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Cyclopaedia of American Horticulture
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

WILHELM MILLER, Ph.D.
Associate Editor

AND MANY EXPERT CULTIVATORS AND BOTANISTS

Illustrated with over
Two Thousand Original Engravings

In Four Volumes
R–Z

New York
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1902

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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 Cyclopedia 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 nur-
serymen in that year. But these volumes were isolated; they pieced 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 gar-
den 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 in-
valuable. 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 ex-
perience and the occidental point of view. It has been the misfortune of many Ameri-
can 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
telest library of American horticultural books.

The details entering into any comprehensive cyclopedia of horticulture are astonish-
ing 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 cyclopedia 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 Cyclopediy 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 cyclopédias were searched for suggestions of subjects to be inserted. Also, a card index was made to portraits of plants in the leading horticultural and botanical serials, to descriptions of plants in current publications, to monographs, and to the names of leading horticultural varieties in some of the larger groups. This card index grew during the progress of the work, and it now comprises about 35,000 cards.

The "trade lists" were also made. These lists were intended to afford a record of the plants actually in cultivation in North America north of Mexico. Catalogues of more than one hundred leading seedsmen, florists, and nurserymen were cut up, and all the information respecting the various genera pasted on yellow sheets of standard letter-paper size. Thus, on one sheet, or one set of sheets, would be all the entries on Abies, Bocconia, Saxifraga, and the like. On these "trade lists" were made notes respecting persons who are skilled in the culture of the particular plants, together with extracts from letters, items of experience, and other incidental information. The name of the catalogue from which the cuttings were made was preserved, in order that doubtful questions might be traced. In special groups, it has been impossible to determine just what species are in cultivation because they are not all recorded in printed catalogues and they are known chiefly to a few fanciers or collectors. This limitation is particularly apparent in orchids; also in such large special genera as Acacia and Eucalyptus. In such cases it is practically impossible to make complete lists, and it is probably scarcely worth while to make the effort; but all the species that are generally known are almost sure to have been recorded. Since the Cyclopediy 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 Virginia had to be brought forward to Chladrastis and Amanthium 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 Cyclopedias 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 Cyclopedias.

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 galleys 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 Cyclopedias 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 Monographiae 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’Illustion Horticole, Flore des Serres, Paxton’s Magazine, Revue Horticole and The Garden are extensive works provided with colored plates, for details of which the reader may consult Vol. I, pp. xvii and xviii. Less extended periodicals containing colored plates have been used, as The Botanist by Maund, The Florist and Pomologist, Knowles & Westcott’s Floral Cabinet, Meehan’s Monthly and an incomplete set of Gartenflora and Revue d’Horticulture Belge. Of horticultural periodicals not containing colored plates, the Gardeners’ Chronicle is a great store of botanical knowledge, being published since 1841. It is full of botanical monographs of garden genera, and is a rich repository of description of new species. A complete set of the Journal of Horticulture has been available and all the pictures in its third series have been indexed. Of American periodicals, Garden and Forest, American Gardening, American Florist, Florists’ Exchange, Florists’ Review and Gardening have been very helpful.

The three most useful bibliographical works on botany have been Pritzel’s Thesaurus, Jackson’s Guide to the Literature of Botany, and the Catalogue of the Kew Library. About two dozen cyclopedic works were thoroughly examined and kept at hand for various periods, as those of Nicholson, Mottet, Siebert and Voss; the Bois’ Dictionnaire d’Horticulture, Johnson’s Gardener’s Dictionary, Paxton’s Botanical Dictionary, Rümppler’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 Rchter 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 Cyclopedia. 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 Cyclopedia are: Charles W. Furlong and W. C. Baker, Instructors in Drawing in Cornell University; E. N. Fischer and C. H. L. Gebfert, Jamaica Plain, Mass., who had access to the Arnold Arboretum; Miss H. A. Wood, Kingston, Jamaica, West Indies, who has drawn tropical economic plants; G. R. Chamberlain, who has drawn many plants, particularly annuals, in the gardens of Cornell University; 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 larger part of the work. As a matter of fact, however, it has required more labor to secure articles from correspondents than it would have required to have written them ourselves. This is not because correspondents have been negligent, but because of the inherent difficulties of doing work at long range. The value of the material, however, is vastly improved and broadened because of the number of persons who have been engaged in preparing it. It is probable that two-thirds of the labor in preparing the Cyclopediа has been of a character that is not directly productive of written articles,—as correspondence, keeping of accounts, filing of material, securing illustrations, proof-reading.

**PROSPECT**

The Editor hopes that this Cyclopediа 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 Cyclopediа, 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 Cyclopediа.

(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 cyclopedia must necessarily be uniform and consistent in its treatment of various and unlike subjects.

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

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

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

It must be admitted that the foregoing categories are ideals. At all points, it is feared, the accomplishment has fallen far short of the purpose. The Editor would like to do the work all over again, so many are the improvements that might be made. One must make a book in order to learn how to make it. The work has grown as it
has progressed. At first it was intended to make a three-volume cyclopedia, but before the first volume was half written it was found that a fourth volume must be added in order to present the subject adequately. The observant reader will discover that the letter A is treated on the three-volume basis. The article "Apple" is wholly inadequate, but partial penance is done under "Pomology." The article "Asparagus" is the first that began to feel the fuller and larger treatment. Whatever usefulness the Cyclopaedia 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 Cyclopaedia 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 Cyclopaedia 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 Cyclopaedia had grown. Like the mature youth, it had left us. It was no longer ours.

L. H. Bailey.

HYDE PARK, New York.

January 11, 1902.
STATISTICS

I. The Number of Articles.

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

- Volume 1: 1270
- Volume II: 1265
- Volume III: 699
- Volume IV: 115

Total: 4357

II. The Number of Plants.

The number of genera described:

- Volume 1: 820
- Volume II: 623
- Volume III: 351
- Volume IV: 461

Total: 2255

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

- Volume I: 2924
- Volume II: 2675
- Volume III: 1465
- Volume IV: 729

Total: 8793

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

- Volume I: 1187
- Volume II: 982
- Volume III: 628
- Volume IV: 358

Total: 3655

Total number of synonyms (in italics type):

- Volume I: 2446
- Volume II: 2104
- Volume III: 1243
- Volume IV: 1689

Total: 7482

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

- Volume I: 2331
- Volume II: 864
- Volume III: 576
- Volume IV: 733

Total: 4524

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:

- Volume I: 668
- Volume II: 631
- Volume III: 416
- Volume IV: 704

Total: 2419

IV. The Dates of Publication:

- Volume I: February 14, 1900
- Volume II: July 18, 1900
- Volume III: April 23, 1901
- Volume IV: February 26, 1902

(xv)
COLLABORATORS

I. LIST OF CONTRIBUTORS TO THE CYCLOPEDIA

*The asterisk designates the contributors to the fourth volume.

Many of the contributors have also assisted in reading proofs and in other ways.


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

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

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


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

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

ATKINS, F. L., Florist, Rutherford, N. J. (Platycerium.)

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, Haverton, Pa. (Herbacées Perennials, Rheum, Sonchus, Silphium, Sesquiclinium, Sud starttime, Statice, and many others, mostly hardy herbs.)

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

*BARNES, CHARLES R., Prof. of Plant Physiology, Univ. of Chicago, Chicago, Ill. (Fertilization. Flower. Tectology. Has read proofs of physiological subjects.)

*BARNES, WILLIAM H., Secretary Kans. State Hort. Soc., Topeka, Kans. (Kaw.)

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

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

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

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


BECKERT, Theo. E., Florist, Allegheney City, Pa. (Bougainvillea.)


*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 Zon, San Diego, Calif. (Several genera of cacti, as Mamillaria, Melocactus, Pilocereus, Pereskia, Phyllocactus, Pilocereus, Euphorbia, and many others, cultivated in southern California.)

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

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

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

*BURBANK, LUTHER, Plant-breeder, Santa Rosa, Calif. (Nicotiana. Has read proofs of Gladiolus, etc.)

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

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


Cameron, Robert, Gardener, Botanic Garden of Harvard Univ., Cambridge, Mass. (Various orchids, and much help on rare plants. Ajuga, Campanula, Echinocactus, Nemophilus, Primula, Rumonda, Urechina, etc.)


Card, Prof. Fred W., Horticulturist, R. I. Exp. Sta., Kingston, R. I. (Nemesis. Botany and culture of bush-fruits, as Anarchus, Berries, Blackberry, BuffalO Berry, Currant, Loganberry, Raspberry, Raspberries.)

Clinkaberry, Henry T., Gardener, Trenton, N. J. (Certain orchids, as Latas.)


Close, C. P., Horticulturist, Del. Exp. Sta. (formerly Horticulturist Utah Exp. Sta.), Newark, Del. (Utah.)

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

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

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

Conard, Heney S., Senior Fellow in Botany, Univ. of Pa., Philadelphia, Pa. (Nymphaea. Victoria.)


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

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


Cowen, J. H., formerly Assistant in Horticulture, Col. Exp. Sta., died 1900. (Certain Colorado plants, as Lepidahys, Lecocneumum. Verbena.) See personal note under "Verbena."


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


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

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

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

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


Day, J. Burtt, Asst. Botanist, Univ. of Calif. Exp. Sta., Berkeley, Calif. (Trees and Vines of California. various Myrtaceae, and many important subtropical subjects, as Acacia, Celtis, Eugenia, Eucalyptus, Maytenus, Pittosporum, Psidium, Romneya, Schinus, Sollya, Streptosolen, Torenia, Umbelliferae, Washingtonia, Wind breaks, and others.)

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

Dean, James, Florist, Bay Ridge, N. Y. (Nephrolepis.)

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


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

Dorsett, P. H., Associate Physiologist and Pathologist, U. S. Dept. Agric., Washington, D. C. (Violets.)


Drew, E. P., Manager Roeky River Nursery, Clifton, Park, O. (Pine.)

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

DUFFY, Louis, Wholesale florist and specialist in hard-wooded plants, Whittestone, N. Y. (Erica. Has read other 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, Whitestone, N. Y. (Erica. Has read other Heath-like plants.)


Ewart, John, Bulb-grower, Canton, Mass. (Lilium.)

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

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

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


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

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

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. Acelimatinizing Ass'n, Santa Barbara, Calif. (Rare plants grown in S. Calif., as Dasylirion, Flavocurria, Fouquieria, 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.)

Gannett, Frank E., Editor, "The News," Ithaca, N. Y.; formerly Secretary 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.)

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

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

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


Gould, Mrs. T. S., 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. (Dodecathecum. Help on Viola.)

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

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

*Grey, Robert M., Gardener, North Easton, Mass. (Numerous important orchid groups, as Cypripedium, Epidendrum, Lycaste, Maxillaria, Masdevallia, Oidionglossom, Oncidium, Orchid, Phalaenopsis, Saccoblivium, Stanhopea, Zygopetalum.)

Groff, H. H., Gladiolus specialist, Simeone, Ont. (Gladiolus.)

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

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

Halsted, Prof. B. D., N. J. Exp. Sta., New Brunswick, N. J. (Diseases. Fungi.)
HANSEN, Geo., Landscape Architect and Botanist, Berkeley, Calif. (Epidendrum.)

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

HARRIS, Frederick L., Gardener, Wellesley, Mass. (Limonum. Melochiod.)

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

HARRIS, W. K., Florist, Philadelphia, Pa. (Ficus elastica. Help on Lilium Harrisianum.)

HARRISON, C. S., Pres. Park and Forest Soc. of Neb., York, Neb. (Pseudotsuga.)


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

*HASELBRING, Heinrich, Asst. Pathologist, Ill. Exp. Sta., Urbana, Ill. (Iris. The article "Orchids," and botany of most orchid genera from Gongora to Zygopetalum. Several caulescens, as Scherera and Thunbergia. Also Rust, and has helped on plant diseases.)

HASTINGS, G. T., formerly Asst. in Botany, Corvallis, Oreg. ( celery.)

HAY, J. H., Asst. of Botany, Cornell Univ., Ithaca, N. Y.; now Science Teacher, Santiago, Chile. (Some tropical plants, as Berberis, Bertholletia. A few grasses, as Hierochloa, Holcus, Hordeum.)

HATFIELD, T. D., Gardener, Wellesley, Mass. (Numerous and varied contributions, as Gossenia, Gossenlia, Lachnanthes, Lecia, Macaranga, Oliander, Oxyris, Polygonum, Richardsia, Rhexia, Richardson, Rheediana. Has read many proofs.)


HEINZ Co., H. J., Manufacturers of pickles and canned goods, Pittsburgh, Pa. (Tomato.)

HENDERSON & CO., Peter, Seedsmen, New York, N. Y. (Bulbs, Eremurus, Pachystachis. Much help on proofs and many suggestions.)

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

HARRINGTON, A., Gardener, Florham Farms, Madison, N. J. (Uchryanthemum coccineum. Hollyhock.)

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

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

HICKS, G. H., late of U. S. Dept. Agric., Washington, D. C. (deceased). (Seed-testing.)

*HICKS, Henry, Nurseryman, Westport, L. I. (Agrostis. Transplanting.)

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

HILL, E. G., Florist, Richmond, Ind. (Regonia.)


HOLLISTER, E. J., Celery cultivator, Holley, Colo. (Celery.)

HOOPES, Josiah, Nurseryman, West Chester, Pa. (Hedge.)

HORSFORD, Fred H., Nurseryman, and specialist in lilies, Charlotte, Va. (Alpine Gardens. Lilium. Has read proof of many articles on native plants and hardly 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.)


*JACOB CHAS. W., & ALLISON, Importers, New York, N. Y. (Raffia.)

*Jackson & Perkins Co., Nurserymen, and specialists in Clematis, Newark, N. Y. (Clematis. Rosc.)

JAENICKE, Adolph, Manager propagating dept., J. L. Chihls, Floral Park, N. Y. (Primula.)

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


*JUNGHANNS, R. L., San Juan, Porto Rico. (Reseda. Help on Mignonette.)

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


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


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

Kift, Robert, Florist, Philadelphia, Pa. (Cutflowers.)

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

Knapp, S. a., Special commissioner U. S. Dept. Agric., Lake Charles, La. (Philippine Islands.)

Lager & Huerell, 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.)

Landeeth, Burnet, Seedsman, Philadelphia, Pa. (David Landreth.)

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

*Le Moyne, F. J., Amateur in orchids, Chicago, III. (Sobralia.)

Lewers, Ross, Fruit-grower, Franktown, Nev. (Neruda.)

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

Lonsdale, Edwin, Florist, Wyndmoor, Chestnut Hill, Philadelphia, Pa. (Conservatory.)

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

Lothrop & Higgins, Dahlia specialists, East Bridgewater, Mass. (Dahlia.)

Lyon, T. T., Pomologist, South Haven, Mich. (Died 1900.) (Pea.)

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

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

MacPherson, James, Landscape gardener, Trenton, N. J. (Exhoriaria. 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. Lucilia.)


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, Proe. C. W., 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, Grammatophyllum, Ionopsis, Limatodes, Miltonia, Pholidota, Selenepidium, Sophronitis. Has read many proofs on orchids.)

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

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

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


Meredith, A. P., Gardener, South Lancaster, Mass. (Humera.)

*Mills, Rt. Rev. Edmund M., Amateur rosarian, Elmira, N. Y. (Rose.)

*Mischke, Emil, Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (Quisqualis. Toyon.)

Moon, Samuel C., Nurseryman, Morrisville, Pa. (Oak.)

Morritt, Roland, Fruit-grower, Benton Harbor, Mich. (Peach.)

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

*Mott, Jr., Samuel R., Manager of Genesee Fruit Co.'s Freezing and Cold Storage Dept., Rochester, N. Y. (Storage.)

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

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

*Murrell, Geo. E., Fruit-grower, Fontella, Va. (Virginia.)

*Neuring, H., Milwaukee, Wis. (Pharbitis, Sabal, Serenea, Tabernanthera, Tecoma, Thunbergia and other plants cultivated in his garden at Goth, Fla.)

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

Newell, A. J., Gardener, Wellesley, Mass. (Coection orchids, e.g., Odonatia). [Read proofs.]

Newman, J. S., Vice-Dep. S. C. Exp. Sta., Clemson College, S. C. (South Carolina.)

Norton, Prof. J. B. S., Pathologist Md. Exp. Sta., College Park, Md. (Genus of Euphorbiaceae. Phyllocladus. Numerous botanical papers.)

Osston, Colin, Gardener, Kimball orchid collection, Rochester, N. Y. (Dendrobium.)


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

Orpet, Edward O., Gardener, So. Lancaster, Mass. (Border. Cyclamen. Dianthus, and certain orchids.)

Parsons, Jr., Samuel, Landscape Architect, New York, N. Y. (Lawn. Help on Park.)

Peacock, Lawrence K., Dahlia specialist, Ateo, N. J. (Dahlia.)

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

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

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


Powell, George T., Dir. School of Practical Agriculture and Horticulture, Briar Cliff Manor, N. Y. (Pears. Has read proofs of other important fruits.)

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

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

Purdy, Carl, Specialist in California bulbs, Ukiah, Calif. (California native plants, as Brodiaea, Calochortus, Erythronium, Fritillaria, Stropholirion. Help on Lily.)

Kane, 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, Filibert, Chief of Div. of Forestry, Department of the Interior, Washington, D. C. (Floras.)

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


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

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

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

Scott, WM., Gardener, Tarrytown, N. Y. (Berberolone and other tender foliage plants.)


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

Seavey, Mrs. Frances Copley, Landscape Gardener, Chicago, Ill. (Railroad Gardening.)
Shepard, Charles U., Special agent U. S. Dept. Agriculture in charge of experiments in tea culture, Summerville, S. C. (Tea.)

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

Shore, Robert, Gardener, Botanical Dept., Cornell Univ., Ithaca, N. Y. (Various articles, as Acalypha, Bedding, Dichorisandra, Episcea, Fuchsia, Gardenia, Ixora, Launaea, Lauris, Nerium, Nepenthes, Puya, Sonerila, Tococa, and others.)

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

Slingerland, 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, Cestudium, 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.)


Steele, 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, W. M., Nurseryman, Waban, Mass. (Koivik.)

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


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


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

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


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

Thorburn & Co., J. M., Seedsmen, New York, N. Y. (Hyacinth. Seed Trade. Have read many proofs of hill's, ails, vegetables, herbs, etc.)

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

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


Trelease, Dr. Wm., Dir. Mo. Botanical Garden, St. Louis, Mo. (Certain desert plants of the lily family, as Aloe, Apicra, Gasteria, Haworthia, Yucca. Shaw. Sturtevant. Ozalis.)

Tricker, Wm., Specialist in aquatics, Dreer's Nursery, Riverton, N. J. (Aquarium. Aquatics. Most aquatics, as Limnanthemum, Limnocharis, Nymphaea, Nelumbo, Oenothera, Victoria.)

Troop, Prof. James, Horticulturist, Ind. Exp. Sta., Lafayette, Ind. (Indiana. Persimmon.)

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

Turner, Wm., Gardener, Oceanic, N. J. (Forcing of Fruits. Mushrooms.)

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.)

Semple, James, Specialist in Chino asters, Bellevue, Pa. (Aster.)

Sexton, Joseph, Founder of the pampas grass industry, Goleta, Calif. (Gynanopium.)

Shepard, Charles U., Special agent U. S. Dept. Agriculture in charge of experiments in tea culture, Summerville, S. C. (Tea.)

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

Shore, Robert, Gardener, Botanical Dept., Cornell Univ., Ithaca, N. Y. (Various articles, as Acalypha, Bedding, Dichorisandra, Episcea, Fuchsia, Gardenia, Ixora, Launaea, Lauris, Nerium, Nepenthes, Puya, Sonerila, Tococa, and others.)

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

Slingerland, 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, Cestudium, 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.)


Steele, 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, W. M., Nurseryman, Waban, Mass. (Koivik.)

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


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


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

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


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

Thorburn & Co., J. M., Seedsmen, New York, N. Y. (Hyacinth. Seed Trade. Have read many proofs of hill's, ails, vegetables, herbs, etc.)

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

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


Trelease, Dr. Wm., Dir. Mo. Botanical Garden, St. Louis, Mo. (Certain desert plants of the lily family, as Aloe, Apicra, Gasteria, Haworthia, Yucca. Shaw. Sturtevant. Ozalis.)

Tricker, Wm., Specialist in aquatics, Dreer's Nursery, Riverton, N. J. (Aquarium. Aquatics. Most aquatics, as Limnanthemum, Limnocharis, Nymphaea, Nelumbo, Oenothera, Victoria.)

Troop, Prof. James, Horticulturist, Ind. Exp. Sta., Lafayette, Ind. (Indiana. Persimmon.)

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

Turner, Wm., Gardener, Oceanic, N. J. (Forcing of Fruits. Mushrooms.)

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.)
COLLABORATORS

VAUGHAN, J. C., Seedsman and florist, Chicago and New York. (Christmas Greens.)

VICK, JAMES, D. Landreth's Sons, Philadelphia, Pa. (Malvaceae. Melastomataceae.)

VOORHEES, Prof. EDWARD B., Dir. N. J. Exp. Sta., New Brunswick, N. J. (Fertilizers.)

WALDRON, Prof. C. B., Horticulturist, N. Dak. Exp. Sta., Fargo, N. Dak. (North Dakota.)


WARD, C. W., Wholesale florist, Queens, L. I. (Pelargonium. Jlclp on Carulian.)

*Ward, K. H., Supt. Lincoln Park, Chicago, Ill. (Warder.)

*WATKINS, Edward J., Prof. of Agricultural Practice, Univ. of Calif., and Horticulturist, Calif. Exp. Sta., Berkeley, Calif. (Almond, Apricot, Cherry, Grape, Lemon, Lime, Nectarine, Pear, Strawbery, Walnut and Vegetable Gardening in California.)

WEISS, Fred, Fruit-grower, Fairland, Kans. (Kansas.)


WEILHOVSE, FRED, Fruit-grower, Fairmount, Kans. (Kansas.)

WHEELER, C. F., Asst. Prof. of Botany, Michigan Agric. College, Mich. (Pyrola.)


*WRIGHT, CHARLES, Fruit-grower, Seafood, Del. (Peach. Help on Delaware.)

*WYMAN, A. P., Asst. to Olmsted Bros., Landscape Architects, Brookline, Mass. (Dirca, Epigaea, Exochorda, Halesia, Hypericum, Kerria, Lonicera, and other hardy trees and shrubs. Also Lathyrus, Lupinus, Veronica.)


ZIRNGIEBEL, DENYS, Florist, Needham, Mass. (Pansy.)

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

ABRAHAM, CHARLES, Nurseryman, San Francisco, Calif. (Trees in Calif.)

ALLEN, R. C., Fruit-grower, Bonita, Calif. (Olives.)

ALVERSON, A. H., Grower of 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. (Rhoia Island.)

BALL, C. D., Wholesale florist, Holmebush, Philadelphia, Pa. (Plants and decorative plants.)

BAEKER, CHARLES, Fruit-grower, Milford, Del. (Peach.)

BASSETT & SON, WM. F., Nurserymen, Hammon-ton, N. J. (Native plants, as Hibiscus.)


BERGER & CO., H. H., Importers, New York, N. Y. (Japanese and Californian plants.)

BETSCHER, C., Florist, nurseryman and seedsman, Canai Dover, Ohio. (Gleditsia.)


BOARDMAN, S. L., Sec. Maine Hort. Soc., Augusta, Me. (Maine.)

BRECK & SONS, JOSEPH (Corporation), Seedsmen, Boston, Mass. (Portrait of Joseph Breck.)

BRESE, 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. Barornicns.)

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 Keizensis.)

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, Frederic, Asst. Horticulturist, Wisconsin Exp. Sta., Madison, Wis. (Irrigation.)

Daillelouze Bros., Wholesale florists, Flatbush, Brooklyn, N. Y. (Mignonette.)

Daley, CHARLES L., Fruit-grower, Salem, Ore. (Prune.)

Daney, CHARLES E., Prune-grower, Salem, Ore. (Prune.)

Dandridge, Mrs. Danske, Amateur, Shepherdstown, 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.)

Devimon, 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., Sec'y, State Board of Hort., Hillsdale, Ore. (Oregon.)

Downer's Sons, J. S., Fruit-growers, Fairport, Ky. (Kentucky.)

Dreer, Henry A. (Inc.), Seedsmen and Plantsmen, Philadelphia, Pa. (Many and varied services, especially in aquatics, ferns, foliage plants and rare annuals.)

Eisen, Gustav, Author of Gov't. bulletins on figs and raisins, San Francisco, Calif. (Fig. Raisin.)

Elliot, J. Wilkinson, Landscape Architect, Pittsburgh, Pa. (Kochia, Oak, and some herbaceous perennials.)

Ellwanger & Barry, Nurseryman, Rochester, N. Y. (Hardy plants.)

Emerson, Prof. B. H., Horticulturist, Neb. Exp. Sta., Lincoln, Neb. (Nebraska.)


Fernald, M. L., Asst. in Gray Herbarium, Cambridge, Mass. (Sarcia.)

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. (Poasciana.)

Goodman, L. A., Fruit-grower, Kansas City, Mo. (Missouri.)

Greenman, J. M., University Museum, Cambridge, Mass. (Zumra.)

Halliday, Robert 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. (Palm.)

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. (Poiy gala, and some other native plants.)
Howard, A. B., Seed-grower, Belchertown, Mass. (Verbenae, Zinnia.)

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

Jack, Mrs. Annie L., Chateauguay Basin, Prov. Que. (Native Plants.)

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


Katzenstein, Otto, Manager Pinehurst Nurseries, Pinehurst, N. C. (Stillingia.)


Kellogg, Geo., J., Pomologist, Lake Mills, Wis. (Wisconsin.)

Kerman, John, Market-gardener, Grimsby, Ont. (Tomato.)

KINNEV, T. L., Fruit-grower, South Hero, Vt. (Lowbush.)

King, F. H., Div. of Soils, U. S. Dept. Agric., Washington, D. C. (Irrigation, Mulching, etc.)

Ladd, E. F., Prof. of Chemistry, N. D. Agric. Coll., Agricultural College, N. D. (North Dakota.)

Lake, D. S., Nurseryman, Shenandoah, Iowa. (Trees on Plains.)

Latham, A. W., Sec. Minn. Hort. Soc., Minneapolis, Minn. (Minn.)

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.)

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

Lyons, Wm. S., Census Bureau, Washington, D. C. (Tomato.)

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

Macfarlane, Prof. J. M., Dir. U. of P. Botanic Garden, Philadelphia, Pa. (Hybridization, Nepenthes, Pinguicula.)


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. (Apricots.)

McDowell, Prof. R. H., Agriculturist and horticulturist, Nev. Exp. Sta., Reno, Nev. (Yerba.)

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

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

Meehan, John, Nurseryman, Germantown, Pa. (deceased). (The article "Horticulture.")

Merian, Dr. Horatio C., Salem, Mass. (Peonia, Popavera.)

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. (Genus of grasses.)

Nickels, Miss Anna B., Grower of Cacti, Laredo, Texas. (Certain genera of Cacti.)

Omer, Nicholas, Fruit-grower, Dayton, Ohio. (Ohio.)

Osterhout, W. J. V., Botanical Dept., Univ. of Calif., Berkeley, Calif. (Variegation.)

Parsons, Samuel B., Nurseryman, Blushing, L. I. (The articles "Horticulture" and "Pomology.")

Pendergrass, 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. (Salpiglossis.)

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


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

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

RERMANN, 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.)

ROHNEET, 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. (Pear.)

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.)

SANDER & 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.)

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

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

SCOOK, 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, Zamia 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., Sec. Soc. American Florists, Boston, Mass. (Syringa.)

SOLTAV, CHES, 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 & IIDA, Yokohama Nursery Co., New York, N. Y. (Japanese plants.)

THOMPSON, Mrs. J. S. R., Spartanburg, S. C. (Per annum Gardening.)

THURLOW, T. C., Nurseryman and specialist in peonies, West Newbury, Mass. (Paonia.)

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, Minn. (Minnesota.)

WHILLDIN 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

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

II. OF BOTANICAL TERMS

fl.              flower
g.is.            flowers
fl.d.            flowered
fr.              fruit
h.               height
l.f.             leaf
l.f.              leaflet
lvs.             leaves
st.             stem
stems.
syn.            synonym
var.            variety

III. OF BOOKS AND PERIODICALS

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

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

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

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

B.F. . . . See F.
B.H. . . . La Belgique Horticole. Ghent. 35 vols. (1851-1883.)
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 1-3014. In vols. 24-33 they are numbered independently in each vol. There are 688 plates in vols. 24-33. "An Appendix to the First Twenty-three Volumes" (bound separately or with the 25th vol.) contains an index to the first 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. (298=page.)
ABBREVIATIONS


F.J. . . . See F.


F.P. . . . See F.


F.S. . . . Florides des Serres. [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 16. (23:224=vol. and col. plate.)


I.H. . . . L'Illustration Horticole. Ghent. (1854-1896.) (43:52=vol. and col. plate.) The volumes were numbered continuously, but there were 10 series. Series I., 1854-61. Series II., 1862-69. Series III., 1870-80. Series IV., 1881-86. Series V., 1887-90. Series VI., 1891-96. The plates were numbered continuously in the first 16 vols. from 1 to 614; in vols. 17-23 they ran from 1 to 619; in series V. from 1 to 109; in Series VI. they begin anew with vol. 1. Valuable indexes in vols. 19 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 "linden" and "lowe."


R.B. . . . Revue de l'Horticulture Belge et Etrangère. Ghent. Founded 1875. (23:258=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 1826, but is now considered to have been founded in 1829. (1899:596=year and page opposite col. plate. 1899, p. 596=year and page page opposite black figure.)


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 catchcrop 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 a 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 care, 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 60° to 70° in the shade, and at night it may drop to 55° to 60°. 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 5 to 8 inches apart, and they are thinned in the row until they stand 2 or 3 inches apart. In order that the crop shall be uniform and mature simultaneously, it is advisable either to sift the seed or to transplant the young Radishes. Gallamay has found by experiment that Radish seeds

twenty-fifths of an inch in diameter are too small to give a satisfactory and uniform crop. He therefore advises that seeds be run through sieves with a mesh of that diameter in order to separate the small speci-

mens. In a certain experiment, he secured from two pounds of commercial seed 14% ounces of large seed, 10% ounces of small seed, the remainder being lots 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 used for forcing, as 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 matur

ity. 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. 2069-2062 show some of the forms.

The origin and nativity of the Radish are questions of dispute. For geographical reasons, it is supposed that the Radish is wild in temperate Asia, probably in the oriental part, although truly indigenous Radishes are not yet known. Not infrequently the Radish runs wild about gardens, and in
The Radish is only a modified form of the wild charlock, or Raphanus raphanistrum. In fact, experiments were made on the charlock by Carrier, but it was only after a few years that edible Radishes from the wild plant could be produced. While these investigations seem to be conclusive that the Radish can be produced from the charlock, yet there is no evidence that such was the actual origin of the garden Radish. DeCandolle, whilst accepting Carrier's experiments, was unable to understand how the Radishes of India, China and Japan could have originated from the charlock, since it is unknown in those countries and the Radish has not been cultivated there for centuries. It is possible that the Radish was carried eastward from Western Asia into Europe, but such a transference of the plant does not seem to have been generally recognized and its species is generally regarded as the same as those in the Orient. See Raphanus.

The experiments of E. A. Carrier with the wild Radish, Journal d' Agric. Prat., 1869, were separately printed in a formal 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 and desirable forms of Radish in cultivation. Carrier began by gathering seeds of the wild Raphanus raphanistrum (Fig. 2605), 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 colored 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, rose or violet, succulent, and good to eat. Figs. 2604, 2605.

Carrier 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 1/2—10 inches, the thickness from 1/2—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 35 per cent. Among the forms pictured by Carrier 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 forms 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 Rut-tail Radish, Fig. 2606, 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 Radish. A very small space 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 good growth, and use the product in prime condition.

Spring Radishes. The earlier quick-growing sorts will reach a marketable 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 hard, and the first sowing should be made as soon as the ground can be worked. The richer and more friable the soil can be made the better, and there is little danger of over-watering provided that the weather is fine, and the elder and better decomposed it is the more satisfactory will be the results. Having mixed the fertilizer with the soil and made it as fine and smooth as possible, form drills about 1 m. deep and 10 lbs. in, a part, and drop 10 seeds to the foot, covering with about half in. of soil well stirred down with the hand or hoe. From 2 to 4 feet of drill will furnish an abundant supply for one person during the time these from a single sowing are useable, 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 unheated 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 among the turnips to remind the gardener to see and cultivate the rows sooner; and the Radish crops is matured and pulled before the space is all needed for the more permanent crops.

Petite tete Ontario, is a little hambut of French var. 2065. Root of the wild Radish, with which Carrier began his experiments 1869.
RAILGARDENING

RAILROAD GARDENING 1489

Malagasy name of a palm which fur-

1489

-riti. leaf of commerce called raffia fiber.

MHihigascar, where it grows without

inn of any kind. One raffia leaf, or

i-lini long green division 2-5 ft. in

divisions of the sugar palm, but a dark

green color, and darker and stiffer. The

mild part of this green leaf is of a pale

brown color, and its skin is

leathery as the

palm pod, ex-

pungent to the tip

•11 (■[ the pal-

larabasandreha.,.,;,. «lirl, linin,- fancy

prices in Europe and is used in

Anjou, where it

course of fancy baskets in America, while raffia fiber has been used to

limited extent in the manufacture

of hats, its principal use is for tying

vines, pipes, and for making

bunches and for grafting. It is soft as

silk and not affected by moisture or

change in temperature so as to risk cut-

gging or the most delicate tissues, and it does not break or ravel

when folded or knotted. These qualities bring it in general use in Europe,

especially in the vineyards of Loire, where it is extensively used, and conse-

quently maintain its price. It is virtually inexhaustible in Madagascar, the

supply being limited only by the scarcity of labor. For export, the fiber is

collected in large skeins, twisted or plated, and then packed in compressed

bales of about 100 kilograms (220 lbs.) each. About 20,000 bales are exported

annually.

Chas. W. Jacob & Allison.

RAGGED LADY. Nippera Dumos-
cena.

RAGGED ROBIN. Lychnis Flocc-
culata.

RAG GOURD. Luffa.

RAILROAD GARDENING. Plate

XXXII. This expression usually refers
to the formal use of flower beds about

railroad stations. Such work is orna-

tmental gardening, not landscape gardening, the latter being the art of

arranging plants so as to make nature-like pictures.

Most of the so-called landscape gardening that is done at railroad stations is

really ornamental gardening. Carpet beds are relatively costly as compared

with hardly shrubbery. They last but a few months and then leave bareness,

while the best hardy trees and shrubs skillfully arranged are interesting all

the year round. This making of nature-like pictures with relatively simple, inexpen-

sive and planting the sticks, and leaving them to a height that is

involved in creating and maintaining formal flower beds. However, both things have their places. Many a

tired traveler is cheered by the bright colors of a neatly

kept railroad station, such displays are suitable at the

stations if anywhere along the line. They are always

preferable to dirt, ugliness and a general air of in-

difference.

W. W. Tracy.
RAILROAD GARDENING

It may be well to begin an account of railroad gardening with an illustrative sketch.

The Movement in England. Planting has been done on the stations and 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 1865 on the Midland, and for a shorter time on the Great Western railways. The prizes range from 5s. to 15s. and in 1890 aggregated £200 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 brome and gorse on certain slopes of the permanent way between stations. The allotment gardens that attract attention on English roads are small tracks near stations that are rented to employees of the roads, who use them as vegetable, fruit, and, to some extent, as flower gardens. The Railway Banks Floral Association is a new and interesting factor in the improvement of English railway rights of way. Lord Grey was the originator of the novel and excellent scheme. The society is an organization for interesting owners of adjoining property, and for collecting money and materials for sowing and planting "banks" (downward slopes) and "cuttings" (upward slopes) of the permanent way, to the end of making them more attractive. The results have been unanimously satisfactory.

Denmark's Progress. In Denmark the railways belong almost without exception to the government, and improvements are begun when the roads are constructed. There consist of five classes of works: (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 ("plantekelder") owned by the roads and consist for the most part of shrubs, largely conifers. These nurseries, as well as the entire planting, are under the supervision of a "plantere," i.e., a chief botanical instructor. The allotment gardens, like their English namesakes, are tracts near the block signal stations where railway employees conduct vegetable and fruit gardens for their own use, and sometimes care for a few flowering plants.

Conditions in Sweden. Ornamental planting has been universal on government railways, as well as on the majority of private railways in Sweden since 1882. 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 for "ornamental and economic" ends (hedges, fences); (3) planting along private 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 feeding plants. At the largest stations—only about 400 in number—are exclusively used for "modern and elegant combinations." The planting at decoration 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 10,000 hard-woody plants (trees and shrubs), and 100,000 soft-woody plants (perennials and annuals), which are nearly all grown at five greenhouses, hotbeds and nurseries situated in different parts of the country. About 10,000 fruit trees and 500,000 gooseberries and currants are at present planted out on the station grounds. On private railways the same scheme is followed on a smaller scale. (See G.P. 2236 for further facts regarding railway planting in Sweden.)

In various other countries there are scattered instances of ornamental, economic, and protective plantings 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 between railroad and other suitable trees to supply the tie material of the future.

The director of the association called Het Nationale 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-stemmed peanum), shrubs, and blooms and wild prime trees are used, the fruit of the last being "used for jams."

The common quince is used to a limited extent in Utrecht for binding earth on embankments, and the Paradise tree for shading station platforms. "The Ombu is the national tree of Uruguay, whose wood is used as coal, less as food, but as welcome as Jonah's goathorn at midday at certain seasons."

The Royal Railway Department of San Juan supports through M. Kloek, acting Director General of Railways, that efforts have formerly been made to establish protective Tammarroled hedges along embankments in the Koral section, which were destroyed by cattle; Eucalyptus trees grown from seed received from Australia have developed quickly into "stately trees;" and good success has also resulted from the introduction of a tree from Manila which is said to strongly resemble the cherry.
RAILROAD GARDENING

RAILROAD GARDENING

used in protective plantings. The fruit trees include mandarin, orange, lemon, medlars from Japan, pomegranate, apricots and almonds. This information comes through Daniel S. Kidder, E. C. Consul at Algiers.

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

The planting so far done consists largely of strictly ornamental gardening, that is, of formal grouping, flower-beds, and of similar planting composed of tender material, but it is encouraging to note evidences of following dissatisfaction with this ephemeral style of horticultural improvement. The most brilliant and progressive railroad men are quick to recognize its limitations 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 cochere driveways, steps to an overhead bridge and to an underground passage.

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

evined an interest in the care of the grounds that attracted the favorable attention of the assistant engineer, who sent him men and material for grading and building. This so encouraged the baggage-master that he solicited the town people for money to buy seeds and plants, and with such success that he maintained for three years a flower garden that favorably impressed the higher officials of the road, and led to the establishment of similar gardens at other points, and eventually

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 abandoned 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 Central, the Chicago & North-western, the Illinois Central, the Delaware & Hudson, the Philadelphia & Reading, the Lake Shore & Michigan Southern, the Chicago, Burlington & Quincy, the Atchison, Topeka & Santa Fe with its San Francisco & San Joaquin Valley line, the Cleveland, Cincinnati, Chicago & St. Louis, the Boston & Maine, the Long Island, the Union Pacific, and the Northern Pacific railroads, all of which have planted more or less tender material, with the use of an increasing proportion of permanent planting. A number of others have reserved plots for future improvement, and some have turfed such spaces. Several prominent companies do no 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, carpet-bedding, and of similar planting composed of tender material, but it is encouraging to note evidences of growing dissatisfaction with this ephemeral style of horticultural improvement. The most brilliant and progressive railroad men are quick to recognize its limitations 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...
various companies that are even now turning from the martistic and fleeting summer shade of perishable material. For instance, the New York Central & Hudson River Railway Company reports: "Herebefore the planting has consisted largely of bedding plants. Since the present Company has adopted a liberal system of permanent improvement of station-grounds with ornamental trees, shrubs and vines instead of annuals."

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

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

From Mr. Stiles' editorial (previously mentioned) we find that in 1888 the highest authority in the art of planting held the opinion that: "Up to the present time, with few exceptions, railroad gardening has accomplished what the public has a right to expect of it from an artistic point of view. Instead of using their opportunities for increasing the taste and knowledge of the communities they serve, railroad managers have generally been satisfied to perpetuate all that was glaringly bad in the prevailing horticultural fashion of the time. Perhaps this is inevitable, and it will continue so as long as they feel that they need not call for the advice of an expert of a higher class than the ordinary jobbing gardener. It is the old story—a man employs an architect to build his house, but thinks he needs no advice in laying out the park that surrounds it."

"The principles that underlie good railroad gardening are simple. They relate, so far as such gardening has been given to the immediate influence 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 approaches, 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 occasional advice of a higher official charged with the management of the horticultural affairs of the corporation."

"The adoption of a system of general treatment is the only difficult thing, and it is here that railroad managers have usually failed. Most railroad gardens,—and this is as true of Europe as of America,—consist of a badly laid-out rectangular strip of land, in which are cut as many large and often grotesquely-shaped beds as can be crowded in and filled during four months of the year with the most showy and ill-assorted plants, the care of all consisting in pruning eight months; of a few shrubs, mutilated almost past recognition by bad pruning, and by a clamp of pampas grass to complete the decoration; also often the manner of planting in intrinsic: in other words, three centuries ago, 'You may see as good sights many times in that.' Such grounds are not artistic, therefore bad from the point of view of the public, who expect them to be co-ordinated expensive and difficult to maintain, therefore bad from the point of view of the road."

"If railroad gardening is ever to become a potent and permanent influence, it must be synchronized upon a more economical basis, and with more regard to the laws of good taste and good business. This subject has already occupied the attention of a few thoughtful policy toward that end is confident that some progress is at last been made."

Mr. Stiles goes on to commend the plans of the then new station-grounds of the Boston & Albany Railway for "convenience and effect," and give an idea of that happy result was due to the influence of Prof. Charles S. Sargent, of the Arnold Arboretum, a director of the road, and to Mr. Wm. Bliss, its president. Designs for the improvement of the grounds around these stations were made by F. L. Olmstead, the veteran landscape architect, and since 1882 the development of these plans, as well as of all the horticultural interests of the road, have been in charge of a competent landscape gardener, Mr. E. A. Richardson, who says: "The plan followed is to conform to the treatment and development of the station-grounds to the adjacent ground; natural style being followed amid natural surroundings, and a more cultivated style in highly cultivated regions; to utilize all natural advantages of ground surface, rocks, water and native growths; to make large use of trees, shrubs, vines and plants indigenous to the locality where improvements are being made; to supply beds for shrubs from eighteen to twenty-four inches of good ground; and to plant so closely in the beginning that as the plants grow they can be thinned to supply other grounds as needed."

It goes without saying that these methods are not only the most practical but that they insure the most artistic results.

Railroad Gardening in Florida.—Possible development of railway horticulture is limited in the southern states only by the taste and work expended. With logically treated surroundings, mile after mile, becomes pleasant highways studded with charming groups of foliage and bloom, expressing the type of the country traversed and marking the advance into a different climate. Florida, especially, should become celebrated for its railroad gardens. Its chief "crop" is conceded to be the winter tourist, and nothing appeals more strongly to this class than the contrast of luxuriant vegetation and snow-covered snow. Each station-ground should be planted to emphasize this contrast on a gradually increasing scale, to reach its climax in the novel and effective semi-tropical vegetation possible in the southern part of the state. Each station-ground should commend itself as the best advertisement for securing both pleasure-seeking and home-seeking patronage. Little has been done so far, although the Florida Eastern Railroad Company has made several of its station-grounds, notably, with decorative plants at St. Augustine and with roses at Ormond, but the planting on this line is largely in the way of demonstrating, bedding-in snow, the possibilities of home-seekers and property-owners (peach trees around its section houses being an example of practical results shown), and viewed in that light is considered a success. The Florida South Western and the Jacksonville & Southwestern railroads have done similar planting. All that has been done is ineffective com-
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 limited 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, 1880s being a means of advancing real estate interests. Some years later, however, embiblished station gardens 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 choly spots along its routes at Merced, Fresno, Santa Monica, Pomea, Pasadena, Riverside. The range of soil and climate is wide. At Los Angeles there are palms dating from the Spanish occupation, a collection of semi-tropical shrubs, and a display of cacti, agave and other curious vegetation from the Arizona desert.

2068. One method of treating a railway ground.

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

Johannes Reimers, landscape gardener of the San Francisco & San Joacuin Valley Branch of the Santa Fe road, furnishes the following information: "For lawns, we use exclusively a mixture of Australian ryegrass 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 rich, dark 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 (Melina Azedarach), known as the Texas umbrella tree, for boll fences and for avenues. Its low, spreading form makes it harmonize with the broad-roofed Spanish style of architecture used for our buildings. It is a rapid grower and is not deformed by the continuous northwest trade wind."

2069. A better method of treating the area. (Sterculia) and casuarina, which latter does exceptionally well, eucalypt, acacia in all except the most tender varieties, grevillea, lignanera, magnolia, Forschauer Californica and E. creata, where water is available, crape myrtle, Freehara serrata and F. magroa, which thrive in the heated valleys, bignonia and wisterias, also guajaves, which incline to burn when used in the interior of the state, as do also maple trees. Of palms, F. Pritchardii and Fern, lagar, ex, are easily grown as ornamentals: Phoenix Caimenensis does well, and Chamaerops grows slowly. A long list of plants, tender in the east, are mentioned, among them geraniums, which are spoken of as being "killed to the ground away from the coast some winters." The plants that have proved best adapted to alkaline soils are: Phoenix, Pritchardii 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 of Italy, Spain and Greece. The state-

lines of the express has not been appreciated here; and what might not be done with the fiz, the olive and the palm on these hill-side slopes?"

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

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

The proof of these deductions is seen yearly on many roads, where thousands of miles of railroad rights of way which, in the spring and early summer, are like ribbons of flowered brocade linking the towns together but later in the season become blackened wastes from accidental or intentional fires. Year by year this maimful program is repeated. Railway officials often offer 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 trees, 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, involves (1) planting 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. As an example of successful banks, one may mention the work done on the Northern Pacific Railway Company. About 50,000 trees have been 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 over-come danger from fire, and through the middle of it runs a groove 60 feet wide, the inner edge being 125 feet from the center line and parallel with the tracks through cuts. The trees are planted in parallel rows spaced 6 feet apart at right angles with and 3 feet apart parallel with the track. The two outer rows on each side are golden Russian and laurel-leaved willows; the third row from the outer margins, box elder and ash; and the five central rows, cottonwood. This arrangement is expected to produce a dense grove, increasing in height from both sides to the center, which will furnish an effective wind-break."

The feasibility of planting for protection against the encroachment of shifting sand on the seacoast, along rivers and on so-called desert lands, has been demonstrated by the researches and experiments of the Agronomy and Agriculture. The advantages of such plantings are too generally recognized and utilized by railway companies whose lines are exposed to this danger.

**Planting for Economic Purposes.**—Planting for economic purposes is considered great in the direction of producing timber for furnishing crosses, poles and posts. It is asserted that under competent supervision this branch can be made to yield practically all the 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 made to in any way lessen the dangers of flagging, 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 railroad lands to this use is certain. In the state of Indiana some railway companies have planted a part of their holdings with trees for the double purpose of growing timber for economic uses and to secure the resulting reduction in taxes, which is a feature of the state forestry law.

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

**Disgraceful Features and Their Suppression.**—There are two important classes of disfigurement: defacement by signs and defacement by abused and neglected grounds adjoining railway rights of way. The more noticeable of these is the display of billboards sign boards that disfigure railway rights of way and, indeed, seem to have the right of way on highways of every description. Few ordinances pass into a public nuisance that should be legally controlled, but as they are placed on adjacent land or buildings instead of on railway property, their direct suppression by railway officials is out of the question. These eye-sores, however, furnish an added and cogent reason for an attractive plan of planting, both trees, shrubs and vines at certain points along rights of way where the topography of adjacent land invites such disfigurement. These gaudy signs not only blot out or mar the most favorable landscape views being directly placed to that direct end, but are allowed to distort otherwise undistressable 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 in favor of the suppression of these conditions. Continuous, systematic work in the way of "planning out" the disfigurements, and by establishing attractive plantations wherever possible. This policy is likely to result in a reforming in the direction of the second source of unpleasant views from trains; viz., the unkempt, sodden and often wretchedly squalid appearance of grounds adjoining rights of way through villages, towns and of the grounds immediately surrounding station grounds, near by residents are likely to catch the good spirit and improve the looks of neighboring back yards. To this end, a rule against dumping on railway grounds should be a condition of tenancy, with objectionable features that obtain in large cities must probably be endured until mitigated by the efforts of municipal and social service leagues.

**Attractive Ideas.**—Railway companies can do no
RAILROAD GARDENING

more effective advertising than by demonstrating the possibilities of the country traversed for home-making. In railroad districts, the old-time gardeners, whose way-station grounds should present refreshing scenes of shade and verdure. Their grounds should be treated according to the rules of landscape art that hold good in all places, but they should not be allowed to become mere "residences for show," but should be well maintained, and the windows of the railroad stations should be kept clean.

In short, railroad gardens should be in the hands of those who will adorn instead of deface them; who will look upon the railroad as a sheet of fresh ground that requires much work and care after planting is established—features that require considerable expenditure, a good knowledge of trees and shrubs, and a large amount of taste in the designer at the outset, but after being established, like the island gardens of Paris, "the hand of man might be withheld for half a century without their suffering in the least."


RAINBOW FLOWER. Iris.

RAISIN. Fig. 2071. Up to about 30 years ago, practically the entire Raisin industry of the world was confined to the Mediterranean districts of Europe and Asia. While it is true that Raisin vines were planted in other widely distant countries at a much earlier date, e. g. — Chile, where it is said they were known 200 years ago — it is only in the last few years that the Chilean Raisins, as well as those of the newer districts of California and Australia, were actually found in the markets of the world. Since that time, however, the development of the industry in these new districts has been most rapid, and it has been shown that even higher quality and flavor are possible.

In California the growth of the Raisin industry has been enormous, the output now reaching about 400,000,000 pounds annually, or more than the entire yearly consumption of the United States a few years ago. In 1891, the growers found themselves face to face with what was then thought to be a serious problem of over-production. The price of Raisins fell below the cost of production. Lack of system in marketing has since been shown to have been the cause, for by cooperative methods in grading and marketing, the price has been considerably raised. The loose or detached berries are, of course, always marketed separately as distinct grades. A great many brands and grades have been packed, designated as " seeded 1" and "seedless 1" by means of a specially designed machine, put up in 1-pound and 2-pound packages, and marketed for cooking.

RAIN BERRY. Bayerus cathartica.

RAINBOW FLOWER. Iris.
RAISIN

RAMPIGN

ing purposes. Some "bleached" Seedless Sultana and Thompson Seedless wines are made from the much higher price for no other reason than that they are considered more pleasing to the eye. The delicious flavor and aroma are entirely destroyed in the bleaching with sulfurous acid, which should be made to encourage the practice. Few, if any, "bleached" Raisins are now prepared.

The varieties planted are: White Muscat of Alexandria, the Muscatel Gordo Blanc and Muscatel of Alexandria, the Seedless Raisins, the Seedless Sultana and Thompson Seedless. It is safe to say that the first two are the prevalent varieties and produce the finest Raisins. The Gordo Blanc is the favorite with some on account of its large uniform berries and full, even symmetrical clusters. The Seedless varieties are both small, "currants" (which, by the way, are not "currants" at all, but the cured fruit of the Zante or Corinth grapevine) and are only partially successful, as they command a lower price, are not considered profitable in California.

The Raisin vines are subject to the same diseases and insect pests as are the vine and table varieties of the Vitis vinifera type, and these are combated by the usual methods.

Bowl mumm is unknown in California, and up to the season of 1900 no Phytophthora 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 average, 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 Salinas and Gila valleys of Arizona as Raisin regions. It is said the grapes ripen earlier and have that advantage over the California districts, as well as that of being nearer to market. How far these advantages will count against the Californian Raisins in the competition remains, as yet, to be seen.

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

ARNOLD V. STUBENRAUCH.

RAISIN-TREE, JAPANESE. Homura daizein.

RAMÓNDA (L. F. E. von Ramondi de Carbonnieres, French botanist and traveler, 1734-1827). Often spelled Ramonda, but originally written Ramondia. Geographically, Ramondia Pyrenaica is one of the choicest and most popular alpine plants. Few, if any, inhabitants of rock gardens have been so often pictured. It is a small, tufted perennial, with roundish leaves, and its scapes bear one or few florets, 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 Ramondia vary in the number of their petals, or rather corolla-lobes. For example, P. Nathalia often has 4-lobed and 5-lobed florets, 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, rotate or broadly bell-shaped, perfect stamens as many as the corolla-lobes, antherd at the base of the corolla; ovary superior; capsule obovoid; seeds minute. 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 hardly in the garden 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 given the first winter and kept in cold storage, they will make neat little plants by the end of autumn. They should be kept in a coldframe for the winter. These one-year-old plants grown in pots are better to establish in the older 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. After a few weeks, if still under glass, 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 its purple or white.
B. Corolla 5-parted, rotate.

Pyrenaica, Richter, Fig. 2072. Sometimes called Rosette Mullein. Well-grown specimens may have 6-12 scapes, each bearing 3-4 fls. of in. across. Native of Pyrenees. Many inferior forms have been sent out in the name of var. alba. On 26, p. 121, repeated in 27, p. 197; 29, p. 43, repeated in 41, p. 59; 73, p. 397; 37,555 and p. 31: 51, p. 20: 36, p. 228: 62, p. 138: 63, 134: 186. H. R. 1865, 520, B. 356 (Verbasco Pyrenaica).

B. Corolla 4-parted, more convolute, short, bell-shaped to lanceolate.

Holdreichi, Jonka (Jewel, or Jonka: Waldwicke, Bois). Leaf ovate, entire, obtuse, silky white above, rusty woolly below: scapes 1-2 fls.: fls. violet. According to Roisier it normally has a 5-parted calyx, 4-lobed corolla and 4 stamens. Thessaly. On 46, p. 394.

A. Color of its yellow.

Serbica. Pane. This is said to be distinguished by its blue anthers; also the fls. are said to be normally 5-lobe; R. C. 1917, 520, B. 356 (Verbasco Pyrenaica).

B. Corolla 4-parted, more convolute, short, bell-shaped to lanceolate.

ROBERT CAMERON AND W. M.

RAMÓNDA. See Ramonda, above.

RAMPIGN (Campaspea 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 Rampon 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 turned 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 Rampon 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 Campaspea.
RAMPOON, HORNED. Phytanuown.

RAM'S HEAD. Cyrtomium arietinum.

RAMSTED. Liruaria vulgaris.

RANDIA (Isaia Rand, author of an index of plants cultivated at Botanical Gardens of the Society of Apothecaries at Chelsea, published 1730 and 1791). Rubiaceae. A genus of about 100 species of tropical shrubs, trees, and woody climbers. Plants often spiny; lvs. opposite, obovate-oblong to lanceolate, frequently curiously stipples between the petioles and stem, short, and usually joined together: fls. white, yellow or reddish, small or large, solitary, terminal, corolla-borne, or fascicled: fr. a berry, globose or ovoid, 2-boxed, many-seeded. For distinctions from Mitriostigma and Gardenia, see Gardenia.

A. Shrubs having spines.

dumetorum, Lam. (R. floribunda, DC.). A small tree or rigid shrub with stout, usually spined, 3- to 4-ribbed branches thickened at the ends of the adventitious roots. Becoming 8-12 ft. high, but flowering under cultivation is so similar to Bavenia of Vellozo, 1825, that the two cannot be distinguished by pronunciation. In the interminably on the short branches of the spadix, Bouche's generic name Ravenea dates from 1878. It appears in the American trade.

B. Corolla-tube \( \frac{1}{2} \) in. long.

Fitzrali, F. Mull. A graceful tree; lvs. often 6 in. long, shining, obovate-oblong, obtuse-acute, spiny; petiole rather long: fls. about 1 in. across, in blossom, few-fl., cymes or the fertile fr., solitary: fr. globular, \( \frac{1}{4} \) in. thick or ovoid and longer, hard. Australia. Cult. in S. Fla.

AA. Shrubs or trees without spines.

bb. Corolla-tube 4 to 10 in. long.

C. Lobes of corolla obtuse.

maculata, DC. (Gardenia Studioyana, Hook.). A much-branched shrub 10-15 ft. high; lvs. elliptical or obovate-oblong, \( \frac{1}{4} \) to \( \frac{1}{2} \) in. long, \( \frac{1}{2} \) to \( \frac{3}{4} \) in. wide, chartaceous, acuminate, narrowed at base; petiole usually with glands near its union with the midrib: fls. usually purple with white lobe, solitary, terminal or at ends of short lateral branches, sessile: fr. oval, obovate or globose, pointed, \( \frac{1}{2} \) to \( \frac{3}{4} \) in. long. Tropical Africa. R.H. 1894: 66. B.R. 3: 17. B.M. 4185. Gr. 38:773.

Cv. 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. BARCLAY.

RANEEVA (anagram of Ravenea, and now first published). Ravenna of Bouché, Palmaeae. One species of palm allied to Hyophorbe, from which it differs among other things, in its dwarfer habit, usually dioecious, in the flowers, which are arranged separately on the short branches of the spadix. Bouche's generic name Ravena dates from 1878. It appears in Bentham & Hooker (3:883) as Ravena. In spelling it is so similar to Ravena of Velzgo, 1825, that the two cannot be distinguished from pronunciation. In the interest of perspicuity, therefore, the name is here changed to Ravena, since both this plant and Ravena occur in the American trade.

Hildebrandtii (Ravena Hildebrandtii, Bouché). Becoming 8-12 ft. high, but flowering under cultivation when half that height, spineless, erect: lvs. elliptic-oblong or ovate-oblong in outline, long-stalked, pinnate, the pinnas 20 or more pairs and narrow lanceolate-acuminate or 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 green, the calyx 3-lobed, the petals 3 and joined at the base, the staminens 6: fr. black. Co- moro Islands (east of Africa). L.H. 27: 403. B.M. 6756. G.F. 4: 239. Florida and Marvel of the World. An excellent dwarf palm, described by W. Watson to be "as elegant as Geodendron belitsae and as sturdy as a Kentia. It deserves to take a prominent place among garden palms, its small size, free habit, elegance, good constitution, being all in its favor, while in the freedom with which it flowers and produces seed we have an exceptional character among dwarf palms." Perfect flowers are sometimes produced, although the plant is habitually dioecious. 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 fully 2000 species. Ninety of these are very long-tined. Parkinson, Americana. B. The members of the genus are naturally hardy, being found in mountainous regions and in cold and temperate parts of the globe.

Genera and species: Perennial rarely annual herbs; lvs. alternate, simple, entire, lobed, dissected or divided: fls. yellow, white or red; sepals usually 5, deciduous or marcescent, persistent; petals 3 or more, conspicuous or minute, nectar pit and scale at base; carpels many, 1-boxed; achenes generally flattened, smooth, papillose or spiny, borne in a head or spike; styles minute or elongated. For structure of the flower and fruits, see Figs. 274, 274-276, 274a. For the botany of the species native to America, see the Synoptical Flora of North America, vol. 1, part 1, f. 29-39.

1. B. Asiaticus, since the Asiatic species is far more attractive than the European. In England and in other European gardens, B. Asiaticus has been in cultivation a very long time. Parry described this species in his Paradisi, published in 1829. He termed it "the double-red crowfoot of Asia." Since his time B. Asiaticus and its varieties have been greatly improved, both in size of flowers and variety of color. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace all shades of crimson, blue, and purple. They are not as well known in American gardens as in those of England or at least not in the eastern states. The writer has seen them in Europe, and it is scattered about them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming is too short for summer bedding. The plants are then a very long time. Parry described this species in his Paradisi, published in 1829. He termed it "the double-red crowfoot of Asia." Since his time B. Asiaticus and its varieties have been greatly improved, both in size of flowers and variety of color. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace all shades of crimson, blue, and purple. They are not as well known in American gardens as in those of England or at least not in the eastern states. The writer has seen them in Europe, and it is scattered about them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming is too short for summer bedding. The plants are therefore, the name is here changed to Ravena, since both this plant and Ravena occur in the American trade.

RANUNCULUS 1479

—Ranunculus acris. Natural size.

293. Flower of Buttercup —Ranunculus acris.

CULTURE OF THE ASIATIC RANUNCULUS.—The culture of Ranunculuses in gardens and by florists has been confined chiefly to the Persian and Turkish 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. Parry described this species in his Paradisi, published in 1829. He termed it "the double-red crowfoot of Asia." Since his time R. Asiaticus and its varieties have been greatly improved, both in size of flowers and variety of color. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace almost every shade except blue, and some are striped and variegated. A well-chosen selection of these charming flowers when in full blossom is a sight not soon forgotten. They are not as well known in American gardens as in those of England or at least not in the eastern states. The writer has seen them in Europe, and it is scattered about them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming is too short for summer bedding. Therefore a position should be given them in the herbaceous border where they will receive some shade during the warmer parts of the day, or a level place in a rock garden with a northern aspect. The roots are tuberous, being like miniature dahlia roots.
1498 RANUNCULUS

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 following 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 congener the European Ranunculi, they like plenty of moisture at the roots during the growing season, and if they can be sheltered 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 toward 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 secured so cheaply.

Of the native and European species of Ranunculus, those of the Patens section, such as R. aquatilis and its varieties, are interesting aquatic plants, while R. repens, var. flavum plenum, and R. amplifices are useful as subjects for the bog garden.

For herbaceous borders or moist corners in the rock garden R. aquatilis, var. flavum plenum, R. cortusifolius, R. montanus, R. pinnatifolius, 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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8. Pl. amb.
9. cortusifolius
10. Cortusifolius
11. acris
12. aconitifolius

1. amplifices. Linn. Fig. 2675. Stems erect, 5-10 inches high, with 2-3 flowering branches; glabrous; Rs. entire, ovate to lanceolate, amplifices, acuminate.

glabrous or at first with hairy edges soon becoming glabrous, glaucous: fls. 3-6, either terminal or axillary, pure white, with yellow stamens; sepals pointed; petals much larger, obtuse. Mts. of S. E. Eu. B.M. 266 (poor). L.B.C. 16;1933. J.H. III. 35;345. G.C. II. 19;383.

2. *R. labrouss*, Gray. Plant shaggy-hairy, 4-12 in. high, sometimes becoming decumbent; root slender; hairs, usually 2-3 times 3-parted and lobed; leaves all narrow-linear, acute; primary divisions of lvs. sessile or nearly so; lvs. membranous in lower part; stems, sessile or on a sheathing base, usually borne opposite, resembling an involucre; petals 5 (or 6 to 8), large, yellow, rounded outwardly, cuneate at base, much exceeding the lanceolate sepals which are hairy beneath; achenes somewhat compressed, nutlike; style long, straight, subulate: head globose to oblong. Summ. Rockies of Colo. altitude 10,000 ft. - Int. 1881. Procurable from dealers in Colorado plants.

3. *R. répens*, Linn. Plant more or less hairy, spreading by runners: root fibrous; fls. stems often ascending 6-12 in.; lvs. petioled, 3-divided; middle lift, or all lifted, often again 3-lobed or cleft, and somewhat pears-toothed, bases cuneate or truncate; petals oblong, 5-6 lines long; sepals much shorter, spreading, hairy below; achenes compressed, margined: head short, stout, slightly bent: head globose. May-July. Low places, from Nova Scotia and Newfoundland to Va. and westward; also Eu. and As. - A double-flowered form (var. florae plena): Fig. 2976. is not uncommon in gardens.

4. *R. montanus*, Willd. Mountain Buttercup. Plant 6 in. high, pubescent, with soft-appressed or spreading hairs, especially toward the top; root-stock creeping, 1-3 in. high, 5 in. thick; radical lvs. few, petioled, smooth, orbicular in outline, 3-parted, and lobed into blunt toothed segments; stems, sessile or nearly so, clasping the stem, 3-5-parted into narrow somewhat toothed or entire lobes; fls. solitary, terminating the simple or once-branched stem, 1 in. across or larger; sepals cuneate, acute, yellowish green, slightly hairy; petals 5, large, broadly obovate, bright yellow, with small scale and pore at base; achenes turgid, glabrous; head strongly hooked, puberulent. May-July. Eu. B.M. 2082. L.B.C. 17;1610.

Var. dentatus, Baum. (R. Cárpicíus, Herb.). Lvs. much more toothed than in the type: plant much taller: fls. larger. B.M. 2926. G.C. II. 52;1138.

5. *R. bulbosus*, Linn. (R. spéridus, 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, often reflexed; achenes 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. *Súkordóttí*, Gray. Roots fibrous; stems slender, 3-6 in. high, glabrous, raced and lowest stem-lvs. small, about 4-8 lines long, suberectiform to broadly flabelliform, with truncate base deeply 3-5 parted or divided; divisions cuneate, again 2-5 cleft or incised; upper stem-lvs. with linear divisions; fls. 1-3, deep yellow; petals round-obovate, reflexed: achenes turgid, lanceolar, sharp-edged, glabrous; style persistent for a time, slender, 2½ line long, equaling the achenes: head of fruit globular. July, Aug. Damp places, 6,000-8,000 ft: altitude. Mt{s. of Wash., Ore., and Mont. - This rare species was offered by F. H. Horfors in 1889.

7. *Asiáctus*, Linn. Fig. 2077. Plant erect, either simple or branched, ½-1 ft. high: roots fleshy; lvs. petioled, becoming sessile upwardly, ternate or bifidate: segments toothed or deeply 3-lobed: fls. terminating the stems and branches, variable in color among the cultivated forms: calyx spreading, becoming reflexed: petals large, obovate, blunt; fr. in a spheroid. May, June. Asia Minor. F.S. 16;1679 (fl. pl.). R.B. 16;133 (var. superbusíssimum). - Highly bred double fls. of many kinds are in cult. Roots are sold as "slips." The Persian and Turkish Ranunculuses belong here.

8. *orthórhóchus*, Hook. Plant 10-18 in. high, erect, branched, hisrate to nearly glabrous: root thick, fibrous: lvs. oblong in outline, pinnately compound: lfts. 2-7, cleft and incised, quite variable: upper lfts. often confluent and sessile or nearly so, lower ones well-stalked: petals 7-10, yellow, rarely purple beneath, obvate; sepals much shorter, pubescent beneath, reflexed, deciduous: achenes glabrous, obliquely ovate, compressed, margined: style of same length, straight, rigid, persist
10. **Californicus**, Reuth. Plant rather weak, 1-2 ft. high, usually pubescent or hispate, 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; achenes flat, slightly marginated, held very short. Rather dry places, W. Calif. and adjacent Ore.

11. **acris**, Link. Figs. 1874, 2074, 2075, 2078. Plant hairy up to the segals, erect, 1-2 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 ovate-cuneate, 2-5 lobed and coarsely toothed or cut; bracts linear, lobed or entire; fls. yellow, 9-12 lines across, several, on rather short peduncles; segals hairy beneath, ovate, shorter than the petals; petals 5, glabrous, oblong, oblongate, bearing a prominent scale at base; achenes compressed, concolorous on margins; style very short; head globose. May-Sept. Newfoundland, Canada, eastern states. Said to be naturalized from Europe. — Var. **floreo-pleno**, Hort. is more common in cult. The best forms are deep, glossy, golden yellow and very double. Called **RACHEL'S BUTTONS.** B. M. 215.

12. **aconitifolius**, Link. Plant pubescent, 1/3-1 ft. high, branched; lvs. palmately 3-parted, parts cut-toothed, uppers coarsely toothed and coiling along to linear-lanceolate leaves; fls. white, several on a stem; segals flat, pubescent; petals oblong, cuneate or orbicular. May, June, Mountains of middle Europe. — Var. **floreo-pleno**, Hort. (var. glabrosa), called **BUTTERCUP**. B. M. 215. **FAR MAIDS OF FRANCE** has very ornamental, double, white, globose flowers. Gm. 45, p. 29; and 48, p. 506. Var. **luteus-plenus**, Hort. Fls. much doubled but of a golden yellow color. The type and varieties are suited to borders and half wild places.

2078. **Buttercups**—**Ranunculus acris**. Natural size.

R. **arvensis**, Zehl. din. in white tinged rose. Austria Gm. 23-234. — R. **aquatilis**, Link, sometimes called Lasodevart, Ram's Foot, etc., is an interesting aquatic plant common in temperate regions, the floating lvs. often broad and lobed, while the submerged lvs. are cut up into numerous thread-like segments. — R. **amphitribax**, Link, is a yellow fl., species offered in single and double forms by Dutch bulb dealers. Mediterranean region — R. **cardiophyllus**, Hook., offered in Colo. in 1900, is very


dsidered by Gray as R. affinis, var. validus. It is an American species pictured in B. M. 2099 with yellow fls. 14 in. across. — R. **flaviceps**, Muhl. Height 1 ft. June. N. Am. Min. 2:14. — R. **Ferens**, Linn., called Lett Celandine, is a European plant, native of Europe and the Caucausus region. It has yellow fls. about 1 in. across. A double form is procurable from Dutch bulb dealers. — R. **frangipani**, Linn., is a European species of which a double form is advertised by Kelbage, of Haarlem, Holland — R. **Lithos**, Hook. f., the New Zealand Water Lily grows 2-4 ft. high but with white or rose-colored fls. 4 in. across, borne in many-flowered panicles. In Europe it

2079. **Dwarf Essex Rape** 

is considered a cool greenhouse plant. It is a pungent species and ought to succeed somewhere in North America. C. C. 18, P. 237. — R. **parasitoides**, Linn., is a white fl., European mountain plant common in high pastures, much used by Dutch bulb dealers. 4:9, 3:30, 37. B. C. 2:345. B. M. 396. — R. **pedatula**, Waldst. & Kit., a native of the Hungarian Alps, has yellow fls., petals subulate, claw orange. Offered by Dutch dealers — R. **ruptuosus**, For. is advertised in B. M. 255, with showy 3-petalled yellow fls. fully 2 in. across. It is a native 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 **Ranunculi**, known also as R. Asiaticus, var. superbus. — R. **vulgaris**, Hort. Var. Tubergensis is a scarlet and green fl. variety of the Turanian class of R. Asiaticus. — K. C. **DAVIS**.

**RAPE** (Rapae Napus). Figs. 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 sufficient feed during late summer and autumn, when pastures become bare. Varieties used for the latter purpose usually do not produce seed in this climate the same season, though they are usually classed with annuals. **Dwarf Essex** Rape is an example of the kind used for solitary (uniform feeding) purposes. Rape is more important to the fruit grower as a cover-crop. The seed germinates readily, will often grow where a clover catch is impossible, and furnishes excellent sheep pasture late in the season. When grown strictly as a forage plant the tops are cut and hauled to the feed-lot or stable. **Dwarf Essex** Rape much resembles a rata-baga turned at first. It is like a rata-baga 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 hulms in worn-out lands. In the Middle West, where shade is needed, Rape is used as a nurse plant for clover when the latter is sown in orchards in midsummer. Turnips may be used for the same purpose.

**JOHN CRAIG**

**RAPANUS** (classical name, from the Greek). Cru- el. Raper. Raper. Charlock. Annual or biennial branching herbs, of about 6 species in Europe and temperate Asia, of which one, R. sativus, is the Radish (which see). They bear small but rather showy slender pedicelled flowers in rose-like, white, or in some species yellow, in open clusters or solitary; leaves slender, the radical and sometimes the cauline hyrate-pinnatifid. Stems 6, free. Segals 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.
RASPBERRY

1501

long cylindrical, fleshy or soft-leaved siliques, with spiny tissue between the globose, seeds, indehiscent. The genus is divided into two natural groups, one (Raphanistrum) with the pod longitudinally grooved and constricted between the seeds, the other (Raphanus) with the pod not grooved nor prominently constricted. To the former group belongs R. Raphanistrum, Linnaeus, the Jointed or White Charlock (sometimes, but erroneously, known as Rape). It is an Old World annual weed, now naturalized in fields and waste places in the easternmost states. It is erect, sparsely hairy herb, with slender tap-root and radish-like lvs., growing 2-3½ ft. high; fls. rather showy, yellowish, turning white or purplish; seme 1½ in. long, four-seeded, with a long beak. It is from this species that Carriere produced Radishes by means of plant-breeding (see Radish).

To the second section belongs R. sativus, Linnaeus, the Radish, generally considered to be native to Europe and Asia, but unknown in an aboriginal wild state. It is usually an annual, although commonly spoken of as biennial, because the roots can be kept over winter and planted the following spring. The winter Radishes are truly biennial in northern climates. Radish has pink-like or nearly white fls., and short, thick, spongy, taper-pointed pods. Sometimes it runs wild in waste places, and then tap-root-like 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 that have a broad root, much shorter than its sti,dian, and sometimes becoming nearly 1 ft. long. Some forms are scarcely distinguishable from short turnips.

The Madder Radish (India) is grown for its soft, tender peel, from which Radish pickles are made. The Rat-tailed or Serpent Radish, var. caudatus (R. caudatus, Linnaeus), has enormously long pods (see Fig. 2060), which are eaten either pickled, or raw as Radish roots. Frequently the pods are 1 ft. long. The root is short and hard. This is a cultural variety, coming true from seed.

L. H. B.

RAPHIA. See Raffia.

RAPHIDOPHORA. See Raphidophora.

RAPHIOLEPS (Greek, rho phisin, needle, and lepis, scale; referring to the subulate bracts). Sometimes spelled Rhaphiolepis. Roschen. Ornamental evergreen shrubs, with alternate or obscurely whorled, usually serrate lvs., white or slightly pinkish fls. in terminal racemes or panicles and small purplish 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, all of which are called Roxbus and Pluothéin, but fls. in racemes or panicles, and with deciduous calyces; lms. 15-20; style 2-3, connate below: fls. white, bluish or purplish black, brown, with one globular seed.


INDICA, Lindl. (R. rhaban, Lindl. Coleus lupinus, Linn.). INDIAN HAWTHORN. Shrub, to 3 ft., with slender, spreading branches: lvs. oblate to oblanceolate, acute or acuminate, gradually narrowed at the base, serrate, glabrous or slightly pubescent, but when unfolding, 1½-2½ in. long: fls. white or pinkish, about ⅛ in. across, in glabrous or somewhat tomentose, rather loose panicles; sepal lanceolate, acute, usually red like the filaments; petals acute: fr. 1½-3 in. across. May, June. S. China. B. M. 1726. B. K. 6:465; 17:1400. —A very variable species; several forms have been described as distinct species, as R. Phaenostoma, cabro and sabinofolia, Lindl. The latter, sabinofolia, Nichols., is the most ornamental: lvs. oblanceolate, acuminate; panicles rather large and many-fl., stems white or purplish, shorter than sepal., B. K. 8:652. R. H. 1874:276. Gn. 9:26. R. color, ad

vertised by the S. Calif. Aedem. Assoc., is Pyrenantha circuminate, which see. A hybrid between the two species is R. Ptolemaion, Andre, forming a compact shrub with rather large panicles of blushed fls., and the foliage intermediate between the two parents. R. H. 1900:658.

ALFRED REHDER.

RASPBERRY is a name applied to those brambles in which the fruit separates from the receptacle when ripe. Plate XXXIII. Three species are of importance in American fruit-growing. Rubus ilicifolius, the European Raspberry, has been longest in cultivation and is least important now in this country. Though brought to America by our forefathers among their earliest fruits, and the parent of many varieties here produced, the species has never fully adapted itself to the American climate. Owing to this fact, the work of Brincklé and others, in improving it, in the early part of the century, proved of little permanent value. The fruit is of superior quality and continues to ripen through a long period, but the plants are deficient in hardiness and productiveness. Rubus strigosus, the American red Raspberry, is very like its European congener. Though slightly inferior in quality of fruit, its greater hardiness and productiveness have sufficed to confine the commercial growing of red Raspberries in America almost wholly to this species. It has been under domestication only within the last half of the century. Cuthbert, the leading variety, is shown in Figs. 2600, 2601. Rubus alaskensis, the so-called 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 rendered less by most persons than that of the reds. The yellow or 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. arguta*, known as *R. occidentalis*, have given the purple-cane class, of which Snuffer (Fig. 2802) is a leading example. For further notes on species of Raspberry, see Kubitz.

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 impenetrable, it may be improved by subsoiling or sub-tiling. This will provide a deeper reservoir for the storage of moisture. More important is the proportion of vegetable matter. A soil rich in humus admits water more readily and in larger quantities, retains it longer for a series of years, judging from the first crop only. No one can tell the grower how to fertilize his plants; the question must be settled upon his own farm. Cover-crops have not been extensively used, but are likely to receive more attention in the future. Where an inch or more of snow will thrive it is well adapted to the purpose, although somewhat difficult to uproot in spring.

Planting may be done in fall or spring, but spring is to be preferred for black-caps. Young plantings 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 quality of the offspring. Black-cap plants are obtained by burying the tips of the growing cane, late in summer, when they begin to thicken and throw out roots. When thoroughly rooted, the layer is severed and the "tip" (Fig. 2803) is used for planting. Red sons throw up numerous suckers from the roots and these are often 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 checkerrows, six or seven feet apart, with plants four to six feet apart in the row. Cross-cultivation in early spring and after fruiting will improve and in keeping a plantation in good condition. Without it the reds quickly form thick hedge-rows. Intensive methods of plowing require the rows to be planted with common farm methods they are better omitted.

Thorough tillage should be given till mid-summer, 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 given 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 row and bend the plant in that direction. The plants are usually bent in the direction of the row so that the tops will lap over the crowns.

The young shoots of black-caps should be nipped off as soon as they reach a height of eighteen to twenty-four inches, that a well-branched self-supporting bush may be obtained. In spring following, the branches should be shortened to one to two feet. 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 severe should it 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 than their removal gives a good opportunity for cross-cultivation. The check-row system is used; and a thorough cleaning up before the season's tillage is abandoned. Early removal may also help to check the spread of certain enemies. Plantations may be kept in bearing many years if desired, but it is seldom profitable to do so.

The fruit demands care in picking and in handling thereafter. It should not remain on the plant too long. Raspberries are especially difficult to ship 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. It must be watched and should be rooted out and burned at once. Anthracnose is especially troublesome. Only plants free from it should be set, and the plantation should be aban-
RASPBERRY

Donned before it becomes badly diseased. Spraying will reduce it but is not entirely satisfactory. Crown-gall, due to the growth of a specific organism of a very low order, belonging to the slime-molds, is often serious, particularly with reds. Neither affected plants nor

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

FRED W. CARD.

RAT-TAIL CACTUS. Cereus flagelliformis.

RATTAN. See Calamus.

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

RATTLE-BOX WEED. See Hieracium venosum.

RATTLE-BOX PLANTAIN. Goodyera.

RATTLE-BOX ROOT. Prenanthes.

RAUWOLFIA (Leonhart Rauwolf, physician of Augsburg, published a book in 1583 on his travels in the orient; often erroneously stated to be of the eighteenth century). Apocynaceae. About 40 species of tropical trees and shrubs with lvs. in whorls of 3 or 4, rarely opposite, and small fls. often borne in dichotomous or trichotomous clusters. Calyx 5-cut or 5-parted; lobs obtuse or acute; corolla funnel-shaped; tube cylindrical, dilated at the insertion of the stamens, usually constricted at the throat, devoid of scales; lobes 5: disk cup-shaped or ring-shaped: carpels of the ovary 2, distinct or considerably grown together: style short or long: ovules in each carpel 2: drupes 2, distinct or connate into a 2-stoned fruit, the stones 2-grooved or 2-cut: stones 1-seeded: seeds ovate; albumen fleshy, smooth, not ruminate, rarely wrinkled. These plants are little known horticulturally. The only species in the American trade, apparently, is R. Chinensis, Hort. Several years ago the

undersigned received from the Botanical Garden at Hong Kong a few seeds of this small evergreen shrub. The seeds germinated well and the plants grew rapidly, attaining a height of about a foot in a year. During the summer of the second year the rather bushy plants flowered well and bore a crop of shining red berries which were very conspicuous throughout the winter. When well grown and bushy the plant is quite ornamental, its habit being dense and the color of its leaves dark green. The flowers are white, and are borne in dense trusses at the extremity of each shoot. Though an individual flower does not make much show, the plant is very ornamental when covered with masses of blossoms. The plant needs a rich, light soil, much water when in full growth and protection against the fierce rays of the sun. Every spring the old soil should be shaken out and replaced by a rich compost. In the writer's garden at toilet, Orange county, Florida, the Rauwolfa flourishes with great luxuriance in the shade of other shrubs in rather moist spots. Although it is easily winter-killed, it sprouts readily in spring from the roots. When covered with numerous trusses of shining red berries the plant is an object of beauty.

H. NEHLING.

RAVENALA (the name of the plant in Madagascar). Scitamineae. A genus of 2 species, 1 from Brazil and Guiana and 1 from Madagascar. Musa-like plants become 25-30 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 spath or bract: petals long-exserted: sepals free: fr. a 3-valved capsule.

a. Lvs. shorter than pedicels.

Madagascarriensis, 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. Gng. 5:133. V. 23, p. 136. F.S. 21:2254. A.F. 12:535. R.H. 1890, p. 152. G.C. III. 2:693. A.G.

2083. "Tip" or layer of Raspberry.

2084. Travelers' Tree—Ravenala Madagascariensis.
RAVENA

RAVENA (name not explained) Rhaticea. A genus of 2 species of tender shrubs from Cuba and Brazil: Ivs. opposite, l-3-foliolate; lfts. lanceolate, entire; fls. red or orange, borne on rather long axillary peduncles; sepals unequal, the outer being somewhat foliaceous; corolla-tube straight, rather long; the 1 species is Phalaris arundinacea. Bed Mace or Cat-tail is also offered. I.H. 9:323.

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

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 in Canton). Streptosea. A genus of 3 species of trees from tropical Asia, with coriaceous, simple leaves and terminal coriaceous pinnacles of white fls. Calyx-club-shaped or campanulate, irregularly 3-5-lobed; petals 5, oblong, furnished with a caw; staminal column long, adnate to the gynophore; anthers 5, in a globular head, ovary 5-seeded, usually in seed; capsule woody; seeds winged.

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

REINECKIA (J. Reinecke, a German gardener). Lithocarpus. A genus of several species from China and Japan, a slender perennial herb, with attractive foliage in pairs 1-1 1/2 ft. high from a thick, creeping rootstock. Lvs. rather long, channelled; sepals leafless; fls. sessile, in a loose spike; perianth-tube cylindrical; lobes recurved, spreading; ovary 3-lobed, with a few seeds to each cell; berry globose, usually with one seed to each cell. The following is preeminent from Dutch bulb-growers.

carnea, Kunth. Fls. dull flesh or pink: bracts rather large, tinted red; fr. red, 3-4 lines in diam. B.M. 739. —Var. variagata is also offered. I.H. 9:353.

REIN ORCHIS. Habenaria.

REINWÄRTDIA (Kasper Georg Karl Reinwardt, 1773-1832, scientist of Leyden; traveled in East Indies 1815-1822). Linnaeaceae. A genus of 2 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 Reinwardia trigyna is known to this day as Linum trigynum by the gardeners, who usually accent trigynum on the second syllable instead of the first. Reinwardia is distinguished from Linum by the yellow fls., 3-4 styles and unequal or dentate glands; Linum has mostly blue, rosy or white fls., 5 styles, and equal glands. Other generic characters: petals 5, concolorous, tegumentous; stamens 5, alternating with as many staminodes; glands 2-3, adnate to the staminal ring; ovary 3-5-lobed.

Reinwardtias are showy subshrubs about 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. Topshoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for a season may be planted out in the early summer, and these will make good plants and furnish cuttings. They will have to be topped frequently and carefully lifted. Young stock is better kept in pots, as the plants do not lift well. Sunshine is essential during the winter season to get the best development of Reinwardtias. They thrive best in a temperature of 55-60°.

A. Lvs. entire: styles 3.

trigyna, Planch. Flg. 2885. Lvs. elliptic-ovate, 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.

RENAO>EHA \R

Storise, Richb. 1. Stem slender, climbing, 10-12 ft.
high: lvs. alternate, oblong to linear-oblong: panicle
about 1 ft. long and nearly 1 in. broad: fls. 25-3 in.
long; petals and dorsal sepal erect, linear-spatulate, orange-
red, mottled with crimson; lateral sepals pendulous, obovate-spatulate, undulate, crimson with large blood-
red blotches: labelum very small. Philippines. B.M.

Lowei, Richb. f. (Vanda Lowei, Lindl.). Fig. 2066.
Stems very long, climbing, somewhat branched: lvs.
rather crowded, strap-shaped, 2-3 ft. long; racemes
from the upper axils, 6-12 ft. long, bearing 40-50 fls.;
fls. of two kinds, the lowest pair tawny yellow with
crimson spots, the others larger, pale yellowish green,
irregularly blotched with reddish brown; sepals and
petals lanceolate, acute, undulate, on the lowest pair
shorter, blunter and more flabby. Borneo. B.M. 5475.
197. G. C. II. 20:637; III. 27:3. A very remarkable
orchid. Heinrich Haselbring.

RESEDA (from the Latin to calm; said to allude to
supposed sedative properties). Resedaceae. Mignon-
ette. The family Resedaceae includes between 60 and
70 species of small, not showy plants, mostly herbs,
doubtedly distributed in warm-temperate regions. These
species fall into 6 genera, of which only Reseda is cul-
tivated to any extent. This genus contains 53 species
(Muller, DC. Pradr. 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 or cleft petals and 8-40 small
stamens; pistil 1, ripening into a 3-4-horned capsule
that opens at the top at maturity (Fig. 2067), 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. lutetola, 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. lutea, Linn., with pinnatifid lvs.
and petals usually 6.

A. Lvs. entire or nearly notched.
II, 1867. Branching annual herb, at first upright but
becoming wide-spreading and more or less decum-
bitous: lvs. spatulate or oblanceolate, mostly obtuse
usually entire but sometimes notched: fls. yellowish white,
in spicate racemes that become loose and open with age,
409.— Much grown for its strong and agreeable frag-
rance. It has been greatly modified under domestica-
tion. The following garden names seem to belong to
this species: amylios, compacta, cistina, gigantea, granitiflora,
multiflora, pungens. Var. suffruticosa,
Edw., is woody at the base. B. R. 3:227. Forty to 50 named varieties of
R. odorata are in the trade. See Mignonette.
glandea, Linn. Glabrous and some-
what 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. Sec. 70.
AA. Lvs. usually prominently lobed
or pinnatifid.

Alba, Linn. (R. suffruticosa, Loc. f.).
White Upright Mignonette. Fig.
2088. Straight-growing erect gla-
brous annual or biennial plant, 1-3 ft.
tall, weedy: lvs. numerous,
long-stalked, deeply and irregularly pinnatifid,
the segments usually linear and sometimes toothed:
fls. white, in a very long, slender spike. S. Eu. G.C. III.
29:45.— 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.
crystalina, Webb. Glabrous, sparingly branched,
somewhat glaucous annual: lvs. usually 3-parted, or the
lowest ones yellow, of those higher alternate or in a few cases
Canary Islands.—Has been offered as a garden annual.

HENRICK HASSELBRING.

2085. Renanthera Lowei.

× 1/2.

Notes on Reseda odorata. — In the improvement of the Mignonette less
attention has been paid to the individual
flower than to the spike as a whole.
What the florist has desired is as
largely 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 abun-
dance of spikes. Under such circumstances we can ex-
pect 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
ants, 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 small-
ness of their spikes, the pungency of their odor (being
in some cases even unpleasant), and the tendency of the
flowers to produce monstrosities. In the more improved
varieties, and especially in those plants that have been
largely fed, the size of the flowers is sometimes con-
siderably 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 spikes have been picked and hung up to dry that one recognizes the sweeter, paler-like scent. The modern improved varieties are likely to have very little scent when forced or fed high, and in cases of excessive forcing they become nearly or quite scentless. But if left them will 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 releasing surplus ethereal oils freely under normal 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 given kinds of soil will be less fragrant than when grown in certain other soils. Thus Henderson, in his "Handbook of Plants," states that "Mignonette should always be grown in light, sandy soils, it is possible; as when grown in a rich loam it loses its fragrance." To test this matter, a number of plants of the same variety (Improved Victoria) were grown in soils varying in proportion of sand and loam and amount of manure as follows: Soil 1. 3 parts sand, 1 loam, 1/2 dung; Soil 2. 2 parts sand, 1 loam, 1/2 dung; Soil 3. 1 sand, 2 loam, 1 leaf mold; Soil 4. 1 sand, 2 loam, 1 manure; Soil 6. 1 loam, 2 manure, 1/2 dung.

The difference in fragrance was difficult to estimate on account of the difference in the plants were in bloom and trying to strike an average. The conclusion was reached that the plants grown in the lighter soils had a stronger and more pronounced fragrance than those grown in the heavy clay soils. The amount of fragrance given by wilting flowers on the heavy clay soils is very perceptibly less than that given off by flowers from the lighter soils. In plants grown in a heavy clay loam richly manured, the fragrance was hardly perceptible and very faint even on wilting.

The influence of the different proportions of manure and soil used was not measurable, as the difference, if any, in the strength of the odor given off by the different spikes was too slight to measure.

Heavy manuring seems to have a deleterious effect on the fragrance of Mignonette. Two plots of the same number of plants growing in a solid bed were taken. One was manured weekly with liquid manure; the other was left unmanured. The manured plants made more growth and produced less but larger flowers than the unmanured plants. The fragrance 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, plants of the same varieties were grown in houses whose mean temperature was 59° F., 63° F. and 72° F. The plants had the same soil. Those in the house whose temperature was 59° F. were grown in flats and benches, while those in the other two houses were grown in 3-inch pots. All were sown November 16.

Those in house of 59° F. germinated two days ahead of those in house of 63° and three days ahead of house of 72°. In a relative amount of fragrance the plants stood as follows: (May 15): Hot house, first; cold house, second; medium, third. But in fragrance they stood as follows: Medium house, first; hot, second; cold house, third. The outside temperature became high enough to curtail the outside temperature in the medium house in fragrance. At certain stages of the spike-development, the fragrance seemed stronger in the hot house than in the medium house, but did not fast 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 grown from the cool house to the temperate (65°) house and left there for some time, with the result that after a time no difference in the fragrance between the cool house plants and those grown in the medium house could be detected, although there was a difference at first. Plants taken from the temperate house into the cool house, on the other hand, apparently did not lose their fragrance until the old spikes had been replaced by new 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 is 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 difference in odor between plants grown in a warm 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 lost and volatilized above a normal rate, whatever that rate may be; hence the tardiness of the plants to react with the cooler temperature.

R. L. JUNGHANS.

RESEDA

RESEDALCA (Joseph Emanuel Restrep, a student of natural history in the tropics). Ochidaceae. A genus of very interesting little plants, allied to Masdavallia, and not unlike that genus in habit and appearance. The stems are tufted on creeping rhizomes, each bearing a single leaf and clothed below with scales. The flower-stems appear from the axil of a single leaf. 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 is 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 difference in odor between plants grown in a warm 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 lost and volatilized above a normal rate, whatever that rate may be; hence the tardiness of the plants to react with the cooler temperature.

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R. L. JUNGHANS.
Anastatica, Linn., which means "Resurrection Plant from Jericho." The plant is a native of the sandy deserts from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall off and the branches roll up into a ball, reminding one of wicker-work or lattice. Inside the ball are the fruits, which are borne in a protected position near the tips of the inrolled branches. The plants are then uprooted and are blown about on the desert. These balls were thought by many to be "the rolling thing before the whirlwind" mentioned in Isaiah, and were brought to Europe by the crusaders. They may be dried and wetted alternately many times. The vitality of the seed is doubtless considerable, but it is not necessary at any stage, at least in America. The plant is anything but ornamental. The undersigned has often grown it for classes in botany, sowing the seed in February in pots and not having a long, slender silicle. The growing plant has obovate lvs., the lower ones entire, upper ones toothed, and the fls. are small, white and borne in spikes in midsummer. Excellent pictures of Resurrection Plants may be found in Kern and Oliver's "Natural History of Plants," together with reliable accounts of the behavior of the various kinds. See also B.M. 4400. G.C. 1872:1668. Gn. 4, p. 111. These plants have much folk-lore.

1. The Rose of Jericho properly Anastatica Hierochuntica, Linn., which name means "Resurrection Plant from Jericho." The plant is a native of the sandy desert from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall off and the branches become woody and roll up into a ball, reminding one of wicker-work or lattice. Inside the ball are the seeds, or, in botanical language, the fruits, which are borne in a protected position near the tips of the inrolled branches. The plants are then uprooted by the winds and are blown about on the deserts. These balls were thought by many to be "the rolling thing before the whirlwind" mentioned in Isaiah, and were brought to Europe by the crusaders. The shape of these balls might be fancifully compared to that of an unopened rose. When the winter rains descend or when the balls are blown into the Mediterranean the branches at once open back and stretch out straight, the fruits open, and the seeds germinate very quickly, "often in the fruit," according to Warming. The dead plants do not, of course, "come to life," but they retain their hygroscopic properties for many years. They may be dried and wetted alternately many times. The vitality of the seed is doubtless considerable, but it is a question whether there is any good scientific record on this point. The balls are often sold by fakirs and dealers in novelties and attempts are often made to grow the plants at home. Botanically, Anastatica is highly distinct by reason of its short and broad fruit or silicle, which has 2 ear-like appendages at the top. The silicle is divided by a transverse partition into 2 cells, each of which contains a seed. There is only one species. The genus belongs to the Arabis tribe of the Cruciferae, but is exceptional in not having a long, slender silicle. The growing plant has obovate lvs., the lower ones entire, upper ones toothed, and the fls. are small, white and borne in spikes in midsummer. Excellent pictures of Resurrection Plants may be found in Kern and Oliver's "Natural History of Plants," together with reliable accounts of the behavior of the various kinds. See also B.M. 4400. G.C. 1872:1668. Gn. 4, p. 111. These plants have much folk-lore.

2. 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 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. 461. F. 1671, 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 interior volume 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 Odonotispernum. See Fig 2901.

4. Several species of Mesembryanthemum are known to be hygroscopic. According to Kern and Oliver, "the capsular 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, lithotomy 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.

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
plant could be grown in a window-garden. For his special purpose the writer has been accustomed to sow seeds in Feb. in 4-inch pots, using a light, sandy soil, in a house with a temperature of 60° F. If the seedlings are large enough they are transplanted into other 4-inch pots, 3 plants to a pot. As to the vitality of the seed the writer can only say that the seeds of Crucifers, being generally, not only, often retain their vitality for five years or more.

Selaginella lepidophylla is a perennial plant. It is rarely cultivated in greenhouses for ornament, like the evergreen kinds. It is chiefly grown by fanciers of ferns and selaginellas, as it is by no means the most beautiful member of the genus. The writer grew a plant of it for four years, and once saw at one of the botanical gardens which has long cultivation had developed a stem almost a foot high. It looked like a miniature tree-fern, except of course that the fronds were arranged in a dense rosette, giving the plant a flat rather than a pendant appearance. Whether the plants received directly from Texas have a crop of spores on them is a question. The spores do not discharge when the plants are watered. Many extravagant statements are made about the Bird's-nest Moss. The dried plants offered by the trade will turn green and grow unless they are too old or have been kept dry too long. They would probably not grow if kept over more than one season. They cannot be dried again and again indefinitely.

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

The writer has a fern which could just as truly be called a Resurrection Plant. It is Polypodium internum. It is native of the southern states, where it grows up the trunks of trees, on stones, and in the sand. At certain times it is dried up and parched, but as soon as moisture conditions are restored it looks as if it were growing again. If the plants are growing on the branch of a tree in a cool house and it has been tested several times, they will turn green and grow unless they are too old or have been kept dry too long. It is often kept for years by gardeners who have it in hanging baskets. It has been used in the same way as the Bird's-nest Moss, the dried plant being put in a bowl of water, where it will grow until it is used up again and then is dried off and put away until needed. When the writer has a fern which could just as truly be called a Resurrection Plant. It is Polypodium internum. It is native of the southern states, where it grows up the trunks of trees, on stones, and in the sand. At certain times it is dried up and parched, but as soon as moisture conditions are restored it looks as if it were growing again. If the plants are growing on the branch of a tree in a cool house and it has been tested several times, they will turn green and grow unless they are too old or have been kept dry too long. It is often kept for years by gardeners who have it in hanging baskets. It has been used in the same way as the Bird's-nest Moss, the dried plant being put in a bowl of water, where it will grow until it is used up again and then is dried off and put away until needed.

Edward J. Canning.

RECEDING 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 it is true that the only plant in which the art of retarding plants is practiced in commercial establishments. There is sufficient demand for these flowers all the year round to justify the expense of cold storage. Listed in the catalogue "pips" of the American Fruit Growers' Exchange are: Daphnis orientalis, var. decussata, and some intermediate forms, with yellowish or white flowers, show yellowish marks on the upper side of the leaves like a Chinese Fir. These Retin-spora forms are described under the genus Chamaecyparis, chiefiy disjunct in Japan and China. They usually bear seeds without changing the foliage on the same plant. They do not appear to be the true relation of these forms and were as far as to place one of them in the genus Juniperus. With the exception of Retin-spora viridicaulis, which C. Koch recognized as the juvenile form of Thuja occidentalis, the origin of these juvenile forms remained doubtful until L. Beissner, after having carefully studied the subject, showed that there was a relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedlings which have still retained their primordial foliage, in which larger plants of these doubtfů forms had been observed accidentally to develop branches with the foliage of the typical form. See, also, Gt. 1878, pp. 109 and 122; 1881, pp. 210 and 290, and 1882, p. 138.

There are a number of these juvenile forms generally in cultivation, each of them with an intermediate form showing either a kind of foliage approaching that of the type or two different kinds of foliage on the same plant. There seems to be no doubt that all these forms have been secured by propagating branches of young seedling plants. All seedlings of Chamaecyparis, Thuja, and other genera of the Cupressineae produce in their juvenile state a kind of primordial foliage very different in appearance from that of the adult plants. The first leaves are always linear and spreading, passing gradually into acicular and at last scale-like leaves. In some plants, especially where they have not sufficient nourishment, the primordial foliage is retained longer than usual and these have probably been selected for perpetuating the juvenile state, by means of cuttings. In many generations the propagation of those branches which show the juvenile state most distinctly, these forms have become well-fixed varieties and even sometimes bear seeds without changing the foliage on the same plant. They are as a rule found branching of the typical form. The leaves, however, are much softer and not sharply and acutely pointed as in Juniperus; they are mostly marked with white or grayish green lines beneath, which is never the case in Juniperus. Thuja orientalis, var. decussata, and some intermediate forms, with yellowish or white flowers, show yellowish marks on the upper side of the leaves like a Chinese Fir. These Retin-spora forms are described under the genus Chamaecyparis, chiefiy disjunct in Japan and China. They usually bear seeds without changing the foliage on the same plant. They do not appear to be the true relation of these forms and were as far as to place one of them in the genus Juniperus. With the exception of Retin-spora viridicaulis, which C. Koch recognized as the juvenile form of Thuja occidentalis, the origin of these juvenile forms remained doubtful until L. Beissner, after having carefully studied the subject, showed that there was a relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedlings which have still retained their primordial foliage, in which larger plants of these doubtfů forms had been observed accidentally to develop branches with the foliage of the typical form. See, also, Gt. 1878, pp. 109 and 122; 1881, pp. 210 and 290, and 1882, p. 138.

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Chamaecyparis pisifera, var. squarrosa, Beissn. & H. |t. (Chamaecyparis pisifera, Sieb. & Zucc.) Fig. 149. A dense, pyramidal or rounded-headed bush or sometimes small tree, with light bluish green foliage almost silvery white when young, usually coloring violet in
winter: tips of branches nodding; lv. crowded, spreading in line of branch, bright green above, paler 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 suckering lv.s, and is often planted, especially in its golden variegated form. See Fig. 41s, Vol. 1.

Chamaecyparis sphaeroidea, var. ericoides, Beissn. & Hochst. (Retinispora ericoides, Zaw.). Fig. 204. Dense shrub, of stiff pyramidal habit, white upright branches and bright green foliage, changing to violet-red or bright-yellow in winter; lv.s, bright green above, with 2 bluish lines below. This form is very similar to its stiff, conic habit, but is less common in cultivation. The intermediate form var. Andelyensis. Carr. (Retinispora leptoclada, Hort.), shows also a stiff, pyramidal habit and bears chiefly small, subject or almost scale-like lv.s, and occasionally branches with spreading linear leaves. Fig. 204.

Thuya occidentalis, var. decussata, Beissn. & Hochst. (Retinispora juniperoides, Carr. R. squarrosa, Hort.). Fig. 204. Dense, round-headed bush, with bluish green foliage changing to violet or steel color in winter; lv.s, rather rigid, bluish-green, spreading, concave and with a whitish line above. But rather cult. and not quite hardy north. The intermediate form, var. Meldensis, Laws. (Retinispora Meldensis, Hort.), has mostly acicular sub erect lv.s, of the same color as in the preceding var. Andelyensis.

Of Chamaecyparis obtusa no juvenile form seems to be in cultivation, but it is highly probable that the recently introduced Juniperus Sanderi belongs here. In a list of Japanese conifers from Yokohama, the same form is entered: Chamaecyparis obtusa, var. ericoides. It is a dwarf and dense, globose bush, with bluish green spreading linear, obtuse leaves. M.D.G. 1900, 1:489.

Chamaecyparis obtusa, var. leptoclada, Hort., is a form of C. sphaeroidea, or round-headed bush, with upright branches and dull green foliage, changing to bright green in winter: lv.s, linear, soft grayish-green beneath. The intermediate form, var. Elwangeriana, Beissn. (Retinispora Elwangeriana, Hort.), has usually two kinds of lv.s, but the linear lv.s are smaller than those of the preceding form.

Thuya orientalis, var. decussata, Beissn. & Hochst. (Retinispora juniperoides, Carr. R. squarrosa, Hort.). Fig. 204. Dense, round-headed bush, with bluish green foliage changing to violet or steel color in winter; lv.s, rather rigid, bluish-green, spreading, concave and with a whitish line above. But rather cult. and not quite hardy north. The intermediate form, var. Meldensis, Laws. (Retinispora Meldensis, Hort.), has mostly acicular sub erect lv.s, of the same color as in the preceding var. Andelyensis.

These juvenile forms are valuable for formal garden- ing, 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 propagated by cuttings. See also Chamae- cyparis and Thuya.


ALFRED REHDER

REYNOSIA (Dr. Alvaro Reynoso, 1880-1888, Cuban agricultural chemist and inventor of a machine for increasing the yield of sugar). Rhuumaceae. Three species of tender shrubs or small trees, all native to the West Indies. One of them is also native to Miami and the Florida Keys, and was offered by Reasoner Bros. presumably for its edible fruits. The fls. are minute and devoid of petals, but the berries are half an inch long, oval and purple or nearly black in color. Generic characters: fls. perfect; calyx 5-lobed, the lobes deciduous; ovary 2-3-loculed; ovules solitary, erect: fl. a 1-seeded drupe, with ruminated albumen. This genus is not in Bentham and Hooker's Index generum plantarum, but technical accounts may be found in the Synopsis of the flora of North America, Sargent's Silvics and Chapman's Flora of the Southern United States.

latifolia, Griesch. Red Ironwood. Darling Plum. Slender tree, 29-27 ft. high, with slender, oblong or subrho- und, especially umarginate, 1-1.5 in. long, leathery; margins revolute: fls. in axillary umbels, borne in May: fr. ripens in November or the following spring. 8-3 2:56.

W. M.
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A. Winter-buds scaly; petals usually 1; sometimes 5 terminating; seeds (and the outer coating of the sultle) saltate or conceive on the back with the cotyledons occurring at the margins; fls. imperfectly doscious.

F. Lvs. opposite; plants usually spiny shrubs.

1. cathartica
2. Dahurica

B. Lvs. alternate; plants unarmed shrubs.

c. Foliage deciduous.

d. Fruits of cones 10-20

1. 2. 3. 4.

1. alpina
2. Libanotica
3. alnifolia
4. lanceolata
5. Alaternus

AA. Winter-buds naked; petals 5; seeds convex at the back, not grooved, with flat and fleshy cotyledons; unarmed shrubs with alternate lvs.

B. Fruits in peduncled umbels

9. Purshiana
10. Caroliniana
11. Franctula

BB. Fruits in 2-6-fld. clusters

12. Frangula

1. cathartica, Linn. (R. Wicklifl, Hort.). BUCKTHORN. HART'S-THOHN. WAYTHORN. RHUSBERRY. Fig. 2995. Shrub or small tree, attaining 12 ft., usually thorny; lvs. oval to elliptic or ovate, usually rounded at the base or cordate, obtuse or acute, crenate-serrate, glabrous or pubescent beneath, 1-3 in. long; fls. in 2-5-fld. clusters, with 4 petals; fr. black, about 3/4 in. across, Europe, W. Asia and N. Asia; often escaped from cult. in the eastern U. S. B. B. 2:106. Grg. 9:2.

2. Dahurica, Pall. (R. cathartica, var. Dahurica, Maxim). Large, spreading shrub, with stout thorny branches; branches glabrous; lvs. oblong or sometimes elliptic, narrowed at the base, acuminate, crenate-serrate, glabrous, somewhat concolorous 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. 9:245 (as R. crenata).—Sometimes 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, acute or rounded at the base, abruptly acuminate, crenate-serrate, dark green above, pale green and glabrous or nearly so beneath, 2-3/4 in. long; fls. in few-fld. clusters; petals 4; fr. black, about 3/4 in. across or less. Mountains of S. and M. Eu. L. B. C. 11:674.

This and the following species are the handsomest of the deciduous-leaved Buckthorns.


5. alnifolia, L. Hért. Low, wide-spread shrub, attaining 4 ft., with puberulous branches; lvs. ovate to oval, obtuse or acuminate, usually narrowed at the base, crenate-serrate, glabrous, 1 1/4 in. long; fls. in few-fld. clusters, 3-merous, without petals; fr. glabrose, 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 branches; lvs. ovate-lanceolate to oblanceolate, acuminate or obtuse, finely serrulate, glabrous or somewhat pubescent beneath, 1-3/2 in. long; fls. in few-fld. clusters, with 4 petals; fr. with 2 nutlets. Pa. to Ala., Tex. and Neb. B. B. 2:445.

7. crocea. Nutt. Shrub or small tree, attaining 20 ft., with pubescent young branches; lvs. coriaceous to oblong-obovate, dentate-serrate, dark green and hirsute above, bronze- or copper-colored and glabrous or slightly pubescent beneath, 3/4-1 1/2 in. long; fls. in few-fld. clusters, 3-merous, apetalous; fr. bright red, about 1/4 in. across, edible. Calif. S. Cal. 2:263.

8. Alaternus, Linn. Shrub or small tree, attaining 20 ft., with glabrous branches; lvs. oval or ovate to ovate-lanceolate, acute or serrate or almost entire, glossy and dark green above, pale or yellowish green beneath, glabrous, 3/4-2 in. long; fls. in short racemes, with 5 petals; fr. bluish black. S. Eu.—Var. angustifolia, DC. (R. angustifolia, Hort.), has narrower, oblong lanceolate lvs. There are also varieties with variegated foliage.

9. Purshiana, DC. Tall shrub to medium-sized tree, occasionally attaining 40 ft.; young branches pubescent or tomentose; lvs. elliptic to ovate-oblong, acute or obtuse, usually dentate, with often wavy margins; dark green above, glabrous or pubescent beneath, 2-4 in. long; fls. and fr. similar to those of the preceding species, but fr. much shorter. Allegheny to a few in the eastern U. S. B. B. 2:404. Grg. 9:2.

2095. Rhamnus cathartica (L.).

11. Franqugula, Linn. (Frangula Aiton, Mill.). Shrub or small tree, attaining 12 ft.; lvs. broadly obovate to oblong-ovate, acuminate or shortly acuminate, obtuse or acute, 5-6 in. long; fls. in short racemes, with 5 petals; fr. black, about 3/4 in. across, 3-merous. Tex. to S. Utah, W. and S. Nebr. and S. Sask. B. B. 2:445.
dulate; an interesting form of very distinct appearance with its feathery foliage. *R. Frangula* is a handsome lawn shrub with shining foliage and glossy light yellow flowers in winter. It is quite hardy.

*E. Herit.* Allied to *E. latifolia* with the style almost straight. Not hardy. A bent shrub, allied to *E. Erythraea.*

*R. Erythraea,* var. *Flexuosa,* Mart. Stems 2-3 ft. high, usually narrowed at the base, hairy. Very similar in habit to *R. Dahurica,* which may be distinguished in winter by its leaves obtuse, slightly serrate. It is quite hardy.

*E. latifolia.* Allied to *E. Erythraea,* var. *Flexuosa,* Mart. Stems 2-3 ft. high, usually narrowed at the base, hairy. Very similar in habit to *R. Dahurica,* which may be distinguished in winter by its leaves obtuse, slightly serrate. It is quite hardy.

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RHEUM (Rho was the old Greek name for rhubarb), Potentaria, Rheum. 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 perennial, with thick clustered roots; petioles semi-cylindric, plane above; R. Batae, suborbicular, deeply coriaceous at base, undulate, about 3-ribbed, shining above, pubescent on the veins beneath; petals tall and narrow, somewhat leafy, densely flowered, the pedicels jointed below the base; akene 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.

undulatum, Linn. Petioles-semi-terete, lightly channelled above the leaf-blades against the corolod, undulate (basal sinus not so deep as in the last), 5-ribbed, glabrous above and puberulent beneath, the upper ones long; lvs. narrow and leafy below, the pedicels jointed near the base; akene ovate or oval. Siberia. — Small plant, earlier than R. Ponticum.

Emoti, Woll. Stem tall and leafy; petioles semi-terete, somewhat concave above, the margins obtuse; leaf-blades large, ovate, coriaceous, obtuse, somewhat undulate, 3-5-ribbed, the under surface and the margin with the pedicels pubescent; petals fastigiate and branched, the fls. dark purple, pedicels jointed below the middle; akene large, ovate or oblong-ovoid. Himalaya, in alpine and subalpine regions. R.M. 5255 (this figure is questioned by Meissner, who thinks it may represent R. austriacum). — Foliage has a coppery hue.

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

compacatum, Linn. Stem tall; pediiles sulcate, plane above; leaf-blades thickish, broad-obovate, coriaceous, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin strongly toothed, the veins very prominent; pedicels with drooping branches; akene large, dark-colored. Siberia to China.

BB. Lvs. deeply lobed or evenly divided.

palmatum, Linn. (R. sanguineum, Hort.). Stem tall and leafy; pediiles subcylindrical, the margin rounded; leaf-blades broad, broad-ovate, coriaceous, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin strongly toothed, the veins very prominent; pedicels with drooping branches; akene large, dark-colored. Siberia.

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

hybridum, Moench. Petiole long, canaliculate above and sulcate beneath; leaf-blades ovate, 3-5-ribbed, the base cuneate or scarcely coriaceous, incise-dentate, puberulent beneath; pedicel lax, leafy; akene large, ovate. Seems to be unknown wild. Perhaps a hybrid series between R. palmatum and R. Rhaponticum. Perhaps R. officinale is concerned with 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, Balli. Probably one of the R. botrytis series, with much cut leaf-blades that extend half the depth of the leaf-base; fls. red. China.

officinale, Balli. Figs. 1045, 2098. Robust, with a short branching stem or crown 1-2 ft. high; lvs. very large, 1-5 ft. across, round-ovate, 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.
RHEUM

bearing numerous greenish fls. that give a feathery effect to the panicle; ake red, winged. Tiebet and W. China, on high table-lands. B.M. 6163. R.H. 1874, p. 95. (Gn 35, p. 243; 48, pp. 199, 208. — Probably the best plant of the genus for general cultivation, making a most striking foliage plant. It is from the short, thick, branching stem or caudex of this plant that most of the true official Rhubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1872. Fig. 2099 is adapted from The Garden.

R. acuminatum, Hook. f. & Thom. "Probably only a small form of R. Emodi, with acuminated lvs., but the fls. are considered half the size of that plant, or vary in its character."—Hooker, Himalayas. B.M. 4877. — R. noble, Hook. f. & Thom. Stem simple and densely clothed with indurate 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 wind, leaving the long pale-exposed. 3 ft. Himalayas. R.H. 1876, p. 296. I H 22:290. G.C. H. 11; 780. A remarkable Alpine plant. — R. Rikis, Linn. 3-5 ft.; lvs. 1 ft. across, cordate to reniform, narrow-winged, blood-red, showy. Asia Minor to Persia. B.M. 7911. "Ricas" or "Ribes" is its Arabic name. — R. spiciflorus, Royle. Dwarf. Ivs. thick, orbicular or broadly ovate, crisped or undulate, the blade puckered or blistered. Ffs. about 1 in. long, oblong-cordate, narrow-winged, blood-red, showy, Asia Minor to Persia. B.M. 7891.

RHEUMATISM 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 perennial herbs, with opposite sessile or short-petioled, 3-5-nerved lvs. and showy flowers borne in late summer. Fls. terminal, solitary or in cymes; calyxtube urn-shaped at the mouth, the petals 4, obovate; stamens 8, equal, the connective being thickened at the base, with or without a spur at the back.

Rhexia Virginitia is found wild in company with side-saddle plants (Narcissus purpurascens) and cranberries in the low meadows of Massachusetts. It is what we should call a bog plant. It is a pretty, low-growing, tuberous-rooted plant blossoming 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 Centaurea, Pteroidea and Medinilla. It increases by means of tubers and seeds, and under suitable conditions soon makes large clumps. Tubers potted in the autumn and kept in a coldframe force nicely in spring-time.


RHIPSALIS (Greek, rhips, wickerwork). Cactaceae. A mixed assemblage of lengthened epiphytic forms, brought together by a common character of small fls., with the tube short or wanting; hero including Hariota, Leychinimum and Pfeiffera. Fls. white or greenish white, except R. cerifera, rosy, and R. salicornioides, R. ochyptera and R. rhombic, yellow. Fruit without spines or wool, except in R. cerifera. For culture, see Cactus.

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<td>Lob. 6-10 lines long</td>
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<td>clionea, Michx. Stem nearly simple, 1-2 ft. high: lvs. ovate, sessile or very short-petioled, 3-nerved: fls. violet-purple, 1-½ in. across, short-pedicelled, in few-fl. cymes; anthers not curved and not spurred at the back. June-Aug. Swamps, Ind. to Fla., west to La.</td>
<td>c. Lob. 1-2 in. long</td>
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R. Virginica, Linn. Fig. 2100. Roots tuber-bearing: stems about 1 ft. high, branched above and usually clustered, forming a compact, bushy plant: lvs. sessile, ovate, acute, rounded or rarely narrowly at the base, 1-2 in. by ½-1 in., usually 5-nerved: fls. rosy, 1-½ in. across, in cymes; petals rounded or slightly reflex; anthers minutely spurred on the back. July–Sept. Sunny swamps, Me. to Fla., west to Mo. B.B. 2:474. B.M. 958–959. This is one of the prettiest of the small wild flowers. When transplanted, it seems to thrive as well in good clay loam as in peaty soils, although it sometimes grows in the latter.


RHIPIDOYDENDRON. See Aloe.

RHIPIDOPTERIS is under Acoraceae.

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2099. Rheum officinale.

2100. Rhexia Virginica. (X 1/2).
B. The branches all alike........................

AA. Branches angular; fls. and fr. not immersed.

1. grandiflora
2. Cassytha
3. virgata

AAA. Branches angular, often nearly covered with rooks; areolas hollowed; the fl. and fr. immersed, with copious bristles........................................11. squamulosa

12. myosurus

13. rhombea
14. pachyptera
15. Houletiana

1. salicornioides, Haw. (H. mesembrianthemoideae, 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, funnelform, % in. long: berry small, whitish. Brazil. B.M. 2461.

2. Sagittaria, Otto (R. briachiata, Hook. Hariota Sagittaria, Lem.). Fig. 2101. Reaching a height of 2 ft., richly branched; long or cereiform branches %—1 ft. long; secondary or fruiting branches oblong-elliptic or short-cylindric, rounded at the ends, spirally or rarely verticillate arranged, sometimes weakly grooved, not more than % in. long; areoles with very scanty wool and 2-4 short bristles, which on the end branches project as a little bristle, fls. near the tops of the short branches, flat, % in. in diam., with 12 white leaves with yellowish mid-stripe; berry white. Uruguay and Argentina. B.M. 4039 (R. briachiata).

3. mesembrianthemoidea, Haw. (HR. mesembrianthemoidea, Lem.). Upright, the ends drooping, richly branched; long branches 4—8 in. long, 1 line in diam.; fruiting branches 3—5 lines long, not more than 2 lines in diam., spirally attached, thickly crowded; areoles sparsely woolly, with 1-2 bristles which project from the ends of the branches; fls. near the top of the joint, about 5 lines in diam., formed of 10 white with yellow mid-stripe leaves: berry white. Brazil. B.M. 3585.—Harly more than a slender variety of the preceding.

4. grandiflora, Haw. (R. rupestris, Salm.). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diameter of more than % in.; ultimate branches short, often verticillate; areoles depressed, bordered by a red line, sometimes in old branches bearing a bristle: fls. wheel-shaped, lateral on the branches, nearly 1 in. in diam. Brazil. B.M. 2746.

5. Cassytha, Gaertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1—% lines in diam., pale green; ultimate branches spirally attached; areoles with sparse woolly hairs and frequently 1—2 minute bristles: fls. lateral on the terminal joints, 2—3 lines in diam.: berry like that of the mistletoe, 1—2 lines in diam. Widely dispersed in Central and S. America, West Indies, Mex., Mauritius, Ceylon and Africa. B.M. 3060.

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

7. ianthothele, Web. (Pletterm ianthothele, Web. R. cereiformis, Forst. P. cereiformis, Salm.). Stems pendent, 1—2 ft. long, branching, less than 1 in. in diam., rarely 3-angled; ribs tuberculate; areoles 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: flr. the size of a cherry, rose-red, with bristles like those of the stem. Argentina.

8. trigona, Pfeiff. Richly branched, becoming a yard long; branches % to nearly 1 in. in diam. 3-angled; areoles sparsely woolly and bristly, the blooming areoles much more copiously so; fls. greenish outside, white within, nearly 1 in. long, little more than half as much wide: flr. the size of a cherry, rose-red, with bristles like those of the stem. Argentina.

9. paradoxa, Salm. Sparingly branched, 1—2 ft. long; branches 1—2 in. long and %—1 in. in diam., twisted at the joints, so that the angles alternate with the sides; fls. % in. long, white. Brazil.

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

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 the production of this crop within a radius of five miles of the city of Providence. The greater portion of the lettuce grown is of the hard-heading type, which is produced during the months from October to May. Over $160,000 is invested in glass for the production of this crop within a radius of five miles of the city of Providence. The greater portion of the muskmelon crop is produced upon the sandy plains of Warwick. The early crop is grown from plants which are either started in pots in the glass-houses and transplanted to the field or planted under sash in the field. For the main crop the large oblong type of melon is the most 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 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 deserted farms. Among the enemies of fruit, the following are the most troublesome: apple scab, codlin-moth, curculio and maggot. The original Rhode Island Greening apple tree, still standing in the town of Foster, is shown in Fig. 2102, as it looked in 1900.

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

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 area of glass. Where ten years ago the figures were given in hundreds, to-day they are increased to thousands of square feet. This development is especially noticeable in the towns which have a population of from 2,000 to 3,000. The carnation is still the most popular flower, although many fine roses are grown, with a steadily increasing demand for rare flowers, as orchids and forced stock, during the winter months.

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

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RHODODENDRON

(Rhode Island and Labrador Pines, rose tree; alluding to the beautiful flowers and the habit; the Rhododendron of the ancient writers is Notunia.)

Bloom season—Highly ornamental evergreen shrubs or trees, with alternate, petioled, elliptical leaves, and clusters of large, showy flowers, varying in all shades of purple, scarlet, pink, orange, yellow and white. None of the evergreen shrubs suitable for cultivation in either 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 attractive at every season (Fig. 3161).

Hardwood 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, Cahnostachyum, Cumanicum, Brahyceratum, Metzneri, saxifragum, cacconolatum, Bokieri, Loppodium, crepens, kirentum, punctatum, and probably also chrysanthum, Pseudoschizostachyum, Callistericum, Leptostachyum, and Quebec. Somewhat more tender are R. grandiflorum, Huepinii, Hodgsoni, Thomsoni, Anthopogon, South of Philadelphia such species as R. cinnamomeum, glaucum, obofatum, Fortunii, lepidus, and the Yunnan species, as R. decurrens, kirentum and racemosum are probably hardy; also R. arboreum, barbatum, Falcatori, Kans, tibetanum and Wrightii in very sheltered positions. Species like F. tibetanum, F. carinatus, Griffithianum, formosum, Muddeni, Nuttallii and pendulum stand only a few degrees of frost. The Japanese species, as R. japonicum, jinamiwkum, brooksvillii and lobii grow and bloom continually and stand no frost at all.

Variation in Height.—Most of the species are shrubby; a few only, and these mostly Himalayan species, grow into small or medium-sized trees. The tree form as in the case of R. barbatum, 40 ft. in R. grandiflorum, 30 ft. in Falcatori, and maximum. A number of northern and alpine species always remain dwarf, as R. terbignianum, herreianum, Loppodium, Falcatori, Pinnatum, and others. A few Himalayan and Malay species are often epiphytal and grow on branches of large trees like orchids; e.g., R. Dalhousia, pendulium, Nuttallii and most of the Malay species.

Their Place in Ornamental Planting.—Rhododendrons are equally effective and desirable for single specimens on the lawn or border, and are especially showy when backed by the dark green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and dwarf, 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 Atlantic States as they are 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. Hunnewell at Wellesley, Mass. (see A. F. 13: 234-31 and :5:385-387), that, even in a trying climate, they can be grown to perfection if the right situations are selected and the right way of cultivation followed.

Out Culture.—The selection of a suitable situation is of foremost importance. If the beds should be shaded from strong drying winds and the burning sun, and be well covered, but the earth always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open, well-drained soil which does

Pears are found growing in abundance all over the state, nearly every valley loc having a few trees of the more popular varieties. There are several small commercial orchards, the principal varieties produced being the Bartlett, Bose, Clapp, Lawrence and Sheldon. Strawberries are produced in abundance in those towns bordering upon the eastern shore of Narragansett Bay, where they are the principal horticultural crop. The majority of the growers use the wire matted row. Some, however, use a very narrow row, or the hill system. This is a profitable crop to grow, as, according to the 1895 State Census, the average price received was 91 cents per quart.

Currants, gooseberries and raspberries are grown in limited quantities, mostly for home consumption. The demand for these fruits is always greater than the supply, so that the prices obtained are always remunerative.

In Providence and Washington counties considerable attention is given to the growing of cranberries. Upon many farms are found wild hogs, to which the only care given is an occasional cutting of the wild growth to prevent its encroachment upon the bog. These hogs are usually found upon lowlands which are naturally overflowed by streams during the winter months. The most profitable hogs, however, are those which are fully cared for and have a water-supply which may be controlled at will, thus often preventing damage from late spring and early fall frosts.

At the present time excellent opportunities are offered for the growing of all kinds of fruits, to those persons who are willing to invest their capital and conduct the work upon a practical and scientific basis, as there are a number of markets which are never supplied with home-grown fruit in sufficient quantities. While it is true that fruit-growing, as an industry, is not largely developed within the state, yet it is a pleasant fact to note that excellent horticultural results are obtained by the amateur. Numerous home gardens, of small area, about many of the homes in the cities and larger villages of the state are beautiful and attractive with their artistic flower beds, varied shrubs, and fine fruit trees.

G. E. Atkins.

RHODE ISLAND BENT GRASS

Agrostis canina.

RHODOCHITON (Greek, red clover; alluding to the large rosy red calyx). Scorpiomenonium. A genus of a single species, a free-flowering, graceful vine from Mexico. Leaves ovate, obtuse, serrate and acutely dentate, its solitary, pendulous, axillary, long-pended; calyx conspicuous, large, membranous, broad bell-shaped, 5-lobed; corolla-tube cylindrical, the throat not personate, 5-lobed; lobes oblong, nearly equal; capsule dehiscent by irregular perforations.

Vibhile, Zucc. Purple Bells. A vine with habit of Marrania, to which it is allied, but more vigorous and having curious, distinct purplish red fs, over 2 in. long on red peduncles, 3fs. about 3 in. long, B.B. 3367.

B.B. 21:1553. I.H. 4531. Blooms the first season from seed and may be treated as a tender annual.

F. W. BARLOW.
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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 sprayed in warm weather. In potting them, their epiphyll 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 Japanese 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: *Rotundatum*, with double white, yellow or pink fs. (75. p. 265., G.C. H. 18:2398; III. 12:769; *Brilliant*, brilliant scarlet; *Cerise*, twbery yellow. (61:4:55; *Dordan*, orange-scarlet; *Duchess of Connaught*, vermilion-red; *Duchess of Edinburgh*, scarlet with orange-crimson. F. M. 1871:115; *Kos*, scarlet-carmine, G.C. III. 19:327; *Exquisite*, large light fawn yellow fs. (56:1232; *Favorable*, satiny rose; *Jasminiforme*, carmine, deep carmine. (61:562; *Little Beauty*, fs. small, but bright carmine-scarlet. (56:1241; *Lord Rothschild*, bright orange-yellow, tinted with rose at the margins; *Mayden’s Blush*, blush with yellowish eye. (61:321; *Princess Alexandra*, white, faintly blushed; *Princess Frederica*, yellow, faintly edged rose; *Princess Royal*, pink; *Ross Moor*, bright pink. (61:2871; *Tenderi*, bright pink with white tinge. F. M. 1877:23; *Triumphans*, 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 seed begins 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.
and if gentle bottom heat can be given after callusing it will be of advantage. They root, however, but slowly, except those of the Javanese kinds, which are mostly propagated in this way, since they grow very readily from cuttings.

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

For the propagation of the numerous varieties and hybrids of hardy and half-hardy Rhododendrons grafting

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For the propagation of the numerous varieties and hybrids of hardy and half-hardy Rhododendrons grafting is most extensively employed. **Rhododendron Catawbiense** or seedlings of any of its hardy hybrids may be used as stock; **R. maximum** is also probably as good. In English and Belgian nurseries **R. Ponticum**, which is inferior in hardiness, is mostly employed as a stock, but this often proves fatal if the grafted plants are transferred to colder climates. **R. arboreum** may be used for strong-growing varieties intended for cultivation in the greenhouse or south. Veneer- or side-grafting is mostly practiced, and sometimes 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 soil without using grafting wax, and the grafted plants kept close and shaded until the union has been completed. If large quantities are to be handled the plants are sometimes not potted, but taken with a sufficient ball of earth, packed close together and covered with moss. Covering with moss to keep the atmosphere moist is also of much advantage if the plants are potted. See Figs. 2107, 2108.

**Distribution of Species.** About 200 species are known, distributed through the colder and temperate regions of the northern hemisphere; in tropical Asia they occur in the mountains and extend as far south as regions of the northern hemisphere; in tropical Asia being in the Himalayas and E. Asia; several species closely allied to those of the Malayan Archipelago are known, distributed through the colder and temperate parts of Europe, Asia, and the Himalayas; in tropical Asia being in the Himalayas and E. Asia; several species closely allied to those of the Malayan Archipelago are known, distributed through the colder and temperate

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

**Generic Description.**—Lvs. lepidote, sometimes lepidote and pilose, or quite glabrous or tomentose beneath; fls. pedicelled, in terminal umbel-like racemes, rarely lateral in 1- to few-fl. clusters; calyx 5-parted, often very small; corolla rotate-campanulate to funnel-shaped or sometimes tubular, with 5-10-lobed limb; stamens 5-20, usually 10; ovary glabrous, glandular or tomentose, 5-10-loculed; capsule separating into 5 valves containing numerous minute seeds. The Rhododendrons possess but few economic properties. The hardy close-grown wood of many of the species is used for fuel; also for construction and for turnery work: the leaves of some species are sometimes used medicinally; those of **R. arboreum** are believed to be poisonous to cattle. The flowers of various species are sometimes made into a subacid jelly. Some authors unite Azalea with Rhododendron, but the two groups are very distinct horticulturally, however closely they may be allied botanically. Azaleas are chairs of deciduous leaves (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. decidualum (Andrews, Bot. Mag. 6:3781). Many hybrids of similar origin were afterwards raised. The first hybrid between true Rhododendrons was probably a cross between **R. ponticum** and **R. arboreum**, but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan **R. arboreum** introduced about 1820 that the first plant was raised which became the runner of a countless number of beautiful hybrids. From the appearance of this cross obtained about 1826, at Highclere, in England, and therefore called **R. Altaclarensis**, the era of Rhododendron hybrids is to be dated.

Figs. 2104 and 2106 are common hybrid forms. A second era in the history of the Rhododendron may be dated from the introduction of a large number of the beautiful Sikkim 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 15, in soil one-half peat, one-half pure fine sand, well drained. 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 seed-pan is good protection from the sun and keeps the soil evenly moist; it should be removed when germination begins. Seeds may also be sown on growing sphagnum, a thin layer being compactly spread above the seed soil and drainage, and an even surface being secured by clipping. Seed-pans or flats of convenient size are used and they should be plunged in 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, 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, 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, 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, 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, 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, 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, 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, a thin layer being compactly spread above the seed soil and drainage, and an even surface being secured by clipping.
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. *Rhododendron* is the usual stock, a free grower and readily obtained from seeds. Attempts have been made to use *R. maximum* in American nurseries, because of the tenderness of *R. Ponticum,* but no great progress has been made. It is asserted that the rate of growth is somewhat slower than that of the hybrids; this seems hardly possible, and it is to be hoped that further experiments will be made. *R. Ponticum* should be established in pots in spring and grafted under glass in autumn and early winter, using the veneer-graft (see Graftage, p. 664, Vol. II). Graft 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 in until of sufficient size to be planted in the nursery rows. Figs. 2107 and 2108 illustrate two common methods of grafting *Rhododendron* 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 *Caucalbeicus* 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. Newell, in G. F. 8:201 (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 are retentive of moisture; (2) plant in masses, at any rate while young, so that they may protect each other and prevent evaporation; (3) give the bed a northern exposure or a situation where the force of the midday sun is broken; (4) do not plant under or near trees like elm, oak or maple which make undue inroads on the natural water supply, nor so near buildings that the border is sheltered from rain or overdrained by cellar walls; (5) mulch with leaves summer and winter, protect from wind and sun with evergreen boughs in winter and in summer give heavy watering whenever the weather is excessively hot or dry.

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

Planting.—Plant in spring when the weather is settled and the March winds have passed. If the ball of roots is dry, soak well before setting. Plant closely, so that the tops are only 10-12 in. apart and pay particular attention to "facing" them, i. e., see that the best side is facing the most important point of view and that all are faced alike. Grafted plants should, if possible, have the worked portion below the surface. Do not plant in autumn. Plants grown on the premises may be transplanted in favorable weather in summer if great care is taken to prevent the roots suffering from dryness. In planning the original border it is well to leave room for extension; when planted, as described above, the beds can be enlarged at intervals of four or five years, or new beds made from the old stock. Place the beds so that the glare of the midday sun is screened both summer and winter, and avoid situations where there is any interference, owing to trees or buildings, with a naturally good condition of the soil in respect to moisture. If permanent protection is desired, use 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-
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dendrons and many deciduous shrubs, among which are
the Azaleas, their near relatives. A background of dark
green conifers seems most appropriate. Mountain Laurel,
Pieris japonica, Lonicera Catawba and Hydrangea
Canadense are proper companions, but at times these
seem better apart. Our native lilies, L. superba and
L. canadensis, are good associates and thrive under the
same conditions.

In hot, dry weather water should be given, not daily
in driblets, 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, where in eastern Massa-
chusetts, 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, re-
serving a part for the summer mulch. Shelter the tops
with evergreen boughs, the bats 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 is aged. Nvlat
go insect pest or fungus disease of importance has
appeared.

VARIETIES. — The following Hardy Rhododendrons, hy-
breds of R. catawbiense, were sent to the Arnold Arbor-
etum in 1891 by Mr. Anthony Waterer, Knapp Hill
Nursery, Woking, Surrey, England. Their hardiness has
been proved by a ten years' test. In flower, foliage and
growth they have nothing to be desired: it is impos-
sible 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 origi-
nated in his establishment.

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

For comparison with Fig. 2307.

A

B

Ulam eleanore, blush changing to white, one of the best; Alleman grandiflorum, blush, fine truss; Alleman rose, height
row; Alleman grandiflorum, intense blood-red; Alleman, blush; Catawbiense, purple-crimson; Catawbiense eleanore.

white, Chas. Bower, cherry red; Chas. Bower, dark scarlet;
C. S. Sargent, bright scarlet, fine truss; Casuarius, blush;
Chamaecyparis, white, Dendropanther, pink, E. H. R. Hay-
S. E. Red, scarlet; Excentricum, rose blue, tinged, one of the
best; F. A. Gaylord, pink, Rose, M. B. Watson, eleanore;
Catawbiense, bright rose, Gradus, deep crimson; Haun–
hall, rose, late; Hauntdell Serigraph, pink, H. H. Hun-
ness, dark pink; H. M. Warner, fine truss; Mrs. Mabel
Batesman, rose scarlet, Jan Macdonald, rose scarlet, Kettle
bloom, purplish crimson; King of Purples, fine habit, Lady
Armstrong, pale rose, having a base very black, splendid
truss, extra, Masson, M. H. Sutton, scarlet, fine, Unizone
Williamsianum, blush, late, H. M. Warner, rose, crin-
son; Mollis, rich purple; Mrs. Maria James, deep red;
H. H. Hunnewell, pink, Mrs. Chas. Serigraph, pink, Mrs.
H. Ingram, rose, black, Mrs. Mary James, deep red;
Catawbiense, bright crimson, Purpurascens grandiflorum; Ralph San-
ders, purple-crimson; Rosaceae elegans; R. E. Field, scarlet;
Seton, dark maroon, extra.

B. M. WATSON.

RHODODENDRONS NEAR BOSTON. — In the vicinity of
Boston there are many notable instances of the suc-
cessful 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 Welles–
ley, 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 experi-
ment whereby a great number of named varieties have been
originally imported on the basis of experiment with a view to
proving what the hardy kinds might be. The hybrids of Rhos-
dendron Catawbiense and R. Ponticum are the principal va-
rieties that have been planted, and extensive trials with their
subsequent numerous failures have established the fact that
the following eighteen varieties can well be stated to be the
hardy varieties for the climate conditions peculiar to this vi-
cinity: Albam elegans, Albam grandiflorum, Atrosanguineum,
Catawbiense, Charles Foggley, Charles Dickens, Delicatissi-
num, Erestea grandiflorum, Hauntdell, H. H. Hun-
newell, James Batesman, Lady
Armstrong, Lee’s Purple, Old Port, Parpureum, Pur-
pureum grandiflorum, Rosaceae elegans.

The list noted above constitutes the iron-clad varie-
ties for the vicinity of Boston. The expression "iron-
clad" does not, however, indicate that these varieties
can be promiscuously planted without proper attention
to their requirements. That Rhododendrons do suc-
cess under conditions of comparatively poor soil and
exposure is not an indication that they are happy under
such conditions. Rhododendrons must have the proper
conditions of soil, exposure and moisture in order to
give the most satisfactory results in growth and flower.
Soil and conditions do not necessarily involve an extended
stay in preparation, provided the original conditions are
good, ordinary composition such as would maintain
common garden products to good advantage, but it is
desirable to add 25 per cent of well rotted leaf mold,
thus providing that peat-like humus that Rhododendron
seems best to thrive in. On the other hand, care
must be taken that this percentage is not largely in-
creased, as frequent instances arise where beds have
been prepared with humus at a percentage of 50 or
more, with the result that where the beds have once dried
out the texture of the soil becomes that of a very dry
sponge. When the soil is in such condition it is impos-
sible to wet it down satisfactorily. The exposure need not necessarily be confined to shel-
tered locations, provided soil conditions are sufficiently better that the gardener be not over-particular in raking leaves. It is perhaps in this respect that care be taken to apply such fertilizer that it be done in such a manner that the fine, fibrous roots of the Rhododendron which are so close to the surface of the soil be not seriously disturbed. It is perhaps better to leave these leaves in the spring, leaving the bare surface of the ground exposed, with the consequent injury to the dwarf rhododendron will suffer better than from the loss of leaves through early growth with its consequent injury from late spring frosts. When massed against a background of evergreens the Rhododendron perhaps shows to its best advantage, but with the use of the taller-growing species they may make tall, showy banks of Rhododendrons alone. The greatest cause for disappointment in the use of the imported Rhododendron occurs through lack of discrimination in the selection of varieties and especially in the manner of propagation of these varieties. Rhododendrons grafted on Rhododendron Ponticum, a native of southern 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 lost sight of, though the fact remains that for many years R. maximum has contributed to the establishment of a class of hardy forms such as the variety Delectabile, in which one finds the vigor of growth and size of foliage indicative of the Maximum parentage, while the abundance of bloom and color can be traced to that other parent, R. catawbiense. Some other varieties are in commerce that have had similar hardy parentage, and some seedlings are known in this country which combine great merits but which up to the present time have not been offered or propagated largely. Among these could be mentioned the variety "James Comley," a seedling originated by James Comley on the estate of Francis B. Hayes, of Lexington, for which the Massachusetts Horticultural Society awarded a silver medal in 1885. 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 growing effects. In the case of some imported varieties, the landscape architects of recent years have sought a variety of Rhododendron that would combine vigor of growth, blooming quality and perfect 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 that such large producers as William Rockett, W. J. Elkins, Mrs. Eliot F. Shepard, and others, have very largely been stocked with collected plants of R. maximum, supplied in car-load lots and in sizes ranging from 8 foot bushy specimens down to small plants that could be grown on for future flower and foliage effects. 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 growing in soil of sufficient richness to assure their digging with a large amount of clinging earth in the roots. With proper care in transportation and after-cultivation the results show a surprising small loss of plants. 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 violated, the results are correspondingly less satisfactory.

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

AA. Fallage lepidote or glabrate, rarely more than 3 in. long; ovary lepidote, Lepidotocardium.  
BB. Corolla with ciliate tube, long as or longer than lobes.  

1. Californicum, Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous; Ivs. oblong, somewhat acuminate, pale green beneath, 3-6 in. long, sometimes crowded beneath the fls.; clusters many-fl.; corolla broadly campanulate, with oval cilia-lobes, rosy purple or pink; paler toward the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers; ovary with suppressed silky hairs. May, June. Calif. to Ore. B.M. 4863. -  

CC. Ivs. deciduous or semi-per-  

152; 

11. jauminiflorum  

12. ferrugineum  

13. hisutum  

14. punctatum  

15. arbutfolium  

16. myrtifolium  

17. Keiskei

1. Californicum, Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous; Ivs. oblong, somewhat acuminate, pale green beneath, 3-6 in. long, sometimes crowded beneath the fls.; clusters many-fl.; corolla broadly campanulate, with oval cilia-lobes, rosy purple or pink; paler toward the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers; ovary with suppressed silky hairs. May, June. Calif. to Ore. B.M. 4863. -  

2. Catawbiense, Pursh. Fls. 2109, 2110. Shrub, 6 ft. high, rarely 20 ft.; Ivs. rounded at base, oval to oblong, usually obtuse and mucronulate, glaucous beneath, 3-5 in. long; clusters many-fl.; pedicels rusty pubescent; corolla broadly campanulate, with broad roundish lobes, lilac-purple, about 1½ in. across; ovary tomentose. June. Va. to Ga., in the mts. B.M. 1671. L.B.C. 12:1170. -  

3. maximum, Linn. Great Laurel. Flg. 2111. Shrub or small tree, attaining 35 ft.; Ivs. mostly acute at base, narrow-oblong or lanceolate-oblong, acute or shortly acuminate, whitish beneath, 4-10 in. long; clusters many-fl.; pedicels viscid; calyx-lobes oval, as long as ovary; corolla campanulate, deeply 5-lobed with oval lobes, usually rose-colored, spotted greenish within, about 1½ in. across; ovary glanular. June, July. N.S. and Ont. to Ga. B.M. 951. Em. 2:435. Mn. 1:1 and 3, p. 22. D. 16. - This is one of the hardest species, being hardy as far north as Quebec and Ontario. Three vars. have been distinguished: var. Pursh (R. Purshii, Don), with white fls.; var. purpureum, Pursh (R. purpureum, Don), with purple fls., and var. roseum, Pursh, with pink flowers. This species and the former are now often extensively used in park-planting and taken by the ear-loaders 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; Ivs. elliptic to oblong, acute, pale green beneath, 3-5 in. long; clusters many-fl.; pedicels longer than fls.; calyx-lobes as long as ovary, the lower ones half as long; corolla cam-

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

6. arboreum, Smith. Flg. 2112. Large shrub or tree, attaining 40 ft.; Ivs. oblong to lanceolate, acute, rugose above, distinctly veined and whitish or ferrugineous-tomentose beneath, 4-6 in. long; clusters dense, pedicels short; calyx minute; corolla campanulate, blood-red, pink or white, usually spotted, 1-1½ in. across; ovary ferrugineous-woolly or mealy, usually 7-8-celled. March-May. Himalayas. B.R. 11:386. P.M. 1:101. -  

7. Caucasicum, Pall. Dense low shrub, 2 ft. high, often with procumbent branches; Ivs. oblong-oblong or narrow-
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 oblong or "fusiiform" at both ends, dull greenish with purple spots, 2 in. across. June. B.M. 2347. — This is one of the hardiest of the Himalayan species. 

9. Metternichii, Siebl. & Zucc. Shrub, 4 ft. high; lvs. oblong or oblong-lanceolate, narrowed at both ends, acute or obtuse, ferrugineous-tomentose beneath, 3-6 in. long; clusters 2-5-fl.; calyx minute; corolla campanulate, pale purple or pale lilac or almost white, reddish-vrouwly beneath, 3-6 in. long; clusters 2-5-fl.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes, pale yellow, 1 1/2 in. across; stamens much exserted. May, June. Japan. — A fine hybrid.

10. campanulatum, Don. Shrub, attaining 16 ft.; lvs. elliptic to elliptic-oblong, usually rounded at both ends, ferrugineous-tomentose beneath, 3-6 in. long; clusters many-fl.; pedicels short; calyx lobes short; corolla campanulate, pale purple or pale lilac or almost white, with few purple spots, 2 in. across. June. Himalaya. B.M. 3759. L.B.C. 2:324. — This is one of the hardiest of the Himalayan species. 

11. keiskei, Miq. Low, sometimes procumbent shrub; lvs. elliptic to oblong-lanceolate, acute, dull green above or lepidote beneath, 1 1/2 in. long; clusters 2-5-fl.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes, yellow, 1 1/2 in. across; stamens much exserted. May. Japan. — The earliest of all hardy Rhododendrons, and for its handsome scarlet fall coloring.

12. ferrugineum, 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, rosy-colored, 1-1 1/2 in. across. June, July. Dahuria, N. China, Japan. G.C. 9:65. — Hardy shrub valuable for its very early lvs. (it is the earliest of all hardy Rhododendrons), and for its handsome scarlet fall coloring.

13. hirsutum, Linn. Shrub, 3 ft. high, with hirsute branches; lvs. oval to oblong, ciliate, light green and glandular-lepidote beneath, 1 1/2 in. long; clusters few-fl.; calyx lobes short; corolla broadly funnelform, with ovate-rounded and slightly undulate lobes, usually pale rose and spotted greenish within, about 1 in. across. June, July. B.M. 2285. B.R. 1:37. — Handsome shrub, a white form.

14. punctatum, Andr. (R. minus, Miq.). Shrub, 6 ft. high, with slender spreading or recurving branches; lvs. oval- or ovate-lanceolate, acute at both ends, glabrous above, glandular-lepidote beneath, 2-5 in. long; clusters rather few-fl.; calyx short; corolla broadly funnelform, with ovate-rounded and slightly undulate lobes, usually pale rose and spotted greenish within, about 1 in. across. June, July. N. C. to tia. B.M. 2285. B.R. 1:37. — Handsome shrub, often white without.

15. arbutiformum, Hort. (R. arbutoides, Hemsleyi, and others). Shrub, 3 ft. high, with slender spreading or recurving branches; lvs. elliptic to oblong-lanceolate, acute at both ends, 1 1/2-3 in. long; clusters 2-5-fl.; calyx short; corolla broadly funnelform, with ovate-rounded and slightly undulate lobes, usually pale rose and spotted greenish within; in, about 1 in. across. June, Aug. N. C. to tia. B.M. 2285. B.R. 1:37. — Handsome shrub, a white form.

16. myrtifolium, Lodd. (R. ovalifolium, Hort. R. ovatum, Hort., not Hook.). Hybrid between R. punctatum and hirsutum, much like the preceding, but generally smaller and broader, less densely lepidote beneath, 1 1/2 in. long, sometimes sparingly ciliate when young; lfs. longer pedicelled and calyx-lobes narrower and longer. June. L.B.C. 10:938. — Originated in the nursery of Lodgides.
2111. Rhododendron maximum: 1, 1914.

**R. calophytum**, Nutt. Shrubs, 3 ft. high; leaves ovate-oblong or elliptic, glossy above, glabrous beneath, 2 in. long; flowers red, fragrant, 2 in. across; in dense clusters, June to July. Ru. B. M. 5562, F. S. 496, S. 547.


RHODODENDRON

rhododendron: ivs. lanceolate, acuminate, glabrous, pale beneath, 4-7 in. long: fls. many, campylotome, bright scarlet, 2 in. long, several few fl. clusters at the end of branches; fls. broadly campanulate, bristly, pale, across, Yunnan. B.M. 284.

- R. Lancifolium, Hook. f. Small shrub, to 1 ft. high; ivs. lanceolate, glabrous, pale beneath, 3-4 in. long: fls. many, campylotome, bright scarlet, 2 in. long, several few fl. clusters at the end of branches; fls. broadly campanulate, bristly, pale, across, Yunnan. B.M. 284.

- R. Lancifolium, Hook. f. Small shrub, to 1 ft. high; ivs. lanceolate, glabrous, pale beneath, 3-4 in. long: fls. many, campylotome, bright scarlet, 2 in. long, several few fl. clusters at the end of branches; fls. broadly campanulate, bristly, pale, across, Yunnan. B.M. 284.
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 resemble small single roses. The fruits as big as cherries and taste like raspberries.
of the ovary. *E. discolor* is a short-stemmed erect-grow ing long-leaved plant, not unlike a broad-leaved small Pandanus in habit. Fal. white, small and many in a boat-shaped spathe-like structure arising from the axil of leaves and held erect on a long slender stem. Stamens 3, free, or more or less petal-like; petals 3, soon withering; petals 3, free, or more or less petal-like; petals 3, soon withering; stamens 6. Var. vitata, Hook. (Tracheloscutia discolor, var. vitata, Miq. *T. discolor*, var. caselegiae, Hook. *T. recurvata*, ex Miq.) is a small upright or prostrate, herbaceous plant, with sheaths 8-12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the greenhouse, or for the open in the South. B.M. 2579. F.S. 11:1168-70. Cult. as for greenhouse Trachaeloscutium.

L. H. B.

**Rhopalostylis**. See *Rhopalostylis*.

**Rhopalostylis** (name refers to the club-shaped spadix). *Palmicera*. Two species of pinmate palms, both of which are favorable conservative palms and nearly always sold as species of Areca or Canna. However, Rhopalostylis belongs to the large group in which the ovule is borne on the side and is more or less pendulous, while in Areca and Canna the ovule is at the base and erect. R. Eichleri under *Hellecosteopsis* (see below) Rhopalostylis differs as follows: stipes of staminiferous fls. awl-shaped to lanceolate, not imbricated; stamens 6-12; pistillate fls. with short petals, valvate; frs. rounded, with 1-3 nerves on each side; rachis conceave above, scurfy; petiole very short; sheath elongated; spadixes short, spreading, with a very short, thick peduncle, and fronds leafless, but floriferous, bearing staminal filaments, elliptical, oblong, flattened, the upper 2-winged; bracts adnate to the flower-bearing areas, subulate at the apex; bracteoles scaly; fls. medium: fr. small or medium: lvs. 4-6 ft. long, pinnate: R. Dourierii, Seem. (Areca seymouriana, Hook.) is a broad-leaved palm, with small but spreading leaves, growing in a boat-shaped spath-like structure, followed by a short-stemmed erect-long-leaved plant, not unlike a broad-leaved small Pandanus in habit. Ped. white, small and many in a boat-shaped spathe-like structure arising from the axil of leaves and held erect on a long slender stem. Stamens 3, free, or more or less petal-like; petals 3, soon withering; petals 3, free, or more or less petal-like; petals 3, soon withering; stamens 6. Var. vitata, Hook. (Tracheloscutia discolor, var. vitata, Miq. *T. discolor*, var. caselegiae, Hook. *T. recurvata*, ex Miq.) is a small upright or prostrate, herbaceous plant, with sheaths 8-12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the greenhouse, or for the open in the South. B.M. 2579. F.S. 11:1168-70. Cult. as for greenhouse Trachaeloscutium.

L. H. B.

**Rhubarb**. See *Rheum*.

**Rhubarb** or Pie-plant (see *Rheum*), is commonly grown by division of the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, often proves satisfactory, and always interesting, as the seedlings vary greatly. The seed germinates easily, and 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 market-garden crops, even in small places and neighborhoods. A large number of home gardeners are still without this precious root, although it is by no means the case that want Rhubarb pie as soon as spring opens, this plant may have the following available material in the year for pies. Rhubarb delights in extremely rich soil. Very large and long-fruited plants are the result when the soil is rich. Plant on the flat, and not in a peat pot. The benefits of the soil that is really filled with manure to over-fertilizing. The seedlings, however, may be started in any good clean garden soil. Sow seed in early spring, in rows a foot apart, with a peat pot on the flat. In the fall, promptly start 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 for division, and prepare the nursery 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 stalls may be pulled freely. When soil fertility forces a rampant growth, the stalls will be large and brittle enough without the aid of boxes or legs. In the fall, the stalks are cut off and thrown over the plants. The beds should be renewed 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. Then the clumps are divided, the roots being 8-12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the greenhouse, or for the open in the South. B.M. 2579. F.S. 11:1168-70. Cult. as for greenhouse Trachaeloscutium.

L. H. B.

**Rheum**. See *Rheum*.

**Rheum** or Pie-plant (see *Rheum*), is commonly grown by division of the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, often proves satisfactory, and always interesting, as the seedlings vary greatly. The seed germinates easily, and 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 market-garden crops, even in small places and neighborhoods. A large number of home gardeners are still without this precious root, although it is by no means the case that want Rhubarb pie as soon as spring opens, this plant may have the following available material in the year for pies. Rhubarb delights in extremely rich soil. Very large and long-fruited plants are the result when the soil is rich. Plant on the flat, and not in a peat pot. The benefits of the soil that is really filled with manure to over-fertilizing. The seedlings, however, may be started in any good clean garden soil. Sow seed in early spring, in rows a foot apart, with a peat pot on the flat. In the fall, promptly start 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 for division, and prepare the nursery 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 stalls may be pulled freely. When soil fertility forces a rampant growth, the stalls will be large and brittle enough without the aid of boxes or legs. In the fall, the stalks are cut off and thrown over the plants. The beds should be renewed 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. Then the clumps are divided, the roots being 8-12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the greenhouse, or for the open in the South. B.M. 2579. F.S. 11:1168-70. Cult. as for greenhouse Trachaeloscutium.

L. H. B.
Hues are likely to be of weak vitality. Not more than 15 per cent can be counted on to be fairly true to the variational type. In the writer's experiments,440 seeds were sown each season. The seed was selected from selected plants that had been propagated by division.

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

Forcing of Rhubarb. The forcing of Rhubarb has now become quite a profitable industry in the vicinity of many of the large cities. It may be forced either in the field where the roots are growing or lifted and placed in hotbeds, under green-house benches or in a dark cellar. See Fig. 213.

Much of 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. See Fig. 2114. These houses are simply and cheaply constructed, the sides usually being about five feet high, of rough boards, which are covered with cheap building paper. The roof is formed of hothed sash. These buildings are usually from 24 to 30 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 by three feet apart and should be fertilized annually with liberal dressings of compost, that made from cow and hog manure being considered the best. The sash should be adjusted to the house during the first part of February, and may be removed for use on hotbeds and coldframes in from four to six weeks. The stalks are usually pulled twice, the returns being from $1.25 to $2 per sash, depending upon the season at which it is placed upon the market. The cost of production is often greatly reduced by growing a crop of spinach or dandelions between the rows, the price obtained for these being usually sufficient to pay for all cost of labor and maintenance.

213. Stalks of forced Rhubarb.

The leaf-blades do not develop.

RHUS (ancient Greek name, Anacardium, an application of plant, which is important in the earliest periods of the cultivation of the land, and in the days of the primitive man.)

RHS (Rhustaia, a tribe of ancient Greece.)

Roots for forcing under green-house 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 have 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 into growth they should be given an abundance of moisture. When forced in this summer light it 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 the 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 55 to 65, although the lower the temperature the larger the crop 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 (Linnaeus, 1753, Syst. Nat. [10th ed.], vol. ii, p. 405.)

Tree or shrubs with alternate, usually oval, ovoid, oblong-ovate, or oblong-rounded leaves, some of them deciduous, some evergreen, some with resinous or milky juice, wood often yellow, bark and foliage absurd in tannin, and for this reason used in dressing leather.

All these species are beautiful and have been apparently much neglected by planters. Any one who has observed our native Sumachs covering rocky hillsides or barren railway banks with their rich fern like verdure during summer or when autumn has given them colors of fire, should appreciate their value as subjects for ornamental planting. Some species, too, retain their crimson fruit throughout the year, and help to make bright spots amid the snows of our northern winters. Some of the stronger growing species answer very well in sub-tropical planting and may be cut to the ground every year to encourage the strong young shoots that give the most of the foliage. Some are admirable as single specimens, having a picturesque character that is quite refreshing. When grown as standards, however, they are likely to be short lived, and so the succession must be provided for. The handsome varieties of two of our native species seem to give more leafage than the type, and are worthy of developing. All the species are easily propagated by seed, layers, root cuttings and some of them by top cuttings. The tendency that some of them have to spread by runners is a disadvantage where they are used in the hedges.

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

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

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A. Foliage simple.

B. Peduncles not plumose in fruit. 1. integrifolia 2. ovata

BB. Peduncles plumose in fruit....


- An evergreen species.

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

3. Cotinus, Linn. SMOKE BUSH. VENICE SUMACH. A bush 10-12 ft. high, with simple obovate lvs. and brown bark: fls. purple, in ample loose panicles and on very long pedicles, 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 bores or other causes, it has not been replaced. Gnp. 5:118. Gn. 31. p. 162; 34. p. 565.

4. cotinoides, Nutt. A small tree, 20-40 ft. high: lvs. undivided, oval or obovate, smooth, thin: fls. greenish yellow, in large panicles: pedicles becoming plumose as they develop. Flowers in spring, and the foliage in spring and the following spring, is distinguished by the darker bark: fls. purple, in ample loose panicles and on very long pedicles, 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

6. Toxicodendron, Linn. POISON OAK. POISON IVY A scalding or climbing plant: lvs. smooth or often pubescent on veins, ovate, sinuate, or lobed, petiolate: panicles short-stalked: fr. rilled when dry. June. N. Amer. — One of the most beautiful, but unfortunately

2116. Young plants of _Rhus typhina_. var. _laciniata_.

- This species is used in cultivation, but it does not seem to reproduce itself as readily as some species, and in many cases when killed by bores or other causes, it has not been replaced. Gnp. 5:118. Gn. 31. p. 162; 34. p. 565.

5. Canadensis, Marsh. ( _R. aromatica_, Ait.). Spreading shrub, 2-8 ft. high, with 3-lobate, crenate, pubescent, petiolate, aromatic lvs.: fls. yellow, small, in clusters or short spikes, either axillary or sometimes terminal: fr. globular, oval 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 divided. 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 scalding or climbing plant: lvs. smooth or often pubescent on veins, ovate, sinuate, or lobed, petiolate: panicles short-stalked: fr. rilled when dry. June. N. Amer. — One of the most beautiful, but unfortunately

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

8. glabra, Linn. Smooth Sumach. Fig. 2115. Smooth, glabrous., 10-15 ft. high: lfs. 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. 1885, p. 7. V. 124.

9. venenata, DC. DOGWOOD. Poison Sumach. Usually taking the form of a tree, 10-20 ft. high: lfs. 7-13 on a red petiole 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
the most poisonous of the Sumachs. The name R. vernicifera in the United States is used by some authors for this species and by others for R. vernicifera; in order to avoid confusion, it seems best to drop the name and to substitute the plant of great value where a color effect is desired.

15. copallina, Linn. BLACK SUMACH, SHINING SUMACH. A shrub or small tree, sometimes growing to the height of 25 or 30 ft.; its numerous, entire or sometimes indented or cut near the apex, smooth above, usually pubescent beneath; shoots also tomentose; midrib winged between the leaflets; leaflets small, greenish, in dense panicles at the end of the branches: fr. slightly flattened, hairy, crimson. July, Aug. Eastern N. Amer., to the Great Plains; succeeds well in dry soils. N.S. 3:105-3.

16. semialata, Murr. Fig. 2117. Plant 15-20 ft. high; leaflets 9-13, smooth above, brown-pubescent beneath; petiole broadly winged between the leaflets; fls. small, in a large, many-branched panicle. July, Aug. Japan. — A very distinct and useful species, assuming brilliant orange and red color in autumn. Var. decandea, Britton. — (R. Osbeckii, Carr.), also cult. JOHN F. CONウェル.

RHYNCHOSPERUM (from the Greek, beak-end). An epiphytic genus of shrubs or small trees with lip spurs that may be several inches long. The flowers are small and greenish, with a tuft of long stamens, usually 14, and a very broad, semi-axillary, green or brown fruite. The fruits are small, black or brown, and have a long, beak-like appendage.

12. semialata, Murr. Fig. 2117. Plant 15-20 ft. high; leaflets 9-13, smooth above, brown-pubescent beneath; petiole broadly winged between the leaflets; fls. small, in a large, many-branched panicle. July, Aug. Japan. — A very distinct and useful species, assuming brilliant orange and red color in autumn. Var. decandea, Britton.

11. typhina, Linn. STAGHORN SUMACH. A densely covered shrub or small tree, with a height of 15-20 ft. The leaflets are numerous, entire or sometimes indented, smooth above, and pubescent beneath; petioles are broad and winged. The flowers are small, greenish, and borne in dense panicles at the end of the branches. The fruits are small, black or brown, and have a long, beak-like appendage.

10. succedanea, Linn. LAC SUMACH. Plant 15-18 ft. high; leaflets 9-13, smooth above, whitened beneath; fls. yellowish, fr. white, large. E. Asia. R. H. 1863, p. 120. — Poisonous.

RHYNCHOSTYLIS (Greek, beaked column). Orchidaceae. This genus includes a few species closely related to Saccolabium and usually sold under that name. Epiphytic herbs with monopodial stems and 2-ranked, crowded, leathery or flabby leafs; fls. in dense racemes from the axis of the leaf, medium to large, with the lip widely spreading. Several species are in the trade. Var. majus, Hort. Larger in all its parts. L.R. 15:545. Gn. 31, p. 69; 36, p. 230 (all as Saccolabium Blumei, var. majus).

2117. Rhus semialata. (Cling.)
Species 69 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. 2110, 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 spectabile, which is hardy and productive everywhere. The hybrid R. Gordonianum is also popular for its long clusters of bright pink flowers. Its vigorous habit and lilacine color is also fairly well known, and is hardy in the northeastern states. There are several shrubbery forms with white, very dark red, and purple flowers. Some of the species are useful in shrubbery masses for their foliage and habit.

INDEX TO SPECIES IN AMERICAN TRADE.

1. speciosum, Pursh. Fuchsia-flowered Gooseberry. Fig. 2119. Branches covered with fine rustish prickles and glandular-tipped hairs: thorns long, slender, commonly in 3's; lvs. small, thick, shining, partially evergreen; peduncles slender, drooping; 2-4-flowered; fls. showy; calyx cylindrical, 3-4 in. long; stamens exerted ¾ in. or more beyond calyx, both bright red: berry small, prickly, dry, few-seeded. California. B.M. 3350, B.R. 18:1557. Gn. 31, p. 333; 34, p. 250. — The most showy member of the genus, but not hardy in the northern states.

2. rotundifolium, Michx. Thorns mostly single, very short: lvs. wedge-shaped, smooth or slightly downy, ciliate on margins and veins; calyx-lobes narrow or oblong, greenish or dull purplish, shorter than the stamens; berry small, agreeable. Along the Alleghan mountains. L.B.C. 11:1694 (as R. triflorum). Sometimes offered by dealers in native plants.

3. oxycanthoides, Linn. Fig. 2120. also 226-9, Vol. II. Branches slender, reclined, but often crooked; thorns single or triple, slender, very finely pointed. 1½-2 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, equal 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. 6092, B.R. 15:1237 (as R. setosum). — Parent of the representative American Gooseberries of gardens.

4. Grossularia, Linn. (R. lutea-via, Linn.). European Gooseberry. Figs. 222-5, Vol. II. Bush stocky, rigid; branches thick; thorns mostly triple, heavy and thick at base, the central one 3½ 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; petioles and peduncles pubescent and glandular; peduncles long; flower stalks and calyx-lobes narrow, oblong, acute, half as long as tube; ovary glandular-hispid: berry large, prickly or rarely smooth, reddish purple. Eastern North America.— Fruit edible, variable; sometimes cult. for its fruit, and worthy the attention of the plant-bredser.

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

deeply cut or notched lobes; the stalks glandular; peduncles long and stellate; fls. small, red, open and the tube nearly wanting; berry small and bristly. Cold hogs. N. Eng. to Calif. B.M. 6492. L.B.C. 9:884. — Offered by dealers as a hog-shrub. Intermediate between Currents and Gooseberries. Fls. in short racemes.

7. Lobbii, 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-ovate, 3-5-cleft and notched, glandular on both surfaces; peduncles drooping, 1-2-flft.; fls. showy, with purple tube and reflexed lobes; the small, erect petals white, the thorns exerted; berry glandular-hairy. N. Calif. to R. C. B.M. 4921 (as R. suberithum). G.C. II. 1914. —Showy.

XX. Stems thornless and prickless. (Currents.)

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

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

8. multiflorum, Kit. Younger parts pubescent, bearing glandular-tipped hairs; lvs. glabrous above, whit

cued downy beneath; racemes long, dense, pendulous; fls. green or reddish green; fr. dark red, large as a pea. Southeastern Europe. B.M. 2368. L.B.C. 14:1331. — Grown for ornament.

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 hog and rock-work plant. Lvs. bright colored in the fall.

10. rubrum, Linn. GARDEN CurrAnt. Fig. 2122; also Fig. 610, Vol. I. Branches black and sticky; lvs. pubescent when young, becoming glabrous; racemes drooping: fls. small, yellowish green or purplish; calyx saucer-shaped; fr. thin-skinned, shining, bright red, yellowish white or striped. En. Asia and N. Japan. R.H. 1804: 191. —Parent of all the domestic red and white Currents.

11. alpinum, Linn. (R. saxatile, Hort., not Pall.), Mountain CurrAnt. Branches upright, whitish; lvs. slightly hairy above; fls. yellowish green, discinate; clusters 20-30-fl.; pistillate clusters 5-10-fl.; peduncles glandular-hairy; berries larger than pedicel and yellow: calyx flat: fr. smooth, scarlet, insipid or sweetish, Mountains of Europe and the Orient. L.B.C. 15:1486. Var. aureum, Hort., has yellow foliage.

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

12. fasciculatum, Sieb. & Zucc. Very like R. alpinum. Plant reaching 4 ft.; fls. all green, often imperfect, the male fls. somewhat larger than the female by reason of the longer sepals; lvs. larger than those of R. alpinum, bright green, the lobes and serratures more obtuse, the younger ones pubescent below and on the nerves but becoming glabrous; fls. yellowish purple; calyx-tube broadly urn-shaped; lobes small, greenish or purplish; berry ½ in. in diameter, black and resinous-dotted, edible. N. Calif. to Alaska. B.M. 7439.

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

15. Americannum, Mill. (R. berberina, L'Hert., Ameri- can Black Currant. Fig. 612, Vol. I. Bush-sprawling; branches slightly angular; lvs. bearing bright yellow resinoid dots; few above, many below; racemes long, pendulous, many-fl.; fls. greenish white or yellow, ¼-¾ in. long; calyx-tube bell-shaped, not resinous-dotted; lobes large, petal-like; ovary ovate, fr. black, resembling R. nigrum in flavor. Nova Scotia to Virginia, westward to Colorado and Manitoba.
BR. Fls. large, tubular, red or yellow.

16. sanguineum, Pursh. Red-flowered Currant. Fig. 2121. Branches red, smooth; young parts pubescent or glandular-hairy; lvs. 2-4 in. broad, round-cordate; racemes long, pendulous; bracts lobate, membranous, as long as the pedicel; fls. purple red or rose-colored; calyx large, ovary and petals not short, glandular-tipped; fr. bluish black, rough, glandular-hairy, dry and bitterish. British Columbia, through California and Mexico to South America. B.M. 20603. B.R. 15:1849. Gn. 51:1110.

Var. variegatum, Watson. Bush low; racemes short and dense, ascending, barely glandular; lvs. thicker, downy beneath.

Var. albidum, Hort. R. albidum, Hort., is a form with whitish, dirty yellow or yellowish red flowers and light-colored fruit. R.H. 1843:419. Gn. 51:1110 (as R. albidum). Var. atro rubens, Hort., one with dark, blood-red flowers. Var. flore pleno, Hort., has dark, clear double flowers. R.H. 1843:245. G.C. II. 14:144. All the forms of this species are worthy ornamental plants.


cc. Racemes toothy.

18. aureum, Pursh. Missouri Flowering Golden or Buffalo Currant. Fig. 2125; also Fig. 615, Vol. I. Plant free-growing; sprouting from root: lvs. cuneate or truncate, smooth, shining, when very young densely covered with brown or yellow resinous heads, which disappear with age; peduncles short, few-fl.; bracts large, leaf-like; fls. spicy-scented, yellow and showy; calyx-tube 2-5 in. long; petals red; fr. dark brown or black, with bluish bloom. Mississippi valley to Rocky Mts. B.R. 2:213. Much grown for its yellow fragrant flowers. It has given rise to the Cranberry and some other fruit-bearing sorts.


19. cereum, Dougl. Fig. 2126. Upright branching shrub, reaching 3-4 ft., the young parts minutely pubescent and more or less glutinous; lvs. nearly oblong, to reëniform, rather small (cotyledon more than 1 in. across), 3-5-lobed and crenate-toothed; racemes short and drooping, glandular-hairy; lvs. 1 in. or less long, narrow tubular, white or pinkish; fr. bright red, rather small, sometimes glandular, sweet but mealy. Rocky Mts. and west. B.M. 3008. B.R. 15:1293; 17:1471 (as R. inebrians).—Sometimes grown for ornament.

20. viscosissimum, 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.

RICIOCA (F. F. Ricci, Italian nobleman, patron of the botanist Micheli). Ricciocca. Riccia filiformis, Linn., is one of the few beardless or spinulose plants in cultivation aside from the ferns, musc-ppons and selaginellas. It is cultivated by one specialist in aquatics presumably for the benefit of students of botany. It is now commonly advertised among aquarium 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. filiformis* is distinguished from other species by the linear, dichotomous, floating thallus, with the capsule protruding from the lower surface. For full description, see Gray's Manual.

RICE. See *Oryza*.

RICE FLOWER. *Pimelia*.

RICE, MOUNTAIN. *Oryza*.

RICE PAPER. The Chinese rice paper is made from *Fritillaria japonica*, which see.

RICHARDIA (L. C. Richard, 1754-1821, French botanist). *Artibus. Calla Linn.* Perennial herbs with many long-pedicled flowers from a thick rhizome; peduncles appearing with the leaves; petals obovate, 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 staminate above and pistillate below (Fig. 2127). Differ from *Belandra* in floral characters, *S. Africa. Species 10-12* See *Gn. 46:416; R. B. 27:16; Engler, DC. Monogr. Phaner. vol. 2. The true *Calla* is not of this genus; see *Calla*. For the Black *Calla*, see *Japan*.

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

A. Leaves segmental or ciliate.
B. Foliage spotted.

**albo-maculata.** Hook. Spotted *Calla*. Fig. 2128. Petioles short; blade 12-18 in. long, white-spotted all over, hasteate, three to four times longer than broad, the basal lobes widely spreading, triangular, obtuse or acute, 3-4 in. long: spathe trumpet-shaped, 4-5 in. long, 2 in. wide, dull creamy yellow with a blotch of crimson at the base. B.M. 1540. L.H. 7:225. F.S. 21:2258. —Will stand in the open with good protection for the roots. Not of much value except in botanical collections.

**Nelsoni.** Hort. Allied to *R. albo-maculata*; very vigorous and floriferous, reaching 3-4 ft., the scape overtopping the foliage; leaflets, sagittate, bright green, sprinkled with peduncled dots or spots, as in *R. Elliotiana*; leaf short, very pale yellow with a purple blotch at the bottom. —One of the most recent species.

**melanoleuca.** Hook. Black-spotted *Calla*. Fig. 2127. Common *Calla* Lily—Richardia Africana (X 1/2).

Left-hand specimen shows the spadix, the spathe being removed.
2127. Blade about twice as long as wide, cuspidate at the apex, cuneate-sagittate at the base, both leaves and spathes varying greatly in size; spathes 5-10 in. long, white, creamy inside at the base, sparingly and narrowing to a cuspidate tip. S. Afr. B. M. 832. (Cm. 33353.)—Fragrant. Sports with double and triple spathes often occur. A. F. 5:83. (See fig. 2126.)

Var. nanana compacta, Hort. (R. nanana compacta, Hort.). Little Gem. Like the type, but only 12-16 in. high; spathes 3-4 in. long. Var. Devoniensis, Hort. (R. Devoniensis, Hort.). Dwarf; finer bloomer than Little Gem, and more fragrant.

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

Pentlandii, Whyte. Erect perennial; Jvs. ovate-cordate, acuminate-cordate, with an open sinus, basal lobes rounded; midrib thick; spathe golden yellow, broadly trumpect-shaped, its lower margins convolute one-third, flaring above, the salutate tip abruptly recurved, margins recurved, slightly warty and with a black-purple blotch at the base within. Basuto-land, S. Afr. B. M. 787.—Hooker writes (in B. M. 7897) that "R. Pentlandii is much the largest-leaved species, and is the only one with a deeply crenate yellow spathe within, which is much the largest and broadest of any," first flowered in 1892 by R. Whyte, Pentland House (Lee, England).

2128. Richardia albo-maculata (X 1.5).

tip erect, black-purple at the base within, the leaf blade long and rather open, creamy white with a black or purple throat. S. Afr. Distributed by Max. Leichtlin (Germany) in 1888. There are hybrids of this and R. Elliottiana, R. arietiniflorens, 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, petal-like 4 1/2 in. long. Angola.—R. arunza, Hort., said to be a hybrid of R. arietiniflora and R. maculata, but better regarded as a variety of hastata: leaves spotted, spathe large, yellow. Said to be a hybrid of R. arietiniflora and R. hastata. "R. suffusa." A distinct dwarf-habit 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. Ten., 55, p. 35.

2129. Calla with double spathe (X 1).
or the real—end and about as large as marbles. Mr. Tailey now has bedded them, and seems as large as turnips—\(\text{\ldots}\) anyway, four inches in diameter. Tailey's experience is interesting and it may be valuable to the reader. Because near losing his whole stock by cutting the eye, with the object of getting separate plants. There had been no sign of natural division, nor has there since; though Mr. Tailey is still of the opinion that by proper manipulation they may be increased by division, as are now the potatoes, but the most careful cutting and no potting then, but kept rather dry until the roots develop. The pots will be fairly well filled with roots before much growth shows, and we can keep them under bushes 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-suit suits best, and some liquid fertilizer will help them when the flower-stems appear. The blossoms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully, and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when we know it.

2130. Richardia Africana, Little Gem, or.

The \textit{Richardia} in California. — In considering the Calla in California, it is necessary to treat it under two general heads: first, as an ornament; and second, as an article of commerce. The popular and growing demand for Calla bulbs for our tubers almost equals that for the plant as an ornamental. Many, indeed, are the uses to which it is put. It is, perhaps, most commonly used as a belt along fences, and to infrequently make a bridge 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 houses, and for making object in damp places, at watersides; sometimes as a border around a fish-pond, oftentimes growing in bunches or masses in the water itself; or massed on a slope near water; bathed with other tropical vines; or as a border of tropical jumble; and very effective, indeed, is it in the lower tiers of hillsides around a large fountain with Myriophyllum hanging down from the base of the Calla. For all of these purposes, \textit{Richardia}, of course, is of more importance than the flowers. As it grows luxuriantly here in almost any location, it is very seldom

seen as a pot-plant either in the dwelling or on sale at the nurseries. In the most favored places only is it entirely secure from the frost; though the damage from this source is not serious in and around Los Angeles. Though doing fairly well in the full sun, our summer climate is too dry for its greatest beauty and luxuriance wholly without protection, and it may therefore only be seen in perfection when grown in partial shade. A good supply of water and sunshine is also an important factor in its proper development.

The spadix is subject to many variances in form, both in size and shape, some being long, rather narrow, and pointed, ending in a small indurated, greenish-yellow cone; others are nearly circular, with the sharp point almost wanting and standing upright the same as the balance of the spadix. It frequently happens that the spadix is double and even triple, sometimes in its entirety but often partially so. In the latter case it often resembles 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 \textit{R. hemsleyana} 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 and flowers is of course limited, but if grown in a practically breastless belt, the bulbs will be more than ready for the cultivation of the winter field, as in that season the year flowers of all kinds are scarce. The retail price of good blooms in midwinter is 50 cents per dozen; the wholesale price about $1 per 100. Bulbs at retail cost about one-half, or even less, what they do in the East. Our commercial growers get at present quantities that from 60 to 80 per 1,000, according to size, the market calling for tubers 2 to 3 inches in diameter. Larger sizes are quoted as "fancy" and command extra prices. Though they can be grown in almost any soil with some success, a free, cool, blacksoil base is best, and they do not thrive in a hot, gravelly or rocky soil. The land near the coast, where swept by the cooling sea breezes, are producive 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 be present. In field planting it is much better to put small bulbs about 4 inches apart than to sow the offsets precociously in the row; when the sets are thus sown, they should be taken up the following year and the small bulbs properly planted. Offsets even an above and left 4 years the usual time for a good crop, have never produced satisfactory results. No pest seriously attacks foliage or bloom, but in dry years yellow stomachs enter the tubers very soon and receives considerable assistance from smallpicks. Both these pests are quite a nuisance to the California nurseryman and gardener. The much photographed "Arums of Callas in Bloom," so familiar to visitors and much used to illustrate articles on California, fancy stationery, etc., was grown by Capt. M. E. Walker, of Los Angeles, to whom the writer is indebted for many of the leading facts in this article regarding the culture of the Calla for the general market.

\textsc{Ernest Braungart

\textbf{RICINUS} (Latin name, from the resemblance of the seeds to certain insects). \textit{Euphorbia}. Herbsceous, becoming the spadix and receptacle notably like in the tropics, glabrous; its \textit{large}, alternate, petiolar, palmate nearly 7- to many-lobed, the lobes serrate, the petals or disk, in terminal and apparently lateral racemose, large for the order: the upper shorter-petalled, the foliage is of considerable magnitude: calyx 3-5-parted, valvate; stamina many, erect in the bud.

2131. Fruit of Castor Bean, showing the seeds inside.

\textsc{Natural size.}
filaments much branched, each with very many anthers; rudiment of pistil none; the lower lvs. longer pedicelled, pistillate; sepals very deciduous; styles 5, plumose; capsule 3-valved, 3-seeded, explosively separating into 3-valved cocci when ripe; seeds ovoid, with a large ca-

2132. Ricinus communis.

robinia, crustaceous testa and fleshy, oily albumen; isothed-bread.

A great many forms are known, many of which have been distinguished as species by some, but most botanists follow Müller (Decandolle’s Prodromus, vol. 12, part 2; 1861, 1866), in referring them all to varieties of the one species, R. communis. In this, in which the following, listed as species in the American trade, may doubtless be placed: R. Africanus, Barbary, Cambodgean, carinata, Gissone, hypogynum, macrosepalus, Pedunculatus, paniculata, Phillipsi, spectabilis, teucra, Zanzibarensis. See Vilmorin, Blumen- gärtner, p. 293 (1890).

2133. Clump of Ricinus communis. 
beauty of *Pseudacacia* was early recognized and it was extensively planted, but the attacks of the borers have caused great loss and checked the planting of a beautiful tree.

Pseudacacia, Linn. Locust. False Acacia. Black Locust. Fig. 2135. This species is the largest of the genus, growing to a height of 80 ft. L. v. 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; fl. white and fragrant, in drooping racemes. In a broad, brown, many-seeded pod or bean. 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: aurea, Hort., has pale yellow fl.; *bella-rosea*, Hort., rose-colored fls., and is probably a hybrid of *P. Pseudoacacia* and *P. ciceria*. var. inermis, DC., is a thorny variety, with large dark foliage; *bullata*, Hort., is much like *Boscianina* below, but more compact; *Boscianina*, Carr., is a form with handsome rose-mottled fls. K.H. 1863:351. F.S. 19:297. I.H. 19:1227. *Gn. 34.* p. 114: *spectabilis*, Du Mont-Cour, is a strong-growing thorny var.; *muscophylla*, Pelt., & Kirchh., is the Smooth-leaved Locust, and of this there is a slightly pendulous sub var.: *pandia*, Loud., is a form with broad, spreading, somewhat drooping branches; *semperflora*, Hort., is said to flower throughout the summer; *globulus*, stricta and *minosellus* are horticultural forms, which are sufficiently described by their names; *pyramidalis*, Pelt., & Kirchh., is a distinct narrow-growing form; *umbrellifera*, DC. *Umbella Locusta*. Thornyless, the branches densely crowded; fls. ovate. vars. *robin, stricta* and *Boscianina* are forms of this. Very distinct.

*Rhipida*, Linn. Rose Acacia. Fig. 2135. A shrub 2-8 ft. high; all parts of the plant except the fls., briskly or hairy; fls. 9-13; racemes loose; fls. on long pedicels, rose color. May, June. Va. to Ga., in mountains. B.M. 311. *Gn.* 34, p. 157.—Like the next species, it spreads from the root and should be planted where it will not interfere with other plants. Seldom matures seed.


R. *Robini* is a new species, discovered and introduced in 1901, by Harold F. Robey. The bark much resembles *R. Pseudacaica* and the plant is sparingly pubescent. It is a compact shrub of distinct habit.

John F. Cowell.

**ROBIN'S PLANTAIN. Eriogonum bulbiloloides.**

**ROCAMBOLE (Allium Scorodoprasum, Lam.).** 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 and bears at the top an umbel of flowers, some or all of which are changed to bulbils. The presence of these bulbils distinguishes the plant from garlic. The species can be propagated by the bulbils, 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 Caucausus region and Syria. It has flat or keeled leaves, short spathes, bell-shaped, 6-parted perianth, and the 3 inner stamens broader than the rest. S. left, and not longer than the perianth. It is a perennial plant. Good seeds are rarely produced.

**ROCCARDIA. Consult** Helixtrum.**

**ROCHE (de la Roche, French botanist).** Crassulaceae. A genus of 4 species of succulent plants from S. Africa, with opposite, oblong-ovate or lanceolate fls. and fls. in terminal, few to many fl. heads. For generic characters, see *Crassula*. The best species is *R. roccardiana*. The following points concerning its culture are condensed from *Gn.* 16, p. 506: This species enjoys an abundance of light and sunshine, and needs to have its wood thoroughly ripened in the autumn to insure a display of bloom. If small plants can be pressured 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 30-40° day temperature of 55-60° in sunshine, with plenty of atmospheric moisture until the new growth is freely produced, when they should be inured to more air. A shading of the glass may be necessary in summer, or the plants may be placed in a sheltered 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
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 shrivelling.

A. Clusters usually 2-flowered.

Jasminas, DC. (Crassula Jasminae, Ker-Gawl). Stem hermaphroditic, 4-12 in. high, decumbent, branched, flowering part erect; lvs. fleshy, oblong-ovate, 1/16-3/16 in. long.

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A. Clusters usually 2-flowered.

Cocceias, DC. (Kalanchoë Cocceia, Haw. Crassula Cocceia, Linn.). Plant robust, shrubby, 1-2 ft. high; lvs. very closely imbricated, 1-1/2 in. x 1 or 1 in.; lvs. bright scarlet, 1-1/2 in. long, fragrant, borne in summer. Cape, G. 44, p. 360. B. M. 496.

R. falata. DC. See Crassula falata. F. W. BARCLAY.

ROCK-BRAKE. See Cryptogramma.

ROCK-CRESS. Arabia.

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, algæ 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 correspondings 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, mist 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 casions, tufts and nestles 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 I do so doing they may enter a comparatively unexplored 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 Lewisia Gremaneae, Lewisia rosea, Lewisia procumbens, Silene acuta, Dupsina Lappionica, Archistephaul alpina, Vaccinium capillaceum, Saxifraga virescens, Veronica alpina, Gena radulatum, var. Dockisi, Nidularium procumbens, Rhodolobellus Lappionicus, Bryanthus bistidnii, Primula farinosa, Saxifraga oppositifolia, Aluwum and aizoides, Aster polyphythlus and Woodia globulosa; and in the Rocky Mountains and Pacific Coast ranges by Lewisia fitzgeraldii, Lewisia florivas, lamatus and urinaria, Actaeone Brandegii and grossidora, Artemisia borealis, scapulorum and alpina, Silene Soldanelia, Femenitii, petrona, nothubera and prostrata, Cuphea eoca, Campanula unita, Primula farinosa and eulathes, Androsace chamissoe and septentriones, Gentiana prostrata, tricolor, Veroneda, Parryi and simplex, Ptilox hopii, and corynephora, Polemonium coniferum, Cassiope Mertensiana, Bryanthus Breueri, Dona strophoecarca, Parryi and nudicaulis, Arabia Lygalliti and platysperma, Sierlociae valleiana, Lychia montana and Kimia, Catandunia pygmaea, Claytonia syringa, Spraguea umbellata, Dipsac sodetophila, Gena Rossi, Saxifraga chrysanthka and hystaphor, Cypsopteris alpina, Alpographys pygmaea, Lycoclii and acutata, Omphalodes and, var. arcidiodes, Chionolplia jamesi, etc. (Not all of these names are accounted for in this work. They may be found in the Current Manual of 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 deltoidea, Achillea tomentosa, Batanopsis Crassicaulis and Arbis aitiana, are offered by American nurserymen and cultivated in the open border. On a few private places small rock gardens have been established, or advantage has been taken of favorable local conditions to cultivate some additional species, and in one or more botanic gardens considerable collections have been at times maintained, chiefly in frames. Generally what have passed for rock gardens have been rockeries—meiers 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

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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, but it must be remembered that at low elevations the long, hot summers do not allow the period of rest that such plants require. This condition must be met by devices, methods, and locations that will retard the growth of the plants, the propagation of forms, and the development of a complete root system that will enable the roots to extend for a long distance, often many feet, in narrow crevices and pockets between rocks to depths where there is a uniform temperature and uniform moisture supplied by moving water, for frequent freezing and thawing and stagnant water are fatal. These cavities should be filled with such loose material as fragments of rock mixed with decayed vegetable matter, without mortar, and arranged to provide for the free passage of air, roots, and moisture, and to allow drainage and the free access of air to the free passage of air, roots, and moisture, and to allow drainage and the free access of air to the

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2379. A pocket in the rocks.

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adapted to existing conditions than to go to the expense of radically modifying such arrangements.

If artificial methods are to be contrived it is not for the purpose of displaying a collection of curious rocks fantastically arranged, but to provide a place for growing a class of plants that cannot be grown on the ground. In the same way, we think of securing mountain, valley and rock effects in the disposition of the material to be used, but only in the sense of providing many varied conditions and situations as far as rocks fall. What we need are the character and depth of pockets and crevices, the character and depth of soils, subterranean and surface water supply, and whether it be permanent or intermittent. In selecting and arranging the rocks the surface should not be exposed, but rather such faces as are already covered with a growth of lichens for sunny places and with mosses for shady spots. To take full advantage of surface water, pockets and crevices should have a decided downward direction from the exposed surface and not be sheltered by underhanging rock. That this does not apply in all cases, those who are familiar with the habitats of rock-plants know full well. The natural habitat of Phlox, for instance, in the vales is in horizontal crevices well back from the edge of the overhanging rock, where it is absolutely protected from all but the rarest of rains. If it finds sufficient moisture in the horizontal crevices, Peltata alpina will grow in narrow cracks and small pockets on the face of dry limestone boulders where there can be no possible internal supply of moisture. These instances are an evidence that the general principles that will apply to such plants as a class will not apply to all species, and it simply gives emphasis to the importance of trying a plant under all available conditions before assuming that it cannot be grown. The writer remembers well an attempt to grow most exquisite alpine flower, Gentiana crux, in the open border on a little pile of rocks before it suitable

The importance of protection from drying and cold winds and of securing shade in many situations must not be overlooked. Sometimes good advantage may be taken of an existing mass of lichens or evergreen tree or shrub growth, or rapid growing varieties can be planted to make a screen. While shelters of this character are of value about the outer limits of a garden, it cannot be generally used for securing its smaller compartments. For this purpose slow-growing, densestablished evergreens with a restricted root range are best. This includes the Vines, a few of the dwarf forms

Thuya, Junipers, Pines, Retrorsipera and practically all the broad leaved evergreens. The latter, especially the Rhododendrons of which Rhododendron canescens 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 the shelter-hedges form the background and setting of the rock garden and are the dominating landscape features in view from a distance, their composition and disposition is an matter of much importance. The composition must be governed, however, by the special arrangement of the grounds, but in this arrangement an unevenly varied skyline and composition of plant forms and of the various shades of green should be sought for. In the selection of the background, and most the special groups of plants. In this 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 work such as are
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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 Herbs, Borage and Alpine Flowers." Edinburgh and London, 1871.

Up to this point reference has been made for the most part to distinctively 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 best 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 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 pests. In a rockery conditions are such that it is almost impossible to extirpate deep-rooting, vegetative plants, and they above all others should be rigidly excluded. Among desirable rock-plants the writer would include Geranium sanguineum, Anaphalis and Hypericum calycinum, Helleborus niger, Leopoldia comosa, Linaria Cymbalaria, Lotus corniculatus, Lysichiton squarrosus, Potentilla alpina and umbrosa, Centaurea cyanus, Veronica prostrata and capensis, Arabis alpina, Campanula trachelium, Daphne Canadensis, species of Alyssum, Bells, Cerastium, Arenaria, Draba, Euphorbus, Boreas, Thymus, Arabis, Armoracia, Ajuga, Dianthus, Sedum, Sagina, Primula, Aquilegia, Saxifraga, Corydalis, Myosotis, Sempervivum, Parnassia, Viola, Hepatica, Ophelia, Houtonia, Avenula pustulata, var. Nathalianna, dwarf and creeping Campanulas, Corys Canadensis, Dianthus caryophyllus, Galium val croria, Iris cristata, reoma and purple, Leopoldia comosa, Pilot sylvatica, anemone, reptens, Saxifraga Virginica, Silene Pennsylvania and Virginis, Arenaria raphanoides, Wuthrichia fragrans, Galea ophrya, Asperula odorata, low-growing ferns, mosses, etc.

WARREN H. MANNING.

A rock garden or rockery is, or should be, an imitation (though of necessity in a limited and smaller way) of a natural rock slop or alpine rocks seen on mountain sides, but made more interesting and attractive by the planting of a large variety of alpine and other plants. The meaningless mounds of stones too often seen in gardens, planted with summer-beding plants or vines, do not represent the true conception of a rockery. A rockery must of necessity often contain a natural bank or slope, the position or aspect not being an ideal one. A southern slope, unless within the shade of tall trees, is not as good an aspect as a northern one, owing to the soil becoming too hot and dry, just the opposite conditions for true alpine plants. Some of the best rockeries are what are known as under-ground rockeries; for instance, the one in the Royal Botanic Gardens, Kew, London, England, is an underground rockery. Before this rockery was constructed the ground was perfectly level. A cutting was begun at one entrance, at first shallow, but gradually deepening till a depth of some 4 feet was reached, and an average width of about 10 feet at the bottom. All the soil taken out was placed on the top of the slopes, thus still further increasing the height. The cutting was made in a winding manner, not formal or zigzag, but in such a manner that when completed, not only would a variety of aspects be secured to suit the requirements of different plants, but each turn should seem to possess a peculiar charm of its own. The whole cutting is perhaps some 200 yards in length. The rocks are placed in the banks in a natural manner as it would seem possible to place them; now they stand out boldly, almost perpendicular with the edge of the path; then again they recede into hollow recesses. There are not too many rocks, not yet too few. In one place a cascade falls over the rocks into a small pool, which not only provides a habitat for aquatic and bog plants, but adds greatly to the beauty of the rockery. For the convenience of the public a broad gravel path runs through the whole rockery. Rhododendrons and other shrubs are planted on top of the banks in groups, and not in straight lines, while behind those for protection and shading are planted pines and other conifers, as well as some deciduous trees. The rocks are placed in most cases so as to form "pockets" of good size into which the plants could be planted, and the soil made in the pocket to suit the requirements of the different plants. With such a variety of aspects and conditions this rockery is able to accommodate one of the largest collections of alpine and rock plants in the world. As this rockery was for a time the special charge of the writer while a student at Kew, well does he remember the deep carpets of mossy Saxifraga, Anhribritis, Arabis, Cerastium, Sedum, etc., which hove over projecting ledges of rocks, while in fissures and holes in the rocks were growing those dainty rosette-making saxifrages, S. horsfieldii, S. colchicum, S. erinaceum and S. rupicola, as well as the charming meconopsis. In the deeper recesses of the rockery were to be found the

2139. An isolated rockery under a tree. Southern California.

2140. A picturesque rockwork for the wilder parts of the grounds (European).
large-leaved saxifragues, such as S. crassifolia, S. ligulata, S. Stroehiari and S. purpureas. Quite at home and in suitable positions are alpine primulas, auriculas, and the various herbaceous poppies, Himalanian poppies (Meconopsis bettckeana and Althaea fischeri) growing from the tiny blue Geranium revera to the tall S. Septemlata, and many kinds of Fuchsia, Petunias, Erigeron, Eryngium, Dianthus, Euphorbia, Alhagi, Alyssum, Ajuga, Achillea, Armeria, Sagina, Scopervivium and erasing Veronica, besides other plants too numerous to mention. Particularly promising are the various small-leaved, large-flowered saxifragues which would fill up the recesses in the shrubs on the top of the rockery. One end of the rockery beneath the shade of overhanging trees was devoted to hardy ferns, which grew with wonderful luxuriance. With the variety of rare and interesting plants, together with the artistic yet natural appearance of the whole rockery, a more beautiful place it would be difficult to conceive.

With these pleasant remembrances in mind the writer built a rockery in 1896, in the Botanic Gardens of Smith College, Northampton, Mass., somewhat after the pattern of the one at Kew, but at present on a very much more limited scale. The position chosen (the only one available) is near the outskirts of the garden proper, on what was formerly a grassy southern slope. A cutting was made through the slope in such the manner as the one at Kew, but to secure a northern aspect the soil was all banked on the southern side. The path, which is quite level, varies in width from 3 to 6 feet. The height of the banks in which the rocks are placed ranges from 2ft. at the entrances to some 8 or 10 feet at the highest point. For rocks we used large, water-worn boulders collected in the vicinity. One shaded recess, with a northern aspect, is devoted to herbaceous perennials of the Hemirolepideae. All the plants are propagated by seed, cuttings and division. The writer has found most of the low-growing Veronicae, sedums, Scopervivums, arabis, alyssums, sedumifolia, alpine Chamissoas, Aubretias, campanulas, ibericae, dianthuses, and many others do very well in the more sunny or southern aspects of the rockery, while on the northern aspects celastres, hebes, kermes, krigia, Iceland poppies, rosseau and Mexican saxifragues, moss- peas, cupressums, heucheras, carniolanes, dahlias, dianthuses, native arctotis, cuprsepiumes and many other plants do well. On the top of the rockery, to fill up recesses in the shrubbery, are planted foxglaces, verbennas and tall veronicas, while at conspicuous points are planted clumps of Ranunculus Excelsus, Tall-lax species, Lemoens Nudiss, or any herbaceous plant which looks well as an isolated specimen. In among the plants in irregular colonies are planted hardy bulbs, such as crocuses, scillas, onagradnths, narcissi, crocosci, and grape hyacinths. Rodspecies these come up the first thing in the spring and blossom before the other plants get well started into growth, and are a decided acquisition to a rockery.

The smaller alpine plants may be readily propagated by seed, cutting and division of the plants. The writer raises some from seed each year to fill up any vacancies in the spring. His plan is to sow the seeds in 4- inch pots in February in a finely prepared light soil, and place the pots in a coldframe. Here they soon germinate, and as soon as large enough to handle they are transplanted either into other pots similarly prepared, or into small, shallow boxes. They grow vigorously through the early spring months, and by the first of May they may be planted out permanently. Seeds may also be sown in some shaded frame in spring and the plants transferred to the rockery in the fall. All these plants are of a hardy nature and would tolerate a light covering of leaves or light strawy mature to protect them from excessive freezing and thawing during winter, especially those planted on the southern exposure, or they may be protected with a few inches of leaf branches laid lightly over them. These should be removed as soon as the weather will permit in early spring. In planting a newly made rockery it is a mistake to plant too thick. Each plant should be left room to develop so as to show its true character, and the plant should then be limited in a measure to that space. The writer has found it impracticable to keep plants growing in the same place longer than five years, and replacements should then be made. As in other parts of the garden, weeds must be kept under control and must insinuate themselves wherever they can gain a foothold. These must be removed as soon as they appear, and the whole rockery should be gone over at least once in ten days to keep each plant from encroaching on its neighbors, and to keep all in good order.

ROCKY MOUNTAIN BEE PLANT. Thymus integrifolius.

RODRIGUESIA (Commodore Rodgers, U. S. Navy). Saxifragaceous. A genus of one species, a hardy herbaceous perennial for which the following names have been proposed: Rodgers' Bronze Leaf, Bronze Leaf of Japan and Stately Five-Leaf. It grows 3-5 ft. high, and the leaves are fingers-shaped, the 5 lobes bring hold in outline, angled and serrate. In the spring the foliage is light green; in summer it assumes a metallic bronze hue. The plant is a vigorous grower, and under favorable circumstances has been known to make a clump 9 ft. in diameter, the largest lbs. being a yard across and borne on stalks 3 ft. long. The lbs. are borne in midsummer on stalks 4-5 ft. high. The general style of inflorescence is that of the popular Astilbe, to which it is closely allied. The lbs. are very small, but make a feathery spray of white bloom. The panicle is a foot or more long and as wide at the base. Technically the lbs. have no petals; what seem to be petals are the white calyx-segments. As a flowering plant it has been so rare as to be lost to the amateur garden. But the bloom is scantier, rather greenshish at first, and perhaps does not last as long. It may not be so amenable to forcing. Rodgersia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardeners. Although any deep, rich garden soil will do, it is said to prefer a moister peaty soil. It should be placed in a sunny position, with plenty of room, where high winds cannot damage the foliage. Easily propagated. Botanically Rodgersia is closely allied to certain species of Astilbe, having 10 stamens and no petals; it differs in having ovate carpels, scapose inflorescence and 5-carpel rather than thrice-ovate foliage. Other generic characters are: calyx lobes 5; ovaries 2-3-loculed; styles 2 or 3; stigma capitate; seed ovate.


RODRIGUEZIA (Emmanuel Rodriguez, Spanish botanical and apothecary). See Botanica. A small genus of South American herbs, a few of which are grown in gardens for their graceful racemes of delicate flowers. The flowers are nearly always fragrant. The plants vary somewhat in habit. Some species form neat, compact
tufts, while others, like E. decor, have long, straggling rhizomes difficult to keep within the limits of a block or a basket. Pseudobulbs small, compressed, 1-2 lvd. and bearing sheathing lvs. at the base; racemes erect, of the dorsal sepal distinct, ovate, pubescent; labellum, 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 usually extending the sepals; column slender. Robert Brown in his genus Gomesa (sometimes written Gomeza), found on G. recurva, 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 temperature of 50°, giving little water. The growing temperature should be from 60-75°. 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.
   1. fragrans
   2. decor
   3. venusta
   4. candida
   5. pubescens
   6. secunda
   7. crispa
   8. planifolia

Fragrans, Reichb. f. (Bourdonia fragrans, Lindl.). Lvs. tufted; racemes erect; fls. pure white, except the middle of the labellum, which is stained with yellow, very fragrant; lower petals united; dorsal sepal acute; labellum twice as long as the petals; middle lobe rounded, bifid, contracted into a broad claw which has several fringed lamellae; column with falcate hairy cars. May, June. Brazil. B. M. 4534. P. S. 7776. = Var. pieti, Hort. (Bourdonia decor, var. pieta, Hook.). Pseudobulbs orbicular, compressed; fls. short, acute; sepals and petals spotted with deep purple-red. B. M. 3419.

Venusta, Reichb. f. (Bourdonia venusta, Lindl.). Lvs. oblong, flaccid, and growing in compact masses 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 plicate near the middle. Flowers at various seasons. Brazil. I. H. 5.188. = Very near R. candida.

Candida, Batem. (Bourdonia candida, Lindl.). Lvs. oblong, firm; racemes pendulous, 4-6-fl.; fls. white, with a light stain of yellow on the labellum; 2 in. long; dorsal sepal obvate, emarginate, the lower pair united into a concave, bifid blade, saccate at base; petals obvate, with the apex recurved; labellum with a broadly cuneate, bifid middle lobe, longer than the sepals and petals; base and lateral lobes parallel to the column, throat with many lamellae. April, May. Guiana. B. R. 31:1927. F. M. 1511:548.

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

Secunda, HBK. Fig. 2141. Pseudobulbs bearing several thick, linear-oblong lvs.; raceme erect, second, 6 in. high; fls. deep rose; sepals erect, ovate, convex, the lower pair keeled and gibbous; petals like the dorsal sepal; lip coiled up, bluish, emarginate, somewhat longer than the sepals. Ang. Trinidad, Guiana. B. M. 3324. B. R. 11:930. L. R. C. 7.650 (as R. lanceolata). crispa, Lindl. Pseudobulbs elongate-ovate; lvs. oblong-lanceolate, spreading; umbel: raceme pendulous, rather dense; fls. green, with yellowish borders; sepals all free, umbel:crisp; petals similar; labellum lanceolate, sigmoid. Brazil. B. R. 26:34.

Planifolia, Lindl. Pseudobulbs clustered, compressed; lvs. lanceolate; raceme long, drooping; fls. greenish yellow, fragrant; sepals oblong, waved, acute, the lower pair united except at the end; petals like the dorsal sepal; labellum broadly oblong, acute, reflexed, shorter than the lower sepals. Feb. Brazil. B. M. 1745, 304. L. R. C. 7.660 (as Gomeza recurva).

Heinrich Hasselbring and Wm. Mathews.

ROGIERA. See Rondelidia.

RODEA (Mich. Rodhe, physician and botanist of Bremen). Liliaceae. A monotypic genus from Japan, essentially a tender foliage plant with luxuriant radical lvs. 1-2 ft. long. The fls. are borne among the lvs. in short, thick, dense spikes a few inches high; perianth globular-bell-shaped; anthers sessile; stigma peltate; style nearly wanting: fr. a globular, usually 1-seeded berry. Rodeas 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.

Japonica, Roth. Root a long, nearly cylindrical root- stock with fleshy fibers; lvs. typically green, 9-12 in a rosette, erect, ob lanceolate; berry about the size of a small olive, with a red pulp. B. M. 898. G. M. 50: s. 54.

The following varieties, which differ in shape and color of the lvs., are offered by Dutch bulb growers: Var. aureo-striata, falcata, falcata var., latimaculata, macrophylla, marginata minor, pygmea, zobina. G. W. Oliver and F. W. Barclay.

ROLLINA (Charles Rollin, of Paris, 1661-1741, aided Townefort). Amaryllidaceae. 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 wine tinged appendage, the interior small or none: fr. sometimes of separate carpels; fls. 1-3 on peduncles that are terminal or opposite the lvs. The general remarks under Anona will apply to these plants.

Sieberi, A. DC. (Anona sieberi, Jacq.). Low tree, the young growth nearly or quite smooth; lvs. oblong, taper-pointed, smooth; exterior petals oblong and blunt (½ in. long), greenish, the interior smaller but prominent, reddish; fr. about 4 in. in diameter, greenish, sometimes of separate carpels; fls. 1-3 on peduncles that are terminal or opposite the lvs. 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. Ronner Robinson, friend of T. Coulter, who discovered it about 1845)

The California Tree Poppy


—Ever since 1889 and 1890, when it was one of the leading novelty families, 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 Securiginosum, and those not considered hardy in the eastern states, it has been successfully grown in the open in northern New Jersey.

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

W. M.

RILDEDELTIA

romneya, Eckl. (Tripodion coronaria).—Coreopsis, 3-5 in. thick; style, 1-1/2 in. long, sericeous; peduncle 1-6 in. long, 1/2 in. long; perianth with a short tube and a few stamens, purple or white, the throat and a red-like limb, about 1 in. long, the outer segments with 3, violet-purple stripes outside. S. Africa. E.M. 122: (as T. coronaria). F.S. 18: (as C. fistulosa). C.F. 279: (as C. E. Cels.). var. speciosa, Baker (T. speciosa), Koch. has a larger corolla, 1-2 in. long: with yellow or white. A white var. has been introd. by Barr, of England. F. W. Baker.

RONEDELETTIA (Rondeletia, fabled as one of the founders of Rome). — 

Irishpoppy. — T. coronaria. — A genus of about 12 species of grass-like bulbs from the Mediterranean region of Europe, the Cape and tropical Africa. They are small and slender plants with 3-5 flowers, an inch or so across, varying in color from white (white, crimson, and purple) to red, purple, and yellow. They are closely allied to Cynus, but differ in being less hairy, and in having a long pointy, and short flower-tube. Genus characters: ks. linear, radiculata, with a few similar flowers: perianth: solitary: in a spatho, on a simple or branching peduncle; perianth segments oblong, much exceeding the short tube; ovary: valves herbaceous. These bulbs seem to be unknown to the American trade.

A. Fls. erect, crimson. 

rosa, Eckl. (Tripodion rosa).—Coreopsis, 3-in. thick; style, 1-2 in. long, sericeous; peduncle 1-6 in. long, 1/2 in. long; perianth with a short tube, purple or white, the throat and a red-like limb, about 1 in. long, the outer segments with 3, violet-purple stripes outside. S. Africa. E.M. 1225 (as T. rosacea). F.S. 455: (as C. Celsii). var. speciosa, Baker (T. speciosa), Koch. has a larger corolla, 1-2 in. long; with yellow or white. A white var. has been introd. by Barr, of England. F. W. Baker.

RONEDELETTIA (Rondeletia, fabled as one of the founders of Rome).

Romneya is difficult to transplant, due to the scarcity of fibrous roots; in middle California, we transplant suckers which are produced in great abundance without any loss, provided a good, firm ball of earth is kept around the stout, thick roots in transit, and if the stems are cut off at ground level. The plant grows luxuriantly in a heavy soil, producing immense flowers. The name Matilija Poppy (pronounced Mah-tih-lee) is the favorite in California. It comes from the Matilija canyon, Ventura county, where the plant grows in particular abundance. Miss Parsons writes: "Many people have the mistaken idea that it grows only in that region. It is not uncommon by any means but it is found in scattered localities from Santa Barbara southward into Mexico. It is very abundant near Riverside, and also upon the southern border and below in Lower California, where the plants cover large areas. It not only grows in fertile valleys, but seeks the seashore and in remote canyons, and nothing more magnificent could be imagined than a sleep canyon-side covered with the great bushy plants, towering covered with the enormous white fles. The blossoms remain open for many days."

J. Buss Duriv.

The Romneya can be transplanted safely if cut to the ground before lifting and the transplanting is done during its dormant season and soon before growth ensues. The writer has transplanted it in the fall that without cutting it all back—twice a year: in fall into a cold pit, and in April back from the pit to the bed in the garden, and with perfect success. There is no difficulty in growing it from seed; any desired person can get fresh seed,—that is the only secret, and this is im- possible in a pot. The seeds are planted in a seed box in the garden, and are sown as soon as they are large enough to handle. The seedlings are set in the garden bed in the second month, and grow healthily and rapidly.

William Falconer.

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

A. Fls. red.

B. Lvs. opposite.

odorata, Jacq. (Rondeletia odorata, Lodd.). Lvs. ovate, nearly sessile; clusters 10-30-fl'd.: fls. crimson to brick-red, with a conspicuous yellow throat; lobes, which are pink. B.M. 5009. R. Panderi, Hook., a beautiful pale yellow-fl'd. species from Colombia, has a great pyramidal cluster 3 in. across and 4 in. deep, with an astonishing number of fls., perhaps 120-200 in B.M. 5009—R. odorata, Hook., is referred to R. amoena 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 twolobed green spot in the center from the color of the stigma, which protrudes 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 red-worm (Heterodera radicicola) is known as the nematode root-gall (Fig. 2144); the enlargement on the roots of cabbage and related plants by the myxomycete (Plasmodiophora brassicae) is called crown-root; the swellings on the roots of the peach, apricot and many other plants, which are often characteristic of appearances and usually appear at the crown of the plant, are known as crown-gall. Root tubercles are small galls 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 phyloxera, and the galls frequently observed on the roots of our indigenous escarole; (2) vegetable parasites, as in the crown-root and the crown-gall (Fig. 2145); (3) mechanical injury, causing excessive callous development, root-hurts, 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. Rondelcua cordata, B.H.B.


AA. Leaves in whorls.

anomala, Hort. Figured in J.H. III. 35:251 with 8 fls. in a cluster, the fls. 3/4 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.

BB. Leaves opposite.

cordata, Benth. (R. cordata, Planch. R. thwaitesii, Hort., not Rothl. Fig. 2145). Lvs. ovate, acuminate, cordate; generally said to have pink or flesh-colored fls. with a yellow throat (as in F.S. 8:734, page 19), but in R.H. 1878:230 they are shown as pure white. Guatemala. Franceschi says it is native to Mexico.

BB. Base of lvs. not cordate.

c. Cordatilobus ovatus: stipules broadly ovate.

ameno, Hemsl. (R. amoena, Planch.). Lvs. elliptic, broader than in R. grattissima, and shorter acuminate, 2-3 in. long; fls. rose-pink, with a conspicuous yellow throat, Guatemala. F.S. 5:412. See also R. grattissima in supplementary list.

d. Cordatilobus leucolobus: stipules subulate.

grattissima, Hemsl. (R. grattissima, Lindeni. Lvs. oblong-elliptic, 1-2 in. long, short-petioled, mostly roundish at the base, fls. with a bright rose tube, the lobes falling from pale rose to white; throat not conspicuously yellow. Trop. Amer. L.H. 2:384. F.S. 13:350 (cordatilobus often obscure; stipules narrowly ovate). Gr. 496 (as R. elegans)."

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

2144. Root-galls due to nematodes—Tomato roots.
and apricot in the Southwestern, but as yet it remains to be investigated.

Swellings on the roots of the mulberry are said to be due to the hypotrophy of the hemi-plumule. Some investigators have attributed gall-like root-growths in some instances to the hypotrophy of adventitious buds.

The root-galls caused by the nematode (Heterodera rotiare) may usually be instantly recognized from other forms of hypotrophy and tissue-caries by the numerous knotty enlargements on the smaller roots infected by the worms. By careful search, in most instances, the distended female worms may be found in the infested tissue, where they appear as small, nearly spherical, pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called cod-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 all rubbish that would harbor the worms during the winter. In greenhouses steam can be forced through the infested soil. When potted plants are badly affected they may be severely root-pruned and replaced in soil free from worms. They are not transmitted in soil that has been frozen since an infested crop was grown in it.

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

The most effective method of holding the insect in check appears to be in the use of resistant roots, i.e., the grafting of the more tender varieties on to resistant roots that are stronger and better able to resist the attack of the insect. Biannual growth of carbon 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 crown-rot of different plants, and the cause has been definitely ascertained only in a few instances. The levee growths so abundant in the Southwestern on the roots of the infected plants, known under the name of crown-gall, are caused by a slime-fungus (Diplophragnum ghibonum), which is parasitic in the infected roots.

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

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

ROQUETTE or ROCKET-SALAD (Eruca 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 potherb. The flavor of its leaves resembles that of the turnip, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown.

The flowering 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 leaf will probably be tough and acid. Inter-culture is the same as for spinach, lettuce and similar crops. Frequent watering and tillage in hot, dry weather to insure rapid, vigorous growth should result in succulent leaves. In summer the plants run rapidly to seed; in spring and autumn they will produce abundantly after being cut. The pale citron-yellow flowers emit a perfume resembling that of orange blossoms.

ROSA (Ancient Latin name). Rosaceae. Rose. Ornamental deciduous shrubs, upright or climbing or creeping, usually with prickly stems, alternate, stipulate, odd-pinnate, leaves, simple or lobed, opposite; flowers, usually yellow or white, pink or pink-white flowers, and conspicuous, often ornamental, usually scarlet fruits. There is probably no flower more popular and better known than the Rose. From time immemorial it has been praised for its beauty, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarkable to note, however, that the 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-stature, and it is the double-flowered Garden form whose image the word "Rose" almost invariably brings to mind. The single, white or pink, double-flowered Roses much less attention has been given. The ornamental value of single Roses is rarely fully appreciated. The Wild Roses have a simple charm and graceful beauty. No need the Rose to rival other florals. The dominating beauty of the double Roses has eclipsed the more modest attractions of the single Roses.

The longer flowering season of the Garden Roses is also a factor in their favor. Though the Wild Roses cannot, perhaps, be compared with their more noble sisters of the garden, they are nevertheless fully able to rival other ornamental shrubs for the adornment of park and plot. According to the habit peculiar to each species, they can be used for a variety of purposes. Most of the species are shrublike, rarely exceeding 6 or 8 ft., and may be used for borders, or for covering slopes and rocky ridges, especially R. rugosa, R. hae- nicles and various American species. Some kinds, like R. rugosa and R. lacera, make handsome ornamental hedges. The climbing species are used for covering walls, trelliswork, arbors, porches or pillars, but perhaps display their beauty to the most advantage when allowed to ramble over shrubs or rocks. The half-evergreen R. Wichuraiana makes a beautiful ground-cover and may also be used for edging groups and flower beds.

The fruits of most species are decorative and often remain on the branches all winter. The most attractive of most of the species of the Carolina and Cinnamomeae groups are effective in winter also. The foliage of most of the American species turns purple-orange or yellow in autumn, and so does that of R. rugosa, which is in
Rosa is a widespread genus, easily distinguished by well-marked characters from allied genera, but in the limits of the genus itself the characters are exceedingly variable and it is very difficult to group into sections and species the innumerable forms which often pass gradually into each other. In no other genus, perhaps, are the opinions of botanists so much at variance in regard to the number of species. While some, as Bentham and Hooker, estimate the number at about 30.

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Roses, with 109 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, group, and the sequence of the plates, neither pages nor plates being numbered continuously in this edition.

The economic properties of the Rose are of little importance. The most valuable product is the oil obtained from the flowers, of which some species are extensively cultivated in the Mediterranean region. Some species are particularly noted for their fragrance, such as the species known as 'Roses of the East.'

For general notes on culture, see *Rosa*.

**KEY TO THE GROUPS.**

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

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

Subgenus Hulthemia (Species Nos. 1-10)

AA. Lvs. pinnate, stipulate...

Subgenus Eurosa (Species Nos. 11-20)

B. Styles exserted beyond the mouth of the receptacle...

C. Exserted styles connate into a column.

(See Fig. 2150 right.)

Climbing or creeping: style about as long as receptacle. (See Fig. 2150 right.)

Climbing or spreading: style longer than receptacle. (See Fig. 2150 right.)

For general notes on culture, see *Rosa*.

1548

**ROSA**

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

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

Subgenus Hulthemia (Species Nos. 1-10)

AA. Lvs. pinnate, stipulate...

Subgenus Eurosa (Species Nos. 11-20)

B. Styles exserted beyond the mouth of the receptacle...

C. Exserted styles connate into a column.

(See Fig. 2150 right.)

Climbing or creeping: style about as long as receptacle. (See Fig. 2150 right.)

Climbing or spreading: style longer than receptacle. (See Fig. 2150 right.)

For general notes on culture, see *Rosa*.

1548

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SUBGENUS EUROSA.

Section I. Syntyle. A group of about 12 species (one of them Ancestris), well marked by the stigmas being connate into a slender, erect column, Stems sarcous or climbing, with hooked prickles, fls. in corymbs, low or many; outer sepals pinnate, rarely entire, relined after flowering, cadu ces.

Key to Species of Section I.
A. Stipules plicate; prickles usually multifida
AA. Stipules straight or declinate; prickles scattered
B. Lvs. of flowering branches 5:7-foliolate; pubescent beneath
   b. Watsoniana
BB. Lvs. of flowering branches usually 9-glabrous
   b. Wichuraiana
BBB. Lvs. of flowering branches 5:7-foliolate
   c. Sepals acute, abruptly acuminate; fls. buds broadly olate, abruptly pointed; corymbs usually few-flowered
   d. sempervirens
   7. arvensis

CC. Sepals lanceolate, gradually acuminate; fls. buds show glands; corymbs usually many-flowered
   8. moschata


The Dawson Rose, or R. Dawsoniana, is a hybrid with General Jacqueminot. A very beautiful hybrid and one of the best climbing Roses is Crimson Rambler (Fig. 2141), a vigorous grower, with large corymbs of bright red flowers.

2149. A spray of Rose hips.

2150. Section of Rose flowers (X 3/5).

To show two forms of styles.
5. Watsoniana, Crep. Deciduous shrub, with sarmentose or creeping branches. Hts. 3-25 ft., linear-oblong, with entire wavy margin, pubescent beneath, to 1 in. long; fls. in many-fld., pyramidal corymbs, or in fuscous to white, style glabrous; fr. small. June, July. R.B. H. 14, p. 183. G.F. 32:4. A very curious Rose of unknown origin, supposed to have been introduced from Japan, but not known in a wild state. Not quite hardy.

4. setigera, Michx. PRAIRIE ROSE. Figs. 2152-4. Shrub with prickly branches attaining 6 ft., with long and slender recurving or climbing branches; fls. 3-6, oblong-ovate to lanceolate, shortly acuminate, serrate, tomentose beneath, to 1 in. long; fr. in several fld., corymbs, deep rose, fading to whitish, about 2 in. across, almost seedless; pedicels and receptacle glabrous; fr. oblong, pubescent, quite fragrant, 4 in. long. June, July. From Ontario and Wis. to Tex. and Fla. Mn. 8:35. G.F. 10:32:3. A.G. 13:196, 197; 16:229. G.M. 13:25. M.D.G. 1900:243. — Var. tomentosa, Gray (R. cudiflora, R. Br.). Less more tomentose beneath; corymbs with more, but smaller fls. A valuable hard climbing Rose. Several varieties with double fls. are in cultivation; some are probably hybrids with R. arvensis, multiflora, and other species.


7. arvensis, Huds. (R. riparius, Scop. (R. silvestris, Herrm.). Deciduous shrub, with sarmentose or creeping stems; fls. usually 7, ovate to ovate-elliptic, acute, serrate, dull above, glabrous or slightly pubescent beneath, rather thin, 1 1/2-1 1/4 in. long; fr. in few-fl. corymbs, sometimes solitary, white, scentless, 1 1/2 in. across; style glabrous; fr. ovoid. June, July. Europe. B.M. 5864. Var. capreolata, Neill. AVOCET ROSE. Fls. usually 5, larger: fls. double, white to deep pink. It may be a hybrid with R. gallica. Hardy.

8. moschata, Mill. (R. Rambouillet, Lindl.). Musk ROSE. Deciduous shrub with sarmentose or climbing branches. Hts. 3-7, oval or oblong, mostly acuminate, serrate, usually pubescent beneath, 1 1/2 in. long; fls. white, fragrant with the odor of musk, 1 1/2 in. across, single or double; styles pubescent; fr. ovate, small. July. S. Asia, Abyssinia. B.R. 18:629. F.S. 4:306:307. R.M. 4093. Naturalized in some localities in Asia, in a form with rather broad, cuneate or obtuse levs. Var. Abyssinica, Crépin. (R. Abyssinica, Lindl.). More prickly; flowering branches shorter; inflorescence more compact; petals with smaller lobes. Var. Leschenaulti, Crépin. (R. Leschenaultii, Wight & Arn.). Fls. larger, in few-fl. corymbs; pedicels and receptacle glandular-hispid. R. Pimpinelli FERR., a vigorous-growing Rose with numerous white fls., figured in R.H. 1888, p. 341, 345, is also a form of the Musk Rose. Several hybrids are known; the most important is R. Noisettiana (See No. 12). The Musk Rose is a handsome free-flowering climbing Rose, but is not hardy north.
Section II. Stylosa. Contains only one European species, with the appearance of a hybrid between R. arvensis and R. canina.


Section III. Indica. Few Asiatic species with upright or procumbent stems; prickly: fr. scattered, hooked, few: fls. 5-7, rarely 1: inflorescence 1-many-fl.; sepals entire or the outer ones sparingly pubescent, reflexed after flowering; berries and stipules narrow, the latter with small, divergent spines.

10. giganta, Collett. Procurved; 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 entire, long-acuminate. Burman. G.C. II. 615.—Hardy only south. It is possible that Fortune's Double Yellow (Beauty of Glasswood), with large, double, salmon-yellow fls., figured in B. M. 4679, is a var. or hybrid of this species.

11. Chínensis. Jacq. (R. Indica, Lindl., not Lindl.). China Rose. Large upright shrub, with slender branches, sometimes almost unarmed; fls. 5-7, sometimes 1, ovate to oblong, acute, finely serrate, coriaceous, shining and dark green above, pale beneath, glabrous, 1-2½ in. long: fls. usually few or solitary, crimson, pink, white or yellowish, sometimes 3 in. across, fragrant fr., usually obsolete. Flowering all summer and fall. China. From this species and R. Gallica and its forms most of the Garden Roses have originated. Several vars. are known.

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

Var. fragrans, Thory (R. Indica, var. olorotissima, Lindl.). Trae-wanted or Tea Rose. Similar to the following but fls. more fragrant, salmon pink or light rose; fr. ovate. B. R. 10:298. More tender than the other vars.

Var. Indica, Koch (R. Indica, var. fulgiris, Lindl.). Mostly Red Rose. Stems rather stout, 3½-5 ft. high, glaucous green, with brownish red prickles; fls. pink to white, with glandular pedicels; fr. obvate.


Var. minima, Curt. (R. Lauricéphala, Hort. R. Indica, var. púnica, 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 Fairy Roses belong to this variety. B. M. 1762. Red. Ros. (3:23, 6, 7).

Var. semperflóres, Nichols. (R. semperflóres, Curt. R. Bongéi-asis, Pers.). Crimson Chinese Rose. Low shrub, with slender, prickly or almost unarmed, dark green branches; fls. rather thin, mostly staminated with purple; fls. usually solitary on slender pedicels, crimson or deep pink. B. M. 284.

Var. viridiflóra, Dipp. Green Rose. With monstrous green fls., the petals are transformed into small, narrow green lvs. F. S. 11:1136.

Var. Manétti, Dipp. (R. Manétti, Hort.). Fig. 2756. Of vigorous growth, upright; pedicels hispid-glandular, fls. deep pink, single or semi-double. This variety has been recommended as a stock for forcing Roses; grows readily from cuttings, but is not quite hardy.

12. Noisettiana, Thory. Noisette Rose. Champaîse Rose. Supposed hybrid of R. Chínensis and R. moschata. Stems upright to 6 ft., with hooked redish-prickles; fls. 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 was raised about 1815 by John Champtey, of Charleston, S. C., from seed of the Musk Rose fertilized by a blush China Rose. From the seed of this hybrid Philippe Noisette, a florist at Charleston, obtained a Rose which was afterwards distributed as Blush Noisette by his brother Louis Noisette, of Paris.

13. Borbónica, Morren. Bourbon Rose. Supposed hybrid of R. Chínensis and R. Gallica. Upright shrub, with prickly and often glandular-hispid branches; fls. usually 5, ovate or ovate-lanceolate, acute, shining; fls. double or semi-double, usually purple, blooming in summer and fall. The Bourbon Roses are harder than the Noisette, China and Tea-scented Roses, but require protection north. R. Chínensis and its varieties and hybrids (hybridizing with the harder Roses of the Gallica group) have given rise to the Hybrid Perpetual or Remontant class. See Nos. 11 and 16.
1552

Baltimore Belle Rose—Rosa setigera (L.) No. 1

SECTION IV. BANXSIE. Contains one Chinese species with long, very narrowly prickly or unarmed stems; stipules quite free, subsacate, caducous; sepals entire, reeled after flowering, caducous.


15. Fortuneana, Lindl., is a hybrid of R. Banksiana and R. brevifolia. Climbing shrub, with sparsely prickly stems; lfts. 3-5: lfts. large, double, white, on hispid pedicels. P.F.G. 2. p. 71.

SECTION V. GALlica. Contains only one very variable species, native of Europe and W. Asia. Low, upright shrub; the stems with usually hooked prickles mixed with hirsute lfts., more or less with spines or spiny leaflets. Myr. B.M. 7035. Var. macrantha, Hort., similar to the preceding, but the spines pale. Gn. 52:1148. Var. officinalis, Thory (R. provincialis, Mill. Var. plena, Regel), is the typical form but with double lfts.

16. Gallica, Linn. Upright shrub, rarely attaining 5 ft. high; lfts. 3-5, broadly ovate or ovate, rounded at base, usually doubly serrate with glandular teeth, pubescent above, pubescent beneath, deliquescent, 1-2 in. long; rachis glandular-pubescent and often prickly; lfts. on rather stout, upright, glandular-hispid and bristly pedicels, deep pink to crimson, 2-3 in. across, receptacle glandular-hispid; fr. subglobose or ovate, brick-red. June. M. and S. Eu., W. Asia. The following are the most important forms: Var. Agatha, Thory. With rather small, very double purple lfts., the outer petals spreading, the inner ones concave. Red Ros. (2:17, 17-21). Var. incarnata, Voss (R. incarnata, Mill.). Lfts. narrower, elliptic-ovate; rachis not prickly; flowering branches unarmed; lfts. large, pale crimson, solitary; fr. ovoid. B.M. 7035. Var. macrantha, Hort., similar to the preceding, but the spines pale. Gn. 52:1148. Var. officinalis, Thory (R. provincialis, Mill. Var. plena, Regel), is the typical form but with double lfts.

18. alba, Linn. Upright shrub, becoming 6 ft. high: stems with scattered hooked prickles and sometimes with bristles; lfts. usually 5, broadly ovate, serrate, pubescent beneath, 1-2 in. long; upper stipules dilated.
fls. single or double, solitary or several, white or blush, fragrant; pedicels glandular-hispid; receptacle usually smooth; fr. oblong, scarlet. June. Probably hybrid of R. Gallica and R. canina.

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

SECTION VI. CANINAE. Many species in Europe, N. Africa and W. Asia. Upright shrubs, with scattered usually hooked and numerous prickles; upper stipules dilated; corolla usually mongoid.; with dilated bracts; outer sepals plumose, removed after flowering and caducous or erect and persistent.

A. Foliage pubescent on both sides or densely glandular

20. villosa, Linn. (R. panicera, Herm.). Upright shrub, attaining 8 ft., with almost straight spikes; fls. 5-7, oval to ovate-oblong, acute or obtuse, doubly glandular-serrate, grayish green, pubescent above, lomentose beneath, 1-2 in. long; fls. 1-3, pink, 1-2 in. across on prickly pedicels; fr. scarlet, ovoid or subglobose, to 1 inch across, hispid, with persistent erect sepals. June. July. En. W. Asia.—Hardy Rose, with large ornamental fruit. Var. mollissima, Roth (R. nudius, Sm.). Lower, with shorter prickles, smaller, silky-pubescent fls.; fr. smaller, less hispid.

21. rubiginosa, Linn. (R. Epacanthis, Mill., not Linn.). Sweetbriar. Oval-shaped, Dense shrub, attaining 6 ft., with hooked prickles, often mixed with bristles.; fls. 5-7, orbicular to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, 1-2 in. long; fls. 1-3, on hispid short pedicels, bright pink, 1-2 in. across; receptacle usually glandular-hispid; fr. subglobose or ovoid, orange-red to scarlet, with upright-spread, usually caducous sepals. June. Europe; naturalized in some localities in the East. B. B. 2:323. —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: fls. 5-7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, 3/4-1 1/2 in. long; fls. 1-3, light pink, on usually glabrous pedicels; sepals reflexed, caducous; fr. ovate, orange-red or scarlet, glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities. —Much used as a stock for grafting.

23. ferruginea, Vill. (R. rubelloba, Vill.). Upright shrub, attaining 6 ft., with slender, purplish branches covered with glaucous bloom; prickles few, hooked or straight: fls. 7-9, elliptic to ovate-lanceolate, simply serrate, blush green and more or less tinged with red, 3/4-1 1/2 in. long; fls. 1-3 or more, pink, 1-2 in. across, on usually hispid-glandular pedicels: sepals long, with dilated apex, upright spreading, tardily caducous; fr. subglobose, scarlet. June. Mountains of M. and S. Eu. B. B. 2:430.—Effective by its reddish foliage; fls. less conspicuous. Hardy.

SECTION VII. CAROLINAE. Contains only American species. Upright, mostly low shrubs: stems slender, with usually straight prickles, placed in pairs and often mixed with bristles; upper stipules usually narrow; corolla generally mongoid; sepals spreading after flowering, caducous, 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; fls. 5-9

B. Pedicels finely many-tined: prickles usually hooked; stipules cordate:

24. Carolina, Linn. (R. palustris, Marsh. R. corymbosa, Ehrh. R. Pennsylvania, Michx.). Fig. 2158. Upright shrub, attaining 6 ft., with slender stems: fls. usually 7, elliptic to narrow-oblong, acute at both ends, usually pubescent beneath, 3 1/2-2 in. long; stipules narrow; fls. usually corymbose, pink, about 2 in. across; fr. depressed-globose, glandular-hispid, about 1/2 in. high, like those of the following species. June-Aug. Nova Scotia to Minn., south to Fla. and Miss., preferring swampy and moist ground. G.W.F. 35. Blm. 2-488. Mn. 1, p. 36.—Var. Nutalliana, Hort., has later fls., appearing later and continuing until September.

27. **nitida**, Wild. Low upright shrub, 1½ ft. high; branches covered with straight prickles and numerous bristles: Ifts. 7–9, narrowly oblong, acute at both ends, bright green and shining above, glabrous, ½–1 in. long; fls. usually solitary, 1–2 in. across, on slender glandular-hispid pedicels; sepals entire. June, July. Newfoundland to Mass. B.B. 2:231.

28. **foliolosa**, Nutt. Low shrub, 1½ ft. high; stems with rather few slender prickles, sometimes almost unarmed: Ifts. 7–9, narrow or linear-oblong, bright green and shining above, glabrous or pubescent on the midrib beneath, ½–1 in. long; fls. solitary or few, pink, about 1 in. across; sepals 4–5, glandular-hispid; fr. globose, with rather few akenes. May, June. Ark. and Ind. Terr. to Tex. G.F. 3:101. - Like the preceding, a handsome dwarf shrub with graceful foliage.

Section VIII. **Cinnamomea.** Many American, Asiatic and European species. Evergreen shrubs, with usually straight prickles, or pairs or scattered, and often with numerous bristles: Ifts. 4–8; upper stipules dilated; corolla usually many-fid., with dilated瓣: sepals generally entire, upright after flowering and persistent, rarely deciduous; receptacle usually smooth.

### A. Prickles in pairs at the base of pedicels: branches globose

#### B. Sepals deciduous: fr. about 1½ in. across, with very few akenes

#### D. Stipules flat

#### E. Fls. in usually many-fid. corymb: fr. with spreading sepals

#### F. Sepals quite entire

#### AA. Prickles scattered, sometimes in pairs in No. 41.

#### BB. Stems and branches with numerous prickles and bristles.

#### CC. Branches and prickles glabrous.

#### DD. Fls. corymbose: fr. with erect spreading sepals

#### EE. Fls. with prominent corymbs, fr. globose-ovate

#### FF. Stems slender, with slender, straight or ascending prickles, without bristles, sometimes armed: Ifts. 5–7, oblong-obovate, simply serrate, pubescent beneath, ½–1½ in. long; fls. pink, about 1 in. across, on short usually smooth pedicels; fr. globose, with a very short neck. June to Aug. Brit. Col. to Ore. B.M. 6857.

#### GG. Stems slender, with slender, straight or ascending prickles, without bristles, sometimes unarmed: Ifts. 5–7, oblong-obovate, simply serrate, pubescent beneath, ½–1½ in. long; fls. pink, about 1 in. across, on short usually smooth pedicels; fr. globose, with a very short neck. June to Aug. Brit. Col. to Ore. B.M. 6857.

#### HH. Two or more prickles at the base of pedicels: branches oblong-ovate.

#### II. Fls. in corymbs, usually 1½ in. across; sepals sometimes solitary in Nos. 41 and 42: fr. about 1½ in. across; stipules usually entire and narrow.

#### JJ. Fls. globose, with or without very short neck, about 1½ in. high (sometimes ovate in No. 31).

#### KK. Stipules entire.

#### LL. Fls., usually few or solitary, 1–2 in. across; sepals 4–5, glandular-hispid: fr. globose, with a very short neck.
doubly glandular-serrate, pubescent beneath or on both sides, often glandular, rarely glabrous, ½-1 ½ in. long; fls. on slender, usually smooth pedicels, over 1 in. across. June-Aug. Brit. Col. to Calif.

34. Nutkana, Presl. Stems stout, 5 ft. high, with usually straight prickles and sometimes bristly; lfts. 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. Var. hispida, Fernald, has the receptacle glandular-hispid.

35. Cinnamomea, Linn. Cinnamon Rose. Figs. 2159, 2160. Stems slender, 6 ft. high, with hooked prickles, flowering branches sometimes unarmed; lfts. 5-7, sometimes 3 on lvs. of flowering branches, oblong, simply serrate, dull green, densely pubescent beneath, ½-1 ½ in. long; fls. solitary or few, about 2 in. across, on short, naked pedicels; fr. depressed-globular, scarlet. May, June. Europe, N. and W. Asia. A.G. 13:343.—Var. fondulisa, Voss (B. fondulis, Muench). With double fls. Sometimes escaped from cultivation in the East.

36. Pendulina, Linn. (R. alpina, Linn.). Fig. 2148b. Stems slender, 3 ft. high; lfts. 7-9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ½-1 ½ 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. Pyrenaeica, W. D. Koch (R. Pyrenaeica, Gouan.). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gm. 27:496.

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

38. Virginiana, Mill. (R. blanda, Ait. R. traxiinofolia, Borkh.). Stems slender, 5 ft. high, with few slender prickles or unarmed; lfts. 5-7, elliptic to obovate-oblong, usually acute, simply serrate, glabrous or pubescent beneath, ½-2 ½ 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. Arkansana, Porter (R. blanda, var. selecta, Crép., and var. Arkansana, Best). Stems low, sometimes 6 ft. high; lfts. 7-9, broadly elliptic to obovate, usually cutate at the base, simply serrate, more or less pubescent beneath, ½-2 in. long; stipules usually entire; fls. corymbose, rarely solitary, pink, sometimes white, 1½-2 in. across; outer sepals with one or few lobes. June, July. Minn. and Brit. Col. to New Mexico. B.B. 2:230. Mn 3:116.—Adapted for covering dry slopes and barren places. According to E. L. Greene, the true R. Arkansana is restricted to Colorado and perhaps New Mexico, while the form common in the various parts and west of these localities is a different species, for which he proposes the name R. pratina; this form is described above. The true R. Arkansana, Porter, differs by its glabrous foliage, glandular and bristly stipules and reflexed sepals. At the same place (Pytonia, 4:10-14) Greene describes four other new species belonging to this section.

40. Acicularis, Lindl. Stems low, densely prickly; lfts. 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, Jap.—A very variable species.


41. Rugosa, Thunb. Figs. 2148e, 2162-4. Upright shrub, attaining 6 ft., with stout stems densely beset with prickles and bristles; lfts. 5-9, oval to obovate-oval, rugose, shining and dark green above, glaucense and
Rosa acicularis, var. Sayi.
Natural size, No. 40.

2161.

pubescent beneath, thick and firm, 4–2 in. long; pet- tiles tomentose and bristly; stipules dilated; fls. soli- tary or few, purple or white. 2½–3½ in. across; bracts large; pedicels prickly; receptacle smooth; fr. de- pressed-globose, brick red, to 1 in. across. May–Sept. N. China, Corea, Jap.—Very variable species. Vars. ferox, C. A. Mey. (var. Thunbergian, C. A. Mey. R. florae, Linn. R. Regeliana, Andr. & Loud. R. Andreeva, Lange). Stout and densely armed: lvs. thick, very rugose and shining; fls. large, 3½ in. across; fr. 1 in. across. S. Z. 1:28. B. R. 5:420. Gi. 39:1049. 42. p. 537. G. & C. II. 14:575. Gi. 46. p. 324. 52:1114. 55. p. 434. I. H. 18:47. G. & C. 13:342. 341: 18:567. Var. Kamschatica, Regel (R. Kamschatica, Vent.). Less densely armed: lvs. thinner, less rugose; fls. and fr. smaller. B. R. 5:419. B. M. 3169. Besides these the following forms are often cultivated: Var. alba, with large white fls. Gi. 9:20; var. alba plena, with double white fls.; var. rosa, with pink fls.; var. rubra, with purple fls.; var. rubra plena, with double purple fls. Gi. 21:416. R. rugosa is one of the most ornamental Single Roses, especially for shrubberies; it is very hand- some 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-fl. 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 Brunet (Fig. 2161), with double white fls., a cross of R. rugosa and the Tea Rose Sambrew. Another cross with a form of R. Chinensis is R. rugosa, var. tenebrosa, Brunet, with single rose-colored fls. and handsome fr. produced very abundantly. Gi. 46. p. 348; 52. p. 384. R. H. 1865, p. 446, 447. I. H. 42. p. 15. Hybrids are also known with R. multiflora, R. cineraria, R. microphylla, R. spinosissima, R. Wichuraiana and R. humilis, and there are probably others.

SECTION IX. Pimpinellifolia. Few Old World species.
Upright shrubs, usually low; prickles straight, scattered, usually numerous and mixed with bristles; fls. very small, usually 6; stipules narrow, with divergent and dilated auricles; fls. solitary, without bracts; sepals entire, erect and persistent.

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


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

Section X. Lutea. Two Asiatic species. Upright or somewhat spreading shrubs, with scattered, straight or hooked prickles: stipules usually narrow, with divergent and dilated auricules: lvs. yellow, without bracts: sepals entire, persistent, upright.

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

2163. Fruits of Rosa rugosa (× 1/4).

No. 41.


Var. Harisoni, Hort., Harrison's Yellow Rose, is of paler color and 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 spumaiima.

Section XI. Sericea. One Asiatic species. Erect shrub, with the prickles in pairs: stipules narrow, with erect dilated auricules: lvs. solitary, without bracts: sepals entire, persistent and upright.

45. sericea, Lindl. (R. tetrapáta, Royle). Attaining 12 ft., with prickly and often bristly branches: lfts. 5-9, oval or ovate, serrate, glandular or silky pubescent beneath, 2-2 1/2 in. long: lfs. white, 1 1/2-2 in. across; petals usually 4, sometimes 5: fr. globose or turbinate. May, June. Himal. B. M. 5260. R. H. 1897, p. 444, 445.

Section XII. Minutifolia. Two American species. Low shrubs with slender, scattered prickles: lfts. small, incurved: sepals serrate: stipules with dilated and divergent auricules: lvs. solitary, without bracts: sepals erect, persistent, the outer ones purple.

46. minutiflóra, Engelma. Dense spreading shrub, 4 ft. high: lfts. 5-7, ovate to oblong, finely dentate, puberulous, 1 1/2-2 in. long: lfs. short-pedicelled, pink or white, about 1 in. across: fr. hispid. April, May. Calif. G. F. 1:192.
47. stellata, Wats. Similar to the preceding: lfts. 3-5, broadly ovate-oblong; lfts. 1 1/2-2 1/4 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 lfts. Both are probably tender and probably not yet in cult.

SECTION XIII. BRACTEA. Two Asiatic species. Shrubs with erect or sericeous and tomentose or pubescent stems; prickles in pairs; stipules slightly adnate and persistent; inflorescence with large bracts, sepals reflexed after flowering, entire; receptacle somewhat pubescent.

48. bracteata, Wendl. (R. Macractea, Dum.). Macartney Rose. Stems usually procumbent or sericeous, villous tomentose, with stout hooked prickles; lfts. 5-9, oval to oblanceolate, crenate-serrate, bright green above and somewhat shining, almost glabrous beneath, 1/2-2 in. long; lfts. one or few, short-stalked, white 2 1/2-3 in. across, sepals and receptacle densely pubescent. June-Oct. S. China, Formosa; naturalized in Fla. and La. B.M. 1377.—Handsome half-evergreen climber, not hardy north.

SECTION XIV. LEAVIGATA. One Asiatic species. Climbing shrub, with scented hoary prickles; lfts. generally 3; stipules absent here; lfts. solitary, without bracts, large, white; sepals erect, entire, persistent.


SECTION XV. MICROPHYLLA. One Asiatic species. Upright spreading shrub, with the straight prickles in pairs; lfts. 11-15; stipules very narrow, with subulate divergent auricles; lfts. usually several, with small and quickly caducous bracts; sepals broad, erect and persistent, the outer ones pinnate; carpels only at the bottom of the receptacle.

50. microphylla, Roxb. Much-branched spreading shrub 6 ft. high, with straight or ascending prickles; lfts. 11-15, elliptic to obovate-elliptic, acute, sharply serrate, glabrous or pubescent beneath; lfts. pale pink, often solitary, 2-2 1/2 in. across, short-pedicelled; sepals and receptacle prickly; fr. depressed-globose, 1 1/2-2 in. across, very prickly. June, July; China, Japan. B.M. 6346.—Var. plena, Hort. With double lfts. B.M. 3490. B.R. 11:910. Not quite hardy north. Sometimes hybrids with R. Chiense and with R. rugosa are cult, under the name of R. microphylla. The hybrid with R. rugosa has large single-purple lfts., handsome bright green foliage and very prickly branches; it is of vigorous growth and will probably make a good hedge plant.
SUPPLEMENTARY LIST.
(The Roman figure indicates the group to which the species belongs.)


Dense shrub, to 3 ft.; prickles in pairs: its. very small and blunt-tipped. Clematis, white, ciliate and apex of leaf falling off, leaving the small, glabrous fr. with an opening at the top. X. Persia to Azarbaijan and Sistan.


ROSCELA. See Sinningia.

BOSCHERIA (name unexplained). Palmarum. A genus of one species—R. pectinata, Lindl. Allied to Scevola. A genus of one species from the Philippine Islands allied to Rhysophor, which see for differences. It is slender, erect, spiny at the nodes: its. terminal, long-petioled, at first 2-in., later unequally pinnate; segments numerous, linear-lanceolate, 2-fld at the apex, the numerous nerves scarcely concealed: pedicel spineless, somewhat 3-fld, concave above; sepal long, prickly; spadix 2-6 ft. long; pedicle long, slender, compressed; branches slender, rather simple, divaricate: spathes many, entire, narrowed, compressed, naked, the 2 lower ones persistent, the upper deciduous: fls. pale: fr. fusiform, small, black.

melanochlates, Wendl. (Verschaffeltia melanochlora, Wendl.). Trunk 15-25 ft. high, 2-5 in. in diam., with many aerial roots, and when young with a ring of spines below each leaf-scar; its. long, smooth, with a pale band running from the top of the sheath down the back of the petiole; sheath 13-21 in. long, with a few fine black spines: leaf-blade pale green, 7-15 in. long, petiolate; leaf-blades pinnate: segments 1-15, 2-ft. long, 2-ft. at the apex, clothed beneath with peltate scales. Seychelles, 1. H. 13:34.

JARED G. SMITH.

ROSCELA (Wm. Roscoe, founder of the Liverpool Botanic Garden). Scevola. A genus of 6 species of half-hardy perennial herbs from the Hindustan, with
**ROSCOA**

purplish, blue or yellow fls. terminating the leafy stems. Lvs. lanceolate or oblong: fls. in terminal, usually few-flowered, spikes; bracts persistent, l-fld.; calyx long-tubular, slit down one side; corolla-tube slender, as long as calyx or longer; lateral segments spreading; lateral staminodes oblanceolate, petaloid; lip large, cuneate, deflexed, 2-cleft or emarginate.

**purpurea**, Sm. Stem %-1 ft. high, with 5-6 sessile, lanceolate, sheathing lvs. about 0 in. highest flowering: tls. ft-w, purple, rarely lilac or white, in a large lilac in one at a time in midsummer. L. B. C. 1:1404. G. C. III. 8:221. p. w. Barclay. Var. Sikkimensis, Van Tubergen, is said to have the epiphytic habit and more numerous fls. of a different shade. Consult G. C. III. 8:221. F. W. BARCLAY.

**ROSE**

Characters are reproduced in the Perpetuals, and blended together, give rise to endless confusion; thus the following scheme is merely suggestive and should be studied in comparison with the botanical classification (see page 1548).

**American Rose culture**, so far as garden varieties are concerned, can hardly be said to have found it yet. Our growers are to-day striving to overcome the short-lived character of the blooms, so as to impart to our gardens something of the Rose beauty of Europe. The Wohraniana, Raouia, 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.

1. **L.暑假花（重瓣）**
   - Rosier (double),

   2. **R. 柔和的**
   - G. lanceolated / Double;

   3. **R. 混合的**
   - A. grandiflorus;

   4. **R. 混合的**
   - H. floribunda;

   5. **R. 混合的**
   - L. × hybridum;

### Class II. Summer-and autumn-flowering Roses, blooming more or less continuously.

1. **R. 多花的**
   - B. multiflora;

2. **R. 甜美的**
   - E. Sweet;

3. **R. 甜美的**
   - H. Eglantina;

4. **R. 甜美的**
   - M. cultivated.

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 can but use himsælf so much. Nearly all of these char-
Plate XXXV. A Tea Rose. - Bridesmaid
AA. Smaller flowered.
B. Foliage deciduous.
C. Habit climbing .... 15. Musk Noisette
   16. Ayrshire
   17. Polyantha Wichuraiana Hybrids
CC. Habit dwarf, bushy. 18. Perpetual Briers
   Rugosa
   Lucida
   Microphylla
   Herberstifolia
   Scotch

BB. Foliage more or less persistent ............. 19. Evergreen
   Macartney
   Wichuraiana

Garden-group 1. Provence. Fragrant: branching or pendulous: fls. generally globular: foliage bold, broad, wrinkled, deeply serrate: prickles uncertain; sometimes fine and straight, sometimes coarse and hooked. Rich soil. Prune closely unless very vigorous. Types are Musc 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.


French Roses: Fragrant (moderately): more upright and compact in growth than the Provence: prickles smaller and fewer; fls. generally flat. Very hardly, growing in any soil; petals bleached in strong sunlight; makes abundance of wood, which should be thinned out; perfume develops in the dried petals.

Hybrid French or Hybrid Provence, a less robust group with smoother, short-jointed wood and generally light-colored flowers. Type Princess Clementine. Other subdivisions include hybrids with nearly all of the Perpetual group. Madame Plantier is a Hybrid Noisette. Coupe d’Hebe is a Hybrid Bourbon.

Hybrid China (China x French and Provence, partaking more of those parents). Growth more diffuse than the French Rose; foliage smooth, shining and remains on the bush late in the year; thorns numerous and strong. Vigorous of growth; very hardy, and generally well adapted to poor soil; requires but little pruning.

Garden-group 3. Alba, or White Roses. A very distinct group; all light-colored flowers of moderate

Garden-group 4. Ayrshire. Climbing Roses; very hardy: slender shoots suitable for trellises and trunk-of-trees: fls. produced singly. Useful for pot cultivation when trained over a frame; fls. vary from white to deep crimson. Type: Queen of the Belgians, Dundee Rambler. Ruca 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 require 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 underground suckers: fragrant. One hybrid of this group, Stanwell, is a Perpetual.

Sweetbriers. 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 largeflowered varieties, especially Bourbon and Danask. 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 improved Sweetbriers. Brenda is particularly desirable for its fruit.

Prairie Rose (R. setigera). A native species; promises under cultivation to develop some valuable ac-
known in cultivation under the general term of Rambler Roses.

The Polyantha group has given a fairly hardy variety in Crimson Rambler. Useful as pillar and trolley roses and coarse culture. In pruning remove only the old canes, leaving the young new growth to carry flowers next year. Some cluster roses of the Indian or Tea alliance popularly called Polyanthae do not belong here.

Garden group 6. Multiflora. The Multiflora group divides itself naturally into the Multiflora true and Polyantha. R. multiflora, the parent type, is characterized of the varieties here, the flowers being produced in large corymbs and continuing over a comparatively long time. This group is particularly well adapted to the wild garden. There are many hybrids, which are

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quire the nature of large groups, and some are very hardy and well adapted to the wild garden. There are many hybrids, which are

2170. La France, a famous Hybrid Tea Rose (×1\frac{1}{2}).

This picture was made from the White La France. The original La France is pink.

The Polyantha section has given a fairly hardy variety in Crimson Rambler. Useful as pillar and trolley roses and coarse culture. In pruning remove only the old canes, leaving the young new growth to carry flowers next year. Some cluster roses of the Indian or Tea alliance popularly called Polyanthae do not belong here.

Garden group 7. Evergreen. The so-called Evergreen roses hold their foliage until very late in the year and in hybridization appear likely to yield varieties which are practically evergreen.

Sempervirens, useful as pillar roses, producing flowers in corymbs: very hardy; vigorous growth; free bloomer; requires considerable pruning. Types, Pfeifea perpetual.

 Wichurana (Fig. 2155), most popular of all the rambling 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-
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, climbing Roses, and is particularly important in American Rose culture as the base of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichuriana and Teas. M. H. Walsh in Massachusetts, M. Horvath in Ohio, and Jackson Dawson in Massachusetts have accomplished important work in this field. Some of Walsh's recent introductions, as Débutante and Sweetheart, not as yet fairly tried, and the Dawson Rose may be classed here. They are valuable as trellis and pillar Roses for garden decoration.

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

Rugosa or Japanese Rose, a low-growing bush: hardy: useful as a hedge plant, and specially adapted for exposed situations near the seashore. Figs. 216-2. Hybrids have been made with other Perpetual groups, especially Teas and H. P.'s. Mme. Georges Brunot is a type. The Rugosa blood is strongly seen in all cases. Lucida, a small insignificant group, having some connection with the Maclay. 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 frosty throughout the season. Is derived from R. bracteata. Wichuriana. The Wichuriana hybrids already referred to in the Polyantha group may doubtless 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, and Bourbons, Congalas and Teas, and vice versa. Of all Roses, Hybrid Perpetuals, in regions of severe winters, offer the amateur the greatest promise of success.

A warm sunny spot shielded from strong or bleak winds should be chosen for the Rose garden. A piece of woods or a hedge offer good protection if they are far enough away from the bushes so that they do not shade them or rob them of nourishment. Dean Hole says, "The Rose garden must not be in an exposed situation. It must have shelter, but it must not have shade. No boughs may darken, no drip may saturate, no roots may rob the Roses. A hillock is less. A hillock is better than a low flat, to late frosts than valley and is therefore better. The ground must be well drained. If nature has not provided such a spot the Rose-grower must make one.

The ideal soil for the Hybrid Perpetual Rose is a strong rich clay or loam. Though Tea Roses sometimes do well in gravel or sandy soil, Hybrid Perpetuals never do. The ground should be spaded up to a good depth and all stones, grass and roots carefully removed. Late autumn is the best time for setting out hardly Roses. The writer has set out over a hundred Hybrid Perpetuals and Hybrid Teas when he was compelled to show away several months of snow and break up the frozen crust 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, hardly 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 a Rose be set out so quickly and 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 such 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 hellebore sprinkled on the foliage when wet after a rain or dew dispenses of the most dangerous foes of the Hybrid Perpetual. The dew and flour make a paste that holds the hellebore 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 Bonstetten, Baroness Rothschild, Clio, Earl of Dufferin, 2171. Yellow Tea Rose, Madame Honore Defresne, popular in the South (x 1/2).


The Moss Rose (Rosa Gallica, var. muscosa): A universal favorite. The best varieties are Créstel, Gallicis and Common Moss. Fig. 2177. Seven leaves are found on most of them. They must be closely pruned.

The Perpetual Moss Rose (Rosa Gallica, var. muscosa): These are like the Moss Roses except that they are autumnal bearers. Mme. Edward Ory, Salet and Coupert-et-Notting are the best of this class. The best results can be secured only by close pruning.

Sweetbrier (Rosa rubiginosa): Esculente 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 prized wherever known. It owes its popularity not to its flower but to the perfume of its foliage. The attempts made to develop the flower and still retain the fragrance of its foliage have not yet been successful. No better Rose can be found for hedge-making.

Austrian Brier (Rosa Eglanteria): This Rose has 7 or 9
leadets and single flowers of a coppery yellow color. It is so hardy that it can brave the most rigorous climate where man tills the soil. Persian Yellow, Hariaonii 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 Chesun.

Hybrid China Rose: Many Roses, classified as Hybrid Perpetuals properly belong here. It Ellwanger's suggestion that all French, Provence, Damask and Hybrid Bourbon be grouped under the Hybrid China is adopted. Rose cultivation 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 Bourboniana, var. hybridia) has made several contributions to the rosarian. The best hardy but the most beautiful members of this group are Madame Nuanan, Mille. Bonnaire and Eliza Beele. Rambler in beauty and more Hardy are Coquette des Alpes, Coquette des Blanches. The pruning knife should not be spared with this class.

Hybrid Noisette (Rosa Noisettiana, var. hybridia) has made several contributions to the rosarian. The best hardy but the most beautiful members of this group are Madame Nuanan, Mille. Bonnaire and Eliza Beele. Rambler in beauty and more Hardy are Coquette des Alpes, Coquette des Blanches. The pruning knife should not be spared with this class.

Hybrid Tea Rose (Rosa China) 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, Kaisrin Augusta 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 train them high on brier stocks and to grow them as standards. Most Americans prefer the free-growing bush, blooming from the ground, but a double row can be planted at intervals of 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 tramping 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 a bed on a lawn, the soil 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, mixed 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 to be replaced and mixed with a generous dressing of well-decomposed manure; lastly, the surface soil and soil well broken up and a thoroughly enriched with manure, and the bed filled to the level of the adjoining surface with enough good soil added to replace the discarded earth. When the bed has settled the surface should be at least one inch below that of the adjoining soil. In order that all the rain fall be retained the writer believes it is a serious mistake to make any flower bed higher than the adjoining 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 sufficient amount is always present in what is known as a heavy loam. If
the soil does not contain this naturally, it should be added and thoroughly incorporated with the other ingredients. Teas, Bourbons or Noisettes, the soil should be lighter, and if naturally heavy should have added to it a proper amount of sand or leaf mold, and be thoroughly mixed as before. Roses are rank feeders; therefore be liberal with manure for every class.

Garden Roses can be obtained from the dealers grown in two ways: on their own roots, and budded on the Manetti rose stock. 2173. 2174. 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 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 Vicomtesse. Folkestone, 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 these plants to endure the rigors of our winters before becoming established. If the bed is imposed upon at all, it is necessary that the roots be handled as gently as possible and that the soil be packed around firmly. From the writer's point of view the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded Roses who cannot distinguish the brier should it appear, or who is too careless or indifferent to dig down at once and cut the wild shoot clean off at the root, rubbing it enough 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 several leaves, 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; consequently there is little difficulty in detecting and removing them.

Planting Budded Roses. — Should Roses grown on their own roots be preferred, they should be planted as soon as the spring weather has fairly settled and all danger of frost is over, that the plants may be firmly established before the heat of summer. Roses planted late in the season may do well, as they cannot attain sufficient vigor to withstand the burning heat of our summer sun. The holes need not 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 at such time. 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 cold frame 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 2 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 sash should be any desired length or any multiple of 3 ft. A sectional one foot from the edge and 2 ft. apart, and the bed of grown plants will always require staking if the varieties are of upright growth. Always close before sunset and open as soon as the sun shines each morning. Opening the sash to keep the plants cool and prevent growth is just as essential as covering to protect from cold if abundance of flowers is desired. A few days' neglect in opening the sash when the temperature is above 30° will destroy most of the buds for the coming June, as they will be forced out, and one cold night will kill them. Protect from rains 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 ofTea roses that have been grown successfully in such a bed for many years. They give hundreds of fine blooms from May until November and remain so vigorous that many of the 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 9 ft. high. They also look well trained on the house. Reine Marie Henriette, the finest climbing Tea for this latitude, is a charming addition to our collection. All of the 16 varieties given in the accompanying list are desirable. The foliage is abundant, healthy, vigorous and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. The plant may make good and vigorous wood for the next season of bloom. But if quality be desired, all weak shoots 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 there will be at least as many canes to be utilized. The writer has a bed over 20 years, the oldest shoots 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 with others that occupy no more room and give much more gratifying results.

Hybrid Sweetbriers.—The recent introduction of the Marquis of Penzance Hybrid Sweetbriers is a valuable addition to our collection. All of the 16 varieties given in the accompanying list are desirable. The foliage is abundant, healthy, vigorous and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. 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, the oldest shoots 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 with others that occupy no more room and give much more gratifying results.

Tea Roses 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. 2177 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 hardy 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 with others that occupy no more room and give much more gratifying results.

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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 protect the fruiting buds from being attracted by the wind

which 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 eyes will surely be forced 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

buds being destroyed. The upper buds always
devise earliest. Some varieties will not produce large

footstalks under any method of treatment, notably

Prince Camille de Rohan, La Rosarie and Roseristat-

dayroom; but almost all the other kinds do better under

this method than any other, if quality is desired.

Pruning Deciduous Ten Roses.—Ten Roses will

not endure such vigorous cutting back as the Hybrid

Remontants. All good strong shoots should be retained

unless they form a very close head, when it is better to

remove a few from the center. The canes should be

shortened about one-third of their length, the branches

each back to 1 or 2 leaves and after each pruned, the

longest shoots should be trimmed back sparingly.

Bourbons need even less trimming. Souvenir de Mal-

maison. Mrs. Paul and others of this class should have

only the stoutest shoots cut. Each shoot should have

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 a 4-

tined digging-fork, which is less likely to cause injury to

roots than a spade. The beds should then be neatly edged

and the surface raked off smooth and even. Fre-

quent 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 ap-
plied 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

the hole with the liquid manure, being careful to avoid

smearing the leaves; afterwards the bed can be raked

over level and the rain will wash the dainty food to the

eager roots, and thrift and glory will result. This feed-

ing 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 littlr-,

left than is needed to keep the plants

vigorously, and

healthy. There is another advantage in the system

of close pruning: all growths are so short and vigor-

ous 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 must be moved into new ground is also

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 nutri-

tion in the fruiting wood to support a rapid and

development of wood and flowers for many years, es-

pecially if a generous top-dressing of manure be applied

each autumn and liquid manure supplied liberally dur-

ing the summer months with the liquid feedings 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.

Juset Enemies.—The most formidable is the Rose

beetle, which reveals 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

cought when discovered, as he may readily be upon

examination of each bud and flower.

The aphids 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 aphids

increase with enormous rapidity, and unless destroyed

rode the plant of its vitality by sucking out the sap.

A dejection 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

uncovered, syringe the plants every day with the deco-

tion until the enemy is defeated. In extreme cases, in

which the aphids have become firmly established, the

remedy proposed by Mr. H. 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 white-oil soap. To this may be

added another gallon or two of water. The plants

should be syringed with this and all badly infested

shoots dipped into it. Pure water should follow the

day to cleanse the shoots.” If, at the first appearance

of these pests, the finger and thumb are used to

rub them off and destroy them, much subsequent trouble

will be saved.

Slugs are usually found on the under side of the

leaves and may be discovered by the skeletonized

appearance of the leaf. To destroy them, make a

decoection of powdered white hellebore, with one heap-

ing tablespoonful to a pail (about four gallons) of boil-

ing water. After cooling, apply with a syringe or,

better, with a whisk broom. Push the top of the plant

away with the left hand and, with the broom dipped

in the solution, throw the drug up and against the leaves.

One thorough application will usually suffice, but if the

slug has appeared in previous years, anticipate his com-

One of the Hybrid Climbing Roses. See p. 134.
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 louse, or white scale, survives the winters and is usually found on old wood. It can best be treated before the growth begins in the spring. A solution of fifteen grains of corrosive sublimate to one pint of water, brushed over the stalks wherever the lice harbor, will speedily destroy ill. 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 Columbus, Alfred K. Williams, Annie Wood, Baroness Rothschild, Captain Hayward, Caroline d’Arden, Charles Laflèvre, Chloé, Countess of Oxford, Diphosure, Dr. Andry, Duke of Edinburgh, Duke of Teck, Élisée Levée, Eugénie Verdier, Fisher Holmes, François Michelon, General Jaccquemont, Giant of Battles, Heinrich Schultheis, Her Majesty, James Brownlow, Jeanne Dickson, John Hopper, James D. Paul, Lady Helen Stewart, Mahel Morrison, Madame Gabriel Luizet, Magna Charta, Marchioness of Lorne, Margaret Dickson, Marie Brunann, Marie Verdier, Merville de Lyon, Mrs. John Lang, Mrs. R. G. Sharnan Crawford, Paul Neyron (Fig. 2169), Pride of Waltham, Prince Arthur, Prince Camille de Rohan, Rosslyn, Rev. J. B. M. Camus, Suzanne Marie Redcclanchi, Ulrich Brunner, Xavier Ollo, "Hybrid Tea." - Augustine Guinon, Captain Christy, Caroline Testout, Giselle Lyonnoise, Kaisenr Augusta Victoria, Madame Joseph Combet, Miss Ethel Richardsen, Souvenir du President Carnot, Souvenir de Madame Eugénie Verdier, Viscountess Folkestone.

Mr. Alexander B. Scott recommends the following additional H. T. varieties: Antoine lavoire, Baldwin, Bossie Brown, Grass on Trebitz, Killarney, Lady Camorin, Madame Jules Gérole.

Tea-scented Roses - Alphonse Carré, Comtesse Riza du Parc, Duchesse de Brabant, Etoile de Lyon, Francesca Bruge, Inouësente Pirroa, Isabelle Sprunt, Madame Lambird, Madame Moreau, Mannan Cochet, Madame Joseph Schwartz, Marie van Houtte, Papa Contier, Sarafano, Souvenir d’un Ami, The Queen, White Manon Cochet.

Moss Roses - Comtesse de Murinais, Blanche Moreau, Crimson Globe, Lancii, Princess Adelaide.

Climbing Roses - Crimson Rambler, Cheshunt Hybrid, Giselle de Dijon, Céline Forestier, Reine Marie Henriette, Pink Microphylla, White Microphylla, Madame Alfred Carrier.


The Hybrid Wichurannas 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,

2180. The old-fashioned yellow upright Rose (× J).
Plate XXXVI. Rose, American Beauty.
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 then 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 roof also, the sides of the "box" are allowed to remain a short time in order to shield from the winds.

The winter of 1898-9 was unusually severe and did more damage to the Roses and other material than any other winter which the writer has experienced at Highland Park. Following is a list of the so-called 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.; Mme. Grange, Euphrosyne, Russell’s Favorite, H. R.; Louis Van Houtte, H. R.; Paul Neyron, H. R. (Fig. 2169); John Hopper, H. R.

The following dozen were in fair condition after the winter and recovered their form during the season: Mme. Victor Verdier, H. R.; Pierre Notting, H. R.; Anne de Diesbach, H. R.; Ulrich Brunner, H. R.; Baronne Prevost, H. R.; Eugene Furst, H. R.; Prince of Wales, H. R.; Alfred Colombe, H. R.; Lyonnaise, H. R.; Mme. Gabriel Louzet, 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, Multiform and the Dawson Rose were in fairly good condition when wintered under protection. The failures even when protected were Aglaia, Alister Stella Gray, Euphsyne, Russell’s Cottage, Baltimore Belle, Tennessee Belle. The typical Sweetbriers proved hardly unprotected, but the hybrids of them were killed. Protected R. Wichuraiana and its hybrids killed back to the roots; R. 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.

Chablis Supreme and Hermione are the best bedders for permanent planting when protected, and the so-called Fairy Roses stand fairly well, especially Mlle. Cecile Brunner. Papa Martinet and Kaiserin Augusta Victoria are among the best of the more tender class that require the protection of a pit in winter. They seem to stand the biennial root disturbance well. La France browns in the bud under our sun, and, strange to relate, the writer cannot grow it anywhere. Mrs. John Laing successfully, either on its own roots or budded, R. rubriflora (or terraejana), R. spirostigma, var. Alchiler, R. nitida, 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 f. pl., are grown successfully. Figs. 2181 and 2182 show forms of Rosa rugosa; also Figs. 2182-84.

Of the newer hybrids of R. rugosa now quite widely tested, the most desirable are: I. A. C. (Fig. 2183). Ames, Madame Georges Bruant (Fig. 2184), Madame Charles Frederick Worth, and Thunfeld. Kaiserin (Fig. 2185) is also to be commended. It is suggestive that these have come from crossed seeds of what is known in Europe as Rosa rugosa, var. Regeliana (p. 1556), and which we know as the Russian R. rugosa. The first two named came from seeds of Rosa Regeliana introduced by the writer in 1883 crossed with pollen of General Jacqueminot, and the last three were developed from seeds of R. Regeliana grown in Germany as stated by L. Späth, of Bixdorf near Berlin. They are all fine double Roses of the class shown in Fig. 2183, of the two produced at Ames, and all have returned to a large extent the foliage and habit of blooming of R. rugosa. The Russian R. rugosa as introduced from Russia by the writer is divided into two very distinct classes. The one from the Amur valley in

2182. Russian form of Rosa rugosa (x 3/4).

2183. The I. A. C. Rose (x 3/4).

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 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 also differ, as it has flowers on the heads together with the Japanese, but it has only two to three. In addition, we now know by trial that both these Russian types may be grown successfully two degrees farther north than the Japanese type.

The work of crossing the Russian *R. rugosa* began at the Iowa Agricultural College in June, 1892. The pollen of over a dozen of the best garden varieties was used, but the majority of these seem to be quite unsuited to this native species *Rosa blanda* and *Mona Arkansana* with *B. rugosa*. It was succeeded successfully two degrees farther north than the Japanese type.

At the same time we pollinated the blossoms of our native species *Rosa blanda* and *Rosa Arkansana* with *B. rugosa* and *H. Hilli*, and found that bushes of both new varieties were hardy and equal to the common inquiry at a nursery as to "What are the best dozen Roses?" A half score or more is usually met by this equally pertinent query: "In what part of the city do you live?"

Many Roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a 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 Cecil Brunner, and the climbers Cherokee, Bankia, Ophir (or gold of Ophir), Bourbon, and Double Yellow. All these produce most wonderful crops, but none more so than the last-mentioned, which in favored respects possesses the wealth of flowers simply dazzling to behold. Many Rose lovers hold the theory that writers assert that gold of Ophir and Beauty of Clazenwood are one and the same Rose, but this is by no means the case. Gold of Ophir has a distinct historical proof to any who choose to doubt this statement. 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 homes of Los Angeles and vicinity.

All the Roses named thus far are worthy of a place in any garden. One of the chief causes of failure by the average amateur is the lack of an intelligent knowledge of the plant's first requirements and the absolute rest. These necessary resting periods are best secured by the withholding of the water supply. Most amateurs, and a majority of self-styled "gardeners," persist, against all rules of common sense, in planting Roses either in the lawn or in mixed borders with other plants. In either case, all but the Roses require a constant watering. Having planted in this fashion, the grower has east away all chances of first-class results. Rose beds should never be made a feature in landscape gardening, as the plants when dormant and judiciously pruned are unsightly objects at best. The most obscure species obtainable with the possible exception of the hardy *R. rugosa* requiring partial shade. Niphetos and Maltese are most unsuitable with the proper exposure is the place best suited. Many localities cannot grow the most obscure species of Roses requiring partial shade if good results are desired. Many localities cannot grow the two last mentioned, or such as Perle des Jardins, Meteor, Catherine Mermet, Francisca Kruger, Reine Marie Heuriette, and many others, on account of mildew. Even among varieties whose buds are immune, it is often impossible to get good results. Watering is more largely to blame for these unfavorable conditions than any other agency. Laurette is a Rose which often produces the only perfect flowers to be

In Los Angeles, few, if any, do as well here as in Pasadena, which, although only nine miles distant, has the advantage of being several hundred feet higher than Los Angeles, and therefore more likely to maintain a lower temperature. In some places a certain few Roses will produce an astonishingly fine crop of bloom, when but a mile or two distant, with no change of soil and very slight difference in altitude, they will be entirely worthless; while a like number of other varieties will give as good returns as those first mentioned. Consequently the common inquiry at a nursery as to "What are the best dozen Roses?" a half score or more is usually met by this equally pertinent query: "In what part of the city do you live?"

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found among a number of varieties, and this is particularly the case in places visited by heavy frosts. Laurette remaining unscathed, while all others are more or less blasted. The great Rose of the eastern United States, American Beauty, is almost a complete failure here and is not worth growing except in a very few, well-favored gardens, and even then it is far from being perfect.

Many Roses, too, are of little value here unless budded or grafted. Of this class Marcelle Niel is the most striking example. Instances may be found where this Rose has thrived unusually on its own roots, but such cases are marked exceptions. Some few people maintain that all Roses are best on their own roots, but such opinions are easily refuted by consulting any of our veteran rosarians. The undersigned does not advise the purchase of any such stock, no matter how much is claimed for it, or how widely advertised it may be. The best Roses he has ever seen were root-grafted, but of course this procedure is too expensive for the general nurseryman, and the bulk of our local stock is budded on Manetti or Maiden’s Blush, though the Dog Rose (Rosa canina) and even the Banksia are often used. Those Roses grown on their own roots are usually propagated from hardwood cuttings, grown out of doors, and December is usually the best month, though the writer has successfully rooted them from October to March, according to the variety.

Rust bothers us but little; likewise scale, though in many neglected gardens the bush and climbers alike may be infested with both the rose scale and the red scale of the orange. Fuller’s rose beetle is a nuisance only in small areas, but green aphis is quite a pest in winter and spring. La France for many years was the leading Rose in California and grew well, budded or on its own roots, in almost any locality, but is now rapidly becoming a thing of the past, though it can never be wholly discarded, for it is still, in a few gardens, the queen of the family. Its involuntary retirement from our Rose gardens is due entirely to a “die back” (anthracnose), which affects many other plants than the Rose, but seems to have a special liking for La France. Thus far no cure has been found.

Below will be found a list of the best dozen bush and half dozen climbing Roses for southern California, compiled from lists furnished the writer by the best six nurserymen and growers in Los Angeles. An increasing demand for Maman Cochet is quite marked, and the few White Maman Cochet yet grown here seems to mark it as the coming white Rose for this section.

The following lists place the varieties in the order of their desirability for either florist or fancier, when grown out of doors:


**Climbers.**—Lamarque, Marcelle Niel, Climbing Souvenir de Wooton, Reine d’Or, Reine Marie Henriette, Gloire de Dijon. This list will be found to be the best for Los Angeles and vicinity in general. The intelligent nurseryman or careful purchaser should be able to make the slight changes required by peculiar conditions.

To Mr. Frank Huston, nurseryman of Los Angeles, the writer is indebted for many valuable points contained in this article; also to Mr. Wm. S. Lyon, whose little booklet, “Gardening in California,” contains the best practical treatise on Rose-growing ever published on this coast.

*ERNST BRAUNTON.*
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 29. The other, the widely known Dawson Rose (silver medal Mass. Hort. Soc) 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. Linten 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 truss 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 line of hardy Roses, but for five years all efforts to get a single hip to mature when fertilized with others have been in vain. This is the Ardin Rose and received the silver medal of the Massachusetts Horticultural Society in 1893. In this batch of seedlings was one that was very double and in color like Magna Charta, but unfortunately some one else wanted it and one day it disappeared from the nursery. The writer has also crossed R. rugosa with Yellow Harison, but as yet has obtained no yellow Roses of the Rugosa type. On the contrary, they are the biggest lot of mongrels one ever saw, in both foliage and flower. The Rugosa foliage is completely obliterated, and the Harison retained, while the flowers are small and generally a dirty salmon color. The writer was so disgusted with the lot that he threw them all away after working more than four years on them.

Attention was next given to R. Wichuraiana. The possibilities of crossing this seem to be unlimited. No Rose that the undersigned has ever tried yields so readily to hybridizing. The first attempt was with Jacqueminot, always using R. Wichuraiana as the mother plant. The results were excellent. While some plants were nearly R. Wichuraiana they were entirely different in size and color; they had the clusters,
but the habit was half-senecent instead of prostrate. The first to bloom was single, white. It was the Luyaniana, attaining 6 feet in a season; foliage fine, somewhat resembling the Bourbons, but also retaining the gloss of R. Wichurana. Some of the seeds have been of white flowers, growing with bright shiny leaves and clusters of double purple flowers, dying to life. The best of the lot has been named W. Egan, and received the silver medal of the Massachusetts Horticultural Society in 1893. This is, without doubt, one of the finest hybrids of R. Wichurana at present. The flowers are in large clusters and very double, of a delicate flesh color, resembling R. Multiflora in Malva but smaller; the foliage is also like Malva, but brighter. It is perfectly hardy in the nursery and elsewhere without protection.

Next is R. Wichurana was fertilized with pollen from R. Schleger, and while some crosses were obtained the results were not altogether satisfactory. The best of the lot was saved for future use. The flowers are in color near R. Schleger, and the growth prostrate as in R. Wichurana, but shorter jointed. The plant is very hardy. R. Wichurana was next crossed with R. Bagoua, with more pleasant results; Lady Dun- can, silver medalist from the Massachusetts Horticultural Society in 1896, bearing the prostrate, long, rampant growth of the mother, while the Bagoua blood shows in the foliagespines and flowers, these last being a warm, live, purple, and of a delightful shape. The style is long and the stamens small. Another is somewhat deeper in color but of less vigorous growth. A curious fact concerning these extreme crosses is that not one of the Wichurana hybrids can be recognized easily. The plant is less tall, the foliage is more brilliant. The plant grows 5 to 6 feet.

Several seedlings of crosses between Crimson Rambler and Wichurana have recently flowered. The result was seeds freely. Attempts will now be made to cross those of satisfactory color with the Hybrid Perpetuals and Hybrid Teas.

Several seedlings of crosses between Crimson Rambler and Wichurana have recently flowered. The result was seeds freely. Attempts will now be made to cross those of satisfactory color with the Hybrid Perpetuals and Hybrid Teas.
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. Root Inducer, 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 same cuttings will strike readily. 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, and are made into bunches they are covered with moist earth; made into bundles they are covered with moist moss in an open frame in a greenhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface.

A specimen of Mr. Dawson's work is shown in Fig. 2188, the stock being a bit of R. multiflora root; its age is about three months. It is well adapted for garden Roses, since it does not sucker; this great advantage, too, is also obtained by using the root-graft as above described. Some of the commercial florists use Manetti stocks for the purpose of lowering the height of their plants, in which they will grow in the greenhouses. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants; just now many of the foremost growers prefer the latter for forcing. It is a question which it is not possible to settle by a series of exact experiments costing much time and money. It is also quite possible that matters of temperature, soil, moisture and food are equally important factors.

Layering.—This method is employed only when few plants are required; it is cumbersome and wasteful. Layer in spring, using wood of the last year's growth where possible; the bark of the buried portion should be abraded.

Division.—This is an easy means of increasing R. lucida, R. nitida, R. Carolina, R. spinosissima, Crimson Moss and many other varieties which sucker. Plant thickly in good soil, allow them to grow from three to four years, then lift and tear apart. It will be found that the increase is large and that plants so old are fairly certain to show a good 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.

Budded Roses vs. Roses on their own Roots.—For the average amateur Rose planter, we cannot too strongly recommend the desirability of own-root plants. Scarcely one planter in a thousand is observing enough to notice the difference between "suckers" or sprouts from the stock of a budded Rose and the variety that is budded in. Indeed, upon some varieties the growth is so similar as not to be readily noticed even by those familiar with excellent stock for garden Roses, since it does not sucker; this great advantage, too, is also obtained by using the root-graft as above described. Some of the commercial florists use Manetti stocks for the purpose of lowering the height of their plants, in which they will grow in the greenhouses. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants; just now many of the foremost growers prefer the latter for forcing. It is a question which it is not possible to settle by a series of exact experiments costing much time and money. It is also quite possible that matters of temperature, soil, moisture and food are equally important factors.

2187. Short hardwood cuttings of Rosa setigera.

A single cutting is shown at the left.

but will not give such a large percentage of rooted plants. It is highly probable that some Moss Roses, R. lucida, R. Carolina, R. spinosissima, etc., Roses which sucker, could be propagated by cuttings of root or rootstock, but no systematic attempt has been made in this direction.

Budding and Granting.—These are old and well-established methods of propagation. Budding in foreign nurseries is practiced in the open air in June and July, with us in July or August. A dormant shield bud is employed. The stock is R. Manetti, R. canina, or any good brier, or R. multiflora; in Holland R. Carolina is esteemed. In European nurseries R. canina is used for standard, R. Manetti for dwarf stocks. Under glass Roses are budded also, with a shield-bud, at any season when the bark slips, using for stock a vigorous variety. About Boston the yellow and white Bank-scion Roses once had high local repute for stock for Tea and other tender kinds.

Granting Roses in the open air in this country is not often employed, but in the South Hybrid Perpetual and other hardy Roses are said to be root-grafted in winter (very much as apples are root-grafted) in bunches, being stored in sand and planted out in early spring, the worked portion being set well below the surface. Root-grafting is an easy and convenient method of propagation under glass. Jackson Dawson's practice is to use the whip- or splice-graft, but the veneer-graft is also employed, with bits of R. multiflora root 2−3 in. long for the stock, the cion being somewhat longer but of equal diameter. They are firmly tied with raffia and waxed; made into bunches they are covered with moist moss in an open frame in a greenhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface.

A specimen of Mr. Dawson's work is shown in Fig. 2188, the stock being a bit of R. multiflora root; its age is about three months. It is well adapted for garden Roses, since it does not sucker; this great advantage, too, is also obtained by using the root-graft as above described. Some of the commercial florists use Manetti stocks for the purpose of lowering the height of their plants, in which they will grow in the greenhouses. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants; just now many of the foremost growers prefer the latter for forcing. It is a question which it is not possible to settle by a series of exact experiments costing much time and money. It is also quite possible that matters of temperature, soil, moisture and food are equally important factors.
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* (the Dog Rose) is extensively used in Europe as stocks upon which to graft Roses. They have never been largely used in this country, the Manetti seeming to be the favorite here. All of these stocks are propagated from cuttings, though in some cases they are trimmed back closely, both as to the roots and the branches, and planted the following fall. 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.

Roses are not often attacked by any fungous disease, save perhaps mildew, which occasionally makes its appearance consequent to sudden climatic changes, such as occur toward fall, when the temperature may be at 80-90° one day and 40-45° the next. An application of Bordeaux mixture is of value in checking mildew.

The greater proportion of Roses handled by the undersigned are propagated from cuttings, and consequently are 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, when 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 the following spring they will remain two seasons, usually, and by that time attain sufficient size to be dug and marketed.

**Jackson & Perkins Co.**

**Rose Forcing.** — There is no branch of floriculture in this country that in any way approaches Rose forcing in importance, when commercial and private practice are considered. The large number of private greenhouses erected for the cultivation of the Rose by wealthy people in this country 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 greenhouse forcing, especially in Rose forcing, and each year sees some improvement in the style of construction as well as in methods of cultivation. The general principles of Rose-growing are practically the same as they have been for years ago, but the details or small items, as many are pleased to term them, are constantly being improved. To make the method of successful cultivation quite plain to every one, the undersigned will endeavor to detail closely each operation, from the cutting to the full bearing plant. Types of forcing Roses are shown in Figs. 2188 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 2 ½-3 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 or fifth leaflet. Then, with a lath about 2 inches wide laid slanting across the bench and held firm by the left hand, and with a thin knife in the right hand, draw a line about ½ inches deep in the sand; in this place the cutting, pressing each down to the bottom of the opening, leaving just enough room between each cutting so that the leaves do not overlap each other. As soon as the row is full, press the sand as firmly as possible around each cutting; then give a good watering with a fine rose watering pot. Repeat the same operation on each successive row till the whole are put in. Shade from bright sun and never allow the cutting to suffer for want of water. If the weather should be at all warm, a light syringing overhead daily will greatly benefit the cuttings; never use very cold water on them, but water of about the same temperature as that of the air. Treated as above, the cuttings should be nicely rooted in about 30 days; and as soon as they have made roots about in long they should be carefully lifted from the sand with a flat stick to avoid breaking their roots and placed in 2- or 2 ½-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
2189. American Beauty, now the most popular florist's Rose in America. (x 1/2.)

The picture shows a specimen grown in the open.

Rose

or if the plants are to be put into their season quarters, i.e., planted into benches from this size, a little more manure can be added; but if they are to be grown on in pots, some growers will prefer to give them a third shift, namely into 4-inch pots. The plants, if properly cared for, should be ready for this last shift in about six to eight weeks from the time they are planted into 3-inch pots. In this last shift soil considerably richer can be used. Keep off all the buds so as to have the plants sturdy, strong and vigorous.

Presuming that this method has been followed through till the end of May or beginning of June, the plants will be ready for benching out, or, in other words, to be put into their winter quarters. The benches should hold 4 inches of soil and the bottom slats of said benches should be placed not less than ¾-¾ in. apart to allow for ample drainage. If plants have been grown in these benches previously, the benches should be thoroughly cleaned and scrubbed out so as to get all insects, eggs, etc., away. Also, all the soil or surface of the house underneath should be scraped very carefully and swept out clean, and practically all the inside of the house should be thoroughly cleaned. When this is done, take two or three lumps of stone sulfur or brimstone and burn it in the house, preferably in the afternoon while the heat is still hot. As soon as the sulfur is set on fire, shut up the house as tight as possible and leave it till the next morning. After this the benches should be thoroughly washed with hot lime over the entire inside surface. The house is then ready for the new soil to be put in. This should be composed of good fresh loamy soil, preferably of a rather heavy texture: to each part of manure add 3 or not more than 4 parts of soil, the whole thoroughly 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 ordinary varieties such as Bride, Bridal Rose, in fact nearly all the Tea varieties, an average of 14-15 inches apart from plant to plant each way is about the right distance. When planting press the soil firmly around the ball of each plant and when the whole house is filled water the plants sufficiently to soak the soil to the bottom of the bench, but do not saturate the whole of the soil. It is far better to direct the water straight to each individual plant and then syringe the whole of the bench so as to get as little other soil on the surface without making it unduly wet. Give all air possible to the plants day and night during hot weather. Syringing in very hot weather twice a day if it is necessary to keep humidity in the house and get the plants started into clean, vigorous growth. This treatment can be followed for four or five weeks until the plants begin to start their roots into the new soil; then go over the whole of the benches and press the soil as firmly as possible. Be careful not to break the plants in doing so, but it is absolutely necessary that the soil should be thoroughly settled and firm. After this, rake the whole surface over with a blunt-pointed rake so as just to make it level, water as before and as soon as the plants recover from this; in other words, as soon as they show they are starting very growths which are too little and then as the 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 average night temperature should not be allowed to exceed 56° in bright warm days, with an abundance of air on, the temperature can be allowed to run up to 75°, 80° or even 90° on some very bright warm days.

Mildew, which is one of the worst pests of greenhouse-grown Roses in the fall of the year, can be largely avoided by an abundance of air at all times. Should it
ROSE

make its appearance, sulfur on the heating pipes is the best remedy that can be applied. Red spider 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.

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. Helieborus niger.
ROSE, JAPANESE. Kerria japonica.
ROSE MALLOW. Hibiscus.
ROSEMARY or OLD MAN. See Rosmarinus. 
ROSE OF CHINA. Hibiscus Rosa-Sinensis.
ROSE OF HEAVEN. Lychnis Calv-rosa.
ROSE OF JERICHO is Anastatica Hierochuntica. See Resurrection Plants.
ROSE OF SHARON. Hibiscus Syriacus.
ROSE, ROCK. Citrus and Helianthemum.
ROSE, SUN. Helianthemum.
ROSIN PLANT. Silphium.
ROSIN WEED. Silphium laciniatum.


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. Franceschii recommends it for hedges in S. Calif., especially for dry and rocky places near the coast.

Generic characters: calyx 2-lobed; posterior lip concave, minutely 3-toothed; anterior 2-cut; corolla with posterior lip erect, emarginate, anterior lip spreading, 3-cut, the middle lobe longest, concave, 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 filament and indicated only by a slender reflexed tooth.

officinalis, Linn. ROSEMARY. Old Man. Shrub, 2-4 ft. high; lvs. numerous, linear, with revolute margins; fls. axillary, in short racemes, borne in early spring. Mediterranean region. V. 3:61.

W. M.

ROTHROCKIA (Prof. J. T. Rothrock, head of Pennsylvanis forestry dept., and author of the botanical part of Wheeler's U. S. geological surveys of the region in which the plant was discovered). Aesclepiadceae. A genus of a single species, a perennial herb, with somewhat woody stems, spreading and twining; lvs. woolly; fls. in loose racemes, in axils of the lvs.; follicles 4-5 in. long, glabrous, fusiform, often used as a vegetable where native: corolla rotate, deeply 5-cleft; crown simple, inserted at the junction of corolla and stamen-tube.
5-petalled; stigma abruptly produced from the top into a column having a 3-crested apex. Syn. Flora N. Amer., vol. 2, part 1, p. 493.

cordifolia, A. Gray. Lvs. opposite, slender-petioled, cordate, acutely acuminate; fls. white or white, in racemes; corolla-lobes 3-4 lines long. Along water-courses near the borders of Arizona. Cult. in S. Calif.

F. W. BARCLAY.

ROUGE PLANT. Riccia humilis.

ROUPALA (probably a native name in Guiana). Also spelled Rupenla, Rhopala, etc. Predeceaser. A genus of about 40 species of the tropical regions of S. America. They are mostly woody plants, with handsome even green lvs., either simple or pinnate, with 5-8 pairs of stigmas, which are 3-5 in. long, on stout pedicels 1 in. or less long, ovate or obliquely ovate, acuminate, acutely serrate: fls. ½ in. long, white or yellow, in nearly sessile axillary racemes 3-5 in. long. B.M. 6995.

F. W. BARCLAY. ROWAN. Sorbus Aucuparia.

ROYAL CROWN. Eucmenis.

ROYAL FERN. Osmunda regalis.

ROYAL PALM. Oreodoxa regia.

ROYAL PEACOCK FLOWER. Polyscias regia.

ROYENA (Adrian van Royen, professor of botany in Univ. of Leyden; died 1759). Ebenaceae. Royeana Biodro 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 ½ in. across, with 5 narrow or less reflexed lobes. Royena is a genus of about 13 species of evergreen shrubs or small trees, 2 of which are native to tropical Africa and the rest to the Cape. The genus is distinguished from the 4 or 5 other genera of the ebony family by the flowers being hermaphrodite instead of dioecious and the stamens in a single series. Other generic characters (taken from the Flora of Tropical Africa): calyx often accrescent in fruit; lobes 5, rarely 4; corolla bell- or urn-shaped, 5-cleft; lobes reflexed; stamens 10, inserted at the base of the corolla-tube; ovary conical; styles or styles 2-4; fr. globose to oblong, leathery, indehiscent.

lucida, Linn. Tender shrub: lvs. ovate, the younger ones silky; peduncles about 3 in. long as the lvs.; corolla bell-shaped. S. Africa. B.R. 32:40.

2191. To illustrate the fruit-bearing of the black Raspberry.

RUBBER PLANTS. Various plants furnish Rubber. The best gutta percha is said to be produced by Isonandra gutta (which see), a native of India. The Rubber Plant of South America, see Henna Brasiliensis, p. 741. The Rubber Tree of tropical Africa is Lualophora floridana; see B.M. 6993. The Rubber-Plant of horticulturists is Ficus elastica.

RUBIA (Latin, red; referring to the color of the dye extracted from the root). Rubiaceae. A. B. 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 numerous intermediate forms. As many as 1,500 species have been described. The genus is particularly strong in Europe, where the greatest number of specific names have been made (see Weir & Nees, "Rubus Germanicus," 1822-7; Focke, "Synopsis Ruborum Germanica," 1817; Babington, "British Rubi," 1869; W. M. Rogers, "Key to the British Rubi," 1872). Focke describes 72 species inhabiting Germany. There is also a large extension of the genus in the Himalayan region, about 50 species being recognized (J. D. Hooker admits 41 species in the "Flora of British India"). The species extend eastward into China and Japan. Hemsley, in his "Flora of China," admits 41 species. In Japan, Franchet and Savatier admit 22 species. In North America, about 40 species are now recognized, but they have not been studied critically, and it is probable that many more specific types will be recognized in the near future. No end of species could be made, but it is doubtful whether a great multiplication of 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 are valuable for their prickly fruits-which are recognized by Card in "Bush Fruits"—and by the present writer in "Sketch of the Evolution of our Native Fruits." 1889. 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 Hooker's "Flora of the British West Indies." Baker admits 3 species in the "Flora of Mauritius and the Seychelles." Hilliard describes 3 species in "Flora of the Hawaiian Islands." The southern hemisphere has few species. Beath'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 Smollett's work "Flora Capensis." 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 open or urn-shaped) and contains the dry fruits or akenes. In Rubus the torus is convex, conical or elongated, and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stems (canes) that die
after one or two years, but some of them have herbaceous tops. Most of them are more or less prickly. Many of the species are creeping, decumbent or half-climbing, simple or compound, alternate, the compounding on the pinnate order and the leaflets mostly 3 (several in some of the tropical and oriental species). The flowers are mostly white or rose-colored, usually 5-lobed, or sometimes solitary; calyx 5-parted, the lobes persistent; petals 5, usually obovate; stamens many, inserted on the calyx-rim or torus-rim; pistils many, closely packed on the torus, usually becoming drupelets but sometimes dry when ripe. The drupelets are usually more or less coherent at maturity, the collective body forming the "fruit" or "berry" of horticulturists. In the Raspberries, the coherent drupelets separate from the torus at maturity, causing the berry to be hollow or concave on the underside. In the Blackberries, the coherent drupelets also adhere to the torus, which separates at maturity and forms the "cory" of the berry.

Relatively few of the Rubi have horticultural merit, although a few of them are of great importance. As horticultural subjects they are more important in North America than elsewhere in the world. Here we grow not only Raspberries, which are popular elsewhere, but also garden varieties 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. nigroalbus 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. idaeus. 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 ornamental subjects, particularly the Rocky Mountain R. deliciosus, the old-fashioned Brier Rose (R. roseolius), Wineberry (R. phoenicea), and R. crataegifolius for its graceful cut foliage, and sometimes for its fruit, R. leucanthus is occasionally grown. Some of the unimproved native species are offered by dealers in native plants as for wild borders and rock gardens. The beauty of most shrubby Rubi depends largely on the removal of the canes after they have bloomed once. After flowering, the cane becomes weak or may die outright. It should be removed to the ground. In the meantime other canes have arisen from the root, and these will bloom the following year. That is, the stems of Rubi are usually more or less perfectly biennial: the first year they make their growth in stature; the second year they throw out side branches on which the flowers are borne; after fruiting, the entire cane becomes weak or dies (Fig. 2191). Removing these canes enables the rootstock to conserve the vigor of the plant, but it also adds to its appearance of tidiness. These remarks apply with particular force to the cultivation of Raspberries, Blackberries and Dewberries. For other accounts of Rubi, see Blackberry, Dewberry, Loganberry, Raspberry.

Section 1. Chamaemorus. Stems numerous; fr. juicy; fls. diocious, borne singly on upright leafy stalks; lvs. simple, lobed. The Cloud-berry or Bake-apple Berry, of arctic and sub-arctic regions, and much prized for its fruits, belongs here.

Section 2. Cylactis. Fls. perfect or polyzoamous, singly or several together at the ends of the shoots; lvs. ternate or pediform (5-parted), or sometimes only lobed.

Section 3. Anoplobatus (flora is Greek for bramble). Upright or rather soft-wooded shrubs, usually with a sturdy trunk: large, lobed lvs., large erect fls., and broad torus.

BB. Plant spine bearing (exceptions in some Blackberries).

Section 4. Batothamus. Upright shrubs, with simple or ternate lvs., small leaflets and drooping fls. in mostly short clusters.

Section 5. Idaebus. Raspberries, with the coherent drupelets separating from the torus.

Section 6. Eubatus. Blackberries and Dewberries, with the drupelets adhering to the torus when ripe.

INDEX.

2192. Cloudberry—
Rubus Chamaemorus.

RUBUS 1579

Natural size.

2192. Cloudberry—
Rubus Chamaemorus.

1. Chamaemorus, Linna, Cloudberry. Bake-
Apple Berry. Yellow Berry. Fig. 2192 (after
Card). Creeping: branches her-
baceous, covering the ground, pubescent or almost glabrous: lvs. round-cordate or reniform, shallowly 3- to 5-lobed. Flowers: fls. and white, on solitary terminal peduncles: fr. large, globose, red, yellowish, composed of few soft drupelets, edible. Entirely across the continent in high northern regions, and reaching as far south, in the East, as the high land of Maine and N. H.; also in Eu. and Asia. — The Cloudberry is an inhabit-
ant of peat bogs. It grows within the arctic zone. It is much prized for its fruit, which is gathered from the wild in large quantities. It is sometimes planted farther south as a rock garden plant. R. erinacea, Linn., a pink-flowered species with trifoliate lvs., occurs in nearly the same range, and produces small edible berries. This species belongs to Section 2.

Section 2. Cylactis.

2. trilobus, Rich. (R. Americanus, Britt.). Stems slender and trailing, 1-2 ft. long, herbaceous, without

Section 1. Chamaemorus. Stamens about 5: fr. scarcely juicy: fls. perfect, on creeping leafy stems: lvs. simple, not lobed. The present writer prefers to consider Dalibarda as a distinct genus, and it is so treated on p. 453 of this work.
prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhombic-ovate, coarsely serrate leaflets: fls. 1-3 on each peduncle, small and white, the calyx reflexed: fr. small, red. Cold swamp. N. J. west and north.—Offered as a rock garden plant for moist places.

3. xanthocarpus, Bar. & Franchet (R. Polyanthus, Regel). Trailling, the stems dying back every year, the stems plume and weak-spiny: lvs. pinnately 3-foliate, the leaflets ovate, acute or obtuse, strongly and unequally dentate, the terminal one twice larger than the others: fls. solitary or twin in the axils of the upper lvs., the peduncle and calyx weak-prickly, the petals white: fr. large, ovate, bright yellow, fragrant and palatable, the calyx persistent. China; discovered in 1885 in the Province of Kansu, 40° north latitude, and later found in provinces Sze-Chuen and Yunnan.—Int. into the U.S. in 1898 by the Dept. of Agric. through Professor N. E. Hansen, to be tried for its edible raspberry-like fruit. At Brookings, S. Dakota, the plants suffered from the phenomenal winter of 1908-9, but mulched plants have subsequently endured the winters well.

SECTION 3. AN-PETALATTS.

1. trilhis, Thum. Fire Raspberry. Strong-growing and erect, 7-10 ft. tall: lvs. large, palmately 3-5- or even 7-leaf, serrate; fls. sub-solitary, fr. peduncles villous: berry of medium size, scarlet, with pointed drupelets. Japan.—Sparingly introduced, and prized for its bright autumn foliage (whence the name "Fire Raspberry").

AA. Lvs. 5- or less 3-leaved.

B. Peduncles mostly 1-flowered.


AA. Peduncles successively to many-flowered.

6. odoratus, Linn. Flowering Raspberry. Mulberry (erroneously). Fig. 2194. Strong-growing plant, with the red leafy canes reaching 3-6 ft.: lvs. very large, pubescent beneath, 3-5-lobed, the lobes pointed, margins serrate: fls. 1.2 in. across, rose-purple, several to many in the cluster, the sepals with a long point, the peduncles and pedicels glandular-pubescent: berry flat-oval and broad (1 in. across), rather dry, light reddish, edible—but not valued. Nova Scotia to Mich. and Georgia (Fl. 17:1145, p. 259). B.M. 2:253. A.H. III. 31:135. Prefers rich shady woods and banks. It makes a bold subject in a foliage mass, and its fls. are nearly as large as single roses, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.


SECTION 4. BAYSTRAWBERRY.

8. microphyllus, Linn. f. (R. palmatus, Thum). 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, narrowly ovate-acuminate or sometimes nearly triangular-ovate-acuminate, rather deeply 3-5-lobed and the middle lobe long and acuminate, the margins very sharp-serrate: fls. white, nearly or quite ¼ in. across, with broadly ovate petals: fr. small (red 1), 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. crataegifolius, Bunge. Fig. 2195 (after Card). Strong, erect or diffuse much-spreading plant (3-5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-acuminate, acuminate, 3-5-lobed, and the margin coarsely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about 1½ 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 "Primo" is hybrid of this and R. vitifolius, the latter furnishing the seed.

10. Savatiiri (R. morifolius, Sieb., Franch. & Savat. Enum. PI. Jap. 1853) not Muell. 1851. Differs from R. crataegifolius by its more numerous and stronger prickles, the leaves villous beneath and deeply cordate at base, shorter petioles and shorter and thicker pedicels. Southern Japan.—Offered by dealers in Japanese plants, who speak of its pretty fruit ripening in July.

SECTION 5. INERALES, or Raspberries.

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

12. roséolus, Smith (R. floribunda and R. rufus, Hort. R. roséolus, Roxb.), STRAWBERRY-RASPBERRY. Figs. 2196, 2197. Erect and tall-growing, evergreen in warm countries, glabrous or somewhat pubescent-hirsute: lvs. odd-pinnate, the lateral leaflets 2–3 pairs, all the fls. ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-serrate, more or less silky-hairy beneath: fls. solitary or in few-fld. clusters, white, 1½–2 in. across, showy: fr. erect, bright red, long thimble-shaped, usually about 1–1½ in. high, very showy, edible but insipid. Var. sorbetilus (R. sorbetilus, Maxim.) is a very hairy and hirsute form. Var. coronarius, Sims (R. grünthienii, Hort.), is a double form, sometimes cult. as the “Brier Rose” and “Bridal Rose” (B.M. 1753). G.C. II. 11:71. — Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan. B.M. 6979. 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.


In the North it often kills to the ground, but the strong young recurring canes and white-bottomed foliage make it a handsome plant.

14. ellipticus, Smith (R. florus, Ham.). Fig. 2199. Tall and erect or nearly so (6–10 ft.), the canes stout and densely beset with straight red-brown hairs and bearing a few stout, short, nearly straight prickles: fls. 3, the terminal one much the largest, ovate to orbicular-ovate, not lobed, evenly doubly serrate, thickish, soft pubescent and strongly veined and prickly on the mid-rib beneath: fls. white, ½ in. or less across, in small, many-fld. clusters: berry the size of a common Raspberry, yellow, of good quality. Himalayas. — Grown in southern Fla., where it is said to be the only Raspberry that perfects 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: fls. ovate, white beneath, irregularly toothed and notched, usually somewhat plicate or wrinkled; flower-clusters mostly long and interrupted, most of the pedicels dividing into two or three pedicels, the pedicels, as also the flowering shoots, petioles and midribs, finely pubescent, but not glandular, and sparsely furnished with firm recurved prickles: fls. small, white; calyx pubescent; fruit oblong or conical, dark red, yellow or whitish, produced more or less continuously throughout the season. Europe and Asia. — Named for Mt. Ida, in Greece. Early introduced into this country, but now nearly driven from cultivation by the hardier native species. The Antwerpse, Fontenay, and Fastolf belong here. Rubus idaeus itself is not known to be native to N. Amer., but a most interesting form of it (var. anomala, Arn.) has been discovered recently in Vermont. See Fernald, Rhodora, 2, p. 195, with figure.
16. **strigosus**, Michx. (R. Idius, Linn., var. strigosus, Maxim.). Red Blackberries. Fig. 280B. 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, pedicels and calyx, the latter less subsessile or bisitate; flower-clusters more open or scattered; fruit bright light red, or rarely yellow or white, 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, Peck. PURPLE-CANE RASPBERRIES. Figs. 2802, 2200. A large and variable race of hybrids between *R. strigosus* and *R. occidentalis* occurs, both naturally (*Rubus neglectus*, Peck, 2201 Rep. Reg. N. Y. State Univ. 56, 1869) and in the garden (Bailey, Amer. Gard. 11, 724, 1890). These plants propagate either by "tips" or suckers, usually by the latter. The flower-clusters are open and sprawling, and the fruit ranges in color from yellow to purple. As a rule, the fruit is aggregated at the end of the cluster but is scattering below. The Purple-Cane type of Raspberry belongs here. Prominent varieties are Shafer, Philadelphia (now nearly out of cultivation), Gladstone, and probably Caroline.

**cv. Black Raspberries (yellow-tinted forms are known).**

18. occidentalis, Linn. COMMON BLACKCAP. Figs. 2201, 2202. Strong, erect bush, the canes finally recurving and rooting at the tips, furnished with straight spines, glaucous, not bristly; lfts. broadly ovate, dull green above and white beneath, finely and sharply serrate, and notched, the pedioles usually bearing short prickles: fls. in small, dense, prickly clusters with sometimes a few scattering pedicels, the petals shorter than the long-pointed whitish woolly sepals; fr. rather small, hemispherical, firm or even hard, black or occasi

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

2097. **Rubus rosifolius** (X 1/2). Sometimes known as Strawberry-raspberry.
many feet long and recurving or half climbing but sometimes erect; Ifts. 3–5, ovate or rhomb-ovate, coarsely toothed, thickish, pubescent to white-downy beneath; petioles and usually the midribs beneath bearing prickles: Ifts. in terminal panicles, white or pink, showy, the buds white-pubescent: fr. black or dull red.

2199. Rubus ellipticus \((\times \frac{1}{2})\)


the calyx reflexed, edible but little prized. Europe, where it is common in fields and hedges. As a cult plant, known chiefly in the double-fld. form (as \(R. \) pomponius). Gn. 34, p. 234. Sometimes known as \(R. \) spectabilis in gardens.

20. laciniatus, Willd. (\(R. \) triticius, var. laciniatus, Hort.). CUT-LEAVED OR EVERGREEN BLACKBERRY. Fig. 2203. A tall, straggling bush with permanent or perennial canes in mild climates, and leaves more or less evergreen, the stems provided with recurved prickles: Ifts. 3, broadly ovate in general outline, cut into several or many oblong or almost linear sharply toothed divisions, the ribs prickly below and the petioles strongly apparently only a cut-leaved form of the common European \(R. \) triticius. 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. 61, Utah Exp. Sta.). It is probable that the plant has been introduced into the West from those sources, but I think fact does not prove its original native. 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 unarrowed linear to lanceolate canes, and long, open flower-clusters.

21. Canadensis, Linn. (\(R. \) Millspaughii, Britt.). THORNLESS BLACKBERRY. Fig. 2205. A tall, straggling bush with permanent or perennial canes in mild climates, and leaves more or less evergreen: Ifts. 3-5, ovate-lanceolate, long-acuminate, sharply and nearly evenly serrate; stipules usually prominent, narrow; Ifts. large, white, in long, open, raceme-like clusters, on slender spreading pedicles; fr. black, almost globose to short-oblong, usually juicy and good. Eastern Canada, through the high lands of New England, New York and Michigan to mountains of North Carolina.—Not in cultivation, except in botanic gardens and amateurs' collections.

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

22. nigrobacclus, Bailey (\(R. \) villosus. Authors, not Ait.). COMMON HIGH-RUSH BLACKBERRIES. 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: Ifts. 3–5, ovate-acuminate or sometimes lance-ovate, long-stalked (at least in the largest Ivs.), the terminal one often heart-shaped at base, the margins nearly regularly strong-serrate, the under surface glandular-pubescent: Ifts. white, showy, the petals narrow, borne in a long, open raceme-like cluster of which the terminal flower is usually the oldest. Each pedicel standing at nearly right angles to the raceme: 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 Blackberries" as Taylor and Ancient Briton. Var. albicans, 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.

2201. Rubus occidentalis \((\times \frac{1}{2})\)

The original of the cultivated Black Raspberries. No. 18.
Var. sativus, Bailey (R. sativus, Brainard, Fig. 2087; also Fig. 237, Vol. I. Generally lower and the canes more erect; its. 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 juniper. Dry, open fields.

203. Rubus laciniatus (X 13). No. 20.

Distinct in its extreme forms, but running into the species by all manner of intermediate gradations. From this plant the common "Short-cluster Blackberries" of the garden appear to be derived, as Snyder, Kittatiny, Erie, etc.

23. Alleghenianesis, Porter (R. villosus, var. montanus and R. montanus, Porter, not Wirtg.). Very like R. nigrobaccus, and perhaps only a mountain state of a cosmopolitan type: plant smaller, usually less prickly: branches and leaf-stalks usually reddish, and all young growths very glandular-pubescent: its. much smaller, very long-pointed, closer-toothed: fl. clusters usually smaller: fr. small, long, and narrow, tapering towards the top, the drupelets many and small, not very juicy but of good flavor. In mountains and highlands, Ontario to Virginia. — Common on the higher elevations, affording much edible fruit. In its typical form, as seen in the wild, it is very distinct from R. nigrobaccus, particularly in its fruit.

24. heterophyllus, Willd. Fig. 238, Vol. I. R. nigrobaccus x R. villosus, in many forms both wild and cultivated. In cultivation this hybrid class is represented by the "Loose-cluster Blackberries," as Wilson, Wilson Jr., and Rathbun. The plants are usually half-erect, thorny, mostly more or less glandular-pubescent on the young growths; its. broad and jagged: fl. clusters small and usually forking, with long pedicels: fr. rather loose-grained, with large drupelets. The plant is not infrequent in regions in which both R. nigrobaccus and R. villosus grow. It is usually easily distinguished by the half-erect habit and irregularly toothed and jagged its., which are not long-acuminated. In some cases, the bushes naturally stand 3-4 ft. high.

Group 1. Long-cluster Blackberries, with little or no glandular-pubescence and short-flowered clusters that have more or less small its. intermixed.

25. argutus, Link (R. trondhjemiensis, Bisch. R. colenso, var. trondhjemiensis, Torr. R. suberetius, Hook.). Fig. 2208. Very like R. nigrobaccus in habit, but usually stiffer in growth, the young parts and under surfaces of its. only rarely glandular though usually pubescent, the canes generally very thorny; its. often smaller and stiffer, the fl. short-pointed, the pedicels and midribs 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 straight-spined spines, but some forms bear very strong hooked spines, and between these two forms there are all gradations. The species is much needed 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: leaf its. 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): fl. 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. Randii (R. argutus, var. Randii, Bailey, Fig. 2209. Low and wide-spreading (usually less than 3 ft.), sometimes becoming procumbent, with few or almost no prickles, the canes often almost herbaceous: its. very thin, usually becoming nearly or quite glabrous beneath, the teeth coarse, sharp and unequal, the its., 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 (at all) pubescent: fr. small, usually rather dry, but sometimes juicy and good. Shady places, in woods and thickets, New Brunswick to Lake Superior: to be looked for in the mountains of Carolina; it impresses one as a weak woods form, sometimes seeming nearest R. Canadensis but oftenest suggesting R. nigrobaccus; but it seems to hold its characters better than most Blackberries.

2201. Cultivated form of Rubus occidentalis.—The Gregg Raspberry (X 1/2). No. 18.
SECTION 5. Sand Blackberries, with stiff, erect, low and very thorny growths, small fl. clusters, and leaves white-tomentose beneath.

28. cuneifolius, Pursh (R. aciulifolius, Reamsey). Sand Blackberry. Fig. 239, Vol. I. Plant stiff and thorny, usually not over 3-4 ft. tall, the prickles many, hooked, and very strong, the young growths white-tomentose; fls. on bearing canes mostly small and thick, wedge-oblong to wedge-ovate, obtuse or nearly so, densely white-tomentose beneath, the margins sharp-toothed; frs. on the sterile canes drier, often ovate-pointed or elliptic; fl. clusters 4-10 fl., short, more or less leafy and thorny, the fl.-buds globular 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 Toppy 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. suberetus, Peck). Mostly erect, sometimes ascending 2-3 ft., the slender canes clothed with many weak mostly recurved prickles and sometimes conspicuously hispid also, the prickles generally extending to the pedicels and interascence; fls. oblongate to ovate, pointed or acuminate, very strong-toothed; fr. small, with few drupelets, reddish black. Swamps, 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 I. Swamp Dewberries, with weak bristly stems, oblong shining fls., and small red fruit.

30. hispidus, Linn. (R. oblongatus, Michx. R. semipermanens, Bigel.) Fig. 210. Stems very slender, scarcely woody but usually persisting over winter, creeping, bearing many weak reflexed small bristles; fls. usually 3, thick, shining above, wedge-ovate or oval-ovate, usually obtuse, doubly serrate; frs. small, white, on few-flowered herbaceous 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-ovoid, shining black, the drupelets usually large. Fields and roadsides, Ontario (and Newfoundland?) 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 Aiton in 1789, although it has been supposed that he had the High-bush Blackberry (R. nigrobaccus). When

2204. Rubus nigrobaccus (× 1/2). No. 22.

larger, often ovate-pointed or elliptic; fl. clusters 4-10 fl., short, more or less leafy and thorny, the fl.-buds globular 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 Toppy 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.

2205. Rubus nigrobaccus (× 1/2).

Group 3. Soft-caned Dewberries, with the stems thin and little woody or even almost herbaceous and the peduncles 1–2-fl.
Rubus it was determined, in 1898, that Alton had the Dewberry, rather than the Blackberry, when he made the name *R. vitifolius*, it became necessary to revise our nomenclature. It was supposed until that time, also, that Linnaeus meant to designate the Dewberry by his *R. canadensis*, but he really had the Thornless Blackberry.

**Var. Michiganensis**, Carol. A strong-growing form with mostly fewer prickles, very large, irregularly dentate leaflets, and pubescent flower clusters. S. W. Michigan and probably elsewhere. Not known to be in cult.

**Var. zonibaccus**, Bailey. *Lucretia Dewberry*. Figs. 697, 698, Vol. 1. Very robust form, with large, wedge-ovate, deep-cut leaflets, very long pedicels, very large flowers, 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. invius**, Bailey (*R. canadensis*, var. invius, Bailey). Figs. 2213, 2214. Canes strong, terete, somewhat ascending, not very prickly (the prickles straightish); leaflets large and rather thin, light green, those on the verdurous shoots coarsely and simply toothed and the teeth usually abruptly pointed; flower clusters forked, with 2-6 long, slender, usually hispid pedicels; flowers large, with leafy-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 toothed of the leaflets on the sterile shoots.

**Group 4. The Southern Dewberries**, with very long, prickly and often hispid canes, narrow persistent leaflets, and mostly 1-flowered pedicels.

**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 leaves, on the young verdurous sterile shoots; the smaller leaves, on the canes that are to bear fruit, and which often persist over winter and remain at flowering time; the small leaves, that appear with or somewhat before the flowers. It is seldom that the leaves of sterile 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 redish bristles; flowers usually 3, narrow-ovate to oblong, short-pointed, rather scarcely and sometimes bluntly toothed, the pedicels and hispid usually prickly; flowers of medium size, mostly on simple, more or less prickly pedicels; 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 been in error in the past, and 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 Rubus. 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 canes, and fr. often imperfect.

**35. vitifolius**, Cham. & Schlecht. (*R. modestus*, Cham. & Schlecht. *R. macrostachus*, 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; leaves various, usually thicker and more woody upon the staminate plants, composed of three ovate, doubly crested-toothed leaflets, or sometimes only 3 lobed, the long pedicels and usually the hispid prickles; flowers perfect, staminate or pistillate on different plants, borne on shoots 6-12 in. high, which bear 1- to 2-flowered prickly or hispid and generally pubescent pedicels, the petals of the staminate forms large and showy, those of the pistillate forms usually small, the calyx lobes either short and entire or somewhat prolonged and indistinctly toothed; fr. of fair size, blackish, mostly round-oblong,
sweet. In the mountains, particularly in the Coast Ranges, of the Pacific slope; also in Idaho.—It has come into some prominence as a fruit plant within the last dozen years. Named varieties are Amishthibough, 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. 957) is said to be a hybrid between this species and *R. idaho. *R. vitifolius is recorded as having been crossed with *R. stygiophilus by Luther Burbank. The Mammoth Blackberry of California is said to be a cross between *R. vitifolius and the Wild Blackberry of Texas (*R. arguta*). See Pacific Rural Press, Sept. 4, 1897, for description and portrait. The account says that the Mammoth "produces berries of immense size, supposed to be the largest Blackberry ever grown, berries 2½ inches in length being frequently found."

The canes of the Mammoth are very peculiar, being very large and thickly covered with small, short spines. The canes start early in March, grow thick and stout until about 3 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."

2211. Small form of Rubus villosus, the northern Dewberry.
Generally known as *R. Canadensis. No. 32.

2212. Rubus villosus, the northern Dewberry.
(X 3 4) No. 32.

and few short scattered prickles; the fruit is fully as large or larger than Shaffer's Colossal Raspberry, of a purplish wine or mulberry color, and of excellent quality, though the berries do not separate from the receptacle as freely as they should; it is a very promising berry plant." See Burbank's "New Creations in Fruits and Flowers," June, 1894; also *Gn. 48*, p. 130. 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, globose short-pedelled fruits. It is probably *R. Moluccanum. —R. Japonicus*, Veitch. Known to horticulturists in its variegated form (*R. Japonicus* tricolor): slender, trailing, with rose-colored stems and petioles; Ivs. ovate or ovate-lanceolate, white beneath, large and white, 1-3 lobed, very sharply toothed, the youngest ones pinkish white and the mature ones blotched 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.* 16:65. *J.H. III. 20:60. *G.M. 17:442.—R. Mohamedana, Linn. A large Raspberry, common in India and Malaya, and to be expected as an introduced plant in many warm countries. Very robust, with very variable, large, usually hairy, dull-polishcd beneath, shallowly 3-5 lobed, irregularly serrate: fls. white, in contracted terminal clusters; fr. in shades of red, suaveulent. B.E. 6:461.—R. stellatus* Smith, produces an edible fruit, prized in Alaska; stem simple and herbaceous, only a few inches long, 3-d: Ivs. cordate, 3-lobed or parted: its red. Northwestern Arctic America.

L. H. B.
RUDBECKIA (after the two Professors Rudbeck, father and son, predecessors of Linnaeus at Upsala). Compositae. Cone-flower. As defined by Gray (Syn. Flora N. Amer., 1886), Rudbeckia is a genus of 21 species of North American herbs, many of which are hardy and perennial, bearing in summer showy fls. which usu-

ally have yellow rays, though in one species (R. atro-

rubens) 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 horticultural 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 chart 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 1866. The origin of this great favorite seems to be unknown. About 1834 John Levis Childs found it among some plants sent by correspondents. See p. 35. For the structure of the Rudbeckia inflorescence, see Fig. 829, Vol. II.

W. M.

The Cone-flowers are of easy cultivation in almost any soil and situation, from a semi-shady position to one in full sun. Most of the species are found inhabiting moist locations, but thrive well in the garden under the ordinary methods of cultivation, although K. laciniata and its double form, Golden Glow, do much better if abundantly supplied with moisture. K. 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 is a garden plant, and probably the showiest, is Golden Glow, which the undersigned 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 masses and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It resembles K. alba, 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 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 interm may be pulled up again to 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 Elegans—-for a center or background, and interspersing groups of the taller Rudbeckias (except Golden Glow, which is too tall and spreading) and hibiscus next to them. In front of these place R. spicata and R. triloba, with the blue form of Leonotis Nepetiflorus, and for a front 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-

2213. Rubus invius, the cultivated form known as Bartel Dewberry. See Rubus, page 1586.

2214. Leaf of Rubus invius, showing the simple teeth (X 1/2).

RUDECKIA

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

W. C. Egan.

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1. amplexicaulis, Vahl. Annual, 1-2 ft. high: rays 1.5 in. long or more, yellow, often with a brown-purple base; disk brownish, finally somewhat cylindrical. Low grounds, La. and Texas. B. B. 3:418.

2. triloba, Linn. Fig. 2217. Biennial, 2-5 ft. high, bright green; rays 1-2 in. long. B. B. 3:415. B. R. 7:525. — Blooms the first year from seed.


5. hirta, Linn. BLACK-EYED SUSAN. YELLOW DAISY. Biennial or annual, 1-3 ft. high: rays 2-5 in. long; rays golden yellow, sometimes orange at base. Dry and open ground; common over wide range. B. B. 3:416. Gt. 69:1055.


8. nitida, Nutt. This and the next are southern perennials, with rays entire or barely dentate; rays drooping, pure yellow, several or numerous; disk finally cymose, 1-2 in. long. Wet ground, Ga. to Fla. and Tex. G. C. 47:1018.


10. lacinia, Linn. Perennial, 2-7 ft. high: lower stem-ivs. 3-5-parted, upper ones 3-clf. — Prop. by seeds or division.

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amplexicaulis, 1. lacinia. 10. speciosa. 7.

bicolor, 4. maxima. 9. superba. 4.

fulgida. 6. Newmann. 7. subtomentosa. 3.

Golden Glow, 10. nitida. 8. triloba. 2.

hirta. 5.


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RUE

See Ruia gracilissima.

RUE ANEMONE. See Sanguinaria.

RUE, GOAT'S. Galega officinalis.

RUDELLIA (after Jean de la Ruelle, a French botanist). A genus of about 150 species of herbs or shrubs, mostly American, pubescent, villous or rarely glabrous: Ivs. opposite, mostly entire: fls. violet, blue, white, red or rarely yellow. The fls. are sessile or nearly so in axils of Ivs. or bracts; they are solitary, fascicled, or in spreading, paniculate cymes. Bracts hermaphrodite, loose or imbricated, usually small and narrow, rarely oblong or lanceolate. Corolla limb 5-lobed, equal, or with the upper lobes crenate at the base; stamens 4; capsule oblong or club-shaped, terete or compressed, 6-20 seeded; seeds compressed.

RUELLIA


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10. lacinia, Linn. Perennial, 2-7 ft. high: lower stem-ivs. 3-5-parted, upper ones 3-clf. — Prop. by seeds or division.
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.

1590

RUELLIA

2218. Rudbeckia laciniata, var. Golden Glow (X \(\frac{3}{4}\)).

See p. 189.

G.C. III. 17:45.  R.H. 1881:410.  G. W. Oliver says in his "Plant Culture" that \(R. moureana\) is of easy cultivation and is one of the best greenhouse flowering plants for amateurs. Cuttings rooted in September furnish fair-sized flowering plants in January. These, if desired, may be planted out in late spring, when they will have formed large specimens, which may be lifted and potted.

ER. Lvs. marked with white.

C. Fls. white, often veined with lilac.

Devosiana, Hort. A low-growing tender Brazilian species, with lanceolate lvs. marked on the upper surface with white along the nerves and having the lower surface entirely purple; fls. rather small, usually white, with blue stripe, axillary; corolla-tube suddenly dilated and bent at the middle.

CC. Fls. carmine or rose.

Makoyana, Hort. A compact, bushy plant resembling \(R. Devosiana\), Hort., in foliage, but differing in the color of the fls. (bright carmine) and by their somewhat larger size. Brazil. R.B. 21:109. R.H. 1886:576.—Prefers shade. It is said that the color of the foliage is better when soil is mixed with the soil.

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

parviflora, Endl. A low shrub, with branches \(\frac{3}{4}-1\frac{1}{2}\) ft. long, ascending or prostrate; lvs. ovate or ovate-lanceolate, obtuse, deeply crenate, mostly lobed; fls. pinkish, in shortly pedunculate cymes. F. W. Barclay.

RULINGIA (after J. Ph. Ruling, a botanist of Göttingen). Sterculiaceae. This includes two plants cult. in S. Calif. \(R. parviflora\) is highly recommended as a rock plant by Ernest Braunton, of Los Angeles, who grows it in quantity for its trailing habit and myriads of small pink fls. borne in spring. Franceschi says that \(R. moureana\) is odd and pretty by reason of the heavy 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 rarely 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 Australesis 1:237.

AA. Lvs. 1-3 in. long.

pannonia, R. Br. Eventually a shrub, several ft. high, but flowering freely at a young age; lvs. scabrous-pubescent above, densely velvety hirsute 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 \(\frac{3}{4}-1\frac{1}{2}\) ft. long, ascending or prostrate; lvs. ovate or ovate-lanceolate, obtuse, deeply crenate, mostly lobed; fls. pinkish, in shortly pedunculate cymes. F. W. Barclay.

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.

F. W. Barclay.

RUELLIA formosa (X \(\frac{3}{4}\))
RUMEX

As a genus, Rumex is closely allied to Pagozyrum, the buckwheat, Rheum, the rhubarbs, and Polygonum, the grassy sorrels. These are mostly hairy-stemmed plants, with small flowers in panicled, the pedicels mostly in whorls and jointed; frs. perfect or imperfect, with 6-parted calyx, the 3 inner lobes larger and generally one or all of them ciliate, or entire, the calyx-lobes lanceolate; stamina 6; stamina 3: fr. a 3-sided often margined or winged seed. In the larger species the stems are grooved and hollow. Most of them are erect-grazing plants. See Dock and Sorrel.

A. Dock: Ivs. not hastate; fls. perfect, or at least not dioecious.

b. Wings of calyx not tubercle-bearing.

venosus, Pursh. Perennial, 1½ ft. or less tall, glabrous, the pedicels drooping of Indian Terr. and Tex. to Calif. B.M. 7435. "Leafstalks used as rhubarb, for which reason it is known also as pie-plant in California." From- rock. The plant has some ornamental value, but is of great economic importance as a tannin-producing plant. The tannin is secured from the tuber-like roots. For literature on the economic uses of the plant, see reports of experiment stations in Ariz., Calif., and elsewhere.

occidentalis, Wats. Stout perennial, reaching 3 ft., glabrous, the pedicels drooping of Indian Terr. and Tex. to Calif. B.M. 7435. "Leafstalks used as rhubarb, for which reason it is known also as pie-plant in California." From- rock. The plant has some ornamental value, but is of great economic importance as a tannin-producing plant. The tannin is secured from the tuber-like roots. For literature on the economic uses of the plant, see reports of experiment stations in Ariz., Calif., and elsewhere.

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Acetosella, Ann. COMMON FIELD OR SHEEP SORREL. Common in all old fields, where it indicates sterile soil: Ivs. oblong, 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.

rosa, Linn. One to 2 ft., with spreading and branched stems, glabrous and somewhat glaucous: Ivs. small, deltoid-ovate, entire, short-pointed, truncate-ovate or almost cordate at base; meeres short and leafless or nearly so, the pedicels drooping in fr.: wings cordate-ovulate, bilobed or 3-lobed, in across, thin, very revolute, without callosities. Egypt to Persia. Rarely cult. as an ornamental for its showy flowering calices.

RUBFUR-WORT. Herniaria.

RUCUS (an old Latin name). Liliacea. BUTCHER'S Broom. A genus of possibly 3 species scattered over Europe. Erect shrubs, with minute bract-like Ivs. and branches (phylloid) simulating leathery, persistent,voined, sessile, leaf-like bodies: fls. small, springing from the midrib of the lower surface of the phylloid.


According to A. Blake, R. Hypoglaucum, Linn., has been highly commended lately in Germany as a decorative subject. This species and R. Hypoglaumum, 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. G. Baker considers R. Hypoglaumum a variety of R. Hypoglaumum, differing in having the eosta under the cluster of fls. in the form of a large leaflet borne entirely the texture of the phylloidium. In B.M. 20, 2094 R. Hypoglaumum is shown with minute white fls. and handsome red berries, ⅛ in. thick. F. W. Barclay.
RUSSELLIA (Alexander Russell, English physician and author of "Natural History of Aleppo," 1856). *Sorophila ruelliae*. 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, the lobes spreading and nearly equal; staminodia very short or wanting; stamens 4; capsule subglobose, 2-ribbed; seeds numerous, very small, winged. A recent synopsis of Russelia by Dr. R. L. Robinson, with a key to the species, will be found in Proc. Am. Acad. Arts & Sci., vol. 35, No. 16, March, 1900. Russelias are of easy cultivation. *R. juncea* and its varieties make excellent basket plants, being almost continuously in bloom. Propagated by cuttings.

A. *Peduncles 1-3-flowered.*

* juncea. Zure. (*R. scoparia*, Hort.). Coral Plant. Fig. 2220. A tender shrubby plant, with smooth, somewhat rush-like branches, mounding or pendulous at the top; lvs. linear-hanceolate or ovate, small, becoming minute bracts on the branches; raceme very loose, remotely flowered; peduncles elongated. B.R. 21:1775. P.M. 4:79. — Vars. *Lemomei* and *elegantissima* are garden hybrids of *R. juncea* and *R. sormentosa*. 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 Salvia.

RUST. A name for a class of fungi which produce disease in plants. RUSTS are of the class Urediniomycetis. The mycelium branches among the tissues of the host and produces several kinds of spores, either upon the one host (autogenous), or upon different hosts (heterogenous). These spores, as shown typically in the disease of the wheat, are called respectively uredospores, teleutospores, pedicelospores, etc. Recent researches by Eriksson & Humann in Sweden show that the three common rusts which affect the grains, namely: *Puccinia graminis* (Figs. 2221-2), *P. volucreanum* 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

2222. *Ruta graveolens*. Flowers slightly enlarged

forms, delimited by differences in the marked capacity of the uredo- or teleutospores to inoculate on different hosts. Natural rusts are common on cultivated plants causing disease, viz., beef rust (*Uromyces bovis*), broad bean rust (*Uromyces Fabae*), white pine rust (*Uromyces pinastri*), asparagus rust (*Puccinia asparagus*),

chrysanthemum rust (*Puccinia Hymenii*), black or wheat rust (*Puccinia graminis*), hollyhock rust (*Puccinia malvacearum*), etc. John W. Harsharger.

The rusts are fungi constituting a very large and economically important class known as Urediniomycetis. They are all obligatory parasites, attacking a vast number of native and cultivated plants. The mycelium of

2223. Ruta graveolens. Flowers slightly enlarged

the rust fungi exists entirely within the tissues of the host. The spores are formed in masses or spori just beneath the epidermis. When ripe, they break through the epidermis, forming brown patches and spots from which they are scattered. Many of the rusts produce several spore-forms, which occur in regular succession on the same host or on different hosts. For example, the wheat rust produces uredospores and teleutospores on the wheat and acerutospores on the barberry. RUSTS rarely kill the plants which they affect, and hence in many cases the damage done is not as apparent as in many other diseases. In all cases, however, the plants are weakened, and often much disfigured. They are among the most difficult fungous diseases to combat. Spraying has been tried in many instances, but has proved, at most, only partially successful. The most profitable course for overcoming these diseases seems to be the selection of resistant varieties.

Heinrich Hasselberg.

RUTA (classical name of rue). Rutaceous. About 40 species from the Mediterranean region of Europe and from Asia. Perennial herbs, often woolly 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 seeded, indehiscent or dehiscent at apex. *gravesiensis*. Linm. *Ruta* Gravesiana, Fig. 2222. A hardy perennial, woolly at the base, 1-2 ft. high; lvs. fragrant, much divided; lobe oblong, the terminal obtuse; fls. yellow, July. Prop. by division and seeds.

*Patavina*, Linm. (*Hepholadium Patavium*, Hort.). A hardy perennial herb 4-6 in. high; lvs. glabrous, the lower oblong and spatulate, narrowed at the base, the others trifoliate and lanceolate; corymb dense; pedicels somewhat longer than the fls.; fls. golden yellow. June, July. F. W. Barclay.

RUTABAGA, or SWEDISH TURNIP. Consult Brassicaceae, page 177; also *Turnip*.

RUTLAND BEAUTY is *Convolvulus Sepium*.

RYE. See *Secale*. RYE, Wild. See *Elymus*.
S

Sabal (possibly a native name in South America, but the author of the genus does not explain). *Palmetto*. Spineless palms, low, tall or almost stemless, the robust, ringed trunk obliquely ascending at the base, with dwarf roots and a roseate with deep red leaves; leaves, terminal, orbicular or cuneate at the base, flatly multi-angled; segments linear, broad, filamintous on the margins, induplicate in the base, rather short and long; ligule short, minute at the racem; pedicel concolorous almost, the margins smooth, acute; stipe short; spadix large, elongated, compound, at first erect, the branches and branchlets slender, recurving, pendent; spadices sheathing the branches and peduncles tubular, oblique at the throat; bracts and bracteoles minute; flower, small, glabrous, white or green; fruit small, globose, black, the seed of a single basal. Species 6, Florida to Venezuela, and one in Nova Scotia.

Some botanists make the species names all feminine; others neuter. J. 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, where they always form an important feature of the landscape. Generally they grow in dense groups, but they are more beautiful in all their parts than most other plants. In Southern Florida the undersigned has often found underneath the crown of leaves a dense-wreath of ferns (*Polypodium aureum*), which brightens the charn 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 croton (*Rigonia esculenta*), 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 cut off. If the stem has been set at least three feet deep and the soil is well watered after planting, the Palmetto is almost sure to live. In addition to the Palmetto, all of the Sabals mentioned in this work are cultivated by the undersigned on high pine land in Southern Florida. Under these conditions the Sabals have proved a great success, as also all species of *Phoenix* and all Cocos of the australis type, while the species of *Washingtonia*, *Erythrea*, *Livistona* and *Trachycarpus* have been an entire failure.

*S. Blackianum* 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 all grow naturally in rich black soil, but they thrive exceedingly well in the sandy pine woods soil if well fertilized and watered; in fact, they can hardly be fertilized too much, and the more nitrogenous manure and water they get the faster they grow. When transplanted they must be set deep. In planting palms the writer always makes the holes about 5 ft. in diameter and about 2 ft. deep in the center, which receives the plant, is the deepest point, while the ground all around is slightly sloping. Care must be taken to remove the sand after heavy rains or the crown will soon be buried and the little plant dies. As the plant first forms the trunk in the soil and as the growth is rather rapid, this precaution is not necessary after the plant has attained a few feet in size.

H. Nehring.

The Cabbage Palmetto (*Sabal Palmetto*) is rich in historical associations. It is also noted for its imperishability under water. The trunks make good piles for wharves, as they resist the attacks of the borer in sea water. The leaves make the best of thatching. Until the tree reaches a height of 10-20 ft. the bases of the leaf-stalks remain upon the trunk, forming a unique *chevaux 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-spikes rises above the leaves to a height of 6 or 7 feet.

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

E. N. Reasoner.

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BB. Shape of blade orbicular. 1. *Blackburnianum*
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2. mauritiforme, Grisq. & Wendel. Also spelled mauritisciforme, etc. Trunk much-branched, but occasionally attaining 60-80 ft.: Ivs. finally 12 ft. across; blade suborbicular, longer than the petiole, glaucous beneath, brown above. Nehrling writes that this trade rival, S. umbrelliforme, in beauty and rapidity of growth. Its leaves, though smaller, have a beautiful bluish green color.

3. Palmetto, Lodd. Cabbage Palmetto, Fig. 224. Stem erect, 20-80 ft. high: Ivs. 5-8 ft. high, oval, cordate at the base, blade ample, orbicular, glaucous, rather rigid, shorter than the petiole; lobes about 40, ensiform, bifid, filamentous, rather rigid. West Indies. G. F. 4: 307. L. C. S. 5: 553. This species also has been confused in the trade with S. mexicanum.

4. Blackburnianum, Glazebrook (S. umbrelliforme, Mart.) Lvs. 3-6 ft. high, 1-2 ft. wide, divided to the base into many narrow 2-parted segments, which are filaments on the margins: fr. about 1 in. in diam., globose or sometimes 3-lobed, with thin dry flesh. Tex., Mex. S. S. 10: 507. A. F. 12: 628.-S. Molina, Hort., is referred to S. Palmetto by Voss, but Nehrling writes S. Palmetto is a stemless plant from Mexico, more beautiful than the Dwarf Palmetto, bearing immense drupes about 1 in. long. Southern states. S. S. 10: 507. A. F. 12: 628. S. Molina, Hort., is referred to S. Palmetto by Voss, but Nehrling writes: "This species is also confused in the trade with S. mexicanum.

5. Mexicanum, Mart. Stout tree, with trunk sometimes 50 ft. tall and 2 ft. in diam.: Ivs. very large, sometimes 6 ft. high, 2 ft. wide, divided to the base into many narrow 2-parted segments, which are filaments on the margins: fr. about 1 in. in diam., globose or sometimes 3-lobed, with thin dry flesh. Wet pine barrens, N. J. to Fla. B. B. 2: 610.


SABAL

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SABACCIUM (saccharon, old Greek name for sugar) Gramineae. Species 12, in tropical regions, mostly of the Old World. Tall grasses with stout culms and opaque panicles, the branches of which are many-jointed; the small, slender spikelets 1-ft., surrounded by long silky hairs. Differs from Eriandus in having the spikelets awned. The most important species is the Sugar Cane, which is extensively cultivated in tropical and subtropical countries for the production of sugar. Propagated by cuttings of the stem. Native country unknown, but probably central 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, Lind. Sugar Cane. Stem 8-20 ft. high, 1-2 in. thick, third empty glume wanting.

SACCOLABIIUM (name referring to the scent labelna.) Orchidaceae. Epiphytic herbs with erect leafy stems increasing in length by continued growth at the apex; Ivs. distichous, leathery and fleshy, usuallyishorned; inflorescence lateral, in the cultivated species a long, densely-fl. cylindrical raceme; fls. medium or...
small; sepal subequal, free, spreading, the lateral pairs not decurrent on the base of the column; petals similar, sometimes wider; labelium united with the base of the column, spurred, the mouth of the spur open; pollinia on a filiform stipe. About 20 species. Can be propagated by offsets and by cut-backs. Fresh stock is constantly imported.

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochichin, India, Java and Manila. They are closely allied to the genera Aéridés, Phalanopsis and Vanda, and require somewhat similar treatment, but do not always aclimatize 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. amputatum*, *S. curvifolium*, and *S. Hendersonianum*, can usually be grown successfully in the Catthaya or Cypridipedium 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 tissue, and where the compost may readily and frequently dry out, during the resting period especially. Grown otherwise the more succulent species, such as *S. giganteum* (a Vanda), make soft, weak tissue, which is susceptible to wet spot, a usually fatal disease. Clean, chopped sphagnum, freely 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 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 Saccoelabiums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis.

**A.** *Fls. rose-colored.*

**Hendersonianum**, Reichh. f. Dwarf: lvs. 4-6 in. long, strap-shaped, distichous on the stems, but spreading in various directions; raceme upright, about as long as the lvs.: fls. forming a cylindrical mass, bright rose, ½ in. across; dorsal sepal orbicular, concave, lateral ones larger, obovate-oblong; petals obovate; labelum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B. M. 6222.

**amplicellum**, Lindl. Fig. 2225. Dwarf: stem 6-8 in. high, with 2 rows of lvs. I. Fls. strap-shaped, channeled, apex truncate and dentate: racemes nearly erect, 4-6 in. high: fls. deep rose color; sepal and petals ovoid, veined, spreading out flat; labelum 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 stronger growth and larger fls.

**AA.** *Fls. orange or scarlet-orange.*

**curviolium**, Lindl. Stems short: lvs. linear, 8-10 in. long; 2-toothed at the apex; racemes somewhat drooping, 1 in. long, dense; fls. 1 in. across, bright orange; sepal and petals ovoid to obovate, spreading; labelum orange, blade linear, truncate, spur obtuse. May-June. Burma. Java. B. M. 5326 (as *S. miniatum*). IH. 11:496.

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**SACCOFLABIALM**

**Saffron Thistle.** Carthamus.

**Safflower.** *Carthamus.*

**Saffron.** *Crocus sativus.*

**Saffron, False.** *Carthamus tinctorius.*

**Saffron, Meadow.** See *Colchicum*.

**Saffron Thistle.** *Carthamus tinctorius.*
**SAGE**

*Sage officinalis*). For at least three centuries it has been the shrubby, fibrous-rooted perennial from southern Europe has been widely cultivated in kitchen gardens for its aromatic, whitish green, wrinkled, oval leaves. These are arranged oppositely on ascending, slender, decumbent branching stems which seldom exceed 18 in. in height. In early summer the upper parts of these bear generally blue, though sometimes pink or white, flowers, followed by almost black sphericoidal seeds. In the more open gardens for its aromatic, whitish green, wrinkled, oval leaves. These are arranged oppositely on ascending or gardens for its aromatic, whitish green, wrinkled, oval leaves. These are arranged oppositely on ascending or

SAGE, JERUSALEM. See *Phlomis*. 

SAGENIA (derivation unknown). *Polypodiaceae*. A genus of ferns, mostly of large and coarse habit, with superior reniform or heart-shaped indusia fixed by the sinus, as in Dryopteris, but with veins uniting freely to form areoles with free included veins. About 25 species are known, largely from the East Indies, a few from tropical America.


**SAGITTARIA** (Sagittae is Latin for arrow). *Aristolochia*. A member of the Aristolochia, genus of many species depending on the point of view of each author. Nearly or quite 100 specific names occur in the genus, but Micheli, the latest monograph. (DC. *Monograph*). *Aristolochia* contains 13, four of which are doubtful. In his monograph of the American forms (6th Rep. Mo. Bot. Gard.) Jared G. Smith admits 21 species. The present ten species are more closely related to each other than are the few species so widely distributed. They occur in many parts of the world, in both temperate and tropical
regions. Most of the species have arrow-shaped leaves, whence the name. They are useful for foliage effects in bog and shallow ponds, and also for their white buttercup-like flowers, which are borne in successive small whorls on an erect scape. They are mostly used for colonizing in the open, but *S. Montevideensis*—now the most popular species—is grown in indoor aquaria or plunged in open ponds in the summer. The arrowheads are perennials of easy culture, although likely to be infested with 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, montepious (stamine fls. usually in the uppermost whorls) or di- cecious, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small akenes: inflorescence composed of successive whorls of 3-stalked fls. Sometimes the lvs. are floating.

A. Sepals of pistillate fls., usually in the lower whorls, erect after flowering; pedicels of these fls. slender: carpels somewhat glabular.

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

c. Latifolia, Wild. (*S. variegata*, Engelm. *S. sagittaria*, var. *S. latifolia*, 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 numerous, the filaments slender: acene winged, with a lateral or oblique peak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants.

d. Bracts, at base of the whorls.

c. Lvs. usually distinctly sagittate.

*S. latifolia*, 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 maroon-ovate, free or slightly connate at base, shorter than the pedicels; petals large, white; filaments glabrous; acene 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 conspecific. There is a form with double fls. (var. *Florentina*, 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.

SAGITTARIA


*S. Montevideensis*, 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 5 in. across), the rounded petals white with a purple blotch at the base. Argentina to Brazil, Chile and Peru. B.M. 6755. Gn. 27:473. I.H. 31:343.—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. Tended to frost. It is sparingly naturalized in the southern parts of the U. S., on both the Atlantic and Pacific sides.

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SALIEN

SALICORNIA

SAINTPAULIA (from the discoverer of the plant, Baron Walter von Saint Paul). A monocotylic genus from eastern tropical Africa, where it was found growing in wooded places in fissures of limestone and granite rocks, in rich, light soil. It is a stemless hairy perennial herb with short-petioled ovate or oblong-orboid lvs. 1-2 in. long and nodding blue fls. 1 in. across, borne in stout peduncled
few-fld. cymes: sepals 5-7, linear, obtuse, erect, green; corolla sub-rotate, the tube shorter than the sepals; limb 2-lipped, the upper lip 2-lobed, and much the smaller, the lower spreading, all lobes rounded, concave, ciliolate; stamens 2, inserted in the contracted mouth of the tube: filaments short, stout; ovary ovoid, hirsute; style filiform; stigma purple: seeds many, very minute. One of the choicest of blue winter-flowering plants. First bloomed in cult in 1893.

SAINTPAULIA

SAILIX

SALISBURIA. See Ginkgo.

SALICORNIA (Latin, salt and horn). Salicaceae. Glasswort. Marsh Samphire. A genus of about 8 widely scattered species of leafless seashore herbs, hardy or tender, annual or perennial. This and other Chenopodioideae 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 tradesmen as kelp. The species have probably never been in cultivation and have no horticultural interest.

SALISBURIA. See Ginkgo.

SALIX (ancient Latin name of widow). Salicaceae. Willow. A genus of trees and shrubs characterized by simple lvs.; bads with a single bud-scale; lvs. in lax scaly spikes (aments) : the fls. subtended by a single entire scale and nearly or quite destitute of perianth; the stamiinate 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 dehisces, setting free the small appendaged seeds. The wood is light, soft and diffuse porous. For the staminat- ala alat flov, a- v/a r- of Willow, see Figs. 831 and 832. "The cutkins or "passies" are also shown in Figs. 2228 and 2229 herewith.

2227. Staintpaulia ionantha (x 1/2).

A young plant just coming into bloom.


SALAD PLANTS. The principal salad plant in America is the lettuce, which is used exclusively, but not always expertly, for salads. For full directions for growing lettuce in the garden and under glass, see Lettuce. Next to lettuce the best known salad plant in this country is probably endive, which is excellent, especially when well-blanched plants are to be had in the winter. Chicory is much like endive, as regards its treatment either in the garden or in the salad dish. Lettuce, it is frequently seen in the larger city markets. The common dandelion should be mentioned in this category. When forced and blanched it makes a salad fit for the most cultivated epicure. For ordinary house cultivation and use, however, the common garden cress (Lepidium sativum), not water cress, nor upland cress, ranks next to lettuce in value. Its rapid growth and rich flavor equally recommend it. This plant is said to be a great favorite in English gardens and forcing houses, where it is grown in mixture with white mustard and is pulled very young and eaten raw and all. Corn salad is another plant sometimes grown in gardens and used for salad-making. It is most acceptable to those who do not relish the pungency of the mustard and cress. Cives is used by many people as an ingredient of lettuces and other salads; also young onions. Many other plants are used in various places and by various persons for salads.

Besides the salad plants proper, many vegetables are used in a cooked or raw condition for salads. Such are cabbage, cauliflower, Brussels sprouts, potatoes, lima beans, beets, Jerusalem artichoke, etc. With salad plants may also be included pot-herbs, or "greens." 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 had on hand. A warm, light soil, in the best mechanical condition, is necessary for the same reasons.

SALISBURIA. See Ginkgo.

SALIX (ancient Latin name of willow). Salicaceae. Willow. A genus of trees and shrubs characterized by simple lvs.; bads with a single bud-scale; lvs. in lax scaly spikes (aments) : the fls. subtended by a single entire scale and nearly or quite destitute of perianth; the stamiinate 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 dehisces, setting free the small appendaged seeds. The wood is light, soft and diffuse porous. For the staminat- ala alat flov, a- v/a r- of Willow, see Figs. 831 and 832. The cutkins or "passies" 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 thrives 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. 2228, 2229. Its root system is very extensive and when well established withstands the effect of heavy rapid streams as well as wave-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 are among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of north temperate, tropical and south temperate zones are large trees. The 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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SALIX

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.
1. nigra, Marshall. Black Willow. Fig. 2225. Tree, 30–40 ft. high; bark gray, often becoming shaggy; twigs brittle at base; buds small; lvs. lanceolate, green, both sides finely and evenly serrate; aments 1–2 in. long; scales oblong, deciduous; stamens 3–4; 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, Anderson. Peach-leaf Willow. Tree, 30–40 ft. high; bark long; tupidinally furrowed, less inclined to be flaky; lvs. broader, glaucous beneath, on rather long, compressed petioles; aments loosely and freely fl.; ovary lanceolate-conical; style very short. Central and western N. Amer.

3. lucida, Muhl. 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; aments large, appearing with the lvs.; scale pale green, deciduous; stamens 4–5; ovary pedicelled, rather obtuse, glabrous. E. N. Amer. — A beautiful plant, deserving of more extensive cultivation.

4. pentandra, Linn. (S. fragilis, Fries, S. rugosum, Sm.) Brittle Willow. Fig. 2225. Tree, 30–60 ft. high, excurrent in habit and of very rapid growth; branches brown, obliquely ascending; buds medium size, pointed; lvs. large, lanceolate, acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glandular serrate; aments appearing after many of the lvs. are fully developed, not conspicuous. Europe and Asia.

5. fragilis, Linn. (S. fridus, Fries, S. rusticum, Sm.) Brittle Willow. Fig. 2225. Tree, 30–60 ft. high, excurrent in habit and of very rapid growth; branches brown, obliquely ascending; buds medium size, pointed; lvs. large, lanceolate, acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glandular serrate; aments appearing with the lvs. (the staminate tree rare in America), seldom bearing galls, slender; stigmas deciduous, Eu. N. Asia. Gn. 19, p. 517; 53, p. 86. — Frequently cultivated and also growing spontaneously in many places. A company of poachers induced many American farmers to plant hedges of this Willow some fifty years ago. Many of these occur now throughout the country, the trees being 40–50 ft. high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. decipiens: Twigs yellow; buds broad in winter; lvs. smaller and brighter green. Probably a hybrid with another species.

6. alba, Linn. White Willow. Fig. 2224; also 2226. Large tree, with short and thick trunk, and an enormous crown; branches yellowish brown; lvs. ash-gray and silky throughout, giving a white appearance to the whole tree, 24 in. long, elliptical. Eu. Gn. 55, p. 87. — hoodie associated with the next species, from 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. bidenta, Anderss.) Yellow Willow. Becoming a very large and very valuable tree in the same manner as the preceding species, trunk often 4 ft. or more in diameter. It is often pollarded. The crown is deliquescent and rounded in outline. Branches yellow; lvs. silky-hairy in winter, glabrous when mature, glaucous beneath, the whiteness intensified after the lvs. fall. Aments appearing with the leaves. Abundant in E. N. Amer. Muh. 8, p. 23 and S. alba. — Displaying many variations, the most obvious of which are: Var. aurea, Salisbury, (var. amurensis, Hort.), branches golden yellow, especially just before the leaves appear in spring. Var. Britzensis, Hort., bark red. These as well as other choice varieties are grafted. Var. pendula, S. H. 2:361, 371. Gn. 55, p. 15, 22.

8. Babylonica, Linn. (S. pendula, Moench.) Babylon Willow. Fig. 2224. A tree of weeping habit; 30–40 ft. high, with long, slender, olive-green branches; buds small, acute; lvs. 2–4 in. long, attenuate at base and apex; aments appearing with the lvs.; slender, the pistilate green; capsule small, 1 in. long. Caucasus. Gn. 1, p. 371; 34, p. 327; 39, p. 72; 55, p. 92. 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. annularis, Forbes, lvs. twisted back an a sort of ring. Var. dolorosa, Rowen. Wisconsion Weeping Willow, lvs. glaucous beneath; hardy far north. Var. Saligna, Hort., more vigorous and upright in habit, a form originating in France. Gn. 55, p. 19. S. H. 2:373. S. Saloancus of one catalogue is perhaps an error for this. Var. japonica, Thunb., lvs. more decidedly toothed; aments longer and looser.

9. elegantissima, Koch. Thurlow's Weeping Willow. Tree with much spreading habit and larger crown than S. Babylonica; branches long and pendent, yellowish green; sometimes blotched with brown; appears to be more hardy than S. Babylonica. Japan. Gn. 55, p. 24. S. H. 2:363. R. Siebold, Hort., is this species or is closely related.

10. interior, Rowlee (S. rubra, Rich, not Hud.). N. longifolia, Muhl., not Lam. N. Avridilis, Sargent and other recent authors in part. Fig. 2224. Varying in stature from a low shrub to a small tree, usually pinnate; found along streams and lake shores; twigs smooth and brown to densely tomentose and gray; buds plano-convex, with an obtuse and rounded apex, very small; lvs. nearly or quite smooth, sparsely canescent to extremely canescent, sessile, linear-elliptical, remotely dentate, the teeth narrow, sometimes quite spinulose; stipules conspicuous, carpaloid, obscurely denticulate, deciduous: aments of...
Salix

late spring on short lateral peduncles, which bear 4-6 lvs., these borne later in the season on much longer leafy branches, very loosely fdd; its, fascicled in clusters of 2-5 on the axis, a distinct interval between the fascicles, first appearing showy and often being the second set of aments in early summer; scales usually glabrous or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous after flowering; filaments crisp hairy below, smooth above; capsules sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity; stigmas short, sessile; hairs, becoming nearly silvery, 4-10 in. long, margins revolute, entire; aments appearing before the lvs.; stamens orange-red; capsularly lanceolate, nearly truncate at apex. 

11. argophylla, Nuttall (S. longifolia, var. argophylla, Anders., S. thuridithis, var. argophylla, Sargent. S. Handeliana, Bentham). Tree or large shrub, 12-15 ft. high, forming dense thicket but not growing in clumps; branches nearly glabrous and exceedingly tough; bark turning from brown to yellowish, yellowish-brown, reddish, which more or less conceals the veins; stigmas sessile, appearing in May in Oregon and northern California and flowering intermittently all summer. This species is distinguished by its narrowly lanceolate, entire leaves, sessile stipules, small and rather narrow aments, erose scales and hairy capsules. S. argophylla occurs on the Pacific Coast, in Oregon and California, and flowering in spring. Ament surpassed in length by its leafy peduncles; appearing in May in Oregon and northern California and flowering intermittently all summer. 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12. Caprea, Linn. Goat Willow. Fig. 2235. A small tree, 12-25 ft. high, with upright branches; lvs. large, 2-5 in. long, 1-3 in. wide, rounded or cuneolate at base, rugose, very variable: aments appearing before the lvs.; staminate of reddish capsule densely white woolly, with deep set root: branches grav, slender: lvs. small, 1 in. long, linear-lanceolate, very short-peduncled; aments small and rather few-fl.: stamens orange-red. E. N. Amer.

13. discolor, Muhl. Pussy Willow. Figs. 2234, 2235. A shrub, 3-5 ft. high, with rather coarse, stiff, brown lvs., dasy, growth very open; lvs. oblong or elliptic-obovate, usually obtuse at both ends, entire and smooth, reticulate-veined; aments rather few-fl.; capsules reddish brown, drupaceous. N. E. Amer. and Eu. Usually grows in cold peat bogs. — Probably not in cult. The plant sold under this name is probably some form of S. purpurea, which S. myrtuloides closely resembles in general appearance.
22. **cordata**, Muhl. (*S. rigida*, Muhl.); Heart-Leaved Willow. Fig. 223a. A large shrub or small tree, 10-30 ft. high; branches stout; buds large, flattened against the branch; leaves long, oblong-lanceolate, green on both sides, glabrous and rather rigid at maturity; aments slender, appearing with the lvs.; capsules glabrous, greenish or brownish. **SALPICHRÓMA** (Greek, spiculum, a small solid body; alluding to the hard seed-like fruit). See *Salpichroa*.

23. **irroráta**, Anders. Colorado Willow. A dense diffuse shrub, 8-12 ft. high; branches stout, covered with a white bloom; buds large; lvs. linear-lanceolate, 3-4 in. long, ½ in. wide, green above, glaucous beneath, undulate or serrate; aments all appearing before the lvs., sessile, very densely flab.; staminate golden-yellow; capsule glabrous, nearly sessile. Rocky Mts.

24. **incánus**, Schrank. (*S. petiolaris* and *S. rhomboidea*). Half of Amer. gardeners, but not of botanists. Shrub or small round topped tree, with long, slender branches; lvs. linear, revolute, 2-5 in. long, very narrow, green above, white-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. **purpurácea**, Lindl. (*S. Forthi*). **Salmonberry**. Fig. 223b. A shrub or small tree, spreading at base, with long, flexible branches; lvs. oblong-lanceolate, glabrous, veiny, 3-6 in. long, often appearing opposite; aments sessile; pistillate recurved; scales purple; stamen one; capsule small, ovate. Eu.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket Willow. Var. *pendula*. Branches pendent. Gng. 4:213.

26. **Stéphanis**, Sans. **Sitka Willow**. A shrub, 10-12 ft. high and more; lvs. ovate, glabrous, clothed beneath with silky hairs which have a beautiful satiny lustre; aments appearing with lvs., long, cylindrical and graceful, also satiny. This Willow, which so far as the writer knows, has never 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. Amer. W. W. HOWE. **SALMON BERRY**. Rubus spectabilis. See also *Alaska*.

**SALPICHRÓMA** (Greek, spiculum, a small solid body; alluding to the hard seed-like fruit). See *Salpichroa*.

**SALPICHLÓSSIS** (Greek, tube and tongue; alluding to the form of the corolla and the appearance of the style). Solanáceae. A genus of possibly 2 or 3 species of annual or biennial plants, natives of Chile. The only species in cult. is *S. spinosa*, which was formerly divided into about 6 species mainly on the color of the flowers. *S. spinosa* has greatly improved in size of flowers and range of color until it is at the present time amongst our very finest half hardy annuals. Plants about 18 in. high, covered with short glandular hairs; lvs. entire, waxy-margined, dentate or pinnatifid; fls. long-stemmed, large, funnel-shaped, ranging in color from various shades of purple and blue through numerous reds and yellows to creamy white, and usually

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**SALPICHRÓMA** See *Salpichroa*.

**SALPICHLÓSSIS** (Greek, tube and tongue; alluding to the form of the corolla and the appearance of the style). Solanáceae. About 10 species. Natives of extra-tropical regions, mostly American herbs or shrubs. Lvs. often small, entire, long-petiolate; fls. white or yellow, 2-3 in. long (section Eusalpicchroa) or only about ½ in. long (section Pericissimum); calyx tubular or short, 5-cleft or parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, acute, often short, induplicate-ovate; berry ovoid or oblong, 2-celled; seeds numerous, compressed.

Kredage says the species described below: "This plant is neither beautiful nor interesting, but it has the advantage of being an exceedingly rapid climber, covering walls within one season with a thick mass of foliage." Franceschi says the small white berries are sold everywhere in Paraguay as "cock's eggs."
beautifully marbled and penciled with several colors. Calyx tubular, 5-cleft: corolla funnelliform, widely bell shaped at the throat; lobes 5, plicate, emarginate: stamens 4, didynamous: capsule oblong or ovoid; valves 2-cleft.

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. Their 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.

SALPIOGLossis

SALPIGLOSSIS (Salpigix, trumpet; referring to the shape of the calyx). Melastomataceae. Here belongs the dwarf summer foliage plant known to the trade as Burtolonia marginata. The lvs. of this species are large, heart-shaped, metallic green above, with lines of small white dots running from the base to the apex as do also the prominent ribs; the lower surface is a dull brownish crimson. For culture, and botany of allied genera, see Bertolonia. Fls. 5-merous: calyx tube 10-ribbed, limb with 5 oblong, narrowly ovate lobes: petals 10, opening by a single pore at the apex.

margaritacea. Triana. (Burtolonia marginata. Bell. Gardiner gibbsii, var. marginata (Nicholson). Tender perennial herb; stem 1 1/2 to 3 in. long, unbranched: lvs. pedate, in decussate rows, cymose, white or rosy white. Brazil. F.S. 16:1697.

W. M. SALSIFY is the spelling preferred in England; Salsify in America.

SALsI FY (formerly sometimes spelled salssfy) is Tragopogon porrifolius, one of the composites. 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 rows, the plants are thinned to stand 2-5 in. apart. The plant requires the entire season 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 shiver 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.

SALSOla KAl is the Russian Thistle. Figs. 2239, 2240. Some of the bulletins devoted wholly or largely to this weed are Calif. 167, Col. 28, Iowa 26 and 23, New Mex. 16, Min. 13, Ohio 55, Wis. 37, 39. See also the following publications of U. S. Dept. of Agric. Farmer's Bul- letin 10, Bulletin 15, Div. of Botany; also Essay 8, "Survival of the Unfitted." 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.

SALTtUISHES 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 semibaccata) has been a great event in the

**SALT-GRASS.** *Distichlis.*

**SALT TREE.** *Halimodendron argenteum.*

**SALVIA** (Latin, *herbaceous or healthy*; referring to the medicinal properties of the common Sage, *Labiata*). A genus of about 600 species of herbs, subshrubs and shrubs, mostly to Del Norte, including *Sage* Clary, *Salvia* and *Salvia* plurigenus, and many other interesting plants. Salvia is by far the largest of the 136 genera of Labiata described by Bentham and Hooker, and is characterized by certain peculiarities of their flowers that are connected with the cross-pollination of the *fls.* by insects. It has been well said that the structure of the flower in *Salvia* is as complicated and specialized as in any other. Some idea of this structure may be gained from Fig. 2241. The bodies shown at 1 and 2 are the two fertile anthers, or rather anther cells. The anthers 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 smaller body which joins the connective to the thorn. The extra-ordinary length (or rather width) of the connective is one of the main generic characters of *Salvia*. In ordinary flowers the connective is thread-like, a linear extension of the filament, and barely separates the two anther cells. In *Salvia* the anther cells are forced to an exponent, in many cases 2 of the cells are obliterated or devoid of pollen.

Within the generic limits of *Salvia* the variation is astonishing. The color of the *fls.* ranges from scarlet through purple and violet to azure-blue, white and even pale yellow, but there seems to be no good pure yellow. Pig. 2243 indicates something of the range in form of corolla and calyx. Some flowers gape wide 3-lobed, but frequently it does not appear to be so, for the lateral lobes are imbricate while the midlobe

2241. Section of a *Salvia splendens* (X 1). Showing structure of stamens.

The hardy species are mostly border plants, blooming in spring and summer, and are generally used for summer bedding, sometimes for conservatory decoration in winter. Many of them bloom in summer and late fall, especially when they are treated as half-hardy annuals.

As regards color of flowers there are also two important groups, the scarlet-flowered, and the kinds with blue, purple, violet, white or variegated flowers. Of the scarlet kind, *S. splendens* is the most 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 *Salvia* cultivated for ornament is *S. splendens*, or Scarlet Sage. This is one of the most brilliant red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places to light up dark woody recesses. It should have a dark background of some kind by way of contrast.

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**SALT TREE.** *Halimodendron argenteum.*

**SALT-GKASS.** *Distichlis.*
Salvia splendens (X K). No. 2.

SUMMