute tubercles 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; ovules many, superposed: stigma capitate: 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 fls. of various colors and naked at the throat. Cyrtanthus proper and

VALLÓTA

the subgenus Monella have beautiful pendulous fls. in umbels, but the plants are not as easy to grow as Vallota. It has been suggested that they be crossed with the more robust Vallota in the hope of combining their varied colors and pendulous grace with the strong constitution of the Vallota. Such a process would be similar to the one by which the noble race of Hippeastrum hybrids has been given to the world. Vallota is undoubtedly related to Cyrtanthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus *C. sanguineus* is in the trade now. The best form of Vallota seems to be the variety *magnífica.*


W. M.

The Scarborough Lily is generally rated as a greenhouse bulb, but it can be grown by the amateur who has no glass, provided the plant can be kept over winter in a well-lighted cellar. Many 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
MICHAEL

Kuttan). O. V. Vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A Vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance below the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when setting to a larger pot.

The final potting is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is necessary to provide a strong, permanent root collar 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 potting 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 spikes have pushed up. Vallota likes full sunshine at all times of the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. The whole plant is then of the strong, permanent nature, and you may push out, 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 the Guernsey Lily,—a Dutch bark having been wrecked off the coast of England, some bulbs washed ashore and become established as garden plants. Vallota is considerably lower and more compact than the Vallotas in the Southern Hemisphere, one bulb in a 6-inch pot with 1 or 2 flower-stalks, but a large specimen is well worth years of care. 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, command-\[0x3c]er of the Discovery in the voyage to our north-west coast in 1791-95). Berberidaceae. A genus of 3 species of low, hardy perennial herbs native to our specific slope. Shade-loving plants, with slender creeping rootstocks and radical 2-3-ternately compound lvs. or rather small white or yellow flowers in an open panicle on a naked scape. Sepals 6, in 2 series, obovate, petal-like, reflexed, soon falling; petals 6, linear - spathulate; stamens 6; follice oblong, membranous, unequally 2-valved; seeds arillate. Vancouveria demands a rich soil in rather shady situations. They are not showy plants, but have foliage of an elegant and refined type.

A. Lvs. thin, membranous: fls. whitish.


AA. Lvs. rather thick: fls. yellow.

chrystanthum, Greene (V. hespera, var. aurea, Rattan). About 1 ft. high: lfts. evergreen, sub-3-lobed, usually whitened and pubescent beneath; inflorescence subumbellate; fls. somewhat larger than in x. hespera. Offered by Pilkington & Co., of Oregon, in 1892.

F. W. Barclay.

VANDA (native name in India). Orchidaceae. One of the most attractive genera of East Indian orchids, nearly all species having large, handsome flowers. In habit they are dwarf and short- stemmed or tall and branched, sometimes climbing to a considerable height. The erect species form compact plants, with stems and branches clothed with 2 opposite rows of leaves. Species like V. teres have a loose, straggling habit. Lvs. flat or channelled and keeled or tereate, somewhat fleshy and deeply channelled; apex pointed, lobed or toothed: fls. in racemes from the axils of the lvs.; sepals and petals similar, spreading, narrowed at the base almost to a claw; labellum firmly united to the column, spurred, lateral lobes small, erect, middle lobe spreading; pollinia on a common stipe. About 20 species, natives of India and the Malay Islands.

Heinrich Hasselbring.

Notwithstanding the various conditions surrounding the different species of Vanda in their natural habitats, the plants may nearly all be cultivated successfully under the same general treatment. When a general collection is grown a house of east and west exposure will be found best suited to the wants of Vandas. The plants require plenty of light and do not need any shade from November until the end of February. A house of east and west aspect will require less shading during late fall and early spring than one of southern exposure, and there will be fewer ill effects from direct solar heat at all times. From February until November shading will be necessary, but it should never be too heavy or black spot is likely to appear. The winter temperature should range from 60° to 65° F. by night and 70° to 75° by day, with a gradual increase of ten degrees during the summer months. A few degrees more with solar heat and ventilation will do no harm.

The atmosphere must be kept moist by damping the benches and paths freely once or twice a day, and ventilation should be given whenever possible in greater or less degree according to outside conditions. Especially during wet, cheerless weather is ventilation important, even if fire heat has to be applied to retain the desired temperature. Vandas may be grown well in either pots or baskets, but the latter are preferable, as they admit air more freely to the roots, whereby they are not so liable to decay from overwatering during severe weather.

The best potting or basketing material consists of chopped live sphagnum moss freely interspersed with large pieces of charcoal. This material should be pressed in rather firmly about the roots, leaving a con-

2635. Vanda cernulosa (X ¾).
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.

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 long time after syringing. A few species, such as V. Amesiens, V. ceraeola and V. Kimballiana, with one or two other alpine species, require about ten degrees cooler temperature, but otherwise similar treatment to other species of the genus.

Stock is increased by removing a foot or more of the leading growth with a sharp knife, allowing several roots to remain attached to each growth and basketing them in the usual manner. These new 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.

INDEX.

A. lamellata, Lindl. F. 2636. Stem 1-2 ft. high: lvs. rigid, linear, 6-10 in. long, obliquely truncate and toothed at the tip; racemes many, slender and pendulous, each bearing about 12 fls.: fls. 1 in. across; sepals and petals ovate-obovate, subacute, undulate or twisted, pale lilac-blue; labellum shorter than the sepals, middle lobe euneate-ovate, with a truncate 2-lobed tip. Native to Freshy dark blue, ridges, side lobes small, dark blue. Spring. Burma. B.M. 5338. F.M. 1877:256. G.C. 1870:529.—Color varies from blue to nearly white. Var. Boxalli, Reichb. f. "... has large, violet or nearly white, with deep violet with white lines on the sides. B.M. 6238."

2. parviflora, Lindl. Stem 4-6 in. high: lvs. strap-shaped, 4-8 in. long, unequally obtusely 2-lobed: pedicels robust, 12-18 in. tall, few-fl.: fls. 1½ in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum as long as the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-oblanceolate, obscurely 3-nerved. Ceylon. No. 13.

3. spatulata, Spreng. Stem 2 ft. high: lvs. 2-4 in. long, obtusely 2-lobed: pedicels robust, 12-18 in. tall, few-fl.: fls. 1½ in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum as long as the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-oblanceolate, obscurely 3-nerved. Ceylon. No. 13.

4. lamellata, Lindl. Lvs. channelled, leathery, obliquely and acutely bifid at the apex; fls. pale yellow, stained with red; sepals and petals obovate, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the labellum abruptly obtuse, nearly, having a pair of red elevated plates and 2 red tubercles just below the apex. Aug.—Nov. Philippines.

5. Boxalli, Reichb. f. (V. lamellata, var. Boxalli, Reichb. f.). Stem tall, with long recurved lvs.: raceme longer than the lvs., bearing 14-20 fls.: sepals white, with the lower margins of the lateral pair sepia-brown; petals white, with violet streaks which are also on the sepals, pandurate with large lamellae and small auricules, mostly lilac. Nov., Dec. Philippines. G.C. II. 15:87. G. 19:574.


7. grandiflora. —This is considered to be one of the best species in cultivation. The fls. are often tessellated.


9. insignis, Blume. Stem erect: lvs. linear, 10 in. long, apex with 2 or 3 teeth; raceme rather short, 6-10-fl.: fls. 2-2½ in. across; sepals and petals obvate, falcate; petals narrower, ochraceous brown, with darker brown blotches inside the falcate; side lobes pandurate, the apical lobe being broadly reniform, concave, white tinted with rose. Summer. Malay. B.M. 5795. G. 25:168.—Var. Schroederiana has yellow fls. with a white labellum. G. 25:168.
VANDA


12. limbata, Blume. Stem about 3 ft. high: lvs. linear, keeled, 6-8 in. long, unequally bifid at the apex: racemes 10-12-flowered, 6 in. long on peduncles of equal length; fls. 2 in. across; sepals and petals spatulate, bright cinnabar, tessellated, bordered with golden yellow, white suffused with lilac outside; middle lobe of the labellum oblong-pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6:173.

2637. Vanda Kimballiana (X 3/4).

13. Parijthali, Reichb. f. Stem very short: lvs. few, 8-10 in. long, 2-3 in. wide, obscurely 2-lobed; raceme drooping, 6-8-fl., 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 labelliform. Summer. Moulineau, India.—Var.

2638. Vanda teres (detached flower X 1-5).

Mariottiana, Relchb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum, white at base, with yellow spots and mauve lines.

14. densiflora, Lindl. (Saccolabium gigantulum, Lindl.). Stem short, thick: lvs. very thick, 6-12 in. long, notched; raceme dense, cylindrical, about as long as the lvs., nodding: sepals white, cuneate-ovate, subacute; petals narrow, with few purple spots at the base; labellum cuneate, obtusely 3-lobed, with two pubescent ridges at the base, terminal lobes bright shining purple. Winter. Burma. B.M. 5:635. F.S. 17:1765. —Var. Illastre, Reichb. f. Raceme and fls. taller; sepals and petals spotted with purple; labellum brighter purple. I.H. 31:517.

15. Amesiata, 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, erect, 1-2 ft. long and bearing 20-40 fls. fl. 1½ in. across, white, with rose-colored spots on the labellum, sepals and petals ovate-oblong, obtuse; labellum with a broadly cuneate, undulate middle lobe, having 5 ridges converging into a reflexed callus, side lobes small, rounded. Flowers at various seasons. India. B.M. 1739. J.H. 111. 29:494; 33:271. A.F. 6:441.


17. teres, Lindl. Fig. 2638. Stem long, climbing: lvs. terete, 6-8 in. long; peduncle 6-12 in. long, bearing a 3-6-fl. 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, reniform, purple or rose-colored. May-
18. **Hookeriana**, Rechb. f. Stem and lvs. terete, as in *V. f. Gigantea*, but the latter only 2-3 in. long, and slender: fls. 2-5 in. across; dorsal sepals and petals white, dotted with purple; lateral sepals narrower, oblong or somewhat obovate, white; labellum as large as the rest of the flower, sides lobes incurved, white and purple, middle lobe fan-shaped, with 3 large lobes, white spotted with purple. Sept. Borneo, I.H. 39:441. G.M. 40:645.—In cultivation the racemes are usually 2-fld.

19. **Cathcarti**, Lindl. Stem 1-2 ft.; lvs. linear-oblong, 6-8 in. long, unequally bifid at the tips; racemes longer than the lvs., 3-6-flld.; fls. 2½ in. across, orbicular in outline; sepals and petals nearly equal, orbicular-oblong, concave, pale straw-colored, transversely streaked with numerous narrow red-brown lines; labellum shorter than the sepals; lateral lobes quadrate, incurved, white with red streaks; middle lobe reniform, margin slightly crenate, center thick, yellow with a crenate border. Spring. Himalayas. B. M. 3845. F. S. 12:1231. G. C. 1870:1949. Gn. 19, p. 351; 33, p. 284; 42, p. 276.—Found near waterfalls, where it is always kept damp.


2639. Vanilla plant.—Vanilla planifolia. The detached flowers were about 4 inches across. Drawn in Jamaica. (The pod × 1/2.)

**VANDÓPSIS** (like *Vanda*). *Orchidaceae*. Includes 2 or 3 species which until recently have been united with *Vanda* or with *Stauropsis*. They are distinguished from allied genera by the labellum, which is opposite or united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble robust *Vandas*, with which they are usually classified for floricultural purposes. Treatment the same as for *Vanda*.


**VANQUERIÀ** (Von Vanqué, Madagascar name of *V. Madagascariensis*). *Rubiaceae*. The *Voa Vaná* 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, colored something like an apple and contains 5 large "stones" 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. I. Bidwell, of Orlando, Fla. In 1887 Van Deeman reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It has probably never fruited in America. It grows readily from imported seeds. Vanqueria is a genus of 20 species native to the warmer parts of Asia and Africa. Shrubs or trees, sometimes spiny or somewhat climbing. Lvs. 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; anthers united inside with a ring of deflexed pilose lobes; lobes spreading or reflexed; stamens 5, rarely 4; disc fleshy or depressed; ovary 5-3-lobed; stigma capitate; ovules solitary; fr. drupaceous; pyrenes 5-3 in number or patamen 5-3-lobed.

**Madagascariensis.** J. F. Gmel. (*V. éculis*, Vahl.) Glabrous shrub, 10-15 ft. high: lvs. very large, oblong, obtuse or acute, membranous, short-petioled: fls. in dense, peduncled, axillary dichotomous cymes, white, ovulate or rarely pseudo-verticillate in 4', oval: fls. small, white or greenish in axillary clusters; calyx 5 or 4-lobed, lobes deciduous or rarely persistent; corolla hairy or not, united inside with a ring of deflexed pilose lobes; lobes spreading or reflexed; stamens 5, rarely 4; disc fleshy or depressed; ovary 5-3-lobed; stigma capitate; ovules solitary; fr. drupaceous; pyrenes 5-3 in number or patamen 5-3-lobed. Madagascar. W. M.
VAHIEGATION

VARIEGATION

1901

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 swelled and vacuolate. In the

whether

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 convert 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 starch into sugar and then store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

White or albino variegation is of course due to a lack of any coloring in the chromatophores, and sometimes to the entire absence of these bodies. The cells seem to have lost completely the power of making chlorophyll. These albican variegations are to be looked upon as the more extreme forms of variegation, and usually arise through a feeble or atrophied condition of the plant. Seedlings raised from parents both of which are variegated in this way are usually very weak. High feeding and favorable conditions of growth, while they will not cause a variegated plant to return to its normal condition, will often stimulate the development of a normal green shoot that takes most of the nourishment and thus causes the starvation and disappearance of the albican parts. In other cases, as in codiums, 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 dracenas and caladiums, is intensified by strong light and nourishing food. The more of the modified chlorophyll there is produced and the more rapid the changes in the modified chlorophyll brought about through the action of light and the acids and oxidizing 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 very large and can be increased by selection. As a rule, the form of spotting or marking is not constant in seedlings, often being very different from the parent. In certain groups of plants, which have for many years been selected on account of the horticultural value of these markings, the variegated condition has become almost a fixed feature of the plant, as in dracenas, caladiums, codiscums, 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-organisms, living either parasitically or symbiotically in the plant, and causing the changes known as variegation.

Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by micro-organisms, but is due to a disturbed 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 starch 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 albuminous foods. They do not 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 extracted 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 it thus becomes evident that such changes could be transmitted by grafting and budding, though no 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 in 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 it is not growing buds or the forming buds, or the seeds, have to develop under such conditions that the ferment content of the cells is increased 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 2691. Kinds of variegation. Sansevieria above and Caladium below.
VARIATION

Vigour of the plants are reduced as a result. It is further
evident that the initial causes of variegation may be quite
diverse, some of the most usual being seed of
low vitality; unsuitable nourishment, especially a lack of
elaborated nitrogen; rapid growth in very moist
soils and the consequent rapid growth of the upper parts of the plant; severe cutting
back, etc.

Though started at first through the influence of envi-
ronmental factors, such as the removal of leaves, variegation
till it has become almost a specific character in some
groups of plants.

Annual Coloration. — A word might be said in this
connection regarding the coloration. The assumption
of color in autumn foliage is, as is well known, due
in part to the gradual destruction of the chlorophyll
when the leaves have reached maturity and approach the
period of death, and in part to the action of acids
on anthocyamin as described below. Many of the de-
structive changes which take place in the chlorophyll
are oxidation processes, the same as occur in the
cells of highly colored variegated plants, and physio-
logically they are not very different from the changes
occurring in Calathea, Caladium, Codiaeum, etc. The
approach of maturity in the leaf, and the coming on
of cool weather in autumn, stimulates the production of
oxidizing agents, such as vanillin and the strong acids of the cell-sap upon the chromogen, or color
contents of the leaves, especially the chlorophyll and anthocyamin, causes many of the brilliant colors of
autumn foliage. There is a popular belief that these
colors are due to cold weather or frosts; but while
frosts, if they are light, hasten the solution and de-
struction of the chlorophyll, they cannot be looked upon
as more than hastening changes which would occur in
these without them. Even in the tropics, some foliage
before it matures becomes highly colored, and on the
Japanese maples the writer has observed beautiful
autumn colorations in July in the region of Washing-
ton.

In practically all deciduous trees, bushes, etc., before
the maturing and falling of the leaves, all of the valu-
able 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 ma-
terials be protected from the strong action of light, and
it is believed that part of the coloration of maturing
leaves serves this purpose.

A coloring material, or chromogen, known as antho-
cyamin, is always present in such cases, and develops
beautiful reds when the cell-sap is acid, blue when no
acids are present, and violet when they are weak.
Acids, 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 Ailanthus glandulosa, Juglans regia,
Vitis, Cissus, and many other plants, this same antho-
cyamin is developed as a protection to the albuminoid
materials traveling to the young cells. Such protective
colorations have the effect of separating from varie-
gation the evergreen leaves, during the winter, the
chlorophyll granules are protected by the development
of anthocyamin, forming a brownish or reddish tinge in
the cell-sap. This is especially prominent in many
colored

While, as stated above, these protective and in some
cases transitory colorations should be clearly distin-
guished from variegation, it is an interesting fact
that the diseases for active nutrition are unfavorable,
and may in many cases be produced in
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 the condition common to yellow or white 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 spray-
ing the foliage with a dilute solution of iron sulfate or
other iron salt, or watering the roots with the same.
Even within a few hours the chloroplasms will begin
to turn green, and the plant goes on making starch and
sugars from the products of respiration. It is a great
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. Plants are especially sensitive to an
excessive amount of lime, and turn yellow readily as a
result of its action. Soils which contain too much mag-
nesia in proportion to lime also often cause a yellowing
of foliage 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 mot-
ted 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.

VARIEGATION

VASES

Vares. Such vases as are shown in Fig. 2642 are
common features in 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 points of its manufacture.
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, as
a sharp edge cuts through 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 neces-
sary to water them every morning during hot weather, and
it is therefore desirable to have the water supply
near at hand. A watering cart is often a useful
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 build-
ing in a shady place sheltered from the high winds small palms
may be used in vases, together with Rex beg-
gonias and Pandanus Veitchii.

The plants used in vases should be of a firm texture,
and resistant to drought, dust and occasional high
furnishings in art and foliage plants that are likely
to be cut or whirled by the winds are necessarily ex-
cluded. The first thought should be given to a center-
piece. This should usually be something formal or architectural nature. Cordylina Indivisa
and C. australis are excellent for the purpose. They
should stand well above the other plants. Around the
edges vines are used, especially in variegated,
nasturtiums and Senecio mikanioides. Another
choice plant for this purpose is Helichrysum

2642. Stone flower vase 4 or 5
feet high, used in formal gar-
dening.
petalatum, known to gardeners as *Anaphalis lanata*. This is an "everlasting" plant which is not truly a vine; it does not flower in vases but is valued for its silvery foliage and pendulous habit. Between the run of such vines are used such standard plants of medium height as *geraniums,* dusty millers, petunias and the common bedding material, as *Lobelia Erinus,* coleus, achryson and *Scaevola Cineraria* and *G. gymnastica* 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, but pansies like peat. Often the bowl seems too shallow and becomes filled with roots add 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 time 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 combers in pots which have been wintered in a fine room, or bordered pansies in the bowl. The decorator best and can find the time at this season.

Rustic vases are much less expensive than stone, iron or earthenware ones and in some situations are very suitable. As an excellent vase to elevate an ordinary vase on a cheaply constructed pedestal of tree trunk or boards, which will soon be hidden by *Ampelopsis Veitchii.*

ROBERT SHORE.

**VAUX, CALVERT** (1824-1895), an American landscape gardener. Together with Frederick Law Olmsted he planned Central Park, New York, the prototype of large, accessible, nature-like city parks. The following account of his life-work is taken with slight changes from *A century of garden making.*

In Garden and Forest 8:480: Calvert Vaux was born in London in 1824. He had achieved success in architecture before the age of twenty-four, when he came to America as business associate of Andrew Jackson Downing. At the time of Downing’s untimely death in 1854 the two men were designing and constructing the grounds about the capitol and Smithsonian Institution, the most important work of the kind that had yet been attempted in America. Meanwhile, the gathering sentiment in favor of spacious and accessible city parks which had found expression in the eloquent letters of Downing were realized, through the wholesale purchase for a public pleasure-ground of the rectangular piece of ground now known as Central Park, New York. In 1856 the city authorities selected, out of thirty-nine bidders, in competition for the new park, the one signed "Greensward," which was the joint work of Frederick Law Olmsted and Calvert Vaux, and Central Park as we know it today is the realization of this design in its essential features. This was the earliest example in this country of a public park conceived and treated as a consistent work of landscape art, and the first attempt in any country to plan a spacious pleasure-ground which should have the charm of simple natural scenery while it met the requirements of complete enclosure by a compactly built city. No one can read the original plan as presented for competition without feeling how thoroughly an experience of nearly half a century has justified the foresight of the young artist, without or with a sense of gratitude to them that our first great park, which has to such an extent furnished a stimulus and a standard to other American cities for similar developments, was a work of such simplicity, dignity, refinement and strength. It may be added that this "Greensward" plan, together with other reports of Central Park, on Morningside and Riverside Parks, in New York, on parks in Brooklyn, Albany, Chicago, San Francisco and other cities, both in this country and the Dominion of Canada, by the same authors, contain a consistent body of doctrine relating to pleasure-grounds which is unique and invaluable. Calvert Vaux was a member of many important commissions, and he acted as landscape gardener for the Niagara Falls Reservation, but for more than thirty years his best work and thought were steadily given to the parks of New York city. He had the genuine creative faculty which gave the stamp of originality to his work. When his career was at its height he served it from anything like eccentricity or extravagance. As a city official he was a model of intelligent zeal and sturdy integrity. Several times he resigned his chair of park commissioners in the face of a crisis, but he was always quickly reinstated by a demand of the people. To Calvert Vaux, more than to any other one man, New York owes a debt of gratitude for the fact that it has had such an attractive and intelligent city. His work has been so held so secure against harmful invasion and has been developed so strictly on the lines of its original conception.

In private life Calvert Vaux was a man of singular modesty, gentleness and sincerity. He lacked the graces of manner and magnetism of social intercourse which carry many men in various walks of life to a brilliant position that much exceeds their real merits. Nevertheless, he had many accomplishments and culture of the best type. It is a sad and singular coincidence that both Downing and Vaux met their death by accidental drowning. The career of Calvert Vaux is an inspiring one to those who wish to be useful citizens in America who are laboring in the work of civic and village improvement. Amid the changing policies of municipal governments, the life-work of Calvert Vaux is a shining example.

**W. M.**

**VEGETABLE GARDENING.** In horticultural usage a vegetable is an edible herbaceous plant or part thereof that may be gathered. In a narrow sense, however, vegetables may be products of the flower, fruit or root, or they may be produce of the whole plant. Vegetables are usually regarded as horticultural commodities; but when they are grown on farms where mixed husbandry is practiced and are made a part of the general farm system in rotation, with equal propriety they may be regarded as agricultural crops. There are certain vegetable-gardening crops that are practically always associated with a horticultural rather than an agricultural business. They are such as demand intensive culture and are used for special markets. Of such are lettuce, parsley, dill, fennel and radish, and all others that are considered as horticultural commodities for market, including many that are grown for the mature seed for selling in the general market, they would be known as agricultural products. In like manner turnips may be horticultural subjects in small areas for home use, but agricultural subjects when grown on large areas for stock-feeding.
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 profit was 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 of 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. 1538). 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-gar-
den were placed between the farm buildings and the
only 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.
Vegetable-gardeners are usually large users of stable
manure. Near the large cities the manure is bought in

2644. Companion cropping.—Lettuce be-
tween young cabbage plants.

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 prosecute-
cd 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
fungal pests that attack the vegetable-gar-
den crops. General remarks under Insects,
Fungi, Insecticidés, Fungicides and Spray-
ing will apply to these difficulties. The spray
pump has now come to be a necessary ad-
just to any efficient vegetable-garden. How-
ever, there are many difficulties that are be-
yond 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; let alone the 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-
rions systems of double-cropping and companion-crop-
ning, 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-
prire, close attention to details and much physical labor.

2645. A better way of growing vegetables,—in long straight rows.
VEGETABLE GARDENING

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 are certain and 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 general subject of vegetable-gardening are those by Greiner, Green, Henderson, Rawson and Landreth. For California one should consult Wickson'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 to varieties of fruits. This was 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 now 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, were almost incredible because so much in advance of ordinary views, and the statements were fully authenticated that many were drawn to California by them. These horticultural pioneers, however, soon found that immigrants from Asia and the Mediterranean region were also flocking in, 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 Asiatics and South Europeans are thriving on it. There has been 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 changing. The result 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 importance which appeal 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 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 California and sea 51,409 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. Nowadays there is a certain fondness for southern fruits, but a desirable variety of vegetables such as late green peas and tomatoes is on the market. The climate of California is dry and the soils are well watered. Irrigation is easy and has been extensively practised. This is a great advantage to the grower of vegetables, as is the case of the Pacific coast, where a great deal of fruit is raised.

The region is admirably adapted to the growing of vegetables for canning, as the prices of canned goods are high. Canning is a highly profitable business in California, and there are a great number of canneries in the state. The demand for canned vegetables is constantly increasing, and the business is becoming a very important one. The canneries in California are mostly located in the central and southern parts of the state, where the climate is most favorable for their operations.

2646. A "run" of hotbeds.
1908 VEGETABLE GARDENING

full satisfaction in California vegetable-growing, but a small amount of water, if skillfully applied, will work wonders. Irrigation will enable one to have something crisp and delicious in the garden every day in the year in the California valleys. It is true, however, that much can be done without irrigation by beginning at the opening of the fall season in September, growing the hardier vegetables while moisture is ample even on the drier lands during the late fall and winter, and keeping the lower lands well plowed and kept unwatered to prevent the tender vegetables can be trusted in the open air, and continuing cultivation assiduously afterwards so that moisture can be retained as long as possible for them. That this is seen to the fact that the large Lima bean product is grown almost entirely without irrigation from plantings made as late as May and the whole growth of the plant is achieved without a drop of water except that stored in the soil. The same is true of the corn crop: perfect corn can be grown without a drop of rain or irrigation from planting to husking. In such cases, however, the winter rains are retained in the soil by cultivation. If with a growth; by beginning at the opening of the year 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 in rotation during the year— the hardy plants in the fall and winter months; the tender plants in the spring and summer. Of course the adjustment of all these factors to local conditions and the following action, and explains why those who have been accustomed to plant at a fixed date and do little but cut weeds afterwards may find it hard to get the best results in California. And yet the California grower has great advantages in his deep, rich soil, in freedom from diseases which thrive in a humid atmosphere and in an exceedingly long growing season. The soil and climate for different crops are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to them. The result is that the earliest vegetables come from 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; the tomatoes from Alameda county and river islands of Sacramento and San Joaquin counties, etc. Smaller areas of these products and others not mentioned are more widely scattered, but everywhere the fact that the soil, exposure and climate are chief considerations.

There is prospect of great increase in all the vegetable products of California. Fresh and dried vegetables either for use or for canning or preserving are in increasing demand. The 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.) Paleozoic of palmate palms native to the Fiji Islands and New Hebrides. The genus belongs to that portion of the Areca tribe characterized by a parietal ovule which is more or less more or less closely disposed in the branches of the spadix, and is distinguished from the allied genera by the following characters: sepals of the male fls. chartaceous, connate at base; female fls. much larger than the male. It is doubtful whether any species is now in cultivation. F. J. Fogg, H. Wendt, and H. F. Fogg, all cult. in the early eighties. The leaf segments have a wide and rather shallow notch at the apex or are oblanceolate. The sheath petiole and rachis are a dark blood color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales. Fr. f/4 x f/4 in., ovoid-ellipsoid, orange, with a red base. G.C. II. 20:205. R.H. 1883, p. 344. It has been conjectured that Kentia Van Houttei advertised in 1895 by American dealers may be a species of Veitchia. The genus is imperfectly known, and nothing further can be said at present of Kentia Van Houttei.

VELTHEMIA (after the Count of Veithheim, 1741-1801, Hanoverian promoter of botany.) Liliaceae. Three species of tender perennial, native to South Africa. Members of the genus have long, recurved, linear to linear-lanceolate, brownish, simple leaves. The flowers are small, yellow, with 6 petals. F. J. Fogg, H. Wendt, and H. F. Fogg, all cult. in the early eighties. The leaf segments have a wide and rather shallow notch at the apex or are oblanceolate. The sheath petiole and rachis are a dark blood color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales. Fr. 2½ x 2½ in., ovoid-ellipsoid, orange, with a red base. G.C. II. 20:205. R.H. 1883, p. 344. It has been conjectured that Kentia Van Houttei advertised in 1895 by American dealers may be a species of Veitchia. The genus is imperfectly known, and nothing further can be said at present of Kentia Van Houttei.

VENIDUM (name not explained by its author). Compositae. The plant listed in one of the largest American catalogues of flower seeds as V. calendulae- ceum is so little known in America that the following account is based, as a general rule, on information from G. W. 1908. It is a graceful single-flowered composite which flourishes under the ordinary treatment accorded half-hardy annuals, making a compact, rounded mass 2 ft. high. It has a flat, Pendulous Plant which, however, is of Indian origin. The leaves are 3-3½ ft. high and bloom toward the end of October. Two species are offered by Dutch bulb-growers. They are not showy but are of easy culture. They are practically unknown in America. Generic characters: peri- anth withering and persistent; tube long, cylindrical; segments 6, very short, ovate; stamens inserted at the middle of the tube; anthers dehiscence interosseous; ovules 2, collateral, placed near the middle of the locules; capsule large, membranous, top-shaped, acutely 3-mer- ced, loculicidally 3-valved. These plants have a large tufted bulb 2½-3 in. thick. The genus is monographed in Flora Capensis, vol. 6. For culture, see Bulbs.

A. V. green, 2-3 in. broad. viridióflóia, Jacq. V. oblong-lorato, wavy-margined, finally 1 ft. long: scape mottled with purple; raceme very dense, 3-6 in. long, 25-30-fl.; fls. 1½-1¾ in. long, yellow or greenish-yellow, with a flat, grassy, terminal leaf. V. odoróf., vol. 512:3245. B. M. 501 (Aletris Capensis).

AA. V. glaucousa, 1½ in. broad. gláucen, Jaqc. V. oblate-lorate, acute, glaucous: scape less stout: fls. "yellow or bright red," according to Baker. B. M. 1091 (fls. white, dotted red toward the tips); 3456 (fls. reddish purple, dotted yellow above). W. M.

VELVET BEAN. Mucuna pruriens, var. utilis. See also Bull. 104, Ala. Exp. Sta., by J. F. Duggar.

VELVET PLANT. Gynura aurantiaca.

VENETIAN or VENICE SUMACH. Rhus Cotinus.

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VENIDUM

Var. calendulaceum, Harvey (V. calendulaceum, Less.), differs in having the petals not curred at the base or with only a small ear. R.H. 1857, p. 123. Gn. 21, p. 405.—Opinions differ as to its merits. Some consider it coarse and weedy.

V. 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.

VÉRATRUM. See Todtalia.

VERÄTRUM (ancient name of Hellebore). Lilium.

FAKE Hellebore. A genus of about 10 species of tall, perennial herbs from the temperate regions of the northern hemisphere with short, thick, poisonous root-stocks 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; stamina 6, attached at base of segments; capsule ovoid, 3-lobed, 3-located: 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. Fils. whitish or greenish.

B. Perianth-segments crisped-dentate.

álbum, Linn. EUROPEAN WHITE Hellebore. A hardy perennial 2-4 ft. high: root stock short, fleshy; Ivs. green, plicate; radical Ivs. 1 ft. long, oblong, 5-6 in. wide, firm in texture: panicle 1-2 ft. long, dense: fils. whitish inside, greenish outside; segments oblong, spatulate, crisped-dentate; pedicels almost none. June, July, Aug. Eu., N. Asia.

Bb. Perianth-segments serrulate or entire.

viride, Linn. AMERICAN WHITE Hellebore. Indian Poke. Fig. 2647. A hardy perennial, 2-7 ft. high: root stock 2-3 in. long: Ivs. plicate, acute, the lower oval, about 1 ft. long, the upper gradually smaller: fils. yellowish green, stems oblong or oblanceolate, ciliate, serrulate; pedicels 1-3 lines long. July. North America. B.B. 1:408. B.M. 1906 (Helonias viride).

Cálfornicum, Durand. Stem very stout, 3-7 ft. high: Ivs. ovate acute, the upper ones lanceolate but rarely acuminate; perianth-segments broader than in V. víride, obtuse, whitish with a greener base. Colo. and Wyo. to N. Calif. and Ore.—Int. 1883 by Pringle and Horsford. The long panicle of whitish, bell-shaped, drooping fils. is followed by ornamental fruits or capsules.

AA. Fils. blackish purple.

nigrum, Linn. A hardy perennial often 2-4 ft. high, somewhat bulbous at the base: lower lvs. oblong plicate, 1 ft. long, 6-8 in. wide, narrowed at the base; upper leaves lanceolate; panicle narrow: fils. blackish purple; segments oblong, obtuse. June. Eu., Asia. B.M. 963.

J. B. Keller and F. W. Barclay.

VERBÁSCUM (old Latin name of the Mulllein used by Pliny). Scrophulariaceae. MULLEIN. A genus of over a hundred species, mostly coarse, woolly, weedy yellow-flowered biennials native to the Mediterranean region. Considering the fact that the familiar Mulllein (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 Mulllein. The Mulllein 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 Mulllein" 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-flld. 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 herbs, rarely perennial or suffruticose, more or less woolly; racemes or spikes terminal, simple or branched; pedicles 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. v. 10. Boissier Flora Orientalis, vol. 4. Garden 27, p. 172; 41, p. 551.

American trade names are: V. Chaixii, nigrum, Olympicum, phlomoides, phlomide, phosniceum. J. 4-2648.

VERBASCUM

INDEX.

b. Fls. clustered. (Group 1. Eu-thapsus.)
c. Anthers short-decurrent; corolla concave at the throat. 1. Thapsus.
d. Anthers longer adnate-decurrent; corolla flat. 2. thapsiformes.
e. Stem-lvs. long-decurrent. 3. phlomoides.

VERBASCUM

DD. Teeth of calyx linear-lanceolatae

11. Boerhavii

cc. Calyx small.

d. Fls. purple. 12. phlomideum

BB. Racemes branched or panicled.

c. Clusters of fls. finally remote. 14. sinatum

d. Pedicles rarely as long as calyx. 15. pyramidalum

e. Plant green and nearly glabrous. 16. rubiginosum

EE. Plants more or less pubescent.

f. Filaments white-woolly.

g. Tomentum scaly; lvs. tomentose on both sides. 17. Olympicum
c. Tomentum spinulosum. 18. Lychnitis

FF. Filaments purple-woolly. 19. Chaitixi

1. Thapsus, Linn. Common Mulllein. Flg. 2648. Familiar weed in woods and in uncultivated fields, 2-6 ft. high, densely woolly, with large oblong root-lvs. and long racemes of yellow flowers. Eu., Orient, Himalayas, B. 2:143. Gn. 29, p. 118. —Natural varieties have been observed with pale yellow and white fls. and hybrids with V. sinatum, Lychnitis, nigrum, etc. Other variations are: inflorescence dense or lax, simple or branched; fls. large or small; wool dense or loose; flaments glabrous or pilose. The following European trade names are said to be referable to this species: V. canescens, Linnæi, pallidum, Schraderi, and thapsoides, all nearly synonyms; V. collinum, Lamotei, Thapsos-floccosum, and var. Gordonii, Thapsos-nigrum.

2. thapsiformes, Schrad. European species with yellow tomentum and narrowly decurrent stem-lvs. Var. macrum, Benth. (V. macrum, Ten.), has white tomentum and more widely decurrent leaves.


4. longifolium, Ten. (V. pavoninum, Vis. & Pance). 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 racemes of ovoid lvs., flattened corolla and glabrous flaments.—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. (V. blattarioides, Lam.). This and the next are two of the very few Verbascums that are green throughout. V. glabrum, Willd., and V. stoechadum Pers., represents its glabrous and sticky-pilose variations. Cosmopolitan.

9. Blattaria, Linn. Moth Mulllein. Blattaria is from blatta, cockroach, 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 Verbascums, distinguished from V. virgatum by solitary pedicles. Fls. rarely white.

10. nivum, 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.). Purely European in origin, and generally considered one of the most beautiful species, being practically the only purple-flowered species in cultivation; very distinct, with purple, violet, rose, pink and lilac. The white-flowered species, V. ferrugineum, inhabits the mountains of southeastern Asia and E. Asia. The name phoenicium was doubtless suggested by the Phoenician purple and not by the necessity of the plant. The species grows about 5 ft. high, and is one of the few genera, the lvs. being nearly glabrous, or only pubescent. Upright, twice, or thrice, 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 afternoon sun is allowed to strike. B.C. 7:697. 

22. V. ferrugineum, Benth. (V. cripus, Sims), is a garden hybrid raised from seeds of V. oculatum, showing influence of V. phaeum in its copper-colored fls. It has long been a favorite. B.M. 1226.

13. Nigrum, Linn. A common European species, with stems angled above, lvs. nearly glabrous above, long racemes rather branched and purplish woolly filaments. Gn. 27, p. 182, showing the wonderful improvement made by cultivation. V. verne, Wierz. & Rochel, is referred to this species by Index Kewensis.


15. Olympicum, Boiss. Tall Greek species, 3-5 ft. white-woolly: lvs. tomentose on both sides; panicles with a few very long, erect branches; clusters many-flowered: fls. 1 in. across, filaments white-woolly. The garden merits of this species are discussed above. Gn. 1:273. Gn. 30, p. 213; 31, p. 125; 38, pp. 55, 66; 41, p. 555; 47, p. 147.


17. Châlæni, Vill. (V. orientâble, Bieb.). Lvs. green or tomentose beneath, crenate, lower ones cuneate at base, truncate or incised: racemes panicled. filaments purple-woolly. V. vernale of the trade belongs under V. ni- grim instead of here, as commonly stated. Gn. 27, p. 172. Vars. semi-lanatum and Freyninum, Hort., are hybrids. Often attains 10 feet, and acts like a true perennial on warm soils.

W. M.

VERBENA (ancient Latin name of the common European vervain, V. officinalis). Verbenaceae. Verbenas rank very high among garden "annuals," Their clusters of showy and often fragrant flowers are borne in handsome, conspicuous racemes from June till frost. They vary from white through lilac and rose to purple and dark purplish blue, with shades of pink and pale yellow. The clusters are about 2 in. across and contain a dozen or more fls. each, 5-6 cm. in diameter, with a tube and spreading lobes, each lobe being notched at the apex.

When special colors or named varieties are desired it is necessary to propagate Verbenas by cuttings. To propagate a rare variety by cuttings, shortly after the plants about September 1, keep them well watered, and by the end of the month there will be plenty of quick, tender growth suitable for cutting. Put the cuttings in the propagating house, and even flats with some soil or sand on surface. Place the flats in a coldframe, and keep them moist and shaded until the cuttings are rooted. When rooted, transfer to flats in a cool, light house until after New Year's. Then pot them, using 2½-inch pots, and allow a temperature of 50° F., which will soon give plenty of material for additional cuttings. This method of propagating from cuttings tend to flower early, and those propagated in February or March will require at least one pinch. When the planting-out is in beds for summer bloom, bend the plants to the right only to the degree 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 an inch. A temperature of 45-50° will answer, but they should have full light. There is no place equal to a mild hotbed for young Verbenas. About April 15 plunge the pots in a few inches of soil in a mild hotbed. Lift them now and then and rub off the roots which go through the bottom of the pot, in order to check growth and hasten flowering. Customers want to see them in flower before buying, and most of them wait till the end of May. However, Verbenas 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 3's or alternate, spirally arranged, or rarely long or distant-flowered, sometimes corymbous or panicled: corolla-tube straight or incurved; limb somewhat 2-lipped, lobes 3, oblong or broader, obtuse or retuse; petals 4, distinct: ovary 4-locular, 1-ovuled. DC. Prod. 11:535-556 (1847).

The following account of Verbenas 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 was assistant in the horticultural department there. After two years' work at Cornell University he received the degree of Master of Science in June, 1896, when he was elected President of the Colorado College 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, 1906. The work in Colorado was very much his own research. It was his native state, and 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 intention to recast his thesis in cyclopedic form. The following account has been changed as little as possible. The botanical part of this chapter is entirely new, but the readable portion contains Mr. Cowen's own words, with a few slight verbal changes and some omissions.

In 1836 Loudon styled the Verbenas "a genus of sandy plants." A little of a few years ago, Mr. Cowen endeavored to prove this remark to be inapplicable in many cases, for 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. 1826-1838. — The first of this noble race to be introduced was Verbena chamae- dryfolia, a dazzling scarlet. This species has had a profound influence upon the "salvia" of V. hybrid, particularly the scarlets, and is one of the predominant parent species of the "compactas."

The second important South American species to be introduced was V. shahingolofc. This is a plant of a few feet, whose flowers are inclined to rose or purple rather than to scarlet, 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 globular. These two species and V. chamaedryfolia seem to be the principal parents of the various red, scarlet and rose-colored forms in cultivation.

Verbena incisa flowered in England for the first time in 1836. This species is characterized by rose or purplish, rather regular flowers, borne in a flat or slightly convex cluster. The corolla is strikingly lighter colored below than above. The leaves are much more deeply cut than in the two preceding species, so that rows of growth resembling that of V. philoglosa, but is rather tall and weak, three feet high in cultivation. This spe-
Verbenas were doubtless used in hybridizing, but its distinctive characters are now practically obliterated in the forms of *V. hybrida*.

*Verbena tenuioides* is a species of strikingly different characters from the three preceding and one which has exerted the most profound influence upon many races of *V. hybrida*. 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 jasminine fragrance, its recurved, coarsely crenate, sessile leaves, and its stiff upright habit of growth. The characters of *V. tenuioides* are apparent in many forms of our *V. hybrida*, notably so in many of the blue "oculata." Of the four species thus far mentioned, *V. tenuioides* 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. tenua* and *V. Aubletia* 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. tenuioides* 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. chamädrysfolia* provided one of the richest scarlets in nature, *V. phlogiflorum* and *V. incisa* provided various tints of rose and purple, *V. tenuioides* gave white with a rather elusive suggestion of yellow. *V. chamädrysfolia* was of prostrate habit; *V. tenuioides* was stiff and upright; the other two species were intermediate. *V. tenuioides* 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. tenuioides*, seem to have soon lost their specific identity and to have completely merged in *V. hybrida*. 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...
admiration of flower-lovers. A host of showy-flowered and zonal pelargoniums were offered to the public. Henderson says that in 1870 he sold 29,000 pelargoniums and that in 1875 he sold 100,000. In many bedding arrangements Verbena was wholly superseded by the pelargonium. The tuberous-rooted begonias and Pelor Drimonioides likewise contributed to the neglect of the Verbena, the latter of the two largely superseding it as an exhibition plant. In the west of England, however, the Verbena continued to be esteemed to a slight extent as an exhibition plant up to 1889.

(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 the 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 "coddling" 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 "compacta" 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 concomitant evolution. By observing Fig. 2649 it is apparent that in the prototypes of our present garden forms of Verbena hybrida the individual flowers are irregular, the upper lobes of the corolla being ruffled, large vacant spaces occur between the lobes, and the flowers are relatively small. V. chamadryfolia is the most irregular, V. incisa and V. tecioroides are somewhat less irregular, while V. phlogifera (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. lacinia and phlogifera were apparently more showy in respect, while in V. tecioroides the flowers were unsatisfactorily scattered along a sparse spike. The Verbena fancier soon established in his mind an ideal of "piping" and "spreading," toward which he constantly selected. This conception developed from "clear" to "light," to "white," and finally "yellowish." 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 fill the space perfectly, but do not crowd. The flower-cluster is of graceful, oblate-oval form, with no unnecessary angles or points.

Though the Verbena breeder probably never completely realized the ideal flower and cluster, this ideal has had a most significant influence. The greatest improvement in the Verbena and forms therefrom have been made in the individual flower and of the flower-cluster, as in 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 greater distances. Abundance of bloom and depth of color are of greater importance. It is probable that the best Verbenas of to-day would hardly come up to the standard of those grown by the English gardeners of 1886 if judged by formal symmetry.

VERBENA

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. hybrida was that produced by the palliade 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., dark centers and lemon or white centers. In this discussion the term is applied only to the latter. In a list of 48 select varieties published in 1848 several are described as having dark centers, two have lemon eyes, and two have white or "light" eyes. It seems evident from the plates of this period, however, that these "light" or "white" eyes were very small and would now be unworthy of the name. The "clear yellow eye" of "Lord Leigh" is probably the largest distinct eye produced prior to 1863. Previous to this time many varieties had been admired for their dark centers which were doubtless very pleasing; since 1863 less attention seems to have been given to the dark centers and more to the development of distinct white or lemon-colored eyes. The recognition of a distinct class of oculatas does not seem to antedate 1870, and it is the impression of the undersigned that the French and German Verbena fanciers deserve most of the credit for the recent development of the important oculata class. The ideal oculata of to-day has a clear, distinct, white eye of only medium size. Very large eyes are not so pleasing. They have a tendency to give a "chopped" appearance.

Reds.—The first stem parent, V. chamadryfolia, had red flowers, and red in its various modifications of crimson, scarlet, rose, etc., has been predominant throughout the entire history of the Verbena. Every accessible list of varieties from 1815 to the present depth of information on the subject, Robinson's Defiance, a brilliant crimson, very popular in the fifties, has left so strong an influence as to give the class name "Defiance" to numerous varieties and strains, some of which are doubtless direct derivatives of this historic variety.
VERBENA

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, and the other 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 in the British florists somewhat previous to 1849, and 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 was introduced into France and England from Italy about 1862.

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 the derivatives in part of *V. tenera*. 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. tenera*. Neither has the undersigned been able to find any evidence of the anther appendages of *V. tenera*. 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. tenera*, Spreng., but some form of *V. hybrida*, Hort. The striped varieties are unstable and have a strong tendency to revert to "seifs," whether propagated by seed or by cuttings. In the writer's own experience, a seeding with blue and white striped foliage reverted in four generations of cuttings to the old variety, so that some of the plants produced only flowers that were white, and others that were white with only an occasional small mark of blue. Striped 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 1863, 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 a 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 growers of Erfurt deserve much of the credit for the production of this splendid little race that has done so much to help restore the Verbenas again to popularity. Compactas have been fixed in various colors so that they will come true from seed. In most cases they resemble *V. chamaedryfolia* and *phlomiflora*.

Development of Treatment as Annuals. Seed-Fixing.—When the Verbenas were first introduced they were...
propagated to a considerable extent by separating the prostrate, rooting branches and potting them. This method was soon abandoned in favor of propagation by cuttings. Verbenas root very readily and they were grown from cuttings almost exclusively up to 1888, except that seed propagation was employed for the production of new varieties. During all this period, as a consequence of much 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 1868–70 seed propagation was more extensively employed. It obviated the very troublesome experience of wintering over stock plants, which were so susceptible to attacks of mildew and aphis. 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 propagated.

Summary of Present Horticultural Types (V. hybrida).—It is impossible to satisfactorily classify the hybrid garden Verbena according to their botanical derivation. They are conveniently classed according to color of flowers into: (1)Selfs, or one-colored varieties; (2) Occlusals, or eyed varieties; and (3) Italian, or striped varieties. As to habit they may be divided into: (1) Standarids, those of the ordinary loose, spreading growth; and (2) Compactas, 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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2652. The common garden Verbena—V. hybrida (X 1).

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. melindroides has shorter, broader lvs. and is more hairy. Different forms occur over southern Brazil, Uruguay, Paraguay, and the whole of the Pampas.

1. Chamädryfolia, Juss. (V. Melindres, Gill. V. melindroides, Cham.). Fig. 2649. Characterized by red fls. in flatish clusters, oblong, coarsely scalloped, nearly sessile lvs. and rather stiff pubescence. Stems slender, forked, creeping at base, hirsute; branches somewhat ascending: lvs. oblong or ovate, base broadly cuneate, contracted into the short petiole, crenate or sublustrously serrate, serrations often unequal, strirote above, below hairy, especially on nerves: peduncles elongated, ascending: spikes solitary, capitate: bracts lanceolate-subulate, ciliate: calyx hirsute crenate, sparingly glandular, more than twice as long as the bracts: corolla crimson, limb irregular.—Occurs in two

3. incisla, Hook. Fig. 2649. Rosy or purple-fl. species with lvs. more deeply cut than in the two preceding. Whole plant hairy-pubescent; stems ascending; branches erect; lvs. oblong-terangular, base cuneately truncate or subcordately attenuate into the evident petiole, pinnatifid-lobed or deeply serrated and incised, upper lvs. sublanceolate, sessile, incisely pinnatifid: spikes terminal, pedunculate, subterinate, flat or convex: bracts ovate, calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs; corolla long, glandular-pubescent, thrice as long as calyx; limb large, rose-purple, paler beneath, obvolute lobes deeply emarginate. Southern Brazil, Paraguay and northern Argentine Republic. B. M. 3628.

4. teucroides, Gill. & Hook. Figs. 2649, 2653. Characterized by fragrant white fls. in very long clusters. Stems cespitose, rooting at base, ascending, terete, openly and copiously hisrute; lvs. ovate to oblong-triangular, 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. 5:243. B. M. 3694.

5. venosa, Gill. & Hook. Fig. 2654. Differs from all other cultivated kinds by pinnate indumentum and tuberous roots. Herbaceous perennial, 1 foot high: stems simple, rhizomatic, creeping at base, ascending, 4 angled, hairy: lvs. rigid, oblong to oblong-lanceolate, the subuncinate base entire and half-clasping, acute at apex, unequally subacutely dente, the teeth openly acuminate, nerves prominent, hisrate below: spikes in a close terminal panicle, subterinate, lateral ones pedunculate, fastigiate and finally cylindric: bracts subulate, ciliate, often purplish, exceeding the hairy calyx; corolla lilac or bluish purple to nearly sky-blue, very thinly villous without; tube slender, thrice as long as calyx; fls. 3-5. Of all lvs. joint broader, lobes emarginate to obovate; throat of corolla provided with a pallsade 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.

Tubers may be kept indoors over winter, or species propagated by seeds sown in greenhouse in January.

6. teners, Spreng. (V. pulchella, Sw., not Hort.). Herbaceous perennial: stems cespitose, decumbent, rooting: branches slender, 4 angied, ascending, sparsely hairy: lvs. decurrent into the short petiole, 3 parted and again pinnatifid into acute, linear, entire, subrevolute divisions, sprinkled with short hairs: spike-lim-

minial pedunculate: calyx elongated, strigose pubescent or hairy, sprinkled at angles with short stipitate papalliform glands, twice as long as bracts; corolla rose-violet; anther appendages barely exserted, clavate, subacute, subcurved. Southern Brazil and LaPlata region. 4-6 lines broad, lobes emarginate to obovate; throat of corolla provided with a pallelade 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.

2653. Verbenae teucroides, as cultivated to this day (X ¼). The spike elongates still further.

2654. Young plant of Verbenae venosa, too young to show the characteristic pinnalic arrangement of clusters (X ¼).
VERBENA

9. Aubletia, Jacq. (V. Aubletia, var. Drimmondii, Lindl. V. Canadensis, Britton. V. Drimmondii, Hort. V. Labberti, Sims. V. montana, Hort., in part. Fig. 2655. Perennial, pubescent, with rather stiff hairs or entire; thignt; slender and ascend. Form a sometimes creeping rooting base, 6-18 in. high; lvs. ovate or ovate-oblong in outline, 1-3 in. long, truncate, broadly cuneate or subulate at base and the petiole more or less lobed and toothed; deeply 3-cleft; spikes peduncled, dense, short and capitate in early flower, becoming 2-4 in. long in flower: bracts subulate, mostly shorter than the calyx—these and the areal margins glabrous; pubescent; calyx-teeth unequal, filiform-subulate; corollas 6-10 in. long, from bluish purple or lilac to rosy purple or white, frequently approaching blue in dried specimens; limb 3/4-5 in. broad, lobes oblong or obovate, emarginate and more or less revolute near the sinuses, throat provided with pali- sade of short white hairs: upper anthers bearing each a light brown, oblong gland which is barely exserted. Colo. and Mex. eastward across the continent. B. B. 372. B. M. 396:2930. B. C. 4:294. 29:1925. Reported as producing many garden and spontaneous hybrids. Garden forms are of stouter habit, less inclined to root at base; lvs. larger, dark, shiny green above, more copiously veiny, clusters and individual lfs. 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 recom- mended for landscape planting, and the hybridizing with the hybrid Verbenas to improve their constitution. The cross would probably be too radical for best results. It is to be regretted that this charming species, so well adapted to parts of In Europe should be neglected in its native America.

V. bracteata and hastata, two weedy North American spe- cies, have also been offered for cultivation, but they have small garden value. Descriptions are easily obtained.

J. H. COWEN.

VERBENA, LEMON. Lippia.

VERBENA, SAND. See Abronia.

VERBESINA (probably a meaningless alteration of Verbenas), Cowpodsites, Crowne's sand. About 50 spe- cies of American herbs, annual or perennial (some tropical species shrubby), with alternate or opposite, often decurrent lvs. and corymbose or solitary heads of velvety flowers, slightly or non-hirsute: petiole: slender, or slightly thickened or blunt: calyx-teeth acute or obtuse: corollas somewhat longer than the calyx: fruitlets: long: sometimes with 2 or 3 intermediate scales. About half a dozen hardy perennial Verbesinas have already been introduced, but competition among yellow-fld. autumn-blooming composites is so great that Verbesinas 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 cul- ture. It blooms from Aug. to Oct., and has numerous yellow lfs. 3/4-1 in. across in flatish clusters.

occidentalis, Walt. (V. Siegbetckia, Michx.). Hardy perennial herb, 4-8 ft. high: lvs. ovate (uppermost obt- long-lanceolate), acuminate, serrate, the larger ones 8 in. long, contrasted into a marginal petiole: rays stelliferous and usually fertile: awns of pappus not hooked. Dry hillsides, eastern U. S. B. 3:223.

W. M.

VERMONT, HORTICULTURE IN. Fig. 2656. Ver- mont has no reputation as a horticultural state, either amongst her own citizens or outside her boundaries, yet there is not one important fruit or vegetable crop of the temperate zone, not even excepting apricots and peaches, which cannot be grown profitably in the State. With the exception of apricot, peaches and sweet cher- ries all the temperate fruits can be produced in great perfection.

The only reason which can account for the non-development of Vermont's horticultural industries is that the possibilities are not appreciated by her land-owners. Vermont farmers are extremely conservative and slow to make a change in their meth- ods of farming, so that the signal success of the few who have taken up fruit-growing makes but small im- pression on the many who are still busy making butter and preserving hay, potatoes, and little patches of grain.

The home market for fruit and vegetables is generally good. Strawberries rarely sell for less than 12¢ a quart, and the average price for good fruit is probably nearer 15 cents. Blackberries usu- ally bring 10 cents a quart, raspberries 5-8 cents. Cherries are hardly to be bought, though sour cherries thrive and cherry pie is popular. The price for cherries is always $3 to $4 a bushel. Good vegetables sell equally well. With such prices on the market it is not sur- prizing that many small manufacturing villages and a horde of 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 horticultur- 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 grow readily when attended, but are seldom cared for. Greater success is secured with small fruits, the growing of which is greatly encouraged by the large annual immi- gration of summer visitors. The third region is the valley of the Connecticut. It is the least de- veloped 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 suc- cessfully grown in orchards. The few men who are growing plums, cherries, strawberries, etc., are proving every year that the Connecticut 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 reputa- tion at home. There are a few commercial apple orch- ards 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 orchard- ists are found there; but Addison county ships about double the quantity of apples.

The varieties of apples grown for market are princi- pally Greening, Spy, Baldwin and Pemiscot. Next in order come McIntosh, King, Ben Davis, Spitzenburgh, Seek-no-further and Arctic. A few old orchards con- tain many of the old-time favorites, such as Fall Har- vey, Dutch Mignonette, Gilpin, Grimes Golden, and the like. But such trees are for the most part rare.

The modern commercial varieties are the only ones in repute.

Vermont has had some experience with the Russian apple. In fact, Dr. T. H. Hokin's, 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. Loumbard, Green Gage, Bradshaw, the Damsons and other old-fashioned sorts still retain the preference in some of Vermont's old orchards. Next come the peach, and other growers are planting chiefly of the Japanese va- rieties, especially Burbank and Abundance. In the northern and mountain towns only the Américans and Nigra types are hardly enough; but even these are sel- dom grown.

Among cherries Morello, Montmorency and Richmond are favorites. Raspberries are mostly red, the black- caps being seldom grown. 100 acres of sweet cherry variety, though Schiffer and Columbian are gaining friends rapidly. Blackberries are not carefully grown usually. Fine blueberries are picked from the fields in considerable quantities. Early varieties of grape can be grown for table use, Concord, Wines, Moore,Early, Green Mountain and Delaware being leading varieties.
Vernonia

Vernonia but fls. in involucre p active cloudy who a for tables tomatoes, cloudy active

NORTH AMERICA

New York

C A N A D A

MASS

2656. Outline of Vermont.

Truck gardening is practiced, of course, in the neighborhood of all the principal cities; but it cannot be said to be a well-managed business. Those crops which grow in special perfection are beans, potatoes, peas, tomatoes, salal and purses. Those which cannot be grown, or which are, as a rule, unsuccessful, are melons, okra, sweet potatoes, turnips and Lima beans. Special crops which are sometimes grown in quantities for export are seed peas, white beans and onions.

On account of the long, cold winters and the short, cloudy days of that season, greenhouse operations are carried on at a great disadvantage. The production of hothouse vegetables is, therefore, very small, and florists find it difficult to grow roses and lilies, or even violets and carnations, at a profit.

The Vermont Horticultural Society was organized December 3, 1896. It is, therefore, a young, though an active and useful society.

F. A. WAGH

VERNAMIA (after Wm. Vernon, an English botanist who traveled in North America). Composita. 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-fl., involucrc 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, callous base; pappus double (at least in American species). Vernoniaceae are of easy culture in any good, rich border, being easily propagated by division.

A. Heads 30-70-flowered.

Arkansana, DC. Stem 8-10 ft. high: lvs. linear-lanceolate, 4-12 in. long, alternate-acuminate; peduncles not branched; involucre green, the filiform tips often reddish. Plains, Mo., Kan. to Texas. July-Sept. B. B. 3:302.

AA. Heads 15-40-fl., red or yellow.


cc. Plant 3-4 ft. high.

Lettorneyni, Engelmannia. Stem fastigiate and cymosely much branched at the summit: lvs. 2-4 in. long, only 1 line wide, margins not revolute: fl. heads numerous, ¾ in. long, 10-14-fl., July-Sept. Sandy soil, Arkansas.

bb. Lvs. not narrowly linear.

c. Bracts of involucre tipped with slender awns.

Novemboracensis, Willd. Fig. 2657. Stem 3-6 ft.: lvs. oblong to oblong-lanceolate, 3-9 in. long; heads in an open cyme: involucres commonly brownish or dark purplish: fls. rarely white, usually in moist soil. July-Sept. B. B. 3:302. The more common species of the eastern United States.

cc. Bracts not awned.

d. Plant tomentose.

Baldwinii, Torr. Stem 2-5 ft. high: lvs. lanceolate to ovate-lanceolate, 4-8 in. long; bracts greenish acute or acuminate, tips spreading or reflexed. Fls. earlier than most species, in July and August. Prairies, eastern Mo. to Tex. B. B. 3:302.

dd. Plant glabrous.

e. Lvs. thin.

altissima, Nutt. Stem 5-10 ft. high: lvs. veiny lanceolate or lanceolate-oblong, 4-12 in. long; heads obtuse or merely mucronate-tipped, close and pressed. July-Sept. Western Pa. to Ill., La. and Fla. B. B. 3:302.

f. Lvs. thickish.

fasciculata, Michx. Stem 2-5 ft. high: lvs. somewhat obscurely veined, linear to oblong-lanceolate, 2-6 in. long; heads numerous and crowded on the branches of the cyme: bracts obtuse or some of the upper mucronate-acute, close and pressed. July-Sept. Ohio and Ky. to the Dakotas and south to Texas. B. B. 3:303.

F. W. BARCLAY.

2657. Isolated specimen clump of Ironweed—Vernonia Novemboracensis.
VERONICA (after St. Veronica). Scrophulariaceae.

Speedwell. The Speedwells are mostly herbs, with a few exotic shrubs, handsome by their small 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 vegetation. Plants in cultivation are mostly hardy at the North, usually low-growing and occasionally prostrate. Lvs. opposite, rarely verticillate or alternate; fls. in axillary or terminal racemes and breasted; calyx 4-5-parted; corolla usually pink or white, wheel-shaped or salver-shaped, the lateral lobes or the lowestmost one commonly narrower than the others; stamens 2, exerted, one on each side of the upper lobe of the calyx; staminode 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 herbarious border. The shrubby forms are greenhouse plants or grown only in warmer parts of the country, particularly California, where they are everblooming, and where they do well along the coast even in exposed places by the sea. The shrubby species are mostly natives of New Zealand. They are well reviewed in *The Garden* 45, p. 506, and 28, p. 292. Some of them have enjoyed a considerable popularity in England, where they are generally seen in cultivation, 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 Veronicae of to-day have the parentage above indicated, with the results of *V. speciosa*. A species generally much in evidence. If a collective name for Veronica hybrids is desired, *V. speciosa* var. *hybrida* is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but hardier races will probably be secured by using *V. Traversii* and its allies, which have been introduced more recently. Some of these are *V. Colensoi*, *Kakaiensis*, *anomalæ*, *monticola* and *pimeloides*—all unknown to the American trade. A third and stillhardier group of the New Zealand Speedwells is the truly alpine group known as *Whipcord Veronicae*. These should be quite hardy in northern rockeries. They are unknown in America now. The best of these groups is said to be *V. monticola*, var. *variabilis*, known to English trade as *V. salicoides*. Others in cultivation are *V. Hectori*, *Armstrongii* and *lycoepoëdes*.

Veronicae was monographed by Bentham in Latin in DC. Prod. 10:458-491 (1846), 158 species being then known. An excellent account of cultivated Veronicae is found in Vilmorin’s Blumengartnerei.

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1. *Hulkeana*, F. Mueller. Showy lilac-flowered species, readily distinguished by its serrate lvs. and terminal racemes. Slender, erect, sparingly leafy, straggling shrub, 1-3 ft. high, with branching stems: lvs. 1½-3½ in. long, in sparse pairs, ovate or oblong, obtuse or acute, coarsely serrate, smooth, leathery: raceme slender, terminal, branching, spreading, 4-10 in. long; fls. sessile; blue: capsule small, 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-oblong, the latter, 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.)
VERONICA


4. speciosa, R. Cunn. A half-hardy bushy branching shrub, 3-6 ft. high. Stout and very smooth, the branches angled: lvs. ovate-oblong, sessile, thick and smooth, 2-3 in. long: racemes axillary, densely fld.: fls. blue to violet, with rose, red or white varieties: capsule exceeding calyx. Banks of streams, New Zealand. B. M. 4057. R. H. 1844:100. Andersoni, 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. 5:658. Fig. 2658.

Var. imperialis, Boncharait (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. Traversii and V. Hendersonii and to have violet-blue fls. with a white center. The handsome plate Gn. 45:906 shows no trace of V. Traversii nor of white center. The plant is close to V. speciosa. In some catalogues V. Hendersonii and V. subsecialis 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, subsecialis, 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. Bxbauimi, Tenore. Prostrate annual, with elongated slender pubescent stems, the lower branching and often forming a clump or bed: lvs. short-petioled, coarsely crenate-serrate, pubescent, shortly petioled, ¼ in. long, the lower opposite, the upper alternate and similar: racemes axillary: fls. small, blue, scattering, on long pedicels: capsules 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. Syrisca, Roem. & Schult. Ascending, diffusely branched pubescent herb, 6-12 in. high: lvs. ovate or oval-oblong, sessile or dentate, incised or dentate, smooth or petiolate, upper subsecialis, ¾ in. long: racee terminal, slender, 4-6 in. long: fls. blue, with thread-like pedicels ½ in. long: capsule broader than long, notched twice, exceeding the sepals. June. S. W. Asia. R. H. 1897, p. 311.

9. serpyllifolia, Linn. (V. alpæstris, Hort.). THYME-LEAVED SPEEDWELL. ST. PAUL'S SPEEDWELL. Slender, ascending, nearly smooth plant, growing irregularly in clumps 2-4 ft. high, the base prostrate and rooting: lvs. ovate-oblong, entire: calyx blue, capsule: variable: racemes loose, with conspicuous bracts; fls. pedicelled, whitish or pale blue with deeper stripes: capsule wider than long, obtusely notched, exceeding or equal to the sepals. Europe, southern Asia, Greenland and mountainous areas of Asia, Eu., N. Afr., and S. Amer.


11. alpina, Linn. A slender, delicate plant growing from a creeping stock, branching at the base, becoming ascending or upright, the flower-stems often solitary, 2-6 in. high: lvs. opposite, occasionally alternate, subsecialis, elliptic or oblong, entire or dentate, about ¼-1 in. long, of varying size, the lowest small, orbicular: raceme short, spiciform, dense: fls. small, blue or violet: capsule ¼-½ 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. obovate or oblong, some lanceolate or linear, thickish entire, sometimes crenate, sub-sessile, ½-1½ in. long: roots-fls. more 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 calyx. Wet alpine fields along the southern boundary of the alpine and hardy species in any soil or location, shade-enduring though not necessarily shade-loving, blooming early. Prop. by division. Forms a mat and makes a good ground-cover for bare or dry places and is a valuable border plant. One of the earliest. Var. foliis variegatis is a dwarf form with variegated lvs. used in formal bedding. Another variety has larger flower-stems and larger fls., which are light lavender. Var. alba has white flowers.

13. repens, DC. CREEPING SPEEDWELL. Prostrate, slender, compact plant growing in dense masses: lvs. ¼-½ in. long, ovate, slightly crenate, shining green and moss-like: racemes slender, few-fld.: fls. early white, with a trace of blue: capsules broader than long, deeply notched, exceeding the sepals. May. Forests of Corsica. Hardy in Mass.—Grows in the sun. Will cover the ground where grass does not grow, forming a sod in a short time Prefers moist corners but thrives on a moderately dry soil.

14. incana, Linn. (V. edulida, Hort.). HOARY SPEEDWELL. Strong, upright or ascending, white-woolly plant 12-18 in. high, with many sterile matted branches and few white-woolly erect branches: lvs. white-woolly, lower oblong, upper lanceolate, 1-3 in. long, white-to-mentose: racemes erect, numerous, 3-6 in. long: fls. many, blue, short-pedicelled: capsule longer than broad, thick, exuding the white fluff: from July to Aug. in low, flat, and mountain regions. N. Asia, and southwestern Eu.—Resembles V. spicata in habit. Has a good
15. **pinnata**, Linn. Strong, upright plant 2-3 ft. high, glabrous or pubescent: lvs. sparse or somewhat clustered, finely toothed to the spreading segments, the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fl.d., elongated: fls. blue. June, July. Open mountain lands, Russia.

16. **spuria**, Linn. (V. panniculata, Linn. V. amethystina Willd.) Bastard Speedwell. An erect, 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, thickish; racemes numerous, paniculately densely many-fl.d.: 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. **flagrans**, 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. flagrans carnea 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 below, very acute, 2½-4 in. long: racemes long, erect, spikelike, dense; fls. blue, 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 eastern 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. **subsessilis**, Miq. Fig. 2659. More erect, compact and robust 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 longer and fls. longer than of the type and of an intense lustrous blue. Aug.—Oct. Japan. B.M. 6407. B.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. **rosea**, Hort. (V. rosea, Hort.), a probable variety with pink fls., 2 ft. high and much branched. Hardy in Mass. Prop. by division and cuttings. Var. **villosa**, Schrad. (V. crenulata, Hoffm.). A Siberian form with narrower lvs. than the type and large blue fls. Lvs. serrate or doubly notched or incised.


19. **circinolerae**, G. Don. Low, trailing perennial, growing in a dense mass: lvs. lanceolate, crenate toward the apex, small, thick; racemes long, upright or oblong or broad, 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.d., on long pedicels: capsule large, broader than long, slightly pubescent: capsules exceeding the hairy sepals. May, June. Moist woods, temperate Europe.

21. **oficinalis**, Linn. **Common Speedwell**. Fluellin. **Ground-Hele**. Prostrate, leafy native with a pubescent stem rooting at the nodes, slender, 6-18 in. long: lvs. elliptic, oblong or broadly oblong, 3-5 in. long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fl.d.: 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. obovate or oblong-linear, sometimes pinnatifid, crenate, narrow at the base, semi-capsule, 1½ in. long: racemes elongated, many-fl.d.: 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, buggy hills, Asia Minor.—Suitable to dry spots in a rock-garden. Grows in almost any soil and position.

23. **Chamædyca**, 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, exceeding the sepals. May, June. Woods and roadsides, N. and mid-Europe and Canaries. Adventive in this country.—A good border plant.

24. **Teucrium**, Linn. **Hungarian Speedwell**. Saw-leaved Speedwell. Stems produced from rhizomes, the sterile prostrate, spreading 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. Teucrium** by intermediate forms. **V. prostrata** is still used in the trade for a plant with light blue fls. B.M. 2653 (V. prostrata var. **satureiafolia**).
VERONICA

25. AUSTRIACA, Linn. Scurr. upright perennial 18-24 in. high, with woody 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-flowered; spreading; fls. bright blue, broader than high, slightly acutely notched, exceeded by the calyx. S. Eu. and Asia Minor. — A border plant.

The following trade names cannot be accounted for by the writer: V. marina, etc. — V. rupestris, etc. The American trade name is apparently not V. rupestris of the botanists. This name was first used by Salisbur in 1736 and is a synonym of V. fruticulosa, a plant of the racemose type with racemes in axillary, many-fl. racemes. It is a low plant with woody horizontal stem and erect flowering branches 4 or 5 in. high with strict racemes of purplish fls. borne in July and a 4-parted calyx. The capsule is obcordate. This plant has been offered by Rochester nurserymen ever since 1964 and was cult. at Harvard Botanic Garden as far back as 1885. Lvs. narrowly oblong, entire or serrate, 3-5 in. long: calyx segments strongly unequal; pedicels longer than calyx: stem pubescent; lvs. sparsely elliptic, short-petiolate. — V. scabriscula. John Saul. — V. atrorubens, John Saul. — V. verna, John Saul. A name known to Kew authorities in 1961, has been offered by Rochester nurserymen since 1984. Lvs. short-stalked, narrowly elliptic, serrate in upper half: racemes lateral. A. Phelps Wyman.

VERSCHAFFELTIA (Ambrosia Verschaeffelt. 1825—A modern distinguished Belgian horticulturist; foundier L'Illustre Horticulture at Ghent in 1854 and introduced many choice plants, particularly palms and other foliage plants). Palmdeco. A genus of only 1 species, from the Seychelles, and resembling the former in its structure but the former is armed and the latter not. The two genera are alike in having 6 stamens and a much more abundant albumen, but in Verschaffeltia the ovary is 1-loculed, while in Dypsis it is 3-loculed.

Verschaffeltia is a tall palm, spinose throughout or at length spineless, the slender ringed trunks arising from epigonic roots: lvs. terminal, recurved; blade oblong or cuneate-obovate, biffid, plicate-nerved, usually latifid, with the midrib and nerves strong, scaly; petiole half-cylindrical; sheath long, scaly, deeply split: spadix 3-6 ft long, paniculately branched, long-peduncled, recurved, scaly, 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.

VICTORIA (Hendel. Caedex 80 ft. high, 6-12 in. in diam., very spiny when young, with aerial roots; lvs. 5-8 ft. long; petiole 6-12 in. long, pale green; sheath 2-3½ ft. long, white-granular; blade cuneate-obovate, bright green, 4-7 ft. long, 3-5 ft. wide, biffid, deeply incised, with recurved edges. 1. H. 12:429; 43:31. P.R. 2:483. R. H. 1869, p. 148. V. melanochoetes, H. Wendl. See Roscheria. W. M.

VERVAIN. Verbena.

VESIGARIA (Latin, bladder; referring to the shape of the pods). Crucifera. About 20 species of widely scattered herbs with races of large, rarely small, yellow or purple flowers of various forms. Sepals equal at the base or laterally subacute: siliqua globose or inflated, many-seeded, and with a slender style: lvs. entire, occasionally ovate, the genus has a 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 wild weeds and parts of V. sinuata are offered by American dealers, but the plant is imperfectly known. DeCandolle says it is annual or biennial, while Koch says it is perennial or subshrubby. In the former case it is said to be an early-flowering yellow annual, about 1 ft. tall, blooming in May and June.

sinuata. Pol. Lvs. softly tomentose, oblong-lanceolate, narrowed toward the base, sinuate-dentate or subentire. — A name, according to DeCandolle the petals finally become whitish. W. M.

VETCH. See Vicia.

VIBURNUM


VETRIS. See Salix.

VIBURNUM (the ancient Latin name). Caprifoliaceae. Ornamental, deciduous or evergreen shrubs, rarely small trees with flat and entire or lobed lvs. and with white fls. for cymes, followed by decorative red or blackish berry-like fruits. The Viburnums rank among our most valuable ornamental shrubs. Besides showy flowers and decorative foliage, they are also of interest as large, most of which may be assumed a bright fall coloring. The plants are of good compact habit. Most of the deciduous species are hardy north, but V. macrocephalum, var. sterile and V. obtusifolium and V. sieboldii, also V. phlebophorum, V. rubrifolium, and V. rufifolium are not quite 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 shrubberies 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 V. Lentago, prunifolium and rufidulm 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, Sieboldi, prunifolium, rufidulm, molle and dentatum are very handsome in bloom. Varieties with all the flowers of the cymes sterile are known in the case of V. 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 phlebophorum assume a dull yellow color. V. macrocephalum and Sieboldi 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, Tinus, pubescens and prunifolium, grow well in drier places, while V. alnifolium and paniculatius require shade and a porous soil of constant moisture. V. acerifolium does well under the shade of trees in rocky and rather dry soil. V. Tinus is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; it is 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.

Prop. by seeds sown in fall or stratified; also by greenwood cuttings under glass, especially V. tomentosum, macrocephalum, molle, cassioides and the evergreen species; V. dentatum and Opulus grow readily from hardwood cuttings and all species can be increased by layers (Fig. 2660); grafting is also sometimes practiced and V. Opulus, dilatatum 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 Java. Shrubs or sometimes small trees with opposite stipular trichomes, white fls. small in terminal paniculate or mostly umbel-like.
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. 2663. The berries of the Japanese species, V. tomentosum, are a brilliant scarlet, changing to black. The foliage of this Snowball is also remarkably beautiful. The leaves are olive-green with brownish purple or bronze margins, and their plicate character makes them very distinct and attractive. The bush is entirely free from insect pests. The single and double forms of the Japanese species differ 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 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.
VIBURNUM

1. Viburnum opulus, L. : Fls. white, sometimes pink, in clusters; frs. red, often with purple calyx; leaves ovate-oblong, sometimes broader, and often coarsely serrate, usually shining and dark green above; paler beneath, glabrous, 2-4 in. long; fr. white, tinged pink, in dense semi-globose panicles becoming ½ in. high; corolla ⅛ in. long, with cylindrical limb: fr. red, sub-globose. June, July. Loohoehl Isl. B.M. 6172. — Tender.

2. V. sinense, Hassk. (V. suspensum, Hort.). Evergreen shrub, attaining 6 ft., with slender warty branches: frs. oval to oval-oblong, acute or obtuse, usually rather coarsely serrate, green and shining above, green and shining below, ½ in. long; fr. white, tinged pink, ⅛ in. long; corolla ⅛ in. long, with cylindrical limb: fr. red, sub-globose. June, July. Loohoehl Isl. B.M. 6172. — Tender.

3. V. tomentosum, Ker. (V. Awaubilk and Awaufik). Evergreen shrub, attaining 10 ft., with stout warty branches, glabrous: frs. elliptic to elliptic-oblong, acute, remotely serrate, or entire, shining and bright green above, shining and bright green below, ½ in. long; fr. white, pinkish white, slightly fragrant, in broadly pyramidal panicles, ½ in. high; corolla rotate-campanulate; fr. red, changing to black. May, June. India to S. China and Japan. B.R. 6:450. — Tender.


5. V. rigidum, Vent. (V. rugosum, Pers. V. latifolium, Hort. V. Thues, var. strictum, Alt.). Shrub, attaining 6 ft., with spreading hirsute branches: frs. broadly ovate to ovate-oblong, acute or obtuse, pubescent on both sides when young, almost glabrescent above at length and wrinkled, ⅛ in. long; fr. pink, pubescent; fr. red, ⅛ in. long; fr. white, in sessile cymes ⅛ in. broad; fr. oval, black. April-June. Va. to Fl. L.B.C. 15:1496. — Tender.

6. V. nudum, Linn. (V. nudum, var. Cladotoni, Torr. & Gray). Upright shrub, sometimes attaining 15 ft.: frs. oval to ovate-obovate, acute or obtuse, usually entire and somewhat revolute or obscurely crenate, thickish, scurfy on both sides when young, glabrous above at length; fr. white or yellowish white; cymes rather long-peduncled, ⅛ in. broad; fr. globose, pink at changing to dark blue. June, July. Newfoundland to Manitoba and Minn., south to N. C. G.F. 9:305. 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: petioles mostly with waxy margin: 1vs. ovate, acuminate, glabra or pubescent, with veins beneath almost or quite white: fls. white, cymes sessile, 2-5 in. broad: fr. oval, bluish black, with bloom. May, June. Hudson Bay to Manitoba, south to Ga. and Miss. S.S. 5:223, 224.—Hardy, large, often arborescent shrub, keeping its fruits until spring. Sometimes as V. prunifolium and pyriformis in garden. A garden hybrid, originated in Germany, is V. Vittleri, Zabel (V. Lentago x nudum), similar in habit to this species but the cymes on short peduncles over ½ in. long.

10. rufidulum, Raf. (V. prunifolium, var. ferrugineum, Torr. & Gray. V. ferrugineum and rufo-tomentosum, Small). Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter-buds scarcely pointed, obtuse, rusty-pubescent: petioles often with narrow margin, rusty tomentose: fls. elliptic to obovate, usually obtuse, glabrous and shining above, rusty-pubescent on the veins beneath, 2-4 in. long: fls. pure white: cymes 3-5 in. broad: fr. oval, dark blue, glabrous, 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 arborescent shrub with dark green shining foliage, showy fls., and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.

11. prunifolium, Linn. (V. pyriferilum, Poir.). BLACK HAW. STAG-BUSH. Shrub or small tree, attaining 15 ft., with spreading, rather stout branches: winter-buds short-pointed, glabrous or reddish, pubescent: fls. broadly oval to ovate, acute or obtuse, glabrous or nearly so, 1-3 in. long: petioles often with narrow margin, glabrous: fls.: fls. pure white: cymes sessile, 2-4 in. broad fr. oval to subglabrous, bluish black and glossy, little over ½ in. long. April-June. Come. to Fla., west to Ill., and Texas. A.F. 12:1100. G. F. 5:310.


13. alnifolium, Marsh. (V. lantanaoides, Michx.). HONEY-BUSH. AMERICAN WAYFARING TREE. Low shrub, sometimes 10 ft. high, with wide-spreading, often proeminent branches, scurfy-pubescent when young: fls. obovate or broadly obovate, coriaceous at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous above, scurfy pubescent beneath, 3-8 in. broad: fls. white: cymes sessile, 3-5 in. broad; marginal fls. enlarged and sterile, long-peduncled; fr. ovoid-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 shrub or sometimes small tree, attaining 20 ft.: young branches scurfy-pubescent: fls. obovate or obovate-ovate, usually coriaceous at base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, denticulate, 2-4 in. long: fls. white: cymes dense, 2-3 in. broad, with usually 4 fls.: fr. ovoid-oblong, bright red. May, June. Eu., W. Asia, A.G. 18:153 and P. 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.

15. cotinifolium, D. Don (V. cotinifolium, C. Koch). Shrub, attaining 6 ft., with spreading branches, tomentose when young: fls. orbicular-ovate to ovate, coriaceous or rounded at the base, usually obtuse, crenulate-dentate or almost entire, wrinkled above and nearly glabrous at length, tomentose beneath, 2-5 in. long: fls. white, tinged with pink, in cymes 2-3 in. broad, with usually 5 rays; corolla rather larger, funneliform-campanulate, tube longer than the fl., fr. ovoid, red, changing to black. May, June. Northwest Himalayas. B.R. 19:1650. G. F. 5:245.—Not quite hardly north, requiring protection near Boston.


19. **Weightii**, Miq. Upright shrub, to 10 ft. high, with the branches almost glabrous: lvs. almost orbicular or broadly ovate 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; fr. glabrous, red. May, June. China, Japan.—Hardy shrub, similar to the preceding, but of less dense habit, with larger fruits in nodding cymes.

20. **phlebótrichum**, Sieb. & Zucc. Upright shrub, attaining 5 ft., with glabrous branches: lvs. ovate to long, 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-peduncled and nodding, in few-flowered, long-peduncled cymes; fr. globose. May, June. Japan, China.—Not quite hardy north.

21. **dentatum**, Linn. Arrow-wood. Upright bushy shrub, attaining 15 ft., with glabrous branches: lvs. rather long-petioled, orbicular to ovate, acute or shortly acuminate, coarsely dentate, glabrous or pubescent only in the axils of the veins beneath, 1¼–3 in. long; fls. in long-peduncled, glabrous cymes, 2–3 in. broad; fr. sub-globose, black, glaucous. May, June. New Brunswick to Minn., south to Ga. G.F. 10:332. Em. 2:114.—Handsome native shrub, thriving best in moist soil. V. *levigatum* of some nurseries, not Ait., has somewhat larger lvs. and seems to bloom later.

22. **mollis**, Michx. (V. *seeboldtianum*, Champ. V. *Nepalense*, Hort.). Similar to the preceding, but branchlets, cymes and under side of lvs. scaly-pubescent; lvs. larger, with stouter petioles, dark green; peduncles stout; teeth of calyx more prominent: fr. large and more pointed: blooms 2–3 weeks later. Mass. to Fla. and Tex. G.F. 4:30.—Handsomeer than the preceding on account of its larger darker green foliage and more robust habit. In gardens sometimes confounded with **V. pubescens** and sometimes found under the erroneous name of **V. Hanceanum**. See supplementary list.

23. **Demetrióis**, Deane & Rob. Upright shrub, attaining 12 ft.; lvs. orbicular or broadly ovate, cordate, shortly acuminate, coarsely dentate, pubescent beneath or almost glabrous, 2¼–4¼ in. long; cymes long-peduncled, pubescent, about 2½ in. broad; fr. oblong, almost ¾ in. long. Mo. B.B. 3:231.


26. **acétilóium**, Linn. Dockmackie. Shrub, attaining 5 ft., with slender, upright branches: lvs. orbicular or ovate, 3-lobed, with acute or acuminate lobes, coarsely dentate-serrate, pubescent or at length almost...
**VIBURNUM**

Glabrous, 2-5 in. long; fls. yellowish white; cymes long-peduncled, terminal, 1½-3 in. broad; fr. almost black, ovoid. May, June. New Brunswick to Minn., south to N. C. Em. 2.4.14. It grows fairly well in drier situations under the trees. The foliage assumes a handsome dark purple fall color.

27. **pauciflorum**, 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-fl., small, on lateral, short, usually 2-lvd. 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. Americana, Mill. V. triabum, Marsh. V. opuloides, Muhl. V. edule, Pursh. V. Oxy-eces, Pursh.). CRANBERRY-BUSH. HIGH CRANBERRY. Figs. 2664, 2665. Shrub, attaining 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, 3-4 in. long; fls. white, in peduncled cymes, 2-4 in. broad; fr. subglobose to oval, scarlet, May, June. New Brunswick to Brit. Col., south to N. J. and Ore.; also in Ea. and Asia. — 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.

Var. nanum, Jacq. A very dwarf, compact, small-leaved form; flowers but very rarely. Var. sterile, DC. (V. roseum, and roday-ceum, Hort.). GUELDER ROSE. SNOW-BALL. Figs. 2665. All fls. sterile, forming large, globose heads. Gns. 1:9. Gn. 36, 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. Americana, Mill., but differs little from the European form, chiefly by the more vigorous growth, by the pedicels having a shallow rather broad channel and small glands, and by the shorter peduncles and shorter stamens.

29. **Sargentii**, Koehne. Similar to the preceding, of more upright, denser habit; bark of stems darker, fls. 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; pedicels with large glands; sterile fls. larger, sometimes to 1½ in. across; anthers purple; fr. globose, in usually upright cymes. N. China, Japan. — Introducéd under the name Viburnum Opulus from Pekin. It does not seem to fruit as profusely as V. Opulus.

**V. tourjaticum**, Herb. & Regel (V. Burejănianum, Herb.). Similar to V. Lanotica, but lvs. of the leaves, more lanceolate, ovate, and acuminate, with minute, inconspicuous glands; lvs. to 3 or 4 in. long; cymes 1½-3 in. across; anthers purple; fr. globose, in usually upright cymes. N. China, Japan. — Introducéd under the name Viburnum Opulus from Pekin. It does not seem to fruit as profusely as V. Opulus.

2664. **Viburnum Opulus** (× ½).

Single form of the common Snowball as it grows in the wild.

2665. **Fruits of Viburnum Opulus** (× ½).

**VICA**

(classic Latin name). VEGETABLES. TAKE 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 seed; style very slender, with beards or hairs all around the upper part or only at the apex; pods flat, 2-many-seeded, 2-valved and dehiscing, the seeds either globose or flattened; stems diadelphous (9 and 1). Flowers mostly blue or violet, sometimes yellowish or white. The Vics 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, such as Polygonum convolvulus (see Convolvulaceae), and one (V. Faba) in a garden bed. 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.

2666. **Snowball** — Viburnum Opulus, var. sterile (× ½).

All the fertile fls. are changed to sterile, showy ones.
VICTORIA

A. Plant stiff and erect, usually bearing no tendrils, cultivated for the seeds (Vicia).

**Faba**, Linn. (Pisum vulgaris, Moench. *F. sativa*, Berth.). **BROAD BEAN. WINDSOR BEAN. ENGLISH DWARF BEAN.** Figs. 190, 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 axils, dull white and with a large blue-black spot; pods large and thick, from 2 or 3 inches even to 18 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 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 fully 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.

AA. Plant weak, usually climbing by means of tendrils that represent leaflets.

**F.**, Fls. about 2 in the axils, 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: fls. 7 pairs or less, elliptic, oblong or ob lanceolate, mostly truncate and apiculate at the top, the tendril part of the leaf extended: fls. usually 2 in each axil, about 1 in. long, pubescent: 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.

2667. *Vicia villosa*, the Hairy Vetch (*× 1/2*).

BB. Fls. several to many in peduncled clusters.

C. Blossoms small and usually not showy, mostly bluish, in loose often 1-sided clusters: plants grown mostly for forage or in wild gardens.

**Villosa**, Roth. **B.** **HAIRY OR WINTER VETCH.** Fig. 2667. Annual or biennial (sometimes perennial); the wintering in the North, villous-pubescent: fls. 5-7 or more pairs, elliptic-oblong, rounded at the tip but usu-
ally ending in a very minute point: fls. violet-blue, in long 1-sided axillary racemes. Eu., Asia.—Now considerably used as a cover-crop.

**Américana**, Muhl. Perennial, nearly or quite glabrous: fls. elliptic to oblong, obtuse or sometimes emarginate at the apex: fls. purplish, about ¾ in. long. In the U. S. it is a hardy race, which has been naturalized and not as far south as Ky.—Has been offered by dealers in native plants.

**Caroliniana**, Walt. Perennial, nearly or quite glabrous: fls. oblong to linear-oblong, usually obtuse or emarginate: fls. nearly white, ½ in. or less long, in several- to many-fld. loose racemes. Minn. and Kansas eastward.—Has been offered.

**Oroblédes**, Wulf. (Orobus lathryoides, Sieb. & Sm.). Perennial, 2-3 ft. tall: lvs. 3-5 pairs, oval-lanceolate, very acute: fls. handsome, violet-blue, small, in 2 or 3 short clusters each axil.

DD. **Leaflets usually 9 or more pairs on full-sized lvs.**


**Cracca**, Linn. Perennial, usually pubescent: fls., 9-12 pairs, thin, linear to oblong, mucronate: fls. purplish, about ¾ in. long in a rather dense raceme. Across the continent and south to Ky.; also in Eu. and Asia. Offered by some dealers.


CC. **Blossoms red and showy, in dense spikes or spike-like racemes: flower-garden subject.**

**Fulgens**, Batt. Annual, 3-8 ft., pubescent: fls., 8-12 pairs, oblong or lance-linear, mucronate: fls. small, red or nearly scarlet and purple-striped, in a compact raceme or spike. Algeria.—Recently introduced.

L. H. B.

VICK, JAMES (Plate XLI), seedsman and editor, was born at Portsmouth, Eng., Nov. 23, 1818, and died at Rochester, N. Y., May 16, 1882. He came to America at the age of 12, learned the printer's trade, and in 1850 became editor of the "Western Farmer," then published at Rochester by Luther Tucker and subsequently absorbed by "The Cultivator." In 1853 he purchased Downing's magazine, "The Horticulturist," and published it for a time as the editor. In 1860 he sold the business to Patrick Barry, and afterwards the seed business and his trade soon grew to large proportions. For about 20 years his name was a household word, being associated especially with flowers. In 1872 he published "Vick's Magazine," which is still published. Vick's personality was thoroughly amiable, and his letters in "Vick's Magazine" to children and to garden lovers everywhere show the great hold he had on the hearts of the people.

W. M.

VICTORIA (in honor of Queen Victoria). *Nympheaeae. ROYAL WATER-LILY.* This remarkable aquatic genus may be recognized by its huge, round, floating leaves often 6 feet or more in diameter, with the margins turned up at right angles to the water surface to a height of 3-8 inches, making a basin-like object. The (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 pure creamy white, and exudes a delicious fragrance somewhat resembling a rich pine-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, and the sides and summit of which the floral lvs. are situated. Sepals 4; petals 50-70, obtuse, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150-200, in 30-fld. anther-locule: paracarps 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: carpellary styles broad and fleshy in the lower part, produced upward to a fleshy, subulate, incurved process about ¾ 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 4-6 ft. of water, in great patches miles in extent, and is perennial. The tuberous rhizome stands erect in the mud, where it is anchored by innumerable spongy roots which spring from the bases of the lvs. in groups of 10-30 or 40. The tuber may be as much as 6 in. in diameter and 2 ft. long. It decays below as it grows above. The lvs. are arranged in 55-144 order, and the flowers arise in a parallel but independent spiral of the same order (Planchon). Each leaf after the first seedling leaf has a broadly ovate, fused pair of stipules, these organs serving to protect the apex of the stem. The petioles and peduncles are terete, about 1 in. in diam., covered with stout, fleshy prickles, and traversed internally by 4 large, and a number of smaller, air canals. The petioles attain to a length much greater than the depth of the water, so that the lvs. can adjust themselves to changes of the water-level, though Banks states that they may be completely submerged in times of flood. The gigantic lvs. are covered beneath with a close network of prickly veins, the larger of which project an inch or more from the leaf-surface; the tissues are full of air-spaces and canals, thus buoying up the mass of cellular matter. Besides many stomata on the upper surface of the leaf, which open into the air-chambers of the mesophyll, there are innumerable tiny depressions, in each of which one can see with a hand-lens that the leaf is perforated with a fine hole; these holes were termed by Planchon "stomatades" (F.S. 6: 249). He considered them to be useful as air-holes to let out gases which, rising from the water or mud, might be caught in the deep meshes of the netted veins on the under side of the leaf. It is also to be noted that, in spite of the cup-like form of the leaves, water from rain or other sources does not 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 in creases 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 anthers are shedding their pollen (in second-day flowers), the stamens may reach and maintain a temperature 10°F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionsaries, 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 1833 Poeppig found it on the Amazon, and described it as Corypha 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 since been applied to northern species, while the one found at Corrientes was named in 1840, by d’Orbigny, V. Cruziana in honor of General Santa Cruz, of Bolivia.

The struggle to bring the “Queen of Water-lilies” into captivity began with Schomburgk. He removed living plants from inland lakes and bayous to Demerara,
British Guiana, but they soon died. In 1840 bridges obtained seed in the Bolivia locality, province of Mosox, 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 December, but died in December. 1848 dry seeds were sent to England from the Essequibo river, along with rhizomes, the latter in Wardian cases; the rhizomes rotted, and the seeds refused to germinate. In 1848 a second expedition from Demerara succeeded in bringing back to that town thirty-five living plants, but these all died. Finally some seeds were sent to Kew from British Guiana in bottles of fresh water by physicians, Rodick and Luckie. The first seedling arrived Feb. 28, 1849, and on Nov. 8 a plant flowered at Chatsworth; the blossom was appropriately presented to Queen Victoria.

From this stock Victoria regia was distributed to gardens in Europe, Asia and America. Van Houtte, of Ghent, first flowered it on the continent, and Caleb Cope, of Philadelphia, was the earliest successful cultivator in this country. His gardener was the late Thomas Meehan. The first flower opened Aug. 21, 1851.

The next notable importation of seed from South America was sent by Edward S. Rand, Jr., from Para, Brazil, to Mr. Surtevant, then living in Mellon Wn., Phila. The plant proved to be slightly different from the former type, and were called V. regia, var. Randii. It is doubtless the same form that was described by Planche as V. Amazonica, and retained with doubtful subsequent distinction by Caspary has shown it not even varietally distinct from V. regia of British Guiana. In 1894, however, Mr. Tricker received seed of quite another species, which was provisionally named V. regia var. Trickeri, in which it is much more amenable to out-of-doors 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, var. Randii, but recent investigation by Mr. Tricker and the writer shows that it is truly the V. Cruziana of d’Orbigny, dried specimens of which (including seeds) had been sent to Paris over 60 years before. Its far southern and tropical home explains its distinctness. The very starchy seeds of this species are used as food in Paraguay under the name of Maís del Agua, “water-corn.” For much interesting information on Victoria, see Hooker, B. M. 4275-78; Planche in F. S. 6:183-224, etc.; Caspary in Flora Brasiliensis 4, part 2, p. 143 et seq.

In 1854 John Fisk Allen published in Boston a quarto work (pages 21 & 27 in.) with colored plates, entitled: "Victoria Regia; or, the great water-lily of America. A brief account of its discovery and introduction into cultivation: with illustrations by William Sharp, from specimens grown at Salem, Massachusetts, U. S."

Cruziana, d’Orbigny (known in cultivation as V. regia, var. Trickeri, and V. regia). Lvs. densely villous beneath, upturned margins reddish, 3-8 in. high: fls. becoming dull crimson the second evening; sepals prickly almost or quite to the tips: prickles of the ovary about two-fifths in. (10-11 mm.) long: seed elliptic-globose, nearly ¾ in. long, less in diam. (7-8 mm. long, ¾-6 in. diam.): raphe indistinct: operculum elliptic-ovorbicular, with the micropyle at its center and blum at the margin. British Guiana, Amazon and tributaries. B. M. 3775 (poor); 4276-78 (incorrect in some details). F. S. 6:395-602. Kerner, Natural History of Plants, pl. xl. Tricker, Water Gardens pl. 1 and 2; p. 21, 35. Caspary, Fl. Brasil. 4, part 3, pl. 139 (badly).

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 year, together with tropical nymphs, and in some cases without artificial heat, but this method of culture is uncertain and often unsatisfactory.

For many years but one type of Victoria was known, but in 1870. E. A. B. Sturtevant of Boston introduced another form that produced a deep crimson flower; it also possessed darker foliage and the upturned rim was deeper. It was known as Victoria Randii. Having grown thus quite several seasons in the open air, the writer is unable to discern any difference, and two seasons ago he decided to drop V. Randii. In 1894 the undersigned received seeds of another species which is now known as V. Cruziana.

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 planted in pots or seed-trays and placed in an heated greenhouse. Having grown to the size of a 3-4 in. plant in warm weather, the seedling is now known to be unsatisfactory. In the writer’s experience these seedlings should be kept steady growing, potting at intervals, until they are planted out in their summer quarters. As the young plants advance they will require more space, so that the leaves are not crowded and overlap each other.

To raise plants of V. Trickeri 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 treated like seedlings of seedlings. The latter are best kept as described for seedlings and small plants, and as the season advances may be raised to 75° and 80°. The rationality of the cool treatment here afforded is obvious, and essentially the same treatment of seedlings appear if 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 nymphas, 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 sea-son, locality, etc., must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pits in the pond specially constructed for the purpose. Both Victoria and Parana, and Paraguay, and Panay; also at many notable gardens in Europe. Plants grown under glass usually attain to larger dimensions, and are better protected against some of the pests and elements, besides enjoying more of a tropical atmosphere. There is, however, more than one disadvantage.
VICTORIA

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 seat where flowers and ferns may be viewed at leisure.

Whether grown indoors or out, these plants are early annuals, and seedlings are of necessity raised every spring. They form no tubers as do the tender yam, or colocasia or the hardy yampea.

Few, if any, insects are troublesome on these plants. The worst is the black fly or aphis. The use of insecticides should not be resorted to, as they are most likely to damage the foliage. The safest remedy is to introduce a colony two of the well-known "Lady bug." They and their larvae will soon clear off all the aphids without any injury to the plant.

W.M. TRICKER.

VIGNA (Dominic Vigni, Paduan commentator on Theophrastus in the seventeenth 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. Cățăng, Walpers, and V. Sinensis, Endlicher. The former name, however, dates from 1839 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 unequal-sided, the pedicels long. The flowers are bean-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 dark, 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 the buff-colored or clay pea, but now it is commonly used generally. 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 was written by Edmund Ruffin (Essays and Notes on Agriculture, Richmond, 1855).

L. H. B.

VIGUIERA (Dr. A. Viguier, botanist of Montpellier, France). Compositae. About 60 species of herbaceous or perennial shrubs or shrub-like herbs from the whole 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 those on the yellow bur marigold. It bears in ample corollas. 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, subcordate, serrate, tomentose on both sides, 3-5 in. long: heads corymbose: akenes villous, with 2 long awns and many small scales.

W. 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 Honesdale, Pa.; Mt. Pulaskin, Va.; Courthouse, Iowa; Other associations equally noted are composed of both sexes, Bar Harbor, Me., 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 better 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 in school yards, library grounds, railway 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 constitutional power to add 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
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 1853 through the efforts of Miss Mary Gouverneur Hopkins and Mrs. J. Z. Goodrich, and was caused by overhearing the cantle 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 village condition to her 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 petals and best 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 marvelous effect on civic pride, the appearance of the village that interest in the association has never failed. The beauty of the village has 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 fund, 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. The people, 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 due of 81.25. This association was formed 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 improving the present by the improvement of three sections in the immense. Each section working for its own interest after the manner of the American ward associations. Both the German and English associations work for the forest. River-sides are made into a continuous parkway through the town, paths 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 not permit the pollution of streets, and in Europe good 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 charged to consider these problems, but are free to turn their attention 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 Scapa, the mission of which is the checking of the abuse of public advertising, 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 the government in Europe.

In America, the "National League of Improvement Associations" was organized at Springfield, Ohio, Oct. 10, 1906. It is now known as the "American League for

VILLAGE IMPROVEMENT

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 with broom and hoe a general housecleaning takes place. After one or three visits of the T. I. A., 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 a 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 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 the years before the work was undertaken.

Newton Center and Stockbridge, Mass., contend for

2670. A vista of improved backyards in Dayton, Ohio.
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.

As in Europe, the commercial possibilities of the work are being recognized. American but also English and other large owners of real estate and tenant houses are adopting as business methods some of the special features of improvement associations. Commercial clubs and societies are starting to the fact that cleanly and beautiful city containing fine boulevards, riverside drives and parks, public baths and swimming pools, is as much an inducement to new firms desiring to establish a bonus or good will in shipping facilities. Firms and good citizens seeking to attract 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. Nurseriesmen, 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 cast of paint, it is an excellent idea for an improvement association to encourage floral shows, with prizes to schools and school children, for through the latter medium the influence is carried into homes that can be reached no other way. These associations in no way interfere with the work of the city officials. Rather they supplement it by doing the work of the individuals.

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, they are 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 manifold. These societies make far better citizens; 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 village and civic improvement is done by general agency in which the city must be a part. An analysis of these complex social forces is beyond the scope of this Cyclopedia, but the following outline, sent by Charles Mulford Robinson, author of "The American City," is 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 public 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, (3) The State nurseries, (4) Model communities, (5) Improvement of home grounds, neighborhoods. V. By individuals (1) For private profit, (2) Out of public spirit.

VILLARIA nympoides is the plant described at p. 925 of this work as Linnanthemum nympoides. The plant is probably to be referred to Linnanthemum petalatum, however. To the list of pictures add Gr. 48:1036 and 48:300.

VIMINARIA (Latin, vimen, a slender twig or withe, alluding to the branches). Leguminosæ. 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 pectios, although at the ends of the more vigorous or lower branches a few oval or lanceolate lvs. are often found. The flowers are pea-shaped, orange-yellow and are produced in terminal racemes. Calyx-teeth short; petals on rather long claws; standard roundish; wings oblong, shorter than the standard; keel as long as the wings; stamens free: ovary nearly sessile; style long as the form: pod obov-oblong, usually indehiscent: seeds 1s.

Demdata, Smith. The name Leafless Rush-broom has been proposed for this. Leafless yellow-flowered shrub, attaining to 10-20 ft., formerly cult. in Europe. In American houses as a small tender shrub: lvs. 3-8 in. long; pod 2-3 lines long. Australia. B.M. 1190. P.M. 14:123.—Offered in S. Calif. F. W. BARCLAY.

VINCA (pervinca, old Latin name of Periwinkle, used by Pliny). Apocynaceæ. 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 and the plant is especially good under trees and in cemeteries. It is a hardy trailing plant with shining evergreen foliage and blue, salver-shaped, 5-lobed fls. about an inch across, appearing in spring or early summer. It is found in gardens, covering rocks and carpeting groves. It can be planted successfully on a large scale any time from spring to fall during mild or rainy weather. It is propagated by division or by cuttings, as seeds are 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 or double fls. and in most nurseries, as also a form with variegated foliage.

VINCA major is larger in all its parts than the common Periwinkle and not so hardy. It is well known to florists. A variety of it is seen in nearly every veranda box in the country.

V. rosea is a tender plant of erect habit which is used chiefly for summer bedding. It grows about a foot high and has rosy purple or white fls. with or without a reddish eye, and of the ground-road. The plant is grown under trees and continuously from the time they are set out until frost. It can be grown in large masses for public parks with somewhat less expense than geraniums. Mr. Stroumzek, head gardener of the New York Parks, has recorded his experience with Vinca rosea in Florists' Review 1:141 as follows: The seed is sown in Jan. or Feb. in flats of sandy soil in a temp. of 65°-70°. When seed is sown, the flats are potted 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 veranda box should be a sandy loam if possible, and 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 Vinca rosea a satisfactory window plant that has been grown with little trouble from 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 flowered Vinca, and it seeds freely.

VINCA major and varieties are the most useful of the genus to the commercial florist. Some plants from 2-inch or 3-inch pots should be planted out 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 large leafy stock the following 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. The plant makes 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 5-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. Lvs. ovate or oblong-ovate; corolla-lobes wedge-shaped; calyx glabrous.

1. 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.d. 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 connecta, with single dark purple fls.; aurea variegata, with golden variegation; cornella, with single blue fls.; plena, with double blue fls.; rosea, with single rosy fls.; purpurea plena, with purple double fls. Gn. 50:1078. Some of these are advertised without reference to V. minor, as if they were good species, thus V. cornella and purpurea. V. elegantissima alba belongs here, also "The Bride," a white variety with a pink center.

c. Lvs. subcordate-ovate: corolla-lobes obovate; calyx ciliolate.

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 2-3 in. long, ciliate; petiole with 2 glands near the apex; fls. blue; calyx-lobes narrowly linear, ciliate; corolla-lobes obovate. Eu.—This species is much subject to mealy bug. The variegated forms are popular for veranda boxes and hanging baskets. Some are blotted with yellow, others are margined. Here seem to belong V. aurea margina and V. aurea macula, Hort. V. major, vars. variegata and reticulata, are also advertised. Var. elegantissima, Hort., is a handsome form with lvs. bordered and blotted 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.

2671. Vinca minor, the Common Periwinkle, or Running Myrtle. Natural size.

2672. Vinca rosea. (X nearly \( \frac{1}{2} \)).
VINCA

3. **herbacea**, Waldst. & Kit. **Herbacous 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.

**Periwinkle**, American catalogues as **V. alba**, 1vs. elliptical or lanceolate, margin revolute, ciliate; petiole with 2 glands near the middle; calyx-lobes narrowly lanceolate, ciliate; corollas oblong-roseate, dimidiate. Linn. in Eastern Eu., Asia Minor. B.M. 2002. B.R. 4:301.

**Var.**

4. **rosea**, Linn. Madagascar Periwinkle. Fig. 2672.

**Tender**, erect, everblooming plant, somewhat shrubby at the base,cosmopolitan in the tropics: 1vs. oblong, narrowed at base, veiny; petiole glandular at the base. Its, with a very small orifice, rosy purple or white, the latter with or without a reddish eye; calyx-lobes linear, corolla-lobides dimidiate-ovative, mucronulate. Gn. 36, p. 455; 43, p. 389. V. 13:49; 16:49. B.M. 248. 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. octula, 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 purpurea**, **V. alba nova**, **V. octula** 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 hirundinaria* and *V. Japonicum*, is *Cynanchum hirundinaria*, which see.

**VINE-CACTUS**. Fouquieria splendens.

**VINE, GLORY**. Chianthus.

**VINE PEACH**. See under *Cucumis Melo*.

**VINE, PIPE**. Aristolochia sipho.

**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 shrubs, the 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 dioecious; others are true annual herbs, as many gladioli. 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 glories 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.

Vines are really climbing plants. They get up in the world in three general ways: by scrambling or clambering 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-

2673. Hop (Humulus Japon- icum), twining from the observer's left to his right, or against the sun.

2674. Morning glory, twining from the observer's left to his right, or against the sun.
VINES

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 recommended. 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.

**Ampelopsis quinquefolia**, Virginia creeper. Figs. 80, 1880. 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.

**Ampelopsis tricuspidata** (A. Veitch). Fig. 2676; also Fig. 81, Vol. I. A nester 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. 1923. 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.

**Ampelopsis arguta**, Fig. 29. One of the best arbor vines.

**Lonicera sempervirens**, **L. flava** and other honey-suckles. **L. Japonica** (or **L. Halliana**) 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 bittersweet. **Wisteria Sinensis** and **W. spectabilis**. Figs. 2475, 2476.

AA. Top dying to the ground, or nearly so, in winter. Some are annuals.

**Menispernum Canadense**, moonseed. A small but attractive native twiner useful for wild gardens.

**Humulus lupulus** and **H. japonicas**. The former is the common perennial hop; the latter is a sturdy and useful annual.

**Dioscorea divaricata**, yam, Chinese potato, cinnamon vine. The large, deep-seated tuberous roots withstand freezing, but are not grown for the vine, which is not hardy 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.


**Adlumia cirtroha**, Allegheny vine. Tender perennial. **Cobra scandens**. Tender. L. H. B.

**Vines for the South.** I. DECIDUOUS. **Ampelopsis tricuspidea** and **quinquefolia** are exceedingly popular for covering brick walls, stumps, or dead trees. Being deciduous, they are free from the objection of evergreen ivies whose foliage often accumulates dust and is a harbor for sparrows' nests. **A. arborea** 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.—**Centrosema 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. coccinea** with scarlet campanulate flowers, and **C. hederacea**, 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. Jackmani, Fairy Queen, Henryi, lanuginosum, Otto Froebel, Duchess of Edinburgh, velutina, 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.—B. barbara is frequently used for trellises; the red berries, which are retained during winter, are its main attraction.—Passiflora incarnata is often a troublesome weed in newly cultivated lands, but its flowers are remarkably showy and the lemon-like fruits, called may-pops south are exceedingly fragrant and have mucilaginous acidulated pulp. P. lutea has very small greenish yellow flowers and also a very small, purple-colored fruit.—Periploca Grace is of exceedingly rapid growth, and when covered in spring with myriads of flowers is an attractive plant for trellises or rustle 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 coccinea, deeper red; spectabilis, 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 climbers are as desirable.—Wisteria. 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 lobata, 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. quinata, 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.—Oleasters paniculata is almost as 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.—Coceus Carolus twines to a height of 10-15 feet. When covered during winter with a profusion of coral-red berries there is no climber that is more graceful. Once known, in higher latitudes it would prove to be one of the most attractive evergreen plants.—Elagapanthus, var. reticulata, or Japan oleaster, in good soil frequently makes a growth of 8 to 10 feet. The brownish bark contrasts well with the bright green and silvery reflexed leaves, while the clove-shaped flowers are very fragrant. Exellent for covering arbors.—Ficus pumila, although considered a tender exotic plant, has withstood severe cold weather and is very desirable for covering brickwork, especially near the soil.—Gelsemium sempervirens, the Carolina yellow jasmine, is the glory of southern woods in spring, when plants climbing upon lony trees are covered with myriads of golden yellow funnel-shaped flowers that are exceedingly fragrant. The form with double flowers has the additional merit of blooming during a much longer period than the type, and when cultivated in a cool greenhouse

flowers are produced during winter.—Hedera. Of the many varieties of this genus there are few of the variegated-leaved that stand the southern summers, but the Irish and Algerian, the latter with unusually large leaves, are hardy and desirable.—Jasminum nudiflorum expands its bright yellow flowers in late winter and is valued as the earliest harbinger of spring; it is frequently used as a hedge plant when supported by a wire. J. officinale has white flowers during April and May. J. Reesisi and J. humile, with yellow flowers borne in summer and autumn, are great favorites.—Kadsura japonica is valued chiefly for the reddish tint of its autumn foliage. The small white flowers are rather inconspicuous.—Lonicea.
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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*, var. *flexuosa*, *Chinenais* and *Halinaea*; these are frequently troublesome, as they climb upon fruiting plants. Its Vivax *reticulata*, with its attractive foliage, and *L. Periclymenum* var. *Belgica*, which yields a continuous crop of pink and buff flowers, are the most valuable of the exotic sorts. *L. Bonarienisis* (Selloellii) and Learii are the best of the tuberous section, the roots remaining sound during winter if slightly covered with litter. *L. panduratea*, known south as Indian bread, is frequently met with in large quantities in newly cleared rich 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, blue, apron and blue, and Constance Elliott, with pure white flowers, are perfectly hardy and produce bloomers.

**Roses.** Of the climbing varieties there is a great profusion. Most varieties are either perfect evergreens or bloom in 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, Noisette and Bourbon yield a profusion of variously colored flowers from early spring until winter. The Wichuriana section will hardly become popular, as plants bloom only in spring, while the Cherokee and Maclarey and Contorta are still used for making evergreen hedges. *Sula* and *Sula* are of the many species growing south, the *S. laurifolia* is highly valued for its large, shiny leaves; it is of great decorative value for ornamenting rooms. Other kinds are desirable both for leaves and flowers.

- *Trachelospermum 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 stem dies down in fall, but the new growth appears vigorously in spring.
- The others need greenhouse protection north of Savannah. *C. spectrum* and *C. lepota*. Flowers in long racemes of a beautiful pink color and produced from June until frost. *Aristolochia elegans*. This blooms profusely from July until frost. The flowers are tubular, and the limb is perfectly flat and curiously marked and inserted in purplish peignoirs. *Dipogon* is a native 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.


**Vines for Conservatories or Greenhouses.** Flowering vines and climbers, when skillfully trained over the roofs, supports and sides of conservatories and other plant houses, add greatly to the attractiveness of such places. From the number of vines in cultivation good choice may be had both for cool or warm houses, and to suit every taste as well as growing at all seasons. Annual, bulbous and tuberous-rooted vines may be grown in pots or small tubs, but permanent hardy flowering vines must have ample root room. In hotter climates, as with the strong-growing *Dipladenias* and *Thunbergias*, this 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 cypress 5 feet long, 1½ 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 in 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 must be found under their respective headings in this work.

- *Lapageria alba* and *rosae*, 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. *Laelinae gyllisima* makes one of the rarest and most beautiful coolhouse trellis plants. The eymes 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. *Soloum jasminoides* is a strong-growing vine producing clusters of jasmine-like flowers of white or lilac colors. The well-known Mare-
VINES

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. Of 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. Passiflora 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 Bougainvillae a close second. For the covering of unsightly objects in the least possible time, Ipomoea Larii (Fig. 2678) easily takes first place and the loniceras will rank next. Several species of jasmines are worthy of mention, but space forebids, as the list could easily be extended to 10 or more. Vines occupy an important place in the horticulture of southern California, as in other warm and sunny countries.

Bougainvillae, all species; Bignonia venusta; Solanum Wendlandii; Lonicera, several species; Ipomoea Larii, Fig. 2678; Tecoma Ricasoliana; Jasminum grandiflorum; Bignonia Treatediana; Solanum Seafortitians, var. azureum; Wistaria Sinensis; Wistaria Sinensis, var. alba; Solanum jasmoinideo; Tecoma grandiflora; Tecoma jasmoinoidea; Phaseolus Caracalata; Tecoma filiformia; Hardenbergia monophylla; Hardenbergia Complantana; Mandevilla suaveolens, Fig. 2679; Hoya carnosa; Olianthus puniceus; Akebia quinata; Kennedy nigricans; Muehlebeckia complex; Physalanthus albus; Various tasmaniads; Figs. 2457, 2458, 2680.

Vines for Middle California. The number of species of climbing plants cultivated in California for making climbing homes is large, but on account 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 neck as the center) the following are most extensively grown as a covering for porches, arbors and houses: (1) Ampelopsis tricuspidata, (2) Rosa Banksiae and other species, (3) Clematis Jackmani and other varieties, (4) wistarias, (5) tasmaniads and passiflora, (6) Loasa Japanica, var. Halliana.

For house adornment the tasmaniads are not to be recommended, on account of their rampant and dense growth, which tends to keep the building on which they are trained, and cold in winter. The Lady Banks rose is a general favorite on account of its evergreen habit and the abundance of blossoms which it produces in spring. Wistaria 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 shows its wealth upon us in the form of immense trusses of fragrant flowers. Hail’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 lists 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.

Edward J. Canning.

A. Tall, suitable for covering the side of a house.
B. Hardy.

Akebia quinata. Figs. 56, 77.
Ampelopsis heterophylla.
Ampelopsis quinquefolia. Fig. 80.
Ampelopsis quinquefolia var. Engelmanni.
Ampelopsis tricuspidata. Figs. 21, 62.
Araujia sericea (consult Physlanthus).
Bignonia Tweediana.
Boungainvillia basileolides. Fig. 259.
Clematis Henley. Fig. 488.
Clematis Jackmani. Fig. 469.
Clematis kermesina.
Clematis montana.
Clematis paniculata. Figs. 483, 486.
Dolicho lignus.
Delosperma acaulis. Fig. 87.
Hibuscilla latifolia.
Ipomoea Bonn-mex. Fig. 170.
Ipomoea Mexicana.

Jasminum grandiflorum.
Jasminum humile.
Jasminum nuditiflorum.
Jasminum officinale.
Kedneya rubicunda.
Lantana Camara. Fig. 1239.
Lonicer Caprifolium. Fig. 1316.
Lonicer Japonica, var. Haliana. Fig. 1314.
Lonicer Japonica, var. suko-retiulata.
Lonicer Pericylmeeum. Fig. 1315.
Mandevilla suaveolens. Fig. 2679.
Mau tardia Bariliana.
Mau tardia erubescens.
Mau tardia scabridens. Fig. 1378.
Melochia punctata.
Peplisca Graeca.
Plumago Capensis. Fig. 1880.
Rosa Bankiae.
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.

VINES.

For a Tacsonia "...

Pueraria Thunbergiana.

AA. Tender.

Passiflora alata-cereulea. Tacsonia manicata. Fig. 1654.

Tacsonia Voliomi.

3. For tree-trunks, unsightly poles, 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 eucalyptus and to prevent the unsightly 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 quinquelandia 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 lammas of the creeper hang down in beautiful festoons.

In the coast parks the English ivy has been allowed to wander at will over the rounded heads of live oaks (Quercus agrifolia). 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 irritation. Pelargonium peltatum, Tropaeolum majus, Juniperas Chinensis, var. procumbens, and J. Sobrina, var. prostrata, are also used satisfactorily.

Along the banks of creeks, Senecio mikanoides (here called German ivy), Vinea 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 Chiloensis,

Fragaria Indica,

Fuchsia procumbens,

Linaria Cymbalaria,

Lotus Bertholletii,

Mahonia glabrata,

Pelargonium peltatum,

Sollya 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 Richii, Pelargonium peltatum, the hardy tacsonias and Solanum jasmoides. 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 tracerie of Eecremocarpus scaber and the maurandias; Tropaeolum Canaricam may also be used, but is less satisfactory because an annual and requires to be a shady place. Ipomoea purpurea and I. Quamoclit may also be used for this purpose.

Joseph Burnett Davy.

VINES.

BB. Deciduous.

Pueraria Thunbergiana.

AA. Tender.

Passiflora alata-cereulea. Tacsonia manicata. Fig. 2086.

Tacsonia Voliomi.

Section 2. For arbors, porches and trellises where a dense and rapid growth is desirable.

A. Hardy.

B. Evergreen.

Coeba scandens. Fig. 592.

Ipomoea Larii. Fig. 1638.

Passiflora cereula. Fig. 1653.

Tecoma jasminoides, Tecoma Thunbergii, Tecoma radicans, Wistaria Chinensis, Wistaria speciosa, Wistaria multiflora.

BB. Tender.

Allamanda Hendersonii. Fig. 61.

Antigonon leptopus. Fig. 125.

Bignonia venusta. Fig. 235.

Bignonia speciosa. Fig. 195.

Bougainvillea glabra. Fig. 249.

Bougainvillea glabra, var. Sanderiana.

Bougainvillea spectabilis, Bougainvillea spectabilis, var. lateritila.

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 medeonoides. Fig. 125.

Cianthus purpureus, Convolvulus luteus, var. purpuratus, Convolvulus macrostegius, Ipomoea purpurea. Fig. 1167.

Ipomoea Quamoclit. 1169.

Jasminum humile, Lantana Camara. Fig. 1239.

BB. Tender.

Asparagus lucidus, Asparagus plumosus, Asparagus plumosus, var. tenuissimus. Fig. 156.

Asparagus Sprengerii. Fig. 153, 154.

Ficus pumila, Lathyrus latifolius. Fig. 1243.

Lathyrus odoratus, Lathyrus sylvestris, Mauandia Barceladana, Muehlenbeckia complexa, Pelargonium peltatum. Fig. 1702.

Swainsona gaugiotilla, Vinea major.

Asparagus pinnatus, Asparagus plumosus, var. tenuissimus. Fig. 156.

Asparagus Sprengerii. Fig. 153, 154.

Ficus pumila, Lathyrus latifolius. Fig. 1243.

Lathyrus odoratus, Lathyrus sylvestris, Mauandia Barceladana, Muehlenbeckia complexa, Pelargonium peltatum. Fig. 1702.

Swainsona gaugiotilla, Vinea major.

Ficus pumila, Fragaria Californica, Fragaria Chiloensis, Fragaria Indica, Fuchsia procumbens, Linaria Cymbalaria, Lotus Bertholletii, Mahonia glabrata, Pelargonium peltatum, Sollya heterophylla, Tropaeolum majus.

2690. Tacsonia manicata (X54).
VIOLA (classical name). *Violáceae. Violet. There are probably 150 species of Violas. 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. pal- mata*) 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. *cucullata*) 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,
date-ovate and usually acuminate, obtusely serrate, the
stipules large and lanceolate; fls. large, pale blue, the
ovar - ovate - obuse 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,
Furnarius, Maria, Queen and Papilio. The last has
very large flowers, violet in color, with small dark eye.
Fig. 2685.

AA. Plant annual, or imperfectly perennial in cul-
tivation.

tricolor, Linn. PANSY. HEARTSEASE. Figs. 1634,
1635. Glabrous or nearly so, the stems becoming long
and branched; leaf - cordate or round-cordate, those of
the stem becoming lanceolate, all stalked and crenate-
dentate, the stipules large and lanceolate; fls. large,
usually about three colors represented (except in
highbred self varieties), the spur short and inconspic-
uous. 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 Vi-
olas that have been offered to the trade:

A. Blue Violets
(sometimes run-
ing into white and striped forms).

Beckwithi, Torr. & Gray. NEVADA, CALIF., OR.

Canadensis, Linn. Very pale violet or
almost white. Gener- ally distributed.

canina, Linn., var. Muhlenbergii, Trautv. (V. canina,
var. sylvestris, Regel). MINN., EAST. VAR. adunca,
Gray (V. adunca, Smith). MOSTLY WESTERN.

cpulata, Greeno. Offered in COLORADO.

Hattii, Gray. CALIF. AND OREGON.

palmata, Linn. (V. ecvulata, var. palmata, Hort.)

EASTERN STATES.

Var. ecvulata, Gray (V. ecvulata, Alt. V. obliqua,
Hill). Figs. 2681, 2682. On the Atlantic slope. By Birt-
ton & Brown regarded as a distinct species for which
Hill's name V. obliqua (1769) is used rather than
Alton's V. caryophyllea (1783). The commonest Violet
of the northeastern states. V. obliqua, var. striata,
is a striped form now in the trade, and not uncommon
wild. There are forms known as vari. paica and variegata.
One of the most variable species in stature, form of
leaves, and color of flowers. It is easily colonized in
the garden.

pedata, Linn., Bird's-foot Violet, and one of the
handsome species. Sandy soil, Atlantic states and west to
Ind. TER. AN. var. 'branched.' It runs into very distinct forms.

Var. bicolor, Pursh. Two upper petals much darker.
Var. alba, Hort. Flowers nearly white.

rustrata, Muhl. Michig.an, EAST.

sugitata, Alt. MINN. AND TExAS, EAST. Var. picta,
Hort., has striped flowers.

Sel.terminalis, Pursh. *Northeastern states and Canada.

VIOLET

blanda, Wild. Fig. 2686. Low places, across the
continent. Pretty little species, fragrant. Var. reeni-
folia, Gray. Northeastern states and Canada.

lanceolata, Linn. Nova Scotia to Florida and Texas.

primulifolia, Linn. CANADA TO FLORIDA AND LOUISIANA.

stripata, Alt. Yellow-white. MIDDLE WEST.

AAA. Yellow Violets.

globella, Nutt. Rocky Mts. to Calif. and Alaska.

lobata, Benth. CALIF., OREGON.


pedunculata, Gray. California seeds are gathered for
export.

penscens, Alt. Fig. 2687. Dakota, east and south.

rotundifolia, Michx. Nova Scotia to N. Car.

sarmintosa, Doug. Idaho to British Columbia and

Calif.

Steltonii, Torr. CALIF. TO WASHINGTON.

L. H. B.

VIOLET. Commer-
cial Cultivation.—

The Violet probably
ranks third in com-
mmercial importance
among florists' flow-
ers in America. It
has risen greatly in
horticultural import-
ance within recent
years. Though the
violet season is only
about seven months, while
the season of roses and
carnations is
fully nine months.
While the
leading flower crops,
roses, carnations
and chrysanthemums,—
the violet requires
very close attention the
year round. Though Vio-
lets require no stak-
ing, tying or disbudd-
ing, other laborsious
practices are neces-
sary. 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 con-
cerning 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 cul-
ture 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 im-
portant kinds of troubles that devastate Violet plants.
At last the tide has turned. The various problems
investigated by scientists, especially those of the Divi-
sion 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 awk-
wardly 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 knowl-
extion of plant diseases, the introduction of the cyanide
method of fumigation, a rigorous system of plant-breed-
ing 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
crop to grow. 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, 1899.

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. 2689), and King of Violets, dark blue flowers; Lady Hume Campbell, Neapolitan (Fig. 2689) and De Parme, light blue; Swanley White (Fig. 2689), Queen of Violets and Belle de Chatenay, 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, Princess de Galles, Luxtone 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 bonemeal 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 bonemeal 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
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, where they are to grow and flower, or else in beds, where they are cultivated during the summer and the frames placed over them in the fall, or as soon as they require protection; or they are grown in the field as in the case of field and house culture, and transplanted to the frames some time in September or October. This method is still used to considerable extent by commercial growers, especially in regions where the temperature seldom if ever falls below zero for any length of time. Amateur growers usually adopt this method because of its simplicity and inexpensiveness.

Pot culture: The young rooted cuttings are planted in thumb-pots and gradually shifted to larger sizes as growth demands until they are in 7-in. pots. Here they are kept and flowered, or the plants are taken up from the field in the fall and put into 7- or 9-in. pots, according to the size and vigor of the plants. This method is seldom used in commercial growing, being expensive, inconvenient and usually unsatisfactory.

Time of planting: This varies somewhat with different growers and in different sections. Generally, however, the best results are obtained where planting is done in early spring. Plants set out at this time get well established, and as a rule are stronger, healthier and more vigorous than those set out later, when the weather is usually hot and dry.

Proper distance in planting: As a rule, the double Violets are planted 8 or 9 in. apart in rows 10 in. apart, and the single ones 12 in. apart in rows 12 to 18 in. apart, the distance depending somewhat on conditions and varieties. Planting too close is liable to induce disease, and too far apart is unprofitable.

Care and management: The plants should be kept free from all weeds, runners and old decaying leaves, and the earth should be frequently stirred, care being taken not to injure the roots of the plants. During the summer the temperature should be kept as low as possible and in the winter as nearly as possible at 45° to 50° F. at night and 50° 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. 2682). — 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 type 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. The kinds of soil most used 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.
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 prized chiefly for their delicate perfume, and as this diminishes in proportion to the length of time they are picked, the best market, other things being equal, is the one which requires the least possible delay between picking the flowers and placing them in the hands of the customer.

The crop may be disposed of at retail or wholesale or through a commission merchant. Each method has its advantages and disadvantages, and in deciding which one to adopt the grower must be guided by existing conditions. He must in any event have a thorough knowledge of the requirements of the market as regards quality if 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:

Spot disease (Alternaria violae).—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 but leafy 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 violae, Phyllosticta violae, Septoria violae*, etc., produce spots very similar in outline and appearance to those caused by *Alternaria violae*, but only under conditions peculiarly favorable to these fungi do they cause any serious loss. For recent information on this disease, see "Spot Disease of the Violet," Bull. 23, Div. Veg. Physiology and Pathology, U. S. Dept. Agric. Root rot (*Rhizoctonia baceicola*).—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. 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.

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 yet 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.

Aphides (*Aphis f sp. and Rhopalostemph viole*).—These pests are generally known as the green and the black aphids 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 penn 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 100 linear feet of a house 12 to 18 feet wide. Put each part into a 2-pound
manila paper bag and this into a second bag. Attach each package to a string or wire so arranged as to allow it to be lowered from the house into its respective jar. Pour into each jar an amount of water about equal to the bulk of cyanide in the bag, add commercial sulfuric acid until steam is evolved, then from the outside lower the bags into the jars beneath. Fumigate double varieties thirty minutes and single varieties twenty minutes, after which open ventilators from outside, leaving them open at least sixty minutes before entering the house (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. The 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 (Ancyllula 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 (Diploias violacea), violet sawfly (Emphitis Canadensis), greenhouse leaf tier (Phylletus rubigalis) and several species of cutworms (Agrotis et 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.

P. H. Dossert.


VIPER GOURD. Trichosanthes Anguina.

VIPER'S BUGLOSS. See Echium.

VIRGINIA COWSLIP or V. Lungwort = Merzania pulmonarioides.

Orcharding.—It is in the larger fruits that Virginia horticulture has won most renown. The present production of apples is about 300,000 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 Allemande Pippin and Winesap apples. Situated in mountain coves, and on hillsides in many instances barely arable, these orchards enjoy specially favored conditions, and yield almost fabulous returns, an individual tree having produced $100 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 120 bushels 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 several varieties under perfect conditions. 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 as the leading first earlies, open the season the latter part of June and carry the season into July, when the succession is taken up by Sweet Bough,
Astrachan, Maiden's Blush, Summer Queen and Pen-nock, followed by Benoum, Smoke House, Fall Pippin, Fallwater, Winter, Paradise, and Falls. Beauty as leading fall apples, and concluded by York Imperial, Albermarle Pippin, Ben Davis and Winesap, which extend the season through winter.

The pecan crop in Virginia commercial purposes has largely increased with the introduction of Kieffer, Le Conte and others of this type, while Seckel, Bartlett, and Duchess remain the favorites for garden purposes. In peaches the varieties largely planted are Alexander, Alexander allele, Mountain Rose, Early River, Bishop Early, Chinese Cling, Crawford Early and Late Elbertha, Stump the World, Heath Clying, Late Age, Bilyen October and Algibright Winter. It is general acknowledge that those in early peaches with the varieties do best. Sweet cherries probably grow to perfection in Virginia than elsewhere east of the Rocky Mountains, $60 worth of fruit from an individual tree in a season being no unusual occurrence.

The most popular varieties are Early Purple, Black Tartarian, Napoleon Windsor and Gov. Wood. It is considered among observant growers that Mahaleb is a failure as a stock for sweet cherries for orchard purporses in Virginia, and the most successful stock is the Mazzard, which grows with such luxuriance as often to become a striking feature of a Virginia landscape.

With the advent of the Japanese types, mainly introduced in life and plum orchards of considerable size are being planted. Red June, Abundance, Yellow Japan, Burbank, and Wickers have proved profitable about in order named. Satsumas present promise. The Damson plum and a blue type "Horse" plum type are very commonly disseminated throughout the state. The latter reproduces itself in the same manner as the Damson, and seems to be exempt from black knot. Only a few trees of the last two kinds are grown at any one place, but the aggregate of fruit is considerable. Nearly all the pome and stone fruits adaptable to this climate are grown in the state, but few on a commercial scale except as noted below.

That section of Piedmont Virginia near Charlottesville has taken the lead in grape-growing, and extensive vineyards of wine grapes have been planted, and a wine cellar established, whose product has been favorably compared with the best French wines of same character.

Small fruits. - Raspberries are grown in sufficient quantities to supply local demands, with Cuthbert as the leading variety. The same may be said to grape berries as the same to the blackberry. Thibadeau, Chippewa, and purple are the popular varieties of the former and Cherry and Fay of the latter. Strawberries are grown extensively in a number of localities both for local and distant markets, with the Giant being the most popular variety. In Norfolk they are shipped by boat and train loads, and "the patches" are often 100 acres or more in size. Blackberries and dewberries are furnished so bountifully by nature that stimulus for cultivation is held in check, as is the case so far as home consumption goes with many other fruits, for from early spring strawberries, service berries, dewberries, blackberries, huckleberries, Mazzard cherries, haws, wild grapes, plums, seedling apples, pears and peaches follow each other in such reckless profusion in field and forest that all who wish have but to pluck to eat. Commercially, however, the horticulture of Virginia is making rapid strides in methods and increased plantings.

Trucking. - Tidewater ranks first in its trucking and small fruit interest. With its mild climate, tractable soil, abundance of labor, thorough transportation facilities, low freight rates, and nearness to great eastern markets, the growing of peas for 36 years becomes the "Market Garden of the World," the section adjacent to Norfolk producing over six millions of dollars worth of truck per annum. See Vegetable Gardening.

Almonds. - Almonds are being grown in the state are well distributed, with the largest establishments at the junction of the Tidewater and Middle Virginia sections. These nurseries comprise plants of from 300 acres down. The crop speciality of this portion.

Floriculture and landscape gardening have been principally confined to the larger cities of the state, where there has been a rapid increase of glass acreage in recent years devoted mainly to the production of roses, chrysanthemums, large flowers, and chrysanthemums as cut-flowers. The soil and climate of Middle Virginia has been especially favorable to violet production and in Louisa county, 25 or more growers are devoting especial effort to violet culture. The interest in landscape gardening is gradually on the increase.

(V. E. Murrell.

**VIRGINIA STOCK. Matthiola.**

**VIRGIN'S BOWER. Clematis.**

**VISCARIA. See Lychnis.**

**VISCUM** is mentioned under *Phoradendron.*

**VINESA (after a Lisbon merchant). Ternstroemia.** A genus of one species confined to the Canary Islands. It is a large evergreen shrub or small tree resembling in a general way a tea plant or camellia. The specific name Mocana was given this plant as it was supposed to be the "mocan" of the aborigines, which was made into a kind of syrup and used to a considerable extent. The flowers are only three, with an independent stamens and much shorter than the petals; they are, however, very sweet-scented. It has recently been offered in S. Carolina.

Sepals 5, imbricated; petals 5, imbricate, conate at base; stamens included. Ovaries 3-loculed, placentas numerous and pendulous from the apex; fr. an indehiscent berry included by the enlarged and fleshy calyx, which is adherent to the base.

**MOCAÑA, Linn. f. Tender evergreen shrub, 6-9 ft. high, of compact habit and with dark green leafy foliage. Juv. short-petioled, ovate-lanceolate, serrate; fls. solitary, white, pendulous. Canaries.**

W. M.

**VITEX** (ancient Latin name for this or a similar shrub). *Verbena.* Ornamental deciduous or evergreen trees or shrubs with opposite, simple, fragrant, rarely simple leaves and usually with small white, blue, violet or yellowish flowers in axillary cymes often disposed in large, terminal panicles. Most of the species are inhabitants of tropical and subtropical regions and are best adapted for cultivation in warmer climates. The hardiest is *V. erecta,* which is native to Texas and New Mexico. In sheltered positions they thrive and are often used for their late-flowering properties. They grow in almost any kind of soil and prefer rather dry, sunny situations. None of the tender kinds seem to be in cultivation in this country. They thrive in a sandy compost of peat and loam. Propagated by seeds sown in spring and by greenwood cuttings under glass; also by layers.

About 60 species are known, distributed through the tropical and subtropical regions of both hemispheres, few in the temperate regions. Lvs. opposite or rarely alternate, 3-7, rarely with one leaflet; fls. in many-fl. cymes: calyx campanulate, usually 5-toothed; corolla tubular-funnel-shaped, 5-lobed, oblong and slightly 2-lipped limb; stamens 4 or 2 and 2 shorter ones: fr. a small drupe, 4-celled stone. Some species, particularly *albitarsis* and *V. Lantana,* in S. America are native timber trees.

**AGNUS-CASATUS, Linn. Chaste-tree. Hemlock-tree. Monk's Pepper-tree. Shrub or small tree, with a strong aromatic odor, grayish tomentose; lvs. long-stalked; fls. 5-7, 3-lancedolate, acuminate, more or less formed into a short stalk, usually with a few coarse teeth, grayish tomentose beneath, the middle one 3-4 in. long, the fls. in dense, sessile clusters, forming terminal, often panicled racemes 5-7 in. long; corolla usually pale or lilac, grayish to tomentose beneath; stamens and style exserted. July-Sept. S. E., W. A., M. 2, p. 44... Var. folia, Hort. (V. albitarsus, Hort.)... Fls. white. Var. carnea, Hort. Fls. blue.

**INSELLA, Lam. (V. lucida, Hort.).** Fig. 204. Similar to the preceding: fls. incisely serrate or almost
VITEX

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. Monzolla. B.M. 394 (as V. Ne-


gundo). Less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.


lled to V. indica, but lfts. entire or crenately serrate, larger, fls. purple, somewhat larger. Tropical and subtropical Asia. —V. trifoliata, Lindn. Lfts. usually 3, ovate or ovate-oblong, obtuse, entire; fls. blue, in terminal panicles. S. Asia. Pol-

niesia. Var. unifoliolata, Schauer. With a solitary short-

stalked leaded.

Alfred Rehder.

VITICULTURE. See Grape and Vitis.

VITIS (classical Latin name). VINE. GRAPE. Vitâceae or Ampelidæ. A widespread genus of mostly tendril-

-bearing climbing vines, most abundant in temperate countries. In its stricter limitations, the genus in-

cludes less than 50 known species, but some authors unite Cissus and Ampelopsis with it, when it includes some 250 species. The latest monographer (Vianchon, DC. Monogr. Phaner. 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 visulera). For an account of the evolution of these

native cultural 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. Martin, 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 pomologi-

cal; for, although the fruit may not be directly use-

ful, the species give promise of development and hybridization and plant-breding, and some of them offer useful stocks on which to graft kinds that do not resist the phylloxera or root-louse. The following discus-

sion includes all the species native to North America, north of Mexico; it is adapted from the writer's account in Gray's Synoptical Flora, vol. 1, 420-430. These American Grapes are very difficult to distinguish in mature form; and the subjoined descriptions are very full in order to bring out the contrasting characters. Some of the best recent systematic writing on American Vitis is from French sources, since the American species have come into prominence in France as phylloxera-resistant stocks for the Wine Grape. See, for example, the works of Millardet, and Viala and Ravaz; also "Ampelographie Universelle," by Viala and Ver-

more, now publishing.

As understood by Gray, Vitis is distinguished as fol-

lows: Plants climbing by the prehension and coating of naked-tipped tendrils. Flowers polygamo-dioecious (i.e., some individuals perfect and fertile, others sterile whose stamens are only a rudimentary ovary), 5-merous; co-

dolla calyptra-cusaeae, 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, with conical berry pulpy; seeds pyriform, with contracted beak-like base.

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2695. Grape flowers, enlarged.

1. shows the bud; 2. shows the petals or "cap" falling; 3. shows the flower in full bloom; the petals having been cast off; 4. all the flowers; the minute calyx is seen, and in 2 and 3 the disk is shown inside the base of the stamens.

Sperie.* Hark. (Nos. 1-6).

1049. V. fls. (Nos. 8-13).

AA. Species grown, primarily for their ornamental interest: all New World except No. 28.

B. Skin separating from the pulp.

C. Bark not shredding.

CC. Bark shredding.

D. Green-leaved Group.

E. Vitripina-like.

F. Lvs. broader than long.

FF. Lvs. ovate.

G. Diaphragma thin.

GG. Diaphragma very thick.

EE. Cordifolia-like.

F. Plant strong and climbing.

g. Young shoots terete.

a. Young shoots rounded.

BB. Plant scarcely climbing.

EEE. Orbicular-scallop-leaved species.

DD. Colored-leaved Grapes.

E. Mature lvs. only flocculent or cobwebby or glaucous beneath.

F. Ends of shoots white-tipped.

FF. Ends of shoots rusty-tipped.

EE. Mature lvs. densely tomentose beneath.

FF. Tendrils intermitent (at every joint).

BB. Skin and pulp firmly cohering.

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. 28).

C. Bark bearing prominent tendrils, never shredding: nodes without diaphragma: tendrils simple: flower-clusters small and not much elongated: seeds oval or oblong, without a distinct stipe-like base. (American.)

5. rotundifolia, Michx. (V. laurina, Bartram. V. vulgaris, Authors, not Linn. V. muscadina, angustata, verrucosa, petiolaris, Floridana, Raf.). MUSCADINE, SOUTHERN FOX GRAPE, BULLACE OR BULLIT OR BULL GRAPE. Fig. 2996. Vine with hard, warty wood, running rampant even 60 to 100 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-scurfy, 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 falling from the clusters when ripe, spherical or nearly so and large (3/4 to 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 slivery amber-green), ripe in summer and early autumn: seeds 3/4 to 1 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.

2996. Vitis rotundifolia, the Muscadine grape of the South (X 3/4.).
6. **Munsoniana**, Simpson. **MUSTANG GRAPE** of Florida. Bird of Evertheing Grape. Very slender growth, preferring to grow on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously: ivs., 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; spreading: clusters larger and more thryse-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 only the Grape on the reef keys; also in the Bahamas.—Difficult to distinguish from *V. rotundifolia* in herbarium specimens, but distinct in the field.

**VITIS**

2697. *Vitis monticola* (on the left) and *V. vulpina* (on the right).

CC. Bark without distinct lenticels, on the old wood separating in long thin strips and fibers: nodes provided with diaphragms: tendrils forked: flower-clusters mostly large and elongated: seeds pyriform. (*Euvela.*)

D. Green-leaved Grapes, mostly marked at maturity by presence of prominent white, rusty, or blue lomentum or scurf or conspicuous bloom on the ivs. beneath (under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even cohesively): foliage mostly thin: tendrils intermittent, i.e., every third joint bearing no tendrils (or inflorescence). *V. cluerei* and *V. Arizonica* are partial exceptions and might be looked for in DD (Nos. 7-19).

E. Vulpine-like Grapes, characterized by thin light or bright green mostly glossy ivs. (which are generally glabrous below at maturity except perhaps in the axils of the veins and in *V. Champini*), with a long or at least a prominent point and usually long and large sharp teeth or the edges even jagged (Nos. 7-18).

F. Iv. broader than long, with truncate-oblique base. (*V. Treleasei* might be sought here.)

7. **rupéstris**, Scheele. Sand, Sugar, Rock, Bosh, or MOUNTAIN GRAPE. Shrub, 2 to 6 ft. high, or sometimes slightly climbing, the tendrils few or even none, diaphragms plane and rather thin: ivs. reeniform to reniform-ovate (about 3 to 4 in. wide and two-thirds as long), rather open, or sometimes glabrous on both surfaces at maturity, marked by a characteristic light glanscent tint, the sides turned up so as to expose much of the under surface, the base only rarely cut into a well-marked sinus. The margins very coarsely angle-toothed, the boldly rounded top bearing a short, abrupt point and sometimes 2 lateral teeth enlarged and suggesting lobes; stamens in fertile fls. recurved laterally or rarely ascending; those in the sterile fls. ascending: cluster small, slender, open and branched: berries small (¾-¾ in. in diam.), purple-black and somewhat glaucous, pleasant-tasted, ripe in late summer: seeds small and broad. Sandy banks, low hills and mountains, District of Columbia and S. Pa. to Tenn., Indiana, Mo., and S. W. Texas.

Var. **dissæctæ**, Eggert, is a form with more ovate ivs. and smaller (less than ¾ in. long), and a strong tendency towards irregular lobing. Mo.

**VITIS**

FP. Iv. ovate in outline, with a mostly well-marked sinus.

a. **Diaphrags (in the nodes) thin:** young shoots not red: ivs. not deeply lobed.

8. **monticola**, Buck ley (*V. Texana*, Munson. *V. Foaxiana*, Planch). **SWEET MOUNTAIN GRAPE.** Fig. 9047. 2008. A vigorous tall-climbing plant, with a bright green cast to the foliage, normally glabrous young shoots, large stipules, and plane very thin diaphragms: ivs. 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 rechining 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 ¼ in. in diam.), purple-black with a heavy blue bloom, sour and usually astringent, generally ripening late (even after frost): seeds rather small and distinctly pyriform. New Brunswick, according to
Vitis, to N. Dak., Kans. and Colo. and south to W. Va., Mo. and N. W. Texas. B. M. 2429. — The commonest Grape in the northern states west of New England, abundant along streams. Variable in the flavor and maturity of the fruit. Forms with petioles and under surfaces of lvs. pubescent sometimes or never 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 rustyomentum 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. Treleasei, Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the lvs.) tendrils deciduous the first year unless finding support, internodes short, the phragmata twice thicker (about one-sixteenth in.) than in V. vulpina and shallow-bi-winged; stipules less than one-fourth as large as in V. vulpina: lvs. large and green, very broad-ovate or even reniform-ovate (often wider than long), thin glabrous and shining on both surfaces, the basal sinus very broad and open and making no distinct angle with the petiole, the margin unequally notch-toothed (not jagged as in V. vulpina) and indistinctly 3-lobed, the apex much shorter than in V. vulpina: fertile fls. with very short, recurved stamens, sterile with ascending stamens; cluster small (2 to 3 in. long); berries 3/4 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. Arizonica 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. Solonis, Planch. V. Nuevo-Mexicana, Lemn.). Differs from vigorous forms of V. vulpina in having floccose or pubescent young growth: lvs. decidedly more circular in outline, with more angular teeth and duller in color, often distinctly pubescent beneath; stamens in fertile fls. short and weak and laterally reflexed, those in sterile fls. long and strong; seeds larger. N. W. Texas and New Mexico. — Regarded by French authors as a hybrid, the species V. rupestris, vulpina, candida, and cordifolia having been suggested as its probable parents. It is variable in character. In most of its forms it would be taken for a compound of V. rupestris and V. vulpina, but the latter species is not known to occur in most of its range. It was very likely originally a hybrid between V. rupestris (which it sometimes closely resembles in herbarium specimens except for its woolliness) and some tomentose

2698. Vitis vulpina (or V. riparia). Natural size. Probably the most widespread of American native grapes.
species (possibly with V. Arisonica or V. Doamiana), 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. The interesting Grape was found some thirty years ago by Engelmann in the Botanic Garden of Berlin under the name of Vitis Solonis, without history. Engelmann guesses (Bushberg Cat. ed. 3, 18) the name to be a corruption of "Long's." It is probable that the plant was sent to European gardens as Vitis Longii—very likely from Prince's nursery—and the name was misread on the label. The original name, which was duly published by Prins with description, may now be restored.

Var. microspérmis, Bailey (V. Solonis, var. microspérmis, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

12. Chámpúni, Planch. Probably a hybrid of V. rupestris or V. Berlandieri and V. can-dicans, bearing medium to large reniform or reniform-cordate lvs, which are variously pubescent or cobwebby but become glabrous, the growing tips mostly white-to-momentose: berries very large and excellent. S. W. Texas. A.G.193:579. In some places associated with V. caniculans, Berlandieri, and monticola only, and in others with the above and V. rupestris. Often composing dense thickets in the wild.

66. Diaphragns very thick and strong; young shoots bright red; lvs. often strongly lobed.

13. rúbra, Michx. (V. mono-spérmis, 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 or (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 (14-15% in diam.), black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Illinois, Missouri, and Texas. G.F. 2:341.—A handsome plant. V. palmata, Vahl, found on Virginian specimens, is probably V. vulpinus, although it is sometimes made to replace the name V. rúbra.

EE. Cordifolia-like Grapes, with thickish and dull-colored or grayish green lvs., often holding some close, dull pubescence below at maturity and the shoots and lvs. nearly always more or less pubescent when young, the teeth mostly short, the point mostly rectangular and conspicuous (Nos. 14-18).

V. Plant strong and climbing, with stout, persistent tendrils.

6. Young shoots terete, and glabrous or very soon becoming so.

14. cordifolia, Michx. (V. pullára, LeConte). TREE FROST GRAPE, CHICKEN, RAC-coon, or WINTER GRAPE. One of the most vigorous of American vines, climbing to the tops of the tallest trees, and sometimes making a trunk 1 or 2 ft. in diam.: diaphragns thick and strong: lvs. long-cordate, triangular-cordate with rounded base, or cordate-ovate, undivided, but sometimes very indistinctly 3-lobed or 3-angled, the basal sinus rather deep and narrow, the margin with large, acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower pale yellow 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 fls. and short reflexed-curved in the fertile ones: clusters long and very manyflowered, most of the petals with a greenish tinge, or branched or at least bearing a cluster of fls.: berries numerous and small (about ⅙ 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 medially broad. In thickets and along streams from Pa. (and probably S. New York) to E. Kan., Ill., and Texas.

2699. Vitis cínera (above) and V. Berlandieri. (x 25.)

Var. latída, Engelm., has fetidly aromatic berries, and grows in the Mississippi valley.

Var. sempérvíróns, Munson. A glossy-leaved form holding its foliage very late in the season: lvs. sometimes suggesting forms of V. rúbra. S. Fla.
VITIS

Var. Helleri, Bailey. Lvs. more circular (i.e., lacking the long point), and the teeth round-obtuse and ending in a short mucro. Kerr county, S. Texas, 1,600 to 2,000 feet.

go. Young shoots angled, and covered the first year with tomentum or wool.

15. Baileyana, Munson (V. Virginianum, Munson, not Lam.). Possem 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) throughout the entire plant, mostly distinctly and dually 3-angled or shortly 5-angled and pointed towards the apex, the triangular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (shiny), the under surface remaining ash-gray or dun-gray, with rather pubescent teeth in sterile lvs. short, slender and ascending, and in the fertile ones short and laterally recurved; cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all glaucous, ripening very late, and after frost becoming sweet and pleasant: seeds small to medium. Along streams, mostly in limy soils, central Ill. to Kans. and Texas; also N. Fla.; also in Mex.—Readily distinguished from V. astilbus by the triangular-topped sharply 3-lobed ash-gray lvs. and the gray tomentum of the young growth.

Var. floridana, Munson. Growing tips rusty-tomentose, as are sometimes the veins on the under sides of the leaves; cluster longer-peduncled and more compound. Manatee co., Fl.; and apparently also in Ark.; possibly a compound with V. astilbus, but the lvs. have the characteristic shape of V. cinerea. Not to be confounded with any form of V. Carolina, because of the lobed triangular-topped lvs. and much larger teeth.

Var. canescens, Bailey. A form with rounded or heart-like lvs., the upper half of the leaf lacking the triangular and 3-lobed shape of the type. St. Louis, Mo., and S. Ill. to Texas.

V. vitis-idaea L. Plant scarcely climbing, the tendrils perishing when failing to find support.

18. Arizonica, Engelm. (V. Arizonensis, Parry). Carib cte. Weak, much branched, with rather long internodes and thick diaphragms, branches angled: lvs. mostly small, cordate-ovate and with a prominent triangular-pointed apex, the sinuses 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: stems ascending in sterile and prostrate in fertile ones: bunches small and compound, not greatly, if at all, exceeding the lvs., bearing 20 to 40 small black berries of pleasant taste: seeds 2 to 3, medium, with small banks, W. Texas to New Mex. and Ariz., mostly south of the 35th parallel, to S. E. Calif. and northern Mex.

V. graminea, Munson. Plant glabrous, with glossy and mostly thinner and larger lvs. In mountain gulches, with the species and ranging northwards into S. Utah. Distinguished from V. monicola by its triangular-pointed and small-toothed lvs. Probably a form of V. treleasei.

EE. Orbicular-scallop-lvs. species of the Pacific coast.

19. California, Bright. Fig. 2700. A vigorous species, tall climbing upon trees but making bushy clumps when not finding support, the leaves large and diaphragmat rather thin: lvs. mostly round-reniform (the broader ones the shape of a horse's hoof-print), rather thin, either glabrous or covered with finely downy cottony-canescent until half grown and usually remaining plainly pubescent below, the margins ranging from very narrow and deep to broad and open, the margins varying (on the same vine) from finely blunt-toothed to coarsely scallop-toothed (the latter a characteristic feature), the upper portion of the blade either perfectly indistinctly continuous and rounded or sometimes indistinctly 3-lobed and terminated in a very short acute hunch at the middle, mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor: seed large (3/4 to 5-16 in. long), prominently pyriform. Along streams in central Calif. and S. Ore.—Lvs. becoming handsomely colored and mottled in fall.
DD. Colored-leaved Grapes, marked by thick or at least firm foliage, the lvs. prominently rusty or white-tomentose or glaucous-blue. V. cinerea, V. Aris-sonica, and possibly V. Californica might be sought here; and late-gathered forms of V. bicolor might be looked for in D (p. 1950).

E. Lvs. only flocculent or cobwebby or glaucous below when fully grown (i.e., not covered with a thick, dense, felt-like tomentum, except sometimes in V. Domiana). (Nos. 20-24).

F. White-tipped Grapes, comprising species with the ends of the growing shoots and the under surface of the lvs. whitish or gray.

20. Girdiana, Munson. VALLEY GRAPE. Strong, climbing vine, with thick diaphragms; lvs. medium 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).

22. astivalis, Michx. (V. sytlavstris, occidentalis and Americana, Bartram. V. Nortoni, Prince. V. Labrisone, var. astivalis, Regel. V. bracteata and V. araneus LeConti. SUMMER, BURONI, or PIGEON GRAPE. Strong, tall-climbing vine, with medium short internodes, thick diaphragms, and often pubescent petioles; lvs. mostly large, glaucous, at first but becoming rather the ovate-cordate to 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 lobal sinuses equally enlarged and rounded at the extremity, the apex of the leaf broadly and often obtusely triangular, the upper surface dull and becoming glabrous and the under surface rough or felt-like; a covering of copious rusty or red-brown pubescence which clings to the veins and clings together in many small, tufted masses: stamens in fertile fls. reflexed, and later becoming clustered 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. glaucescens, Bailey (V. Linecomei, var. glauca, Munson). Lvs. and mature wood glaucous-blue or ash-y tomentose below, but the veins rusty: berries and seeds larger. S. W. Missouri to N. Texas. —Much like V. bicolor, but with thicker and more pubescent below, and tips of shoots rusty-tomentose. A variety of considerable priority.

Var. Linecomei, Munson (V. diversifolia, Prince. V. Linecomi, Buckley). POST-OAK, PINE-WOOD, or TURKEY GRAPE. More stocky than V. astivalis, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below: berries large (5/4-3/4 in. in diameter), black and glaucous, mostly palatable; seeds mostly much larger than in V. astivalis (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 astivalis type through adaptation to dry soils and climates. Perhaps worth consideration as a geographical species. The name of this Grape was spelled Linecumi by Buckley, with whom the name originated. The name of the person whom he commemorated was spelled Linecum, and Munson therefore changed the spelling of the name of the Grape. However, their spelling should persist, as a matter of nomenclatorial priority.

Var. Bourquiniana, Bailey (V. Bourquiniana, Munson). A domestic offshoot, represented in such cultivated varieties as Leibovior, differing from V. astivalis in its mostly thinner berries and shoots (the young shoots are only slightly red-brown below, the pubescence mostly cinnemon or dun-colored or almost without pubescence, the berries light blue-green: berries large and juicy, black or amber-colored, very sweet and pleasant to the taste, some of it probably a direct amelioration of V. astivalis, and some hybridized with the wine Grape (V. vinifera). Much cultivated south.
23. *bicolor*, Le Conte (*V. argentifolia*, 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 shoots deeply 3- to 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 so as in *V. estivialis*): cluster mostly long and nearly simple (sometimes forked), generally with a long or prominent peduncle: the purple and densely glaucous berries of medium size (½ in. or less in diam.), both sizes brown or dull purple when ripe (just before the seeds rather small. Abundant northwards along streams and on banks, there taking the place of *V. estivialis*. Ranges from New Eng. and Ill. to the mountains of W. North Carolina and to W. Tenn.—Well distinguished from *V. estivialis* (at least in its northern forms) by the absence of rufous tomentum, the blue-glaucous shallowly toothed leaves, and long petioles and tendrils. It has been misunderstood because it loses its glaucous character in the fall.

24. **Caribea**, DC. Fig. 2702. Climbing, with flocculent-woolly (or rarely almost glabrous) and striate shoots: tendrils rarely continuous; lvs. cordate-ovate or even broader and mostly acuminate-pointed, sometimes obscurely angled above (but never lobed except now and then on young shoots), becoming glabrous above but generally remaining rufous-tomentose below, the margins set with very small, mucro-tipped sinuate teeth: cluster long and long-peduncled, generally large and very compound; berry small and gloseous, purple: seed obovate, grooved on the dorsal side. Widely distributed and variable species in the American tropics, 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.

EE. Lvs. densely tomentose felt-like beneath throughout the season, the covering white or rusty white.

F. Tendrils intermitent (every third joint with neither tendrils nor florescence opposite the leaf).

25. **candidas**, Engelm. (*V. Mustagnensis*, Buckl.). **Mustang Grape**. Plant strong and high climbing, with densely woolly young growth (which is generally rusty-tipped), and very thick diaphragms: lvs. medium in size and more or less poplar-like, ranging from reniform-ovate to cordate-ovate or triangular-ovate, dull above but very densely white-tomentose below and on the petioles, the basal sinus very broad and open or usually none whatever (the base of the leaf then nearly truncate), deeply 5-7-lobed (with enlarging rounded sinuses) on the strong shoots and more or less indistinctly lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the sterile fls. long and strong, those in the fertile fls. very short and laterally reflexed: cluster small, mostly branched, bearing a dozen or more thin and long (½ in. or less in diam., purple or light-colored or even whitish berries, which have a thick skin and a very disagreeable fleshy flavor: seeds large, pyriformal. E. Texas, mostly on limestone soils.

Var. **coriacea**, Bailey (*V. coriacea*, Shutt.). **Leather-leaf or Calloosa Grape** Fig. 2703. Differes 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 moistelier climate.

26. **Simpsonii**, Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin, large and large-toothed ones on the main shoots, rusty white tomentum below and very prominently brown-tomentose young growths,—the character of the lvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fla.—This is likely a hybrid of *V. estivialis* and *V. candidas*, 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. Blüdnai*, Prince). **Fox Grape**, **Skunk Grape**. Figs. 949, 950, Vol. II. A strong vine, climbing high on thickets and trees: young shoots tawny or fuscous, with much scurvy 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 and edentate at the bottom) or sometimes nearly continuous in outline and almost deltoid-ovate, the petiolar sinus mostly shallow and very open (ranging to narrow and half or more of the length of the petiole), the margins and thick, scallop-toothed with mucro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny-white, dull-colored or red-brown tomentum: stamine long and erect in the sterile fls. and (in wild forms) short and recurved in the fertile ones; raceem short (berries usually less than 20 in wild types), generally
simple or very nearly so, in anthesis about the length of the peduncle; berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky, and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. 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 confounded with V. austros a. in the Southern States, from which it is distinguished by the habitually continuous tendrils, the more felt-like, Vvs., which are not floccose, and especially by the small-toothed Vvs., very short berries and seeds.

VITRITIA

2704. Vitis vinifera (× ¾).

28. vinifera, Linn. WINE GRAPE. EUROPEAN GRAPE. Fig. 2704. Young growth smooth or floccose, the plant not so high climbing as most American species; tendrils intermitted: Vvs. mostly thinnish, rounded, with a deep sinus and the basal lobes usually overlapping, tomentose or glabrous beneath, the margins crenately notched or jagged: clusters large and long, the berries usually oval or oblong, although many varieties are globular-fruit.

V. vinifera, Linn., very common on the Caspian or Caucasian region and western India. Vari. lacinios a, Hort., has much-cleft foliage; handsome. Gm. 54, p. 425. - Cult. from the earliest times, and the Grape of history. Now greatly varied. The home house Grape, as Black Hamburg, Barbarossa, are of this species; also the wineyard Grapes of California. Not hardy in the northern states and very subject to phylloxera (root-louse) and mildew. Rege, a Russian botanist, considered the Wine Grape to be a hybrid of two species that he characterized as V. Labrusca and V. vulpina, but this view is not accepted.

V. Amurana, Rupr., is much like V. vinifera, sometimes grown abroad for the purple tint of its young growth. Gm. 54, p. 425. - V. Bänesit, Hook. (Clausus Bäneski, Plantch.), and by him referred to C. Carr.}
VOLKAMERIA. Consult Clerodendron.

VRIESIA (named for Dr. W. de Vriese, of Amsterdam). Bromelíaceae. Often spelled Vriesea, but not so spelled by Lindley, who founded the genus. According to Mez (DC. Monogr. Planter. 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 eleft or emarginate ligule on the inside of the base of petals. Culturally Vriesias are like tillandsias. They run to forms with marbled 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 1876–1896. 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 splendens, Brongn. 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 imbricate bright red-acuminate bracts, the scape spotted; fls. exerted, yellowish white. Guiana. B.M. 4382. F.S. 2:107; 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. brachystachyum, 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 scarlet at the base and yellowish green at the end: fls. protruding, pale yellow. Brazil. B.M. 6014.

VRIESIA 1957


psittacina, Lindl. (Tillandsia psittacina, Hook.). About 1 ft. high when in bloom: lvs. rosulate, 6–10 in. long, dilated at the base, yellowish green: fls. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. B.R. 29:16; where the genus is founded. B.M. 2641. 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. bellula, Hort. Tillandsia heliconioides, HBK.). Dwarf and tufted, with many rosulate recurving or arching lanceolate lvs. (about 12 in. long), which are bright green above and purple tinged beneath. Scape overtopping the foliage, simple and erect, with wide-spreading distichous boat-shaped bracts that are light red at the base and greenish at the tip, showy: fls. white. Colombia. I.H. 30:490. G.C. 11:21:140.

bb. Lvs. tessellated (marked in small checker-work) or minutely variegated.


fenestralis, Lindl. & André (Tillandsia fenestralis, Hook. f.). Robust, densely tufted, the lvs. stout (1–2 ft. long) and recurved, brown-tipped, with many dark green veins and cross veins: inflorescence a simple stout spike ½ ft. long and bearing green-spotted bracts: fls. pale yellow. Brazil. B.M. 6096. I.H. 22:215.
**VRIESIA**

*Vriesia carinata.*

**VRIESIA**

Lvs. marked with strong transverse bands.

**hieroglyphica,** Morr. (*Tillandsia hieroglyphica,* Bull.). Lvs. many, rosetulate, stout, recurved, short-acute, very strongly and irregularly marked and banded with dark green above and brown-purple beneath: inflorescence paniculate, the bracts broadly elliptic-ovate, the fls. yellowish. Brazil. I.H. 31:514; 42, p. 318. R.H. 1891:400.—A very striking and showy plant. Sometimes known as a Massangea.

*V. fulgida,* Hort., has been catalogued in this country. It is a garden hybrid (*V. incurvata* × *Duvali*). It has short green lvs. and an exserted simple spike with distichous bright red imbricated bracts. I.H. 35:47.—*V. glaucophylla,* Hook., is referred to *Tillandsia fasciculata.*—*V. mananita,* Cogn., is Guzmania, for which see *Tillandsia.* It is also known as a Massangea (see p. 902).—*V. zebrina,* Hort., is sometimes *V. splendens,* and sometimes *Cryptanthus zonatus.* For the latter, see discussion under *Tillandsia* and Fig. 2315.

L. H. B.

**VULNERARIA.** *V. Anthyllis,* Scop., is *Anthyllis Vulneraria,* which see in Vol. I. The other Vulnerarias are referred to the same genus.

**VYENOMUS** is another spelling for *Euonymus.*

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2707. Vriesia carinata.
W

WAHOO, WAHOO, or BURNING BUSH is Eleon
mus utropurpureus. Ulmus alata, the Winged Elm, is also
called Whahoo or Wahoo.

WAFFER ASH. Ptelea trifoliata.

WAHLBERGIA grandiflora. See Platgeodon.

WAITYZA (F. A. C. Waitz, born 1768, state physician
to the Dutch at Samarang, Java; wrote on Javanese
plants). Compasida. Includes one of the rarer "ever-
lasting 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
stiffer 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
corymb or rarely in oblong, leafy racemes: involucru
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, termi-
nating 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 Australiens-
is, vol. 3.

grandiflora, W. Thompson. (The authorship of this
cpecies is credited to Naudin by Index Kewensis.) Half-hardy everlasting or "immortelle," annual, ex-
ceeding 18 in. in height: lvs. lanceolate, long-acumini-
tate, sessile, green above, slightly villous beneath,
proninent midrib beneath: fls. yellow, in terminal
corymbus. F. 1805:41, where it was originally described.
Probaby 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.

WALDIESTINIA (Franz Adam, Count of Waldstein-
Wartenburg, born 1759 at Vienna; wrote with Kitaibel
an illustrated work on rare plants of Hungary; died 1829).

The YELLOW or BARREN STRAW-
berry, 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 hardy North
American tufted perennial herb, about 4 in. high, with
glossy lvs. composed of 3 wedge-shaped lfts. and 5-
petaled fls. less than ⅛ in. across. It comes with the
first rush of spring, and continues to bloom until sum-
mer. 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-cut or with 3-5 lfts., the lfts. crenate or incised;
scapes bractted, bearing 2-5 yellow fls.: petals 5, obo-
vate, about as long as the calyx-lobes; stamens indefi-
nite; carpels 2-6; akenes obliquely obovoid, dry
and 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: scapes corym-
bose, 3-8-fl.: akenes 4-6. May, June. Woods and
shaded hill-sides, New England to Minn. and Ind.,
510. B. M. 1567 and L.B.C. 5:408 (both as Dalibarda
fragarioides).

W. M.

WAKE ROBIN. In England Arum maculatum. In
Americas, Trillium.

WALDMEISTER is Asperula odorata.

WALKING-LEAF FERN is Camphysoros.

WALL CRESS or ROCK CRESS is Arabis.

WALL FERN. Polypodium vulgare.

WALLFLOWER. Consult Cheiranthus Cheiri.

WALLICHIA (Nathanial Wallich, 1786-1854, Danish
botanist; wrote on plants of India). Palmaceae. Three
species of Himalayan palms, one of which, the first de-
scribed below, is cult. outdoors in S. Fla. and S. Calif.
and in Eu. under glass, and the second, while not ad-
vertised 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 pinnatisect: segments solli-
tary or the lowest in groups, cuneate at the base, ob-
long-obovate or oblongate, erose-dentate, the terminal
one cuneate; midribrenate; nerves flabellate; margins recurved at the base; petiole slender, laterally
compressed; sheath short, split, with the margins deeply
created; spadix short-pediculed, the staminate droop-
ing or recurved, ovoid, much branched, densely fl.,
the pistillate looser, erect; spathe very numerous, slender-
coraceous, the lower ones narrowly brownish, tubular,
the upper ones cymbiform, entire, imbricated: fls. medium,
yellow: fr. ovoid-oblong, red or purple. Stove palms.
For culture, see Didymosperma.

Wallichia is allied to Didymosperma. Arenga and
Caryota, differing in having 6 stamens instead of an
indefinite number. Caryota is the only one of this
group with ruminate albumen. Didymosperma has a
cup-shaped, 3-lobed calyx, and in Arenga the calyx
has 3 distinct sepals.

(1959)
Wallichia

Apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy: 1 vs. disposed in a 3/8 spiral: ft's. in many spiral series. Himalaya.


W. Porphyrocarpa, Mart. See Didymosperma.

Jared G. Smith.

Walnut

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, 1190), 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 confined to the 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 seedlings. 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 reach 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 until the harden them before winter. During the first year the seedlings reach a height of 3\(\frac{1}{2}\)-4 ft. The tap-root, however, grows down from 5-8 ft. If grown in the nursery the second year, they are transplanted 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 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. 1186-8) is now becoming known in the East, and it is perfectly hardy in central New York. It is a handsome tree, but it probably will not become an important fruit tree. For the species of Walnuts, see Juglans.

L. H. B.

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.
The 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 other tie 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. Preocity 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 dills out the nuts and causes the hull to open readily. Heavy frosts are also desirable during harvesting. The nuts are shaken down and picked up. They are spread in trays 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 sulfurous 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 nuts, 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 attack destroys and immobilizes 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 coastal and interior valleys of Central California and is also successfully accomplished in favorable situations in the foothills up to an elevation of 2,000 ft. There are also many instances of thrifty and prolific trees in northern California and southern Oregon. The northward extension of successful 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., Preparturiens, Mayette, Chaberte, Parisienne, Franquettii, 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.

2712. The California Wild Walnut — Juglans Californica (X 14).

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. New 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 thinning 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 ferments or enzymes secreted by the organism. One is a diastatic ferment which converts the starch of Walnuts into grape sugar; the other is a peptonizing ferment which digests the protoids of the cells. The action of these ferments 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 ferments 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.

2713. Walnut orchard in Southern California.

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Newtown B. Pierce.

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Newtown B. Pierce.
WARDIAN CASES

ture, moisture and atmosphere. Similar cases are also used in greenhouses for growing filmy ferns, dwarf foliage plants and other shrubs 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.

WARZEWICZELLA. See Zygopetalum.

WARREA (named for Frederick Warre, who discovered the first species in Brazil). Orchidaceae. Bulbs few or none, bracteate, bearing a raceme of minute showy fles: sepals and petals subequal, concave, the lateral sepals united with the base of the column; labellum not spurred, united with the base of the column, undivided, concave, with longitudinal ridges: column without appendages: pollinia 4, with a narrow stipe. Plants with the habit of small forms of Phaius. They require the same treatment as that genus.

bidentata, Lindl. (W. Lindeni-ana, Hennis.). Labellum regular, slit at the end: ridges convex, the central ones thinner and deeper: bracts one-fourth as long as the pedicels. Sect. Venezuela and Colombia. A. F. 6:555.

W. cyanea, Lindl. = Aganisia cyanea.

HEINRICH HASELBRING.

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 speaking, be said to be very temperate. There are no very great variations in temperature. The summers are cool in the north 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 west by the Olympic mountains are subject to a much greater rainfall than those parts lying immediately east of these mountains. Thus, parts of Jef- ferson county and of Island county border, have an average rain 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 watercourses, where there is a considerable growth of deciduous trees, such as alder, poplar, willow, etc. In a few places scattering specimens of oak have been found. Vast areas of salt marsh have been reclaimed from the sea, or at least from Puget Sound, and these tidal-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 different condition exists. The summers are bright, the temperature high, and during the months of June, July and August prac-

tically rainless. Eastern Washington has a varying rainfall. Those portions immediately south of the Cascade range have a very scanty rainfall, but as we near 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 about 22 inches, quite sufficient in this climate to produce good growth. The size of the rainfall has a marked influence on the climate of eastern Washington. In the valleys of the Columbia and Snake rivers, from 400 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 plants 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, and where 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 1,300 feet must be irrigated to produce crops. The larger portion of eastern Washington, and especially that portion of Idaho, is high, ranging from 1,800 to 2,000 feet above the 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 in deep canions, and the table-lands are anything but level. The soil varies from the deep basaltic clay loams to the volcanic ash, and to the sand and siliceous soils of the river bottom. The higher lands grow the hardy fruits to perfection; the river bottoms grow the peach, apricot, pear, and 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. Whitman county, on the eastern border, has been planted to fruits, mostly apples and pears. Clark county, on the west side of the state, is the greatest prune producer. The Puylulup valley, close to the 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, Whitman, Clark, Spokane and Kittitas. The latter has an excellent climate famous for their fruits. Of the 80,000 acres in fruit now growing within the state, 25,000 acres are in prunes, mostly Italian, 40,000 in apples, and the remainder in pears, cherries and blackberries.

Prunes.—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 highly 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 California in the production of this fruit. Nevertheless it is fairly profitable in Washington, yielding about the same number of pounds to the tree as the Italian, and selling in the eastern markets at a good price. But the Italian usually sells for more money, as the fruit is much larger.

The Silver prune, or Coe Plum (Coe Golden Drop), is a large, handsome prune when well prepared and always brings the top market price, selling for two or three cents per pound more than Italian or French. Not a great many are planted, and in some cases the prune-growers wish to sell or prunish over to Italians. There are numerous varieties of prune planted on the coast, but none so great quantities as the Italian. Much of the fruit of this prune is shipped green, i.e., in a half-ripe condition. This finds its way to the most eastern markets, and some of it even to England. The fruit of the Italian stands shipment well, better than any other variety. Most large growers have evaporators in their orchards, and the most of the fruit is preserved in this way.

Apples. - The late-keeping winter apple undoubtedly leads all other fruits in the total acreage now planted in the state. The counties shipping the greatest quantity are Whitman, Walla Walla, Yakima and Spokane. The varieties mostly planted are Ben Davis, Gano, Northern Spy, Wagener, Esopus, Arkansas, Jonathan, Yellow Newton and Baldwin. The lower warm valleys grow the long season apples, like Yellow Newton and Esopus, to perfection, while the higher altitudes are best adapted to a shorter season fruit, like the Wealthy and the Gravenstein. All apples color finely, and are very fair in appearance. There are few off years, but there seem to be full years and slim years, though the crops are much more constant than in the middle or eastern states. Apple growing is amongst the most profitable of the fruit industries. Many large orchards have been planted that are not yet in bearing. At present the state grows much more fruit than it can consume.

Pears. - Pears are grown to great perfection in almost every part of the state, but there is no finer fruit than that which comes from the low warm valleys of the Snake, the Columbia, Walla Walla and Yakima. Bartlett is the great summer pear, followed closely by Plemish Beauty. For fall and winter, Anjou, Clairegeau, Easter and Winter Nels are largely grown. Pears have been successfully shipped from the Pacific coast to Liverpool and London. The planting of pears is not receiving the same attention as the planting of apples, 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. 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 Dumasons.

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. The sour varieties also grow and yield abundantly. Sweet cherries are the most profitable, attain their greatest perfection and are not so easily injured by weather. The reason for this is probably to be found in the labor 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 a few favorable spots. In the low warm valleys of the Snake and Columbia all varieties seem to do well. 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 in Laconner Flats (reclaimed tide-lands) on Puget Sound. The demand is good, and the crop profitable. Cabbage and onion seed is produced in great 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 great numbers of offsets, and hyacinths propagate freely by the same methods practiced 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 mildes in Idaho, Montana and
Plate XLVIII. Washingtonia filifera, the most characteristic palm in California
WASHINGTON

British Columbia take great quantities of fruit and vegetables. Shipments of perishable fruits have not always been found to be profitable, but the state is fast settling up, and the outlook for the horticulturist is very bright.

J. A. BALMER.

WASHINGTON GRASS. See Cabomba.

WASHINGTONIA (named for George Washington). 

Palmacea. Tall palms, with the robust trunks clothed above with remains of the sheaths and petioles: lvs. terminal, ample, spreading, orbicular, flabellately plicate, robose nearly to the middle; segments induplicate, filamentous on the margins: rachis short: ligule large, appressed: petiole long, stout, plano-convex, very spiny along the edges; spadices long, copiously paniculately branched, glandular: branches slender, densus; spathes long, membranous, split, glabrous: fls.: white; fr. small, ellipsoid. black. Species 3. Ariz., S. Calif. and Mexico. Plate XLVIII.


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 sheathes and petioles, at length brown; blade light green, 3 ft. long by 34 ft. wide; segments 60. Western Mex. G.F. 38:49. R.H. 1885, p. 403.

Sonora, Wats. Stem 25 ft. high, 1 ft. in diam. lvs. 3-4 ft. in diam., somewhat glaucous, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, ¾ in. at apex, floccose-hairy along the margins and with stout curved spines: fr. ¾ in. long, edible. 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 (2-3 ft.) petioles with yellow margins and spines, which is the Colorado Desert species, W. fiflera, 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. Sonore, 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 inflorescence may perhaps establish this palm as a mere geographical variety of W. fiflera, 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 hardiness 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.

The following 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. Sneedorvin, a commission merchant of San Francisco, from the coast of Mexico near Guaymas. 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 B. 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 Roek, 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. 109-182, Mr. T. S. Brandegee records that Washingtonia Sonora occurs at La Paz and San Jose, 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 landed 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 species appears to be much less hardy under cultivation than W. robusta.

From the above notes it would appear that both W. 

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2716. Young plant of Washingtonia fiflera.
Sedona 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. Certainly 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.

**DATES.**—A fairly safe guide is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough soaking. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, a useful test is to tip 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 condition of the soil as regards moisture. The experienced gardener reads 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.

Soft-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-stemmed plants, with some exceptions, may at times even flag somewhat for want of water, and recover permanent injury when a fresh supply is given. Hardwood 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 replanting 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 sour, unless watered with care. When the proportion of soil in propagation is more than for 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 in winter free ventilation is usually impossible. At night there is a tendency toward a damp atmosphere. Careful florists, therefore, water in the early part of the day at this season, so that the house will have become somewhat dried out by nightfall. It is seldom advisable to let plants 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 conditions most favorable for their development. Exposing the old water can on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is large and renders the air of the house drier. During summer, when there is free ventilation, the watering may advantageously be done late in the day. Midday watering at seasons when
WATERING

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 watering plants in glasshouses. The best, 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 of a temperature close to that of the air in the room 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. Spraying of walls, 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. The plan to leave a space of 1½-2 in. 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. 396.

WATERMELON

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Watermelons, some of the advantages of this method of applying water. The essential features of this system are a water-tight bench, with earthenware tile placed in rows upon the bottom, either crosswise or lengthwise, 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 outward and upward into the soil by capillarity—thus moistening the soil from below upward. In beds over 50 ft. long a fall of 2 in. to every 50 ft. is recommended. See Figs. 1182-3, Vol. II.

J. C. Arthur has experimented with a plan which, in most respects, is improved and a superior one. "Here porous brick, having the lower edges cracked off, are placed edge-wise and close together over the bottom of the bench. The shattered edge of one 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 held in a level with the bench; the other rises an inch or so higher outside the edge of the bench. Carnations and lettuce have given excellent results grown by this method of subwatering.

Subwatering in connection with the 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, causing the soluble subwatering to sink 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 and subsequent drought then prove more disastrous than ever. The evening is the best time for surface sprinkling. Watered in the heat of the day, grass and various other plants are likely to have the foliage injured. 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.

Plunging. — While it is true that most of the water given to the plants in glasshouses is absorbed from the hole in the bottom of the pot, yet much that is left in the soil,—which is considerable if the soil is saturated as it should be,—is evaporated from the porous side of the earthenware pots. In warm sunny weather plants in small pots, standing on a bench, 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 day's water 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 quiek-growing, soft-wooded plants, geraniums more especially, for these are quickly exhausted by too frequent waterings.

WILLIAM SCOTT.


WATERMELON. Figs. 2719-20. Plate XLIX. The Watermelon (Citrus vulgaris, which see) is a native of the warmer parts of Africa. It is a tender annual. It has been cultivated from prehistoric times. It reaches its highest development in warm and sunny climates.

2718. Watering-cans.

The can on the left, flattened on the sides, is generally preferable. It can be carried in greenhouse. The long spout enables the operator to apply the water directly to the roots; and the greater force 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. J. Green, Director, Ohio Experiment Station, was one of the first in this country to point out, as the result of experi
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 in some of the sections they thrive as far north as Ontario. 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 secure a very early start and grow rapidly in order to mature in the short season. 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 for several generations in the North give earlier and better results in the North than southern-grown seeds; but the subject yet needs further exploration.

Since these are used generally for the northern parts of the country as the muskmelon, 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 in transplanting boxes or on sods, as explained under Muskemelon and Transplanting. It is well, also, in the northern states, to use rather freely of some quickly available fertilizer, and to hill the order as early as possible. If the lands are loose and leachy and likely to dry out, or, on the other hand, if they are hard and tend to become lumpy, it is well to make "hills" by mixing these soils well with a manure of 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, there will likely to dry out and the fertilizing elements are usually so tardily available that the plant does not get a quick start. The smaller-growing varieties may be planted as close as 6 x 8 feet, but those of larger size should be planted 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 flea beetle and the striped cucumber beetle 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 either the melon with satisfaction. Some 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. 272) and are used for the same purposes as the true citrus of commerce, they are commonly known as citrons. They come true from seed.

L. H. B.

**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, no putrefactive or alcoholic 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 animal nutrition—serving, at best, as a mere diuretic or digestive.

**Habitat and Distribution.**—Throughout the entire tertiary region of the Atlantic and Gulf states, from the seacoast northward, is marked the Piedmont Escarpment which sweeps diagonally down from southeast to southwest from Richmond to Vicksburg on the Mississippi—throughout this vast area—"the land of the long-leaf pine" (and of the long-leaf pines) the Watermelon flourishes unrivalled, attaining there its serenity. In 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.

**Watermelon**

To a certain limit perfection in the melon is found to directly parallel latitude—regulated and modified, of course, by the corresponding climatic, geological formation and local conditions and environment. Every mile traveled southward from New England toward this limit, which corresponds, practically, to the boundary between Georgia and Florida on the Atlantic slope, and to the Brazos river on the Texas, the possibilities of the melon enlarge—its size improves, its sugar content increases, its flavor refines and intensifies. Beyond the limit southward, deterioration again begins, though with even greater rapidity than on the other side, and there is no longer any superior to its more impressive sister of New Jersey or Long Island. In this the melon but follows a fixed morphological rule, prominently 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 Valdosta, in South Georgia, near the Florida line, than anywhere else. Augusta, however, in eastern Georgia, was formerly the "capital" of the melon domain—its very "throne 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 tempting if rather startling announcement, "Augusta Rattlesnakes" could be seen invitingly placarded over every progressive fruit-stall, from the Atlantic to the Pacific coast, in most of the big cities of the land. Then crept in the "Koh Gem," an Alabama product, somewhat superseding, though not displacing the famed "Rattlesnake" as a market favorite, and the public began to prefer the round to the oblong form, though still partial to the "striped rind."

In ante-bellum days, besides the Rattlesnake only two varieties obtained general recognition at the South for excellence—the Lawton and Cuba melons, with their evolved offspring—the former dark green, the latter belonging to the white or gray type (pal green rind with delicate, darker green tracer) but both of them, for some years more, gradually displaced by the Georgia (or Augusta) Rattlesnake, and it, as stated, was in turn forced to partially yield precedence to the Koh Gem. The round or ovoid form became fully established in public favor by the later advent of the "Jones" type, which completely dominated the market, its refreshing dark green color proving particularly attractive. Selections of this strain, culminating with Duke Jones, Lord Bacon and others, have finally brought the melon up to its highest perfection, though the Girardeau innovations from Florida, such as Florida Favorite, New Favorite and Triumph, still contest their supremacy, while the older standards, as Rattlesnake, Sugarloaf, Shearback and the like are by no means "back numbers."

Nor have the North and West been altogether idle in the work of development, many of the best of the recent introductions and some of 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 Jordan Gray Monarch.

Many strains combine to produce the ideal melon. The scale of excellence for the southern type is probably about as follows:

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<th>Feature</th>
<th>Percentage</th>
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<tr>
<td><strong>Shipping capacity</strong></td>
<td>35</td>
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<td><strong>Size</strong></td>
<td>25</td>
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<td><strong>Quality</strong></td>
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<td><strong>Earliness</strong></td>
<td>8</td>
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<tr>
<td><strong>Color of flesh</strong></td>
<td>2</td>
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<tr>
<td><strong>Color of rind, or marking</strong></td>
<td>1</td>
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<tr>
<td><strong>Total</strong></td>
<td>100</td>
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</table>
WATERMELON

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, Kob 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 yield its modicum of moisture, little by little, when called on. Like the ear and the grape, the melon cannot bear "wet feet." Still, some soil should be well drained. Sufficient capillarity must exist to keep the roots of the plants well supplied with their proper amount of moisture, though not enough to evaporate the entire reservoir of water in the top-soil into the atmosphere. The soil too rich in humus is not desirable. Sufficient nitrogen for its use can be supplied artificially where it does not exist naturally. A surplus may, and generally does, produce larger melons, but at the expense of quality. They will prove soft, watery and insipid—poor shippers, 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 an abandoned cowlot, or on the garden spot. "Second bottoms"—the accumulated detritus of hillsides—serve admirably, but creek bottoms or heavy muc of any sort would be no more admirable for more luxuriant than for grapes or peaches.

Rotation of crop area is all-important. Never should two crops of melons occupy the same plat with an interval of less than three years between them. In that time, insect depredation, 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 dug, the shallower the roots will be induced to penetrate, disturbing their normal habit and producing surplus vine at the expense of fruit. But because shallow plowing is permissible, for that very reason, it may be practiced. Thoroughness is 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 Arno harrow, should be given. This leaves the plot in excellent condition, especially if a crop of cow-peas has 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 when the cost of land and labor is heavy. The crop will be lessened, however, by a hireling of 10 by 10 feet. On poor land, and in sandy loam, an opening 5 feet apart will be sufficient. Then, in one direction, with a wide "shovel" plow, an opening furrow is run in which the fertilizer is drilled and thoroughly mixed with a scooper—two trips to the row—on which four furrows are next "listed" 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 this may be excusable; but it is not only preferable, but on a large scale necessary, to drill commercial fertilizers.

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 sandy loam, the annual cow-pea crop provides the manure, if commercial fertilizer is employed, should be put in; compost or stable droppings sooner, to insure partial decomposition by planting time. Stable manures, however, always variable in its ordinary cut of plant-food, and therefore 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>4 lbs.</th>
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<tbody>
<tr>
<td>High grade superphosphate</td>
<td>500 lbs.</td>
</tr>
<tr>
<td>Sulfate of potash (or murate of potash)</td>
<td>1,200 lbs.</td>
</tr>
</tbody>
</table>

2,000 lbs.

This is rather a high grade formula and will analyze:

| Nitrogen (ammonia equivalent 4.0 per cent) | 3.3 per cent |
| Phosphoric acid (available) | 8.4 |
| Potash (K₂O) | 1.5 |

It may be used advantageously at the rate of from 400 to 800 lbs. per acre; the maximum amount, however, will rarely be justified. An extra finish of nitrate of soda—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 spared. Field mice, pigeons, poultry, crows, cockroaches and other depredators frequently prevent a perfect stand where but few seeds 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. It is foolish to lose the marauding 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 "hoo-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 (Nepomex) 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 hasten their growth and development.

"Christ! That melons should any one care for 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 to 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 finally succeed in the mellow soil from the soil as much plant-food as will two, and will give a better account of it, also, on "setting day."

Cultivation is commenced early and should cease early. This is effectuated with either the five-toothed or seven-toothed cultivator or with scythe and serape," and should invariably be shallow, except 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 as soon as the vines cover 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 broad-casting 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 melons are conveyed to the railroad station by the initial haul, which should invariably be on springs. A mile's jolt in a springless vehicle discounts profits more severely than a thousand-mile journey, subsequent to the "laying by," or the cessation of cultivation, should be made almost exclusively where a water route is not convenient. Profits also largely depend on two other considerations: judicious and severe cullling, and the proper selection of a market. The first measure cannot be practiced too severely. Undersized fruit is unusable, 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, over forty quite large, and melons reaching 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 largest filling the upper tiers—not for the purpose of deception or for the sake of appearance, but because the smaller sizes better withstand jolting and pressure and there is also less loss if they are injured.

As the importance of avoiding glutted 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 "Shippers' Unions," however, are usually able to cope successfully with the problem and manage to distribute their crop over the road in such a way as to leave a living profit to the planter. Yet the industry is now by no means so remunerative as formerly. Supply seems to come to an end, and great complaint is made by the grower of excessive freight charges, while the transportation companies insist that their rates on 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.

Warning and Remedy.—When a stand is once obtained—spontaneously and promptly—and this, when all is said, is perhaps the main problem underlying successful melon culture—its affections are comparatively easily disposed of. 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 hyalinae).—A
Plate XLIX. Watermelons.—The Orange variety
small moth, the larvæ of which, light, yellowish green in color, are found about an inch long, destroying the leaves of the Watermelon, but both the foliage and fruit of the cantaloupe or muskmelon. They are "chewers," not "suckers.

2. The flea beetle (Aphis gossypii).—This attacks the foliage, only, in the form of the adult—a small winged green fly, viviparous, whose wingless progeny attain maturity in about a week from birth, and begin to reproduce.

3. The striped cucumber beetle (Diabrotica vittata).—A small black and yellow-striped beetle, a quarter of an inch long, appearing in spring and attacking the young plants as they emerge from the ground, its larvae and adults both attacking the leaves and stems. The adult insect eats the upper surface of the leaves, in irregular patches, and the larvæ 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 for these pests is going to neglect him, and therefore makes his preparations to combat all, separately and collectively, and so plans his schedule as to cover the entire list. The following is a detail of the operations.

1. Apply a pinch of niter of soda to each hill as soon as the young plants are up to insure full vigor and power of resistance to all enemies as they arrive upon the field.

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 arsenite applications) if the melon louse is found to have located on the plants, with a 1 to 20 mixture of kerosene and water (using Wool kerosene or water with kerosene emulsion) as light as possible, but enough to wet the leaves. Whale-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, claw-shells or cheap vessels of any kind, under canvassed covers. This remedy is unfailing, but somewhat troublesome, and is only justified when the commercial grower is fighting the enemy that for his crop and livelihood. Any of the methods of preparing the remedies here suggested may be obtained from the article on Insecticides, in Vol. II of this work, which see.

HUGH N. STARNES.

WATSONIA (Sir Wm. Watson, M.D., 1715–1757, Englishman and professor of botany at Chelsea). Irridaceae, 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, with usually a long, slender tube which is bent near the base. Watsonias are very much like Gladiolus, having the same kind of a corm, the same sword-shaped, rigid lvs., the same kind of a spike and the same season of bloom. It is, therefore, a great mistake to suppose that they are suited only to greenhouse cultivation. The main difference 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 spine. An important botanical difference is that the style-branches of Watsonia are simple, while those of Gladiolus are bifid. Great interest has been aroused in Watsonias recently by the introduction of the White Watsonia from the Cape. The plant might be roughly described as a white Gladiolus. It is likely to receive considerable attention within the next few years. It grows 3 or 4 ft. high, strong specimens being 6 ft. long and about 2 in. across. The purity of its color and its value for cutting make it of exceptional interest to florists. There are other white-fl. forms of Watsonia, 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 trade has been derived from a bulbous seedling, supposed to be descended from plants cultivated by H. W. Arderne, of Cape Town. The original bulb was found 80 miles away in a peat bog amongst thousands of the common pink-fl. kinds. In Oct., 1889, the same bulb was planted near Port Elizabeth, by J. O'Brien, of Harrow, flowered in England in 1889 and was then fully described as W. iridiifolia, 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 Rotterdam, cultivated a white variety in 1886, it being figured in The Garden for that year as Water-sonia 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 white group upon the attention of the plant-breeder. 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 Watsonia and Gladiolus. 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, arcurate, inserted below the throat of the tube. Baker, Handbook of the Iridæae, Flora Capensis, vol. 6.

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| W. alba | 4. coriacea, 6.  
| W. aletroideas | 1. |  
| W. angusta | 2. humilis, 7.  
| W. Ardernei | 4.  
| W. rosea | 8.  

A. Upper part of tube cylindrical or narrow, the tube becoming increasingly slender toward the summit, the summit being a narrow, rounded or pointed point, or a narrow neck at the base of the summit. B. Lower part of tube becoming funnel-shaped, the summit being a swollen, rounded or pointed point, or a narrow neck at the base of the summit.

a. L. of the tube from 5—11 cm. b. L. of the tube from 11—20 cm. c. L. of the tube from 20—40 cm.

c. Tube shorter, mostly 1—2 ft., un-branched. d. Tube 1½—2 in. long. 6. cocinea  

d. Tube 1¾—2½ in. long. 7. humilis  

AA. Upper part of tube short and of a funnel-shaped form. B. M. 5·5 (rosy scarlet, splashed with carmine, the inner segments white at the tip).

2. angusta, Ker. (W. iridiifolia, var. fulgens, Ker.). Scarlet-fl. species distinguished from W. meriana by color of the fls. and by the shape and arrangement of the segments. In Watsonias the segments are decidedly acuminate, 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 ovary-segments, while in W. Meriana it does not. G. 1870 (as W. Meriana, var. coccinea), 44:233.
3. *Watsonia*, Mill. This seems to be the dominant species of the genus and hence the most variable and the one most interesting to the plant-breeder. In its widest sense it includes *W. iridifolia*, for horticultural purposes it will be convenient to consider the latter a distinct species. *W. Meriana* is best restricted to the commonest type at the Cape, which is a rose-flowered species—3 to 4 ft. high, the stem usually branched, lvs. 4 to 6 in. broad, the spikes 12 to 24 in. long. This is the plant figured in B.M. 418 as *Antholyza Meriana*. *W. Watsonia* is more typical in color. The white-flowered form, which is rarer in nature, is treated under *W. iridifolia*. Bakers says that there are scarlet-flowered forms of this species, but he gives them no name, and it is probable that all such should be referred to *W. angusta*.


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 pyramidal inflorescence. Stems unbranched, 2-3 ft. high, a foot lower than *W. Watsonia*. B.M. 6406.—There is a choice variety with pure white lvs. *Var. alba*, Hort., was introduced as early as 1891.

6. *coccinea*, Herb. This showy scarlet-flowered species differs from *W. Meriana* in its stem being shorter and unbranched, the spikes fewer-flowered, and the styles a trifle longer. *W. coccinea*, Mill. 1194 (W. *Meriana* variety).

7. *humilis*, Mill. This species has rose-red lvs. apparently the same size and color as *W. densiflora* but only 4 ft. high, the spike and the stem only a foot or so high. B.M. 631.—A variegated form figured in B.M. 1193 as *W. rosea-alba* has a spike of flesh-colored lvs. with broad bands and splashes of scarlet.

8. *rosea*, Ker. Robust rose-colored species, growing 4-6 ft. high and the lvs., though fewer than those of *W. densiflora*, are 11/2 to 2 ft. long. B.M. 15-165. B.M. 1672.


**WATTLIE.** See *Acacia*.


**WAYFARING TREE.** *Viburnum Lantanum.*

**WEATHER PLANT.** See *Abrus*.

**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 first step in weed farming. Even after we have learned that crops are benefited by the stirring of the soil, we are likely to forget the lesson or to be neglectful of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are among 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 have the habit of wandering; 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 also likely to take the place of grass when for any reason the grass begins to fail. The remedy for weeds in grass lands, therefore, is to secure more grass. In order to do so, it may be necessary to plow the land and reseed. In desert places, however, it is only necessary to give the land a light surface tillage and to use available fertilizers and to sow more grass seed. This is the fundamental remedy for weeds on lawns. If such weeds are perennial, as dandelion and plantain, it is desirable to pull them out or to hoe them out, but a stiffer sod should be secured. The annual weeds that come in the lawns the first year are usually destroyed by frequent use of the lawn mower.

Farmed land 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 riding the land of weeds. Coarse and rough stable manure, which is not well rotted, may also be a conveyer of weed seed. The spring sowing of many weeds is sometimes in 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 cover 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 hay.

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 land, 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 edgings 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.

**WEEPER TREES.** Consult *Trees*.

**WIEGELA.** Referred to *Diervillia*.

**WEST INDIA RATTLE BOX.** *Crotalaria retusua*.

**WESTERN CENTAURY.** *Hesperochiron*.

**WESTRINGIA (J. C. Westring, physician and author).** *Labiatae*. An Australian genus of 11 species of shrubs with entire whorled leaves and solitary, 2-lipped, white or purple-spotted flowers in the leaf-axils or rarely in terminal racemes. 60 to 120 in. high. B.M. 15-165 (worn 3) with a short tube and dilated throat: the upper lip flat and broadly 2-lobed, the lower 3-lobed: fertile stamens 2: staminodia 3, short.

**rosamarinifolius**, 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.
WESTRINGIA

oblong-lanceolate to linear, 1/2-1 in. long: fs, white, axillary, almost sessile; calyx 3-4 lines long; corolla not twice as long as 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, had its beginning as a side issue of the usual operations of the farm. In fact, even to this day is considered as a sort of complement to grain-growing or stock-raising in most sections of the state. In some localities where towns have sprung up in the wake of the result of coal or oil railroad operations, the demand for vegetables and small fruits has been largely met by local producers. The market-garden work, aside from the growing of watermelons, 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 the only 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 harvest varieties are grown, Yellow Transparent, Red Astraphan and Pomme Royal predominating; these are followed by Golden Russet, Grimes Golden and Red Delicious. 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 west part of the state, bordering on the Potomac, form the present areas for the commercial growing of winter apples.

Hancock county orchards (northern end of Panhandle) are unique in some respects. Every grower with any considerable acreage (fifty 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 1899 all the houses were constructed of stone and provided with lee chambers for maintaining artificial cold. In 1890 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, no lee is carried, and good results have followed. These houses are of various capacities, ranging from 2,500 up to 15,000 bushels.

The plan most in vogue is to have the fruit removed from the trees by expert pickers, placed in barrels in the orchard, headed and then transferred immediately to the storage-house. In general, the barrels are stored on green logs in the lees, with the thickest part of the logs, in this position until the 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 stenciled 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, when fruit 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 grower. This is known as the Willow Twig, an apple of good size, good appearance and fair quality, a long keeper and a good cooker. Willow Twig and Ben Davis yield the greater part of the crop of this region, although among varieties of that description the Rome Beauty and Bentley Sweet are some of the best.

The varieties chiefly grown in the eastern counties differ quite as much from those of the Hancock region as do those of Hancock from those of Washington. In the eastern counties York Imperial or Johnson Fine 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 southern counties. This variety, 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 1,200 feet above tide. The soil is gravelly in nature, resulting from the breaking down of slate 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, peach crops are directed 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 canning 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. At variance with its geographical location, at the varied altitudes and exposures, is sufficient to account for the variety of climate. Persimmons, pawpaws and watermelons thrive on the lowland, cranberries on the mountain sides, 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 Lucertia dewberry being a native.

The ornamental 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

WHAIHO0 or WINGED ELM is Ulmus alata.

WHEAT. See Triticum.

WHEAT, INDIA. Fagopyrum Tataricum.

WHIN. See Ulex.

WHIPPLEA (Lient. [afterward General] A. W. Whipple, commander of the Pacific Railroad Expedition from the Mississippi to Los Angeles in 1853–54). Saxifragaceae. A genus of one species, a trailing subshrub with clusters of small white flowers, which soon become greenish. The clusters have 4–9 fls. and the petals are a little more than a twelfth of an inch long. The plant blooms in March and April and is native to woods in the Coast Ranges of Calif. W. modesta, Torr., was offered in the East for western collectors in 1881, but the plant is horticulturally unknown. It is fully described in Bot. Calif. and is Jepson’s Flora of Western Middle California.

WHITANIA. Catalogue error for Withania.


WHITFIELDIA (after Thomas Whitfield, intrepid naturalist who made several explorations into tropical western Africa and brought back many choice plants). Aconitum. A genus of 2 species of tropical African herbs, one with white, the other with brick-red flowers. The latter is a bushy evergreen plant with numerous branches terminated by racemes of about 8 dull red fls. each an inch long. The calyx and corolla and often the large bracts are all colored alike. This species has been considered a desirable stove plant, and the first specimens known to cultivation bloomed from October to March. It is, however, practically unknown in America. It has been catalogued in the American trade, but seems to be little known.

Genera characters: calyx 5-petalled; segments colored, oblong or lanceolate; corolla-tube swelled almost from the base, or slender and cylindrical below and abruptly inflexed above, widening into a bell-shaped throat; lobes 5, ovate or oblong-lanceolate; stamens 4, didynamous.

lateritia, Hook. Tender, evergreen, red-flowered subshrub about 3 ft. high: lvs. opposite, entire, ovate or oblong oval, wavy; corolla between bell- and funnel-shaped. Western Trop. Afr. B.M. 4155. F.S. 1:36. W. M.

WHITLÀVIA. See Phacelia.

WHITLOW GRASS. Draba.

WHITLOW-WORT. See Paronychia.

WHORLBERRY. See Vaccinium.

WIDDINGTONIA (Capt. Widdington, formerly Cook, who traveled in Spain). Coniferæ. W. Whytei, M. Wood, is a coniferous tree from southeastern Africa, probably not hardy N. It grows at an altitude of 6,000 to 7,000 ft. on Mt. Milinjai in Nyassaland and is known as the Milinjai Cypress or Cedar. Seedlings of it were first cultivated in 1834 at Kew, and plants have recently been offered in Calif. According to Davy, it is proved 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 83 ft. at a point 6 ft. above the ground, the trunk being clear for 90 ft. The species has glaucous, linear, juniper-like foliage and a cone smaller than a chestnut and longer than broad. Widdingtonia is considered by Bentham and Hooker as a subgenus of Callitris. Franceschi, however, reports that it has proved quite delicate to raise in S. Calif.

WIGÀNDIA (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, 1–3½ 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 shining hairs, simulating needles. Many large specimens may be seen in California, but the plants are considered to be rather coarse and straggling.

They are generally raised from seed every year, the seed being started indoors as early as January. The plants attain a height of 6–10 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
WIGANDIA

WILDER

1975

Vigieri, Carr. Imperfectly described species of unknown nativity. Carrière merely said it was a silvery plant instead of somber and glutinous "like W. Caratacosa" (by which he perhaps meant W. macrophylla). Nicholson says that the rare hirsute branch is vinous red to fawn-color before fading. In the American trade the red color of the fls. is considered distinctive. N. 4:209.

W. M.

WISTREXEMIA (after a Swedish botanist). Thymelaeaceae. W. pauciflora is offered by importers of Japanese plants. "For several years Japanese copying paper is made." Wistремия is a genus of about 20 species of trees or shrubs native to tropical and eastern Asia, Australia and the Pacific Islands. Leaves opposite, rarely alternate; fls. hermaphrodite, in terminal racemes or cymose panicles. Plant was native of Peru and called Hydrolea urens. Now when Choisy came to monograph the whole family he transferred Hydrolea urens to the genus Wigandia and called it Wigandia urens, Choisy. He, therefore, had to invent a new name for the Mexican plant, and this he called Wigandia kunthii. Choisy's action would be approved by the radical school of American botanists, but not by the international rules of nomenclature as the Paris Code of 1867. Hence it is necessary to give the Peruvian plant a new name, and it is here called W. Peruvianiana. The "common" or English names suggested below may be convenient in explaining the difficulties of the genus. (Kunt=LBR.)

A. Color of fls. lillac or violet.
B. Spikes 1-sided but 2-ranked, the fls. all pointing in one direction.
C. Plant with rusty hairs.............. macrophylla
C. Plant without rusty hairs.... Peruvianiana
BB. Spikes 1-sided but not 2-ranked, the fls. all pointing in one direction.
C. Capsule densely hairy........... urens
CC. Capsule slightly hairy-pubescent...

Caracasana

Vigieri

macrophylla, Cham. & Schlecht. LARGE-LEAVED WIGANDIA. Tender Mexican perennial plant, attaining a height of 6 ft. or more in a season when treated as a subropical bedding plant: plant covered with two kinds of hairs, long white, stiff, spreading, prickly ones and short rusty hairs: only the lower surface of lvs. covered with a thick, white felt: spires not radiated, the same, 5-6 ft. long; R.H. 1801:371. The above is André's conception of the species, but some writers would make it a variety of W. urens, Kunth. The lvs. attain nearly 3 ft. in length under perfect conditions. Lvs. oval-elliptic, base more or less heart-shaped. Peruvianiana (W. urens, Choisy, not Kunth.). PERUVIAN WIGANDIA. Tender Peruvian subshrub, distinguished by the absence of rusty hairs and by the 2-ranked spikes of violet flowers. Very hispid with long, stiff, spreading hairs: lvs. 5-6 in. long in their native place, ovate-cordate, covered with a white felt below. R.H. 1867, n. 470 (same as N. 4:208; doubtful).

urens, Kunth, not Choisy (W. Kunthii, Choisy).
MEXICAN WIGANDIA. Tender Mexican perennial plant,分歧 by 1834 and 1848. Also had a notable collection of azaleas. As early as 1829 he produced a double form of a rose. Among the many floral novelties which he was first to import, cultivate or exhibit in America were Diervera rosea (1851), hardy kinds of Azalea mollis (1874), Cissus vinifera (1844), the hardy form of the infinite variety of ornamental-leaved plants now so generally cultivated and admired, Clematis rubens, var. grandiflora (1841), Littium lancifolium, var. album, the first of Japanese lilies, Gladiolus floribundus (1836), and Oncidium flexuosum (1837), a plant of which bore ninety-seven fully expanded flowers and was the first orchid fully exhibited at any American exhibition. The Marshall P. Wilder rose makes his name as familiar to a greater number of persons as any other rose in America. Wider's greatest service to horticulture was intimately connected with the Massachusetts Horticultural Society and the American Pomological Society. Of the former he was 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 1867. As president he was a most efficient, energetic, and able organiser. He is counted one of the founders of the Massachusetts Board of Agriculture and of the Massachusetts Agricultural College, and of the United States Agricultural Society, president of the last from its foundation until 1857, and from 1868 until his death he was president of the New England Historic Genealogical Society. At twenty-six he was a colonel, and in 1857, after declining the nomi-
wild et alished 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 masonry 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 1500 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 char-

acterized by geniality, dignity, tact and conservatism. 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 XLI 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 Horti-

cultural 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 Commmemorate the Completion of his Eighty-fifth Year," is a stately memorial of 118 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: 20-39, 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 hawkweed, 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 moat 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 pen, trumpet creeper and bitter-sweet! Think, too, of all the sweet flowers and delicate woody 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 exotics 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 uninitiated. 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 harebell in rich garden soil often grows so tall and slender as to require staking, and stakes are always objectionable. In the wild garden a dusty road along which 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 suitable for wild gardens.—*Polygonum sachalinense* (Fig. 2725), *Bocconia cordata*, *Cimicifuga racemosa*, *Hemerocallis*, *Arundo* (Fig. 2727), *Rheum*, hollyhocks, silphiums (Fig. 2723) and perennial sunflowers (Fig. 2726).

There are only three tests which a candidate for the wild garden must pass,—hardiness, vigor and interest, for of course every cultivated plant should have something to make it worth while.

To the many amateurs who wish to cultivate a few colonies of flowers in a small space, the naturalizing of free-growing hardy things is especially attractive. Give the wild flowers a bed by themselves. Avoid mixing cultivated and wild plants in the same border, for the hand of the stranger may "weed out" the wild things in favor of the others.

The place of the wild garden is somewhere near the borders, preferably well towards the rear of the place. However, there are degrees of wild gardening, and it is often in place against the rear buildings or even against the rear of the house. Figs. 2725, 2729.

Everyone who desires a wild garden should own a copy of that charming book "The Wild Garden," by Wm. Robinson. The latest edition, illustrated by Alfred Parsons, is the most desirable. The wild garden should not be confined, but may well include many exotics. In this way the wild garden becomes something more than an epitome of the local flora; and there is practically no limit to its interest and development.

W. M.


**WILLOW.** See *Salix*.

**WILLOW, DESERT OR FLOWERING.** See *Chilopsis*.

**WILLOW HERB.** *Epilobium*.

**WILLOW, VIRGINIAN.** *Itea Virginica*.

**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 winds should not be stopped or wholly deflected, but they should be allowed to pass through the windbreak with diminished power in order that, while their force may be checked, they may still prevent too low temperature. In regions that are very liable to late spring and early fall frosts, a tight 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 lies in protecting from the mechanical injuries that result from high winds and to enable workers 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...
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. 2729) is used for this purpose. Parma in the open windy country may be efficiently protected by belts of woodland, or if the country is wholly cleared, rows of trees may be established at intervals of a quarter or half mile across the direction of the prevailing winds. Fig. 2729.

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 foliaged 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, which is 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

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2727. The Giant Reed—Arundo Donax.
A tall plant of striking habit suitable for wild gardens and borders.
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

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 citriodora*, 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 purporses by providing a certain amount of privacy.

**Joseph Burtt Davy.**

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**WINTER PROTECTION**

**WINDMILL FINGER GRASS.** See *Chloris*.

**WINDOW GARDENING.** See *House Plants*.

**WINEBERRY.** *Rubus phoenicolasius*.

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**WINTER ACONITE.** *Eranthis hyemalis*.

**WINTER BERRY.** *Ilex verticillata*.

**WINTER CHERRY.** *Physalis Alkekengi*.

**WINTER CRESS.** *Barbaraea*.

**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 harder 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. Gallhardias 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 as essential to keep in the cold "during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but 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*, *Euonymus alatus* and some others, and often damage newly planted material the first winter. When the
branched 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. Full-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 1899-1900 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 Heuchera sanguinea, are safer with a covering that will not mat down and rot the foliage or injure the crown. The danger is in open, wet seasons. Forest leaves are excellent for winter covering, provided they do not mat down. Oak leaves are good, but those of elm, maple and other trees that shed their foliage early are soft and mat too much. Leaves may be held in place by evergreen boughs, brush, or tops of bushy perennial like our native sisters, 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, and shield them from the drying winds, and retard premature starting of the flower-buds. Forsythia suspensa trained as a climber on a south wall is benefited by such covering, or by burlaps, as its sheltered position induces activity too early and its flowering buds become a victim to late frosts. Any rhizomatous iris, such as the German iris, should be planted where surface drainage is ample, and in the case of young plants, or those recently divided, not covered with heavy manure, or they are likely to decay in wet weather. Cover such plants with light material. Old established plants seldom need protection. Pyrethrum roseum requires similar conditions and treatment. All lilies except the hardiest, such as L. tigrinum, elegans, Canadensis, superbum, Philadelphiaicum, speciosum, tenellum, etc., are best covered by a mound of ashes, straw or coal— which retains an even temperature. The other lilies may be mulched with manure and L. candidum with leaves. Eremurus in all its species, and Alstroemeria aurantiaca, require a deep box of leaves and the surrounding soil also mulched. An inverted V-shaped trough placed over such low edging plants as Veronica circuvoides and Thymus Serpyllum, var. montanus, is beneficial. It is well to take up a few plants of Monarda didyma, the double perennial sunflower, and Thymus Serpyllum, and winter them in a coldframe, over which 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

evogrees, 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 tetraphylla, and in the eastern states Magnolia grandiflora, hollies, 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 retinosporas 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 hardness may have their branches tied in and empty casks placed over them, one sitting partially inside the other, and held in place by stakes. Put a cone-shaped covering over the top to shed the snow. Or poles may be set close to the tree, wigwam fashion. Wrap these with burlaps, or wind string around them for the straw to lean against, and in both instances wrap with straw.

The so-called hardy climbing roses, such as the Seven Sisters and Prairie Queen, which are hardy without protection but are benefited by it, Wichurana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Penzance Sweetbrier hybrids, if against a wall, may have clematis or
other vines placed thickly over them; or if in an open exposed situation, they may be wrapped in straw. Fig. 2731. Better still, hill up the soil quite high at the roots, 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, choosing a time when there is no frost in them, and cover with soil or sod. If the presence of a lawn prevents venting this method, lay on the grass and cover with a water-tight box filled with leaves. Canes will rot directly open, mounds allow them to remain prostrate some time after uncovering to inure them gradually to the change and to induce the lower buds to strengthen. Hybrid perpetuals, the tender ferns, roses, Herminium, Clothierii, Scaphium, and the dwarf polyanthus, may be wrapped, boxed or bent over and covered with soil. 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 of their names, and all summer labels stored to prevent loss when removing the leaves in the spring. Make a solid frame around them, higher at one end, and fill with leaves so as to cover the plants. Lap the roof boards; they will shed water until new 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 or large enough to prevent the plant from touching the wood. Hibiscus Syriacus, diervillas, deutzias—except D. Lemoinei and D. parviflora which are hardy—Hele Virginica, Cornus Mas, etc., are wrapped and when the thinnings exceed four feet in height they should be staked to prevent high winds from toppling them over. Rhododendrons and Asa tea 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 coldhouse 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 clematis 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 any early blooming bulbs are injured by these varieties should not be bent over, but staked and wrapped. It is best not to cut the foliage of the euclasias 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 tarp paper or water-tight shutters. Place half-rotted leaf-mold over fern beds, narcissi, English and Spanish iris or any early blooming bulbous plant, or a light-strawy covering that is easily removed. Fine old manure a few inches thick is good and can remain. Place a good coating of stable manure around the trees on the lawn, and 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 duty to perform—to be feeding and the grass.

Place short stakes around groups of platymeodos, J. tiberosa, or any other plants that are late to appear in the spring. Otherwise they may be overlooked in their growing and injured by grassing. 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 stylus. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the trunk of the tree on the ground. Such a label is durable, unobtrusive and requires no attention for fear of cutting the wood, nor can it be lost.

W. C. EGAN.

Pits, Cold Pits, Storage Pits and Plant Cellars (Figs. 2736-2742) are structures, with the greater part sunk beneath the surface of the ground, built for the purpose of protecting plants in winter without continued fire heat. They are employed almost exclusively for storing dormant plants. They are not suitable for storing growing plants any length of time, neither are they houses in which to grow plants. They should face the south, and be protected from the winds by 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-pit (Fig. 2741) is very useful for storing tubers and corms.

The coldframe (see Frame) used by market-gardeners for wintering cabbage and lettuce for spring planting, or by the florists for paeonies, primroses, forget-me-nots, etc., is really a simple pit. Such shallow pits, covered in with straw or manure from March to May, and protected with boards, which would be injured by severe weather. A deep pit, like a coldframe, is shown in Fig. 2736. A pit built on the plan of the old-fashioned "outside cellar" (Fig. 2737) is very useful for storing tubers and corms. See that it is well ventilated. A section of another pit is shown in Fig. 2738. More elaborate pits, for accommodating large plants, are illustrated in Figs. 2739-42.

Forms of Pits.—Consult Fig. 2741, in which the numbers are marked for convenience Nos. 1, 2, 3 and 4, and Fig. 2738 for the inexpensive and convenient pits for small and medium-sized plants. They may be built 4 ft. or less deep, with a board 2 ft. or more under the ground, the height and width as shown in the diagrams, the length being some multiple of 3, any thing between 9 and 30 ft., so that the glass roof may be made of hotbed sash and also protected by the straw mats and wooden shutters in common use. See Hotbeds.

These pits are useful for storage in winter and also for carrying some of the 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 achimenes during the summer. They are generally too deep for dund 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 plank instead of glass, and if it is covered with a glass roof on both sides, Easy access to all is obtained through the roof by removing a sash. Sometimes a door can be built at one end of No. 3. No. 2 does not differ much from No. 1 and furnishes more room. By putting a few doors in the north and east it will furnish ventilation. No. 3 gives the best head-room, but is rather dark for evergreens with soft foliage, etc.,

2734. Protecting plants by covering with a box, inside which are placed leaves or straw.
Cytinus Conariciens, 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 se-

2738. Nurseryman's cold pit.

A cheap device for wintering plants that require comparatively little light.

cured 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 inner 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 cement; a good brand can be obtained at about $1.29 per barrel to two parts of clean sharp sand. After a thorough mixture, add enough water to make a thick paste. Add to the 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. Continuance of small batches are made until the work is finished. When the top layers are going in, insert 3/4-in. iron bolts 6-8 in. long at intervals of six ft. These secure the wooden sill. 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.

2737. An outside cellar, in which to store roots and tubers, and pots of resting stuff.
WINTER PROTECTION

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 good grade hotbed 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 exposures. 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, 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 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, stervas, etc.; next the Asplenium, Cyrtisus Canariensis, heaths, etc., some of which remain for the winter, while others are replaced by hardy shrubs, bulbs and other plants for forcing. For spring and summer use, see above.

In eastern Massachusetts gardeners begin to use them in September, but the final storage sometimes is not finished until Christmas. The longer the plants can be kept in the open air the better fitted they are for their winter quarters.

In the care of pits, watering and ventilation are of prime importance. When first housed the plants should be well watered, and if this is carefully done, it will often be found that no further water is required for plants in tanks and large pots (10 in. or more). This is also true of heeled-in stock. Everything, however, should be so arranged that inspection is easy, and water should be given when necessary. Placing on the shelves, 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

2739. A durable storing pit or cellar for very large plants.

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 them as possible. On sunny days ventilate whenever the thermometer registers over 20°. Conserve heat and begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the morning above freezing, remove the sashes entirely. This is the best way to get rid of the continual air, and is essential for keeping evergreen plants with soft foliage in good condition. For changing the air in large cellars is more troublesome; here it is advisable to build and open fires in the afternoon.

2740. A doorway in Fig. 2739.

PROTECTION

or

F

WINTER

OF

PLANTS

LIST

OF

PLANTS

THAT

CAN

BE

WINTERED

IN

PITS.

1. Hardy plants.

A. Hardy plants.

1. Nursery stock of evergreen description that may be required for shipment in winter and early spring.

2. Stocks, cions and cuttings for working during the winter.

3. Young nursery stock,—seedlings, cuttings or grafted too delicate for planting in autumn.

4. Hardy plants of all kinds for forcing or winter decoration.

The temperature of pit or cellar for the above plants should be 50° F. or even lower occasionally. The larger plants should be heeled-in on the floor in sandy loam or in bank-like shelves, along the sides. Instead of loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock is stored in flats or pans in which it has been grown. Particles of brick are 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. Alstromeria, canna, dahlia, gladilous, Milla billova, montbretia, oxalis for summer bedding, tuberose, tigridia, Zephyranthes Atamasco, Z. candida. Keep the above in dry house-cellar, where no frost penetrates, temperature 35-40° F. Dahlias and canna be covered with dry sand if prone to wilt. Tigridias should be hung up in bags to avoid mice.

2. Agave, also, Lippia citriodora, Datura suaveolens, some of the hardier eacti, e.g., Cereus grandiflorus and Opuntia Ficus Indica. Cordyline indivisa, fuchsia, Yucca gloriosa and probably other genera and species of succulent plants. Keep at temperature 35-40° F. in a very dry house-cellar, with as much light as possible; too much moisture is destructive.


Wisconsin 1985

Prunus Lauro cerasus and others, *Psidium Guajava, *Punica Granatum, retinopora in variety, rhododendron (tender hybrids), Romneya Coultleri, roses (Bourbon, Noisette, China, Bengal and other tender varieties), *Ramalina officinalis, Sequoia gigantea, Taxus, Trachelospermum Jasminoides, Ulmus Europaeus.

The above plants are commonly handled in pits for various reasons. In eastern Massachusetts, with the possible exception of those marked with a star (*), they will bear a few degrees of frost, if 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 carrying them through the winter in good condition, but also in giving them a good start in the spring. For this purpose a cool greenhouse must be provided; a cold graper or a house constructed from the sashes used on the pits is equally good, in which the plants can be properly grown until it is warm enough to put them out-of-doors.

4. *Anemone Japonica and A. coronaria, *Bellis perennis, *Dianthus Caryophyllus (clove pinks and European carnations from seeds), *Gaulax aphylia, myosotis sorts, primula in variety, including auricula, Persian ranunculus, Viola odorata (tender sorts), pansies, wall-flowers, lettuce, cabbage, cauli-flower and parsley. These plants are advantageously wintered in coldframes, which should vary in depth with the size of the plant; sometimes the plants are grown in pans or were in the frame, at others they are bedded out when the season permits.

5. *Arisaema, arum, calochortus (different species), freesia in variety, iris (tender species), lilies, spāraxis. The above plants can be potted, November to December, and carried in a pit until wanted in the greenhouse.

B. M. Watson.

Wisconsin, Horticulture 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 variations, and with the exception of some rather large sandy and marshy tracts, is mostly very fer
tile. 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 eastern ocean. The skies, while clearer than in the eastern states, are somewhat more cloudy than in Iowa and Minnesota.

Droughts 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 hardier species and varieties, save 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 Minneapolis and St. Paul 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 northwestern counties. These orchards are located in Fond du Lac, Green Lake, Richland, Sauk, Door and Waupaca counties. The first named county has one orchard of about 6,000 trees, mostly Oldenburgh, located near Ripon, and a second of about 2,000 trees of varieties at Eureka. These orchards are supposed to be the largest in the state.

The older orchards of Wisconsin are the outcome of a long process of climate selection. But the farmers who were most anxious to plant trees in the hope of finding some that would prove satisfactory, and these hopes have been in part realized. Occasionally seedling trees that grew up in fence corners and elsewhere, from chance seed 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 these sorts, and the Oldenburgh. The Russian apples imported by the United States Department of Agriculture and the Iowa Agricultural College have been quite largely planted in Wisconsin, but none have taken a foothold. The chief Wisconsin apple culture in Wisconsin, aside from winter- killing, 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 otherwise. The apple scar is often serious in too closely-planted orchards.

It is controlled to a degree by spray. The apples of Wisconsin are, as a rule, highly colored and of large size, and the trees are very productive.

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 affections than the hardier sorts of American origin, or from western Europe. Pears are frequently grown for home use in the eastern counties, and these fruits are equally productive and long-lived. The Flemish Beauty has perhaps been more successful than any other sort.

The quince is less hardy in Wisconsin than the pear, though it occasionally succeeds in the western 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 triflora, are fairly fruitful in the eastern part, notably in Door and Kewaunee counties. The trees of the last two species, as of those of Prunus persica 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. Pears are better adapted to Wisconsin than these and 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 European and Japanese plums. The Montmorency, as an exception, have been more successful and less protected are usually short-lived. Several varieties of Prunus Cerasus, introduced from Russia, have been tested at various points in the state. While the flower-buds of these do not appear to be as hardy as those of the above-named sorts at Kewaunee, the 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 crops are 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, and berries, except in the extreme northern part of the state, are extensively grown. 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 business in Wisconsin, peas, sweet corn and tomatoes being chiefly consumed. Kitchen-gardening is less practised in Wisconsin than it should be. The farmers generally employ little hand labor, and the hot summers render city gardening more or less unsatisfactory. For the same reason the private growing of flowers receives less attention than in the eastern states.

The shaded areas include most of the region adapted to apple culture. Cherries do fairly well in the apple districts.

WISTARIA (Caspar Wistar, 1761–1818, professor of anatomy in Univ. of Pa.). *Leguminosae*. As a genus Wistaria is a small and imperfectly understood group. A complete study of the pods and seeds of this and allied genera will eventually result in a great shaking up of names. The present treatment is as conservative as possible, out of deference to trade interests. The oldest generic name is *Krausia*. For a more radical point of view see B.M. 7352 and B.B. 2: 224. Beside those mentioned below, there are three species, but they are all of doubtful botanical status. *Lvs. odd-pinnate; ftts. entire: racemes terminal: calyx with the 2 upper teeth short and subconnate: standard large; wings oblong-falcate, free from the keel, often coherent at the apex: keel incurved, obtuse.*

*Wistaria chinensis* is one of the best and commonest of hardy climbers. It has pale green, pinnate foliage and
is to let it alone. This produces rugged, twisted and picturesque branches and gives a certain oriental effect, but it is not the best method for covering a wall space solidly or for making the best display of bloom. To cover a wall completely it is necessary to keep the leaders untamed and to train outside branches wherever they are needed. If quantity of bloom is the first consideration the vines should be pruned back every year to spurs, a common method in Japan. The Japanese chiefly use another species, W. multiflora, which often passes in our nurseries under the name of W. Sinensis, the clusters of the Japanese favorite sometimes attaining 5 or 4 feet. The low, one-storied Japanese building will have a Wistaria so trained that the vine follows the eaves all round the house. The foliage is all above, and the yard-long clusters of purple blossoms depend therefrom in solid, unbroken, linear masses, 2 or 3 ranks deep. W. multiflora is said to be less vigorous and productive in America and Europe than Japan. When trained as a standard the Wistaria requires much care. Probably the finest standard Wistaria is that figured in G.F. 6:256 and G.F. 1:321, where full directions for cultivation may be found. The following dates of bloom will be useful to those who reckon from the latitude of New York: W. sinensis, May 11; W. multiflora, May 4.

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1. **Chinensis**, DC. (W. Sinensis, Sweet. W. consanguinea, Loud. W. polysychy, C. Koch.), CHINESE WISTARIA. Figs. 2744, 2745. Hardy, fast and tall growing climber with pale yellow or carmine flowers. **Uses.** In Japan, W. Sinensis, is a favorite shrub, and is extensively cultivated. In the United States, its growth is much slower and it remains a fairly tall climber. It is a very hardy plant and is used extensively for covering walls and training on arbors. The flowers are large, fragrant, and appear before the foliage. The leaves are compound, consisting of 3 to 9 leaflets. The fruit consists of several small, flat, pod-like structures, each containing a single seed. The seeds are dispersed by the wind. **Cultivation.** In general, W. Sinensis is a hardy plant and requires little care. It thrives in a sunny position and is usually propagated by layering or from seed. **Notable Varieties.** W. Sinensis var. speciosa has large, showy flowers and is often cultivated as an ornamental. W. Sinensis var. rubra has red flowers and is also popular as an ornamental. **Propagation.** W. Sinensis is usually propagated by layering or from seed. Layering involves attaching a branch to the mother plant and allowing it to grow until it is ready to be transplanted. Seed is also used for propagation, but it is slow and not as reliable as layering. **Use.** W. Sinensis is grown primarily as an ornamental, for its flowers, foliage, and habit of growth. It is used in gardens, parks, and along hedges. It is also used as a screen, to cover walls, and to add color and interest to landscape plantings. **Cultivation.** W. Sinensis is a hardy plant and requires little care. It thrives in full sun and well-drained soil. It is propagated by layering or from seed.

**Typical form.** Single purple flower, 4 to 6 inches across. **Uses.** In China, W. Sinensis is used as an ornamental, for its flowers, foliage, and habit of growth. It is used in gardens, parks, and along hedges. It is also used as a screen, to cover walls, and to add color and interest to landscape plantings. **Cultivation.** W. Sinensis is a hardy plant and requires little care. It thrives in full sun and well-drained soil. It is propagated by layering or from seed.
2:463 (both erroneously as W. Chinensis). M.D.G. 1898:477. 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.

3. speciosa, Nutt. (W. fistulosa, Poir.). AMERICAN WISTARIA. KIDNEY BEAN TREE. Not as vigorous as the Chinese Wistaria but climbing over trees and bushes to a length of 20-40 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-fl.: fls. ¾-1½ in. long; pods long, torulose, 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). F.S. 2:294.-Var. brachydôtrîs, Sieb. & Zuc. SHORT-CLUSTERED WISTARIA. Japanese species, distinguished from all others by its low growth. It is said to attain only 3-5 ft. and should therefore be particularly desirable for standards and bushy specimens. Lfts. 9-12, silky; racemes about 6 in. long, about 25-fl.: fls. purple, ½ in.

WONGA WONGA VINE. Tecoma australis.

2746. Wistaria multituga, often called Japanese Wistaria. (X ½.)

WITLOOF. A form of Chicory (which see).
WOAD. See Isatîs.
WOLFBERRY. Symphoricarpos occidentalis.
WOLFSbane. See Aconitum.
WOOD BETONY. Stachys Betonica.

2747. Woodsia ilvensis (X 1/2).

WOOD BETS. In England, Lonicera Periclymenum; in America, Amepolysis quinquafolia.

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, including 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.

Ilvensis, R. Br. Fig. 2747. Lvs. growing in rosettes or tufts, 3-8 in. long, 1 in. or more wide, bipinnatifid; segments crowded, obscurely crenate; sorus confluent when old. Eu. and N. Amer. north of Va. obtusa, Torrey. Lvs. clustered, 6-15 in. long, 2-4 in. wide, minutely glandular-hairy, bipinnate; pinnae rather remote, triangular-ovate. New England to Arizona.

L. M. UNDERWOOD.

WOOD SORREL. Oxalis Aesh- tosellae.

WOODWARDIA (Thomas J. Woodward, an English botanist). Poly-podiaceae. A genus of rather coarse-foliaged ferns of diverse habit and structure, but all bearing the sorid in rows arranged parallel to the midrib like links of sausages. Commonly known as the Chain Fern. See Fern.

A. Lvs. of two sorts, the veins everywhere forming areoles.

areolata, Moore (W. angustifolia, 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.

AA. Lvs. uniform.

b. Veins forming one or more series of areola.

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 buds 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 new.

orientalis, Swz. Lvs. 4-8 ft. long, 12-18 in. wide, with lanceolate pinnae and sinuate pinnules; veins uniting freely. Japan and Formosa.

bb. Veins free between the sorid and the margin.

Virginia, Smith. Fig. 2748. Lvs. 12-18 in. long, 6-9 in. wide on stout 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.

WOOLY 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 Scoparius variculata, Linn., S. subtiliosa, Linn., S. turcica, Linn. S. subulata, Linn., Medicago scutellata, Mill., and Artemisia hamosa, Linn. The last is the one usually known as "Worms." The picture, Fig. 2749, shows species of Scoparius, chiefly S. variculata (beneath) and S. subtiliosa (above). All these various plants are annuals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See Caterpillar. L. H. B.

WORMSEED. See Chenopodi- um.

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 shaggy stems 2-4 ft. tall, which bear abundant, much divided, hoary leaves of intense and persistently bitter flavor, and pinnacles of greenish or yellowish flower heads. The seed, grayish and very small, retains its vitality for about four years, but is usually sown soon after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and,
WORMWOOD

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. 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 Bithye, the green color of this liquor is due not to Wormwood but to the chlorophyll of spinach, parsley or nettles. The plant may be grown without trouble in light, dry, rather poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out the few specimens necessary to furnish a family supply should be placed not closer than 15 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. Cuttings thus taken 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 seabra.

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 altitude. 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 are cultivated areas at less than 3,500 feet altitude, and farming is practiced on high plateaus or in mountain valleys up to 8,000 feet. Wyoming embraces an area 355 miles from east to west and 275 miles from north to south, in the very heart of the Rocky Mountain region. As would be expected, 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 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 2,600,000 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 food 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 a 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

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.
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; 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 legumes 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 harder kinds are successful at much higher altitudes in protected locations. The Wealthy apple has been successfully fruiting 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 fruitied in the state, arranged as nearly as possible in the order of their apparent hardiness and present abundance: Standard—Wealthy, Oldenburg, Antonovka, Gideon, Future, Wolf, Tetofsky, Ben Davis, Transparent, Pewaukee, Pippin, Crab—Siberian, Montreal, Whitney, Martha, Van Wyck, Soulard, Transcendent.

B. C. Buffum.
XANTHISMA (Greek, dyed yellow, referring to the color of the fls., Compositae. A genus of only one species, a summer-blooming, yellow-flowered, composite with heads 1-1½ in. across, composed of a small disk and about 20 rather slender rays. This plant is known to flower-seed catalogues as Centaureodium 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: akenes top-shaped, 4-5-ribbed or angled; pappus persistent, composed of 10 or 12 rigid bristles which are minutely scabrous above, gradually chaffy-dilated towards the base, and longer than the disk-corolla, as many more than half shorter, and usually 5 still smaller and shorter external ones.

Texanum, DC. (Centaureodium Drummondii, Terr. & Gray.) Fig. 2752. Nearly glabrous biennial or annual, 1-4 ft. high: lvs. narrowly oblong to lanceolate; stemb. lvs. entire or with a few teeth toward the apex: fls. attaining a diam. of 2 in. even in the wild. W. M.

XANTHOCHÆRAS (Greek, xanthos, yellow, and keras, horn, alluding to the yellow horn-like processes of the disc.) Sapиндaceae. Ornamental deciduous shrub or small tree with alternate, odd-pinnate lvs., showy white fls. in terminal and axillary racemes, appearing with the leaves in spring on last year's branches. The large greenish flowers are similar to those of the buckeyes. X. sorbitolus, the only species, is hardly 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 a moderate bottom-heat. A monotypic genus from N. China, allied to Ungnadia and Koelreuteria: fls. polygamous, the upper ones of the terminal raceme pistillate, the lower ones stamine, those of the lateral racemes stamineate, with rarely a few pistillate ones at the apex; sepalas and petals 5; disc with 4 suberect cylindrical 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 locule with several gloseob, dark brown seeds.

sorbitolus, Bunge. Figs. 2753, 2754. Shrub or small tree, attaining 15 ft., with rather stout upright branches, glabrous: lvs. 6-12 in. long; lfts. 9-17, usually oppo-
site, sessile, narrow-elliptic to lanceolate, sharply serrate, dark green above, paler beneath, 1-2 in. long; rac-

ALFRED REIDER.

XANTHORRHEA (Greek, yellow flow, referring to the resin which exudes from the trunks.) Junceae. The "Grass Trees," "Grass Gum," or "Black Boys," which form conspicuous features 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, surrounded by a dense, conical 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, scapose, opposite flower-stalk, terminating in a dense cylindrical spike of numerous, closely packed greenish flowers. These picturesque desert plants are well worth trial in the warmer and more 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 discolored by bush fires. The following species have been offered in southern Fla. and southern Calif., but are practically unknown to cultivation in this country. All the species are long-lived perennials native to dry and rocky places. They are said to thrive in a compost of peat and loam and to be propagated by offsets. X. Preissii seems to be the most desirable species.

Xanthorrhæa is a genus of 11 species of Australian

(1903)
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 Australiensis 7:112.

2753. Xanthoceras sorbifolia (X ⅔). (See p. 1993.)

a. Trunk very short.

b. Spike 2-3 in. long.

minor, R.Br. Lvs. 1-2 ft. long, 1-2 lines wide: scape longer than the lvs.; spike less than ¾ 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 (X ⅔).

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; lfts. small, dark or purple. April. Damp and shady places, southwestern New York southward. A.G. 1891:289. B.B. 2:55. —Var. ternata, Huth. Lvs. only tertiate; lfts. often more deeply lobed, the sinuses entire. Same distribution.

K. C. DAVIS.
XANTHOSOMA

Xanthosoma (Greek, yellow body, referring to the stigma). Aroidae. This genus is interesting to the horticulturist as containing the handsome variegated stove foliage plant known as Phylotum 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 scald and more or less poisonous properties are dispersed by the expression of the juice, or by its dissipation through heat” (B. M. 1989). 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 “Yantia 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 Phaner. vol. 2 (1879). They are milky herbs of South and Central America with a tuberous or tall and thick rhizome: lvs. arrow-shaped, 3-cut or pedately cut: fls. unisexual, naked: males with 4-6 stamens connate in an inversely pyramidal synandrium with 5 or 6 faces: ovary 2-4-loculated; ovules anatropous.

a. caulis erect, thick, erect rhizome.

sagittifolium, Schott (Arun sagittifolium, Linn.). Malanga. A tropical vegetable, “young plants of this are stemless, but in age, from the decay of the old lvs., an annulled 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. 1988). 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. 1989.—In northern hot-houses said to bloom in winter.

2756. Xanthosoma Lindeni. Leaves a foot or so long.

AA. Caudex tuberos.

Lindeni, Engl. (Phylotum Lindeni, Andrés). 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. L.H. 19:39. A.G. 19:573 (1898).—Tuberous plant from Colombia. G. W. Oliver, in his “Plant Culture,” remarks that this stove ornamentalplant 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 re-potting, put the pieces in a warm sand-bed to encourage fresh roots. Lvs. oblong-hastate, with acute basal lobes.

X. belophyllum, Kunth. has a short, thick, erect rhizome and a cordate-hastate leaf. Venezuela. Var. Caracasanaum, C. Koch (X. Caracasanaum, Schott. Colocasia Caracasana, Engl.), has lvs. pale green beneath, the posterior lobes more produced at the apex and the midrib and nerves often rosy. Caracas.—X. Mañafia, Schott (Colocasia Manafia, Hort.), closely allied to the preceding, has a similar caudex and a cordate-ovate leaf but the posterior costa are separated by a right or acute angle, the angle in the preceding species being obtuse. W. M.

XANTHÓXYLUM (Greek, xanthos, yellow, and xylon, wood). Sometimes spelled Zanthoxylum. Including Fagara. Puckly Ash. Tooth-Ache 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. Americum 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 Sargant 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: Ivs. odd-pinnate, 3-foliate or rarely simple; fls. dioecious or polygamous, small, in cymes or panicles; sepals, petals and stamens 3-8, sepals often wanting; pistils 3-5; fr. composed of 1-5 separate small dehiscent caps, each with 1-2 shining black seeds. 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.

**Américanum,** Mill. (*X. fraxineum*, Willd. *X. raimillorum*, Michx.). **Prickly Ash.** Fig. 275f. Shrub or small tree, attaining 25 ft., with prickly branches: lfts. 5-11, opposite, almost sessile, ovate, entire or crenate, dark green above, lighter and pubescent beneath, 1½-2 in. long; fls. small, greenish, in axillary sessile cymes, appearing shortly before the Ivs.: seeds black Quebec to Neb. and Va. B.B. 2553.


**XENIA.** The immediate influence of pollen—the influence on the fruit that results directly from a given pollination.

**XERANTHEMUM** (Greek, dry flower: it is one of the "everlastings"). **Compôsice.** 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 coryfy; involucral scales in many series, of various lengths, glabrous; heads solitary on long naked pedicles.

The culture of Xeranthemum is very simple. Seeds are usually sown in the open, when the plants are 2 ft. tall; but they may be started indoors and the seedlings transplanted. Hardy or half-hardy annuals.

**2757. Leaf of Prickly Ash.** **Xanthoxyllum Americanaum (X.$^{\frac{1}{2}}$).** Showing paired prickles resembling stipular spines.

**XERANTHEMUM annuum** Linn. Fig. 2758. Annual, 2-3 ft. tall, erect, white-tomentose: Ivs. alternate, oblong-lanceolate, acute, entire; heads purple, 1-½ in. across, the longer scales wide-spreading and ray-like. S. Europe. Runs into many varieties. Var. ligulósium, Voss (*X. plenísimum* and *X. imperátile*, Hort.). A double or half-double form. Var. perligulosum, Voss (*X. super bíssimum*, Hort.), has very full double heads. In these and the single types there are white-fld. (var. album), rose-fld. (var. roseum) and purple-fld. (var. purpureum) varieties. There are also violet-fld. forms. Var. multiflorum, Hort. (var. compactum) has a more compact and
busky habit, with somewhat smaller heads. X. varius, Hort., is a trade name for mixed varieties.

X. inapertum, Mill. (X. erectum, Pers.) 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.

XEROPHYLLUM (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-parted fls. each ¼ in. across. It blooms from May to July, &s, with delicate fragrance lasting a long time. It is a handsomer 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 literally 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. Xerophyllums 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. being first; perianth-segments oblong or ovate, 5-7-nerved, devoid of glands; stamens 6; ovary 3-grooved; styles 3, reflexed or recurved; capsule loculicidally and sometimes also septicidally dehiscent. Watson in Proc. Am. Acad. Arts. Sci. 14:284.

A. Raceme 5-6 in. long or more: perianth-segments exceeding the stamens: lvs. one line or less wide.

setifolium, Michx. (X. asphodeloides, Nutt.). Fig. 2738. A tall hardy perennial herb described above. Varieties in height from 1-4 ft. Found in the pine barrens, eastern U. S. B.M. 748 and L.B.C. 4:394 (both as Helonias asphodeloides). Gnm. 1:175. A.P. 7:171.

2738, Xerophyllum setifolium growing near the margin of a pond.


AA. Raceme 1-2 ft. long; perianth-segments scarcely equaling the stamens: lvs. about 2 lines wide. pedicels longer, mostly 1-3 in. long.


W. M.
XIMÉNIA (Francis Ximenes, Spanish monk, wrote on plants of Mexico in 1615). *Oliveae*. 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 ¼ 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 baccate, not inclosed in the calyx.

**Americana**, 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 2-4-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 lutea*. 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.

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2760. Yucca arborescens, the tree Yucca, or "Yucca palm," of the Mojave region.
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. Xanfhorrhiza.

YELLOW-WOOD. Cladrastis tinctoria.

YERBA BUENA. Micromeria Douglasii.

YEW. See Taxus.

YOUTH-AND-OLD-AGE. Zinnia.

its forms, and glauca are hardy in the northern states, and Y. Treculeana shows considerable resistance to frost. The tender species are kept in the cactus house. Well-drained sandy loam suits them best, but with good drainage they are tolerant of a large range of soil and exposure. Prop. by seeds, offsets, stem-cuttings, and the rhizomes that several species produce, which may be cut into short lengths and rooted in the cutting bench.

Y. Treculeana blooms usually in March in plant houses, as when wild, and the Mexican species when brought to flower are usually spring bloomers, but they often refuse to flower for long periods and then suddenly and unexpectedly produce an abundance of simultaneous bloom, even on the smaller plants. Of the hardy species, Y. glauca flowers in June and it is quickly followed by Y. filamentosa and Y. flaccida, while the forms of Y. gloriosa, which usually flower only at intervals of several years, bloom from late August to so late in the autumn as to be cut down by frost.

Most species may be fertilised if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. Y. aloifolia commonly fruits freely, but the others rarely fruit spontaneously in cultivation except Y. filamentosa and Y. flaccida, which are pollinated by a small white moth (Promus yuccasella) that accompanies them when cul-

2761. Yucca Whipplei.

YUCCA (Indian name for the Manihot, erroneously applied by Gerarde). Liliaceae. About a dozen species, chiefly of the arid North American table-land and con-

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The great Yuccas, or "Yucca Palms," of southern California (Fig. 2760) are chiefly Y. arborescent. 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.

2. **filamentosa**, Linn. Figs. 2762, 2764-5; 1052. Sometimes called Adam's Needle, Bear Grass, Silk Grass, or Thread Yucca. Acaulecent; lvs. 1 in wide, rather weak, somewhat concave, glaucous when young, short and stout, pointed from the acute apex, with curly marginal fibers; panicle loose, long-stalked; fls. creamy white; style white. Southeastern U. S. B. M. 900. A yellow- or white-margined form is var. variegata, Carr. B. B. 1:427. Var. coneava, Engelm. (Y. coneava, Haw.). Lvs. broadly spatulate, plicate, concave. N. C.

3. **flaccida**, Haw. (Y. puberula, Haw. Y. orchioides, Carr.). Lvs. more flexible, recurving, not pungent, gradually tapering, with thinner and less curly fibers. Eastern U. S. B. M. 1855. B. M. 6316.—Usually cultivated for the preceding, and comprising several forms. Vars. exigua and intigrata have the leaf-margin brown, without detaching fibers.

4. **glaucia**, Nutt. (Y. angustifolia, Pursh. Y. Hanburyi, Baker). Fig. 2766. Lvs. less than ⅓ in wide, thin but stiff, flat, acutely and pungently pointed, with white margin from which slender fibers detach themselves, whitish green; panicle with 1 or 2 short branches within the cluster of leaves, or usually reduced to a rachis; fls. greenish; style green. Rocky mountain region and plains. B. M. 2336. G. F. 2:247. Rept. Mo. Bot. Gard. 6, p. 7. B. B. 1:427.—Var. stricta, Trel. (Y. stricta, Sims). Inflorescence freely branched at top of the leaf-cluster. Southern plains. B. M. 2222.

5. **gloriosa**, Linn. Nearly stemless or with slender trunk, 10-15 ft. high; lvs. 1-2 in wide, thin but not re-
2765. Flowers of Yucca filamentososa (× ¾).

2767. Yucca Treculeana—A much suckered specimen.

2766. Group of Yucca glauca, better known as Y. angustifolia.

with median whitish stripe on the lvs. is var. mediostrìata, Planch. Among the numerous varieties and forms into which this, the first-cultivated Yucca, has sported, the following are most worthy: Var. plicata, Carr. Lvs. very glaucous, strongly plicate. G.C. Pl. 26:310. Rep. Mo. Bot. Gard. 3, pl. 6. Var. recurvifolia, Engelm. (Y. recurvifolia, Salisb. Y. recurvja, Haw. Y. pannula, 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. 1868, p. 432; 1890, 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. nobile, Carr. (Y. Eliacombei, Bak.). Lvs. glaucous, not plicate, less recurved. Var. flexillosa, Trel. (Y. flexilis, 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-fruit species have been artificially produced in Europe. and are in some European gardens under the names Y. Deleuili, Y. anulata, Y. Carrierei, Y. Andreana, Y. draconoides, Y. striatula, Y. Massetiliosa, Y. esfera, Y. loricata, and Y. juncea. R.H. 1886, p. 63; 1895, p. 81. For descriptions see R.H. 1893, p. 109. Other hybrids 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. 1766.—Variegated forms are: Var. marginata, Bommer. 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. Dracónia, Englcm. (Y. Draconia, Linn.). Branching above. Lvs. broad and arching; less pungent. B.R. 22:1894. Var. conspiceus, Engelm. (Y. conspiceus, Haw.). Tall, the stems clustered at base; lvs. broad, recurved, softly green-pointed.


8. Treculeana, Carr. (Y. canaliculata, Hook. Y. dippa, Regel. Y. longifolia, Buckley. Y. Vandervin-ría, Koch. Y. argopódita, 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.
ZALUZIANSKYA (after a Pole, who wrote Methodus Herbariae, Prague, 1592). Including Nystertia, Serophalloides. About 16 species of S. African herbs and subshrubs, belonging to these three genera as known as Night Bal-
sams or Star Bal Sams, from their night-blooming habit. The name Night-blooming Phlox would be better, as the flowers are saucer-shaped and 5-lobed, each lobe being clothed by tiny glandular hairs. Plants usually treated as half-hardy annuals, the seed being sown indoors in early spring. The plants bloom in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very un-
satisfactory and urge that the seed be sown in the au-
tumn and the young plants wintered in a coldframe. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night. Zaluzianskyas are more or less viscosum plants: lowest lvs. opposite, upper ones alternate, usually few-toothed: fls. sessile but long-tubed, disposed in leafy spikes which are cylindrical or flat-topped; calyx 5-toothed, 2-
lipt 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 Zaluzianskyas 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 Zaluzianskyas of the puzzling trade name Zaluzianskyas dypsis, Zaluzianskyas gracilis, Zaluzianskyas speciosa. 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, vases and window boxes, uses to which Erinus alpinus is eminently adapted. E. speciosa 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
Zaluzianskyas, being a synonym of Z. lychnidea, a plant of erect habit with white fls. that are violet outside. Although Erinus and Zaluzianskyas are placed in differ-
ent families of the Acanthaceae, it is difficult to sepa-
rate them by any one important botanical character un-
less it be the shape of the stamens, which is oblong in Zaluzianskyas, 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. The other names 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-
lobes bifid.

A. Corolla-tube slightly pubescent.
B. Duration perennial; bracts broadly lanceolate; lvs. oblong-linear.

high, with fls. ½ in. long, ¾ in. across, white, violet
outside. B. M. 2504, B. R. 9:748 (both as Erinus lychnidea).

BB. Duration annual; bracts oblong-lanceolate; lvs. linear or the lower ones lanceolate.
Capensis, Walp. (Nystertia Capensis, Benth.). Dif-
sers from the above, according to Bentham, in stature, duration of stamens and capsules, lvs., but unfortu-
nately Bentham does not give the height of the plant or color of the fls. According to R. H. 1851:221, the plant has white or lilac flower-clusters on the same plant, each flower bearing an orange eye. The spikes, accord-
ing to Bentham, are commonly short and 4–8-fld; also by division when there is more than one crown.

ZAMIA (name used by Pliny, meaning loss or dam-
age, and first applied to barren pine cones, and trans-
ferred 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. 332–547). Other genera of horticultural interest and discussed in this Cyco-
pedia are Ceratozamia, Cycas, Dioon, Encephalartos and Macrozamia. The Zamias are stocky short- and usu-
ally simple-stemmed cycads-like plants, the trunk some-
times 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 diocious, without en-
velopes; the pistillate flowers are mere naked ovules in-
serted under scales in cones, and the staminate flowers
are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not inclosed in a pericarp or ripened ovary) and are allied to the conifers. The 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 fecundation of Zamia has been studied by H. J. Webber (Bull 2, Bureau of Plant Ind. U. S. Dept. Agr.). His conclusions respecting the Floridian
species are accepted below. Zamias are warmhouse plants, to be treated like spe-
cies of Cycas or Encephalartos, which see. The plants are some adapted to marls, mosses and mires; also by division when there is more than one crown.

ZAMIA Floridana.

2768. Zami Floridana.
ZAMIA

A. Petiole prickly.

furfuracea, Alt. 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, oblanceolate, entire or half serrate or jagged towards the top, acute or obtuse, scurfy beneath (as also the rachis); cone ovate-conical, downy, pedunculate, pale yellowish brown, the pistillate ones 4 in. or less long. Mexico. B.M. 1899.

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 towards the top. Ecuador. I.H.

aa. Petiole not prickly.

b. Species growing beyond the limits of the U. S

integriolâ, Alt. Trunk 12-18 in. tall, erect, globerular or oblong; Ivs. 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 to, are apparently all Z. Floridana and Z. pumila.

Mexicana, Miq. Distinguished by De Candolle as follows; scales of the leaf-buds and tomentose also the petioles at the base, the petioles 3-cornered, unarmured, glabrous, somewhat warty; Ifts. of 9 or more pairs, sub-opposite, narrow-lanceolate, straight or slightly curved, acute or obtus, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex. Mex. - By Index Kewensis referred to Z. Lindeni, a species with prickly petioles.

Pedicellata, Yates (Z. Razzii, Regel). Distinguished as follows by De Candolle: trunk cylindrical Ifts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cuspidate at the apex, with 15 strong nerves which are twice bifurcate. Panama. - Grows on dry trunks.

angustifolia, Jacq. Foliage glabrous when mature; Ifts. 5 in. long, 4-20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrate or entire, the base not narrowed, 6-6-nerved; pistillate cone obtuse but cuspidate. Bahamas, Cuba.

bb. Species native to Florida.

Floridana, DC. Compt. Compt. 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, 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, marily umbonate (projection on the scales), densely tomentose. - Very abundant in southern Florida on the east coast below lat. 26° 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-umbonate cones with seed-bearing scales thinner and more flattened at outer end. - Abundant in central Florida, ranging from 28° 30' north for one degree of altitude, in dense moist woods.


ZANNICHELLIA palastris, Linn. (Niairoidae), or Horned 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 World tropics. It has thread-like submerged Ivs. 1-3 in. long and flowers and fruits under water. It is found in fresh or brackish water. B.B. 1:80.

ZANTE CURRANT. See Raisin, page 1496.

ZANTHORHIZA. See Xanthorrhiza.

ZANTHYXOXYLUM. See Xanthoxyllum.

ZAUSCHNÉRIA (named for a professor of natural history at Prague). Oogræceae. The CALIFORNIA FUCHSIA, or HUMMINGBIRD'S TRUMPET, is a half-hardy perennial plant ¼-2 ft. high, with drooping, trumpet-shaped vermilion Ivs. 1½ in. across and under I 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 obovate 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, 5 stamens, 4-lobed 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 Ivs., 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 choic plant of pendent habit for the steep sides of rockeries and for naturalizing on old walls, or in light and shady parts, and 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 of no value on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.

Californica, Prosl. CALIFORNIA FUCHSIA. HUMMINGBIRD'S TRUMPET. Half-hardy perennial with the flower of a Fuchsia and the fruit of an Epilobium: height

2771. Aggregate fruit of Zamia Floridana (X 3%).

Cones not mature
The ear are both larger than the Sweet or Flint Corns. The color of the kernels varies, the chiefly 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.

Pod Corn (Z. tunicata, Sturt.) is sometimes grown as a curiosity. Each kernel is inclosed in a small husk and the whole ear again inclosed in the usual husk. A form of Flint Corn with variegated leaves goes under the name of Zea Japonica, or Japanese striped Corn. Z. quadrirada and Z. gracilis are seedsmen’s names for other similar forms, the former being variegated and the latter dwarf.

For cultural account, see Corn. A. S. Hitchcock.
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 ornamental maize, 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 in-

Zea mayz, Linn. maize. Indian corn. A composite species, of which no single form can be taken as the type. Linneus meant the name to cover the whole range of forms then known. 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. gracilissima, Koen. (Z. gracilissima and Z. minima, Hort.). Very dwarf, slender form with green leaves, sometimes cult. in Eu. A variety variegata is also mentioned.

Var. Curáguas. Alef. (Z. Curáguas, Molina), is described as a very robust green-leaved form. Sturtevant places it in the Pop Corn tribe. Gn. 42, p. 207.

2774. Zea mayz, var. tunicata (X 3/4).
Each kernel inclosed in a husk.

AA. Maize grown primarily for the grain or fruit.

Var. tunicata (Z. tunicata, Sturt.). Pod Corn. Figs. 2777, 2778. Plate VII. In this group each kernel is inclosed in a pod or husk, and the ear thus formed is inclosed in husks.

Var. everta (Z. everta, Sturt.). Pop Corn. Figs. 551, Vol. I, Plate VII. This group is characterized by the excessive proportion of the corneous endosperm and the small size of the kernels and ear. The best varieties have a corneous endosperm throughout. This gives the property of popping, which is the complete eversion or turning inside out of the kernel through the explosion of the contained moisture on application of heat. A small deposit of starchy endosperm does not greatly interfere with this property of popping, but when the starchy endosperm is in excess, as in a flint Corn, the kernel does not evert, but the corneous portion only explodes or splits, leaving the starchy portion unchanged.

The true Pop Corn is hence tender in its eating; the false Pop Corn has a tender portion of limited extent only. This class of Corns is even more readily recognized by inspection than by description.

Var. indurata (Z. indurata, Sturt.). Flint Corn. Plate VII. Fig. 9779. A group readily recognized by the occurrence of a starchy endosperm, inclosed in a corneous endosperm, as shown in a split seed. This corneous endosperm varies in thickness with varieties. When very thin at the summit of the kernel the shrinkage of the starchy endosperm may cause a depression, thus simulating externally a dent from which its structure at once differentiates it.

2775. Ear of Zea canina, second year from the wild. Cob flat-tish (X 3/4).


2777. Pod or Husk Corn. — Zea mayz, var. tunicata (X 3/4).

2778. Cross-section of ear of Husk Corn (X 3/4).
ZEA

Var. indentata (Z. indentata, Sturt.). Dent Corn. Fig. 2780. Plate VII. A group recognized by the presence of corneous 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 corneous endosperm varies in height and thickness, thus determining the character of the indented surface.

2779. Flint Corn. Var. indentata (X 1/2).

Var. amylacea (Z. amylacea, Sturt.). Soft Corns. This group is at once recognized by the absence of corneous 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, horny appearance of the kernels and their more or less crinkled, wrinkled, or shriveled condition.

Var. amylacea-saccharata (Z. amylacea-saccharata, Sturt.). Starry-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). Commelinaeae. Differs from Tradescantia chiefly in the fact that the corolla is tubular (petals not free); stamens 6, equal; fls. few, sessile, in 2 conduplicate bracts. Two species.

pendula, Schnizl (Tradescantia zebrina, Hort. T. tricolor, Hort., in part. Cynanthis vitata, Lindl. Commelina zebrina, Hort.). Wandering Jew, in part. Figs. 2783-84. Trailing, half-succulent perennial herb, rooting at the joints; lvs. lance-ovate, sessile, the leaf-sheaths about 6 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 margin 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 multiflora. 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. quadricolor, Voss (Tradescantia quadricolor and T. multiflora, Hort.). Lvs. with metallic green under and striped with green, red and white. Handsome.

L. H. B. 2784. Zebrina pendula. (X 1/2.)

ZELKOVA (after the vernacular name Zelkova in Crete, or Selkova in the Caucasus). Syn. Abelia. Urticaceae. Ornamental deciduous trees, with alternate, short-petioled, toothed leaves and insignificant flowers in axillary clusters or solitary, followed by small drupe-like fruits. Z. acuminata is hardy north and Z. crenata harder as far north as Mass., at least in sheltered positions. The Zelkovas, particularly Z. acuminata, 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 conical sepals. From the elm, which they much resemble in foliage, they are easily distinguished by the drupe-like fruits.

2782. Sweet Corn when mature and dry, showing the shrinking of the kernels (X 1/2).
men 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, Speach (*Z. carpinitiflora*, C. Koch. *Plâneura Richardi*, Michx. *Abellâcea ulmoides*, Kunzte). Tree, attaining 80 ft., with slender branches forming an oval or oblong head; lvs. oval or ovate to oblong, slightly coriaceous at the base, coarsely toothed with obtuse teeth, with 8-8 pairs of veins, usually almost

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**ZNÖBIA** (after Znobia, 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) *Eriocere*. Ornamental low deciduous or half-evergreen shrub, with alternate, short-petioled, simple and white, satisfactorily 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 shrubberies, particularly when in bloom; the glaucous form is one of the most conspicuous shrubs with light-colored foliage. Znobia 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, obliquely 5-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, tower of the west wind), *Amarylïldac. Zephyr Flower. Fairy 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 useful for window-gardens, resting somewhat in winter and blooming in summer under such treatment. They all have linear lvs. contemporaneous with the fls., and slender scapes about 6-9 in. high, crowned by solitary 5-lobed fls. of white, rose or yellow. The fls. are 1-3 in. across. Other generic characters: perianth regular, erect or suberect: corolla none; anthers dorsifix; versatile: ovules many; superposed: seeds black, flat.

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**ZEKOVKA**

2785. Tradescantia fluminensis, often confused with *Zelkova* (X × ½). See Figs. 2339–41.


*Z. Japônica*, Dipp., not Miq., is an imperfectly known spe-
ZEPHYRANTHES

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 Zephyrutes.** 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 Pyrolinion.** 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 fls., 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 hardness 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 eaves 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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**A.** Fls., white, often tinged rose outside.

**B.** Stigma 3-lobed.

**C.** Ovary stalked.

**D.** Perianth 5 in. long.

**E.** Lvs. channelled, bright green, shining, with acute margins.

**EE.** Lvs. thick, semi-terete, deep green, not shining, with rounded margins.

**DD.** Perianth 2 in. long.

**CC.** Ovary sessile.

**BB.** Stigma capitate, obscurely 3-lobed.

**AA.** Fls., bright rose-colored.

**BB.** Perianth 2½-3 in. long.

**BB.** Perianth 1½-2 in. long.

**BBB.** Perianth about 1 in. long.

**AAA.** Fls., yellow, often reddish outside.

**B.** Style slightly declinate.

**C.** Pedicel much shorter than spathe.

**CC.** Pedicel much shorter than spathe.

**BB.** Style strongly declinate.

1. *Atamasco,* Herb. (*Amaryllis Atamasco*, Linn.). *Atamasco Lily.* Fig. 2789, 2790. 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; lvs. 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. 24, p. 199; 37, p. 155.

2. *Trestie,* Wats. Closely allied to *Z. Atamasco* and best distinguished by the lvs. as indicated in the

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3. erubescens, Wats. (Amaryllis erubescens, Horsfard). Rare white-fld., August-blooming species supposed to be native to sandy plains of Texas, but perhaps from northern Mexico. Distinguished from the two preceding species by the larger, longer-necked bulb, shorter pedicel and fls. strongly tinged with rose outside. Bulb 1 in. thick; neck as long; spathe bifid above; tube equaling and closely embracing the pedicel (about 1 in. long).—Int. by Horsford 1889 and probably lost to cultivation.

4. vernalinda, Herb. Rare spring-and summer-blooming species, distinguished from other white-fld. species in cult. by the sessile ovary and long-necked bulb. Bulb 1 in. or less thick; neck 1%–2 in. long, greenish white, more or less tinged outside or keeled with rose. Highlunds of central Mex. B. M. 2583.—Offered by Dutch dealers.

5. candida, Herb. Fig. 2790. Most popular of white-fld. 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, 1¼–2 in. long. Marshes of La Plata. Gn. 37:740. B. M. 2607. L. B. C. 15:1419.


7. Lindleyana, Herb. Rare summer-blooming rose-colored species from the mountains of Mexico, inferior to Z. carinata for general culture. Bulb globoso, ¾ in. thick; neck short: fls. 1¾–2 in. long; ovary stalked; stigma 3-fl.; 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 1¾ in. broad; bulb globoso, ¾ in. thick; neck scarcely any; spathe 2-fl. at tip only; ovary stalked; stigma 3-fl. Oot. Cuba. B. M. 2537. B. R. 10:821. Gn. 12, p. 84 (col. plate).—Trade plants of Z. rosea should be compared with Z. carinata.

9. longifolia, Hemsley. Summer-blooming, yellow-fl. species. Distinguished from the next by characters of pedicel and spathe. Bulb ovoidal; neck 1¾–2 in. long; spathe tubular in the lower half: pedicel much shorter than spathe; fls. yellow, coppery outside, ¾–1 in. long. New Mex. Int. by Horsford, 1889, and probably lost to cult.

10. Texana, Herb. Yellow-fl. Texan species. Bulb globoso; neck 1¾ in. long; spathe bifid only at the...
Britain imported 5,600,000 pounds of Ginger valued at $620,000. Medicinal Ginger is prepared from the dried "root;" conglutinal Ginger from the green. Candied Ginger is made from carefully selected, succulent young rhizomes which are washed and peeled and then preserved in jars of syrup. Housewives often preserve their own Ginger; it is important to have the hands protected while scraping the roots or they will "burn" for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially even in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies Ginger may be cultivated in an altitude of 3,500 feet.

Zingiber officinale, Rose. GINGER. Figs. 2791-93. Rootstock-biennial, bearing many sessile tubers: stem 2-4 ft. high in tropics: Ivs. 6-13, in. long, lanceolate, glabrous beneath: spike 2-3 x 1 in., oblong, produced from the rootstock on peduncles ½-1 ft. long, with sheathing, scarious bracts about 1 in. long; corolla-segments under 1 in. long; stamen dark purple. Gn. 26, p. 284.

Z. corallinum, Hance, is a Chinese species offered by Rouson Bros. in 1889 but probably not in cultivation now. It is not described in any work to which the undersigned have access.—Z. Zernabat, Roscoe, is cult. and escaped in Porto Rico. It has broadly lanceolate Ivs. and large pale yellow fls.: about 4 feet. B.M. 2008.

E. J. Canning and W. M.

ZINNIA (Johann Gottfried Zinn, 1727-1789, professor of botany at Göttingen). Composite. 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, lilac, rose, magenta, crimson, red, 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.
ZINNIA

ZINNIA

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. Darwini. This

available in several colors, not all of which are yet fixed in the seed.

The Zinnia is now cultivated 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. Gerez, at Bagnères, 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 1866. Probably the earliest colored plate of double Zinnias is that in Flore 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 even now the purification of the white seems to have been 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. tagetiliflora flore pleno." The curled and crested 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 plenissima. It is also known as the Giant or Mammoth Strain. This strain was developed after many years by Herry C. Lorenz and was introduced in 1886. A maximum diameter of 6 inches is recorded for flowers of this strain. In G.C. II. 26:461 is shown a flower measuring 4 x 4 in., with about 18 series of rays, the latter being so numerous and crowded that the face is less regular than the common type. A specimen Zinnia plant 3 ft. high is attained in the North only by starting the seed early and giving perfect care.

1. MEDIUM-SIZED ZINNIA range from 12-20 inches in height. They are available in about 8 colors. Here belong most of the forms known to trade catalogues as pumila, nana and compacta.

In the Zinnias range from 3-12 inches in height and are of two sub-types, the pompoms and the Tom Thumbs. The pompoms, or "Lilliputians," are taller growing and smaller flowered, generally about 9 inches high, but flowering about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are

ZINNIA

ZINNIA

ZINNIA
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 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, heads of flowers 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

2795. Double Zinnias (× 1/2).

ZINNIA

2012


A. Plant annual.

b. **Akenes** of the disk fls. short and broad, obovate, 2–2 1/2 lines long.

c. **Colora** various: lvs. clasping, corollate-ovate or elliptic... **elegans**

c. **Colora** orange: lvs. sessile, narrow, lanceolate... **Haageana**

BB. Akenes longer, narrower, oblong, 3–4 lines long.

c. **Colora** of rays yellow: disk yellow. **paciflora**

c. **Colora** of rays red or purple.

d. Rays suberect or scarcely spreading; disk yellow... **multiflora**

d. **Rays** revolute; disk dark-colored. **terflora**

AA. **Plant** perennial...

**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 line, 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. 327, P.M. 1:223 and B.R. 15:1294 (the last two as Z. violacea). Double forms, F.S. 13:1594, R.H. 1521; 1864:231. Pompoms in Gn. 46, p. 464 (Lilliput); 30:562 (deceptive as to size). R.B. 20, p. 152.

**Haageana**, Regel (Z. Melziéna, 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. 36, 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. angustifolia in spite of its broader leaves.

**paciflora**, Linn. An erect annual, with yellow heads about 1 in. across, with rather broad, spreading rays. Plant hirsute, with spreading hairs;

2796. **Youth-and-old-age.** Common garden Zinnias, single and semi-double.
somewhat corymbosely branched above: peduncles at maturity enlarged upwards and hollow. Mexico, Peruvian Andes.

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 sub-erect or scarcely spreading. B. M. 149.

teniflora, J. & C. Loud. Fig. 2736. 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 to be no 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. 1899:243.

Benincasa. Nutt. Hardy, low-growing, Colorado perennial, with woody root, shrubby base, linear lvs. and sulfur-yellow rays which are very broad, almost round in outline. Lvs. less than 1 in. long and 3-nerved.

ZIT-KWA. Benincasa cerifera.

ZINNIA (an old Greek name). Gynandraceae. A single species of annual swamp grass found in northern N. A. and northern Asia. Spikelets 1-fl., monoeccious, in large, terminal panicles, the pistillate upper portion narrow and appressed, the staminate lower portion spreading; pistillate spikelets long awned. The plant is a stately and graceful grass, deserving to be better known.

aquatica, Linn. INDIAN RICE. WATER OATS. WILD RICE. Culms tall, as much as 9 ft.: lvs. broad and flat. Recommended for borders of lakes and ponds. The grain is excellent for fish and water fowl. Wild Rice lakes and ponds are favorite resorts of sportsmen in the fall. Before sowing, put the seeds in coarse cotton bags and sink them in water for twenty-four hours. Sow in water from 6 in. to 5 ft. deep, with soft mud bottom, or on low marshy places which are covered with water the year round. In running water, sow as much out of the current as possible. Sportsmen are not generally aware that seed can be obtained in large quantities and at a reasonable price from seedsmen. Wild Rice is very desirable for aquatic gardens, being one of the handsomest of tall hardy grasses for ponds of.

A. S. Hitchcock.

ZIZIA (I. B. Ziz, Rhenish botanist). Umbelliferae. A genus of three species of hardy perennial North American herbs 1-3½ ft. high, with ternate or ternately com-

ound 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, Coulter and Rose's Monograph of the North American Umbelliferae, Contrib. U. S. Nat. Herb. 7:90 (1900), and Manuals. Zizia 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 9-25, stout, ascending.

\[ a. \] ZINNIA (from Zizouf, 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 lvs. and small whitish or yellow flowers in axillary cymes followed by drupe-like sometimes edible fruits. They are not much cultivated in this country.

ZIZIA

2797. Zinnia haageana (X 3/4).

2798. Zinnia tenuiflora.

The rays are typically more revolute than they are shown in this figure.

ZIZIA

and none of the species is hardy north; the hardiest seems to be Z. vulgaris, but it is tender north of Washington, D. C. Most kinds have handsome foliage that are well adapted for planting in the Pacific Coast states, especially California. They seem to thrive in freely drained soil. Prop. by seeds, by greenwood cuttings under glass and by root cuttings. A genus of about 37 species distributed in the tropical and subtropical regions of both hemispheres, allied to Pituaria, but chiefly distinguished by the drupe-like fruit. Shrubs with slender often procumbent branches, or trees; stipules mostly transformed into spines, or often only obtuse or hispid or a straight and the other a hooked spine; fls. 5-merous: ovary 2-4, usually 2-loculed; style usually 2 parted: fr. a subglobose to oblong drupe. The fruit of Z. jujuba, vulgaris and Z. Lotus are edible and the first name is much cult. in China.

Jujuba, Lam. Tree, 30—50 ft. high: branches usually pruny; young branchlets, petioles and inflorescence densely rusty tomentose; lvs. broadly oval or ovate to oblong, obtuse, sometimes marginate serrate or entire, dark green and glabrous above, tawny or nearly white tomentose beneath, 1—3 in. long: fls. in short-stalked many-fl. axillary cymes: fr. subglobose to oblong, orange-red, 3-5 in. long, on the pedicel 1 in. above half its length. March—June. S. Asia, Africa, Australia. Gt. 13, p. 194.

Sativa, Gärtn. (Z. vulgaris, Lam.). Common Jujube. Shrub or small tree, attaining 30 ft.: prickly or unarmed: glabrous or pubescent: leaves cuneate, slender and hairy: fr. the appearance of pinnate lvs.: lvs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes emarginate, serrulate, glabrous, 3/2—2 in. long: fls. in axillary or terminal clusters: fr. ovold to oblong, dark red or almost black, 3/2—3 in. long, short-stalked. March—June. S. Eu. and S. Asia; naturalized in Ala. A.G. 1891:79 (as var. inermis). The Jujube is somewhat planted in Florida and California, although it yet 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 some parts of the state." The fruits or berries are ripe in November and December, and the plant boglies to bear at three years from planting. The Jujube is used in confectionery.

Z. Lotus, Lam. Prickly shrub, 3-4 ft. high: lvs. ovate-oblong, crenulate, glabrous; fls. in few-fl. axillary cymes: fr. yellow—brown. S. Eu. N. Afr. Z.—Paliurus. Wildl. = Paliurus Spin. Christi.—Z. Spin. Christi, Wildl. Small prickly tree; lvs. ovate to ovate-elliptical, glabrous or pubescent on the veins beneath: fls. in axillary clusters; pedicels tomentose: fr. ovoid—globose, red. N. Afr. W. Asia. This species is sup. by Paliurus Spin. Christi. Z. Porrri, Torr. Belongs to the genus Conalia, which is easily distinguished by not having spines borne on the branchlets transformed into slender thorns and by its entire, usually pinnennerved lvs.—Z. Porrri, Weber., is a much branched, glabrous thorny shrub, 4-5 ft. high; lvs. elliptic to obovate, obtuse, cuneate at the base, 3/2—3 in. long: fls. slender pedicled, in sessile clusters: fr. ovoid, 3/2—4 in. long. S. Calif. This plant was once offered by a collector of native plants, but it is probably not in the trade now.

Alfred Rehder.

ZYGOPETALUM (Greek, yoke and gland, some of the species having two glands in the base of the perianth). Liliaceae. As outlined by Bentham & Hooker, the genus has 13 species, one of which is Siberian and the remainder North American and Mexican. This distribution includes Amianthus in Zygodenus, but most authors do not unite the two. They are smooth, rhizomatous or bulbous plants, with simple erect stems bearing a number of simple or multiply compound leaves or greenish flowers; lvs. mostly crowded at the base of the flower-stem, long-linear. The fls. are perfect or polygamous, the segments many-nerved and often adnate to the base of the ovary, the parts withering and persistent; stamens 2; fr. appendiculate. The lvs. are crowded, the locules in fruit separate at the top or for their entire length.

The species of Zygodenus are little known in cultivation. They are sometimes recommended for the wild garden, but in the wild thrive in hot, dry sandy places and are 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: 2, ovary 3, style 2, the base of the perianth. Zygodenus proper.

B. Glands large, covering nearly the whole base of the perianth segments: bulb tunicataed.

c. Fls. usually perfect, rather large.

elegans, Pursh (Z. glaucescens. Nutt. Heloniæa gläberba K., Ker.) Three ft. or less tall, the lvs. 3/4—1 in. or less and very glaucous: fls. greenish, in simple or sparingly branched racemes, the segments broad and less than 3/4 in. long, coherent to the ovary, the fl. opening about 3/4 in. across. Across the continent from New Brunswick and south to New Mexico. B.M. 1891. E.R. 12:467.

Frémontii, Torr. Lvs. an inch or less broad, less glaucous than the above: bracts green: fls. usually larger, rotate, the segments free from the ovary. California, from San Diego north, in the Coast Range.—One of the "Soledad plants." Said to be the best of the genus for cultivation.

Nutallii, Gray. Lvs. from 3/4—2 in. wide, scarcely glaucous, light green: bracts scarious: fls. 3/4—1 in. across, in a simple or branched raceme, the segments free from the ovary. Kans. to Colo. and Texas. Bulk poisonous.

paniculatus, Wats. Usually stouter, the lvs. broader and sheathing: raceme compound: perianth-segments deltoid, acute, short-clawed. Saskatchewan to Calif.—Bulk poisonous.

b. Glands very obscure: bulb somewhat fibrous, narrow.

leimanthoides, Gray. Stem slender and leathj, 4 ft. or less tall: lvs. 3/2—4 in. or less wide, green on both sides; racemes papillose: fls. about 3/4 in. across, the segments oblong, not clawed. N. J. to Ga.

AA. Locules dehiscing only above the middle: stamens inserted on the perianth segments: glands none: bulbous.


L.H.B.

ZYGIA. See Albitia.

ZYGOPETALUM (name referring to the united flower parts). Orchidaceæ. Plants with numerous distichous lvs. sheathing a short stem which usually becomes thickened into a pseudobulb: lvs. membranaceous, veined or plicate: fls. solitary or in racemes, showy or plicate: fr. subsessile or in racemes; seed with wings, not appendiculate, included in a spiny, ovate, 5-angled, Restaurants, which are often separated as distinct genera.

Hennrich Hasselbring.

Zygopetalum is a genus of mostly epiphytal orchids, of easy culture. The Z. Mackallii group grow well under pot culture. One or two species with creeping rhiz.
ZYGOPETALUM

zones, like Z. maxillare, thrive best on sections of tree fern, osmunds 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 shelf below 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 plate just above, or just above the rim of the pot. Repotting should be done when the plants show new root action. The temperature should range about 60° F. by night and 65° to 70° by day in winter, and in summer as low as possible, with free ventilation during inclement weather. A cool, light mixture worked into the cattleya department is favorable. The compost should be kept in a moist condition at all times. The plants are propagated by cutting through the rhizome between the old pseudobulbs at a good eye, potting up the parts and removing them to a rather higher temperature until they start into new growth.

The Bletenmannia, Pescatoria and Wareczewicza 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 consisting almost entirely of chopped live sphagnum, freely interspersed with rough pieces of coal. Autumn is the best time to rehash 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 at 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 50° F. higher temperature during the winter season. The Promenaea group comprises a few small-growing species, all good subjects for the cool department. They grow best suspended from the roof in small baskets or perforated pans in a mixture of peat fiber and chopped sphagnum with a liberal supply of water and good drainage.

R. M. Grev.

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C. petals spotted or blotched.
D. Labellum glabrous.
DD. Labellum pubescent.
CC. petals uniformly colored.
AA. Sepals shorter than the lvs., 1-flled.
B. Column hood-like, arching over the crest.
C. Pls. deep violet.
cc. Pls. violet-purple.
ccc. Pls. rose-colored.
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C. Pls. brown, spotted.
cc. Pls. white or greenish white.
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1. rostratum, Hook. Pseudobulbs oblong, compressed; lvs. lanceolate, 5 in. long; sepals 4 in. long, bearing 1-3 fls.; sepals and petals linear-lanceolate, greenish brown, wavy, 2-3 in. long; labellum about as long as the petals, suberect with rough maracts, pure white with few radiating lines near the base: column wings rounded, sharply serrate on the upper margin: anther with a long beak surmounting the column. May, June, Oct. Octunum, B. 289. 17:100. 1. Hem. III. 18:50. 1. P. M. 1:271. -Distinguished by its small fls. and very large crest.

2. Macalai, Hook. Flg. 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, 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. 17:1453 (as Eutrophia Mackaii). P. M. 2:37. L. B. C. 17:1664. J. H. III. 33:299. -This is distinguished from Z. intermediate and Z. crinitum by its smooth labellum and narrower lvs.

3. Gautieri, Lem. Pseudobulbs oblong sulcate, 4 in. high: scape 2-3-flled; lvs. 3 in. across; sepals and petals green blotched with brown; labellum broadly reniform, deep purple at the base, white in front, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. I. H. 14:553. 1. 17:28. 1. -The lvs. are fascicate, narrowly oblong, keeled, 12-16 in. long: inferences shorter than the lvs.


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6. intermédium, Lodd. Lvs. ensiform, 1½ ft. long, 1½ in. wide; scape longer than the lvs., bearing 5-6 fls. each nearly 3 in. across; sepals and petals oblong, acute, green with large, confluent blotches of brown; labellum rotund, narrowed at the base, deeply 2-lobed in front, pale-pink, bluish white with radiating broken lines of purplish blue; column green and white. Fls. in winter, remaining in perfection about two months. Brazil. R.H. 1872:100 (as Z. Rivieri).—Plants of Z. Mackaii are often cultivated under this name.

7. Sœdeni, 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. 1880:147.—A garden hybrid raised by Veitch.

8. violáceum, Reichb. f. (Hántleya violácea, Lindl.). Fig. 2800. Lvs. as in Z. Lalindaei: fls. on nodding spapes 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. colesté, Reichb. f. (Böllea colestis, Reichb. f.). Lvs. 6-10 on a stout, oblong-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. Columbia. B.M. 6438. Gn. 31. p. 121; 19-1072.

10. Pétini, Reichb. f. (Böllea Pétini, Reichb. f.). Lvs. linear-oblanceol. fls. large, rose-colored, paler than those of Z. Lalindaei: sepals oblongate, 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. Lalindaei, Reichb. f. (Böllea Lalindaei, Reichb. f.). Lvs. elliptic-lanceolate, about 1 ft. long; peduncles 3 in. long, with solitary fls. 2½-3 in. broad; sepals ovate-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, archèd over it. Aug. Colombia. B.M. 6351.—Color of the flower varies to bright violet.


13. discolor, Reichb. f. (Warzea discolor, Lindl. Warzea discolor, Reichb. f.). Lvs. narrowly lanceolate, jointed, 9 in. long; sepalas 4-8 ft., shorter than the lvs.: sepals spreading, lanceolate, white: petals shorter, ovate, white with a tinge of purple, half-spreading; labellum large, broadly ovate, somewhat convolute, white, changing to deep purple toward the disc, and having a whitish or yellowish crest. Central America. B.M. 4830.

14. Wendlandi, Reichb. f. (Warzea Wendlandi, Hort.). Lvs. tufted, lanceolate: fls. 4-5 in. across, solitary, on a scape 3-4 in. long; sepals and petals lanceolate, somewhat twisted, greenish white; labellum ovate, cordate, undulate, white, streaked and spotted with violet-purple: apex revolute, crest semi-circular, violet-purple.
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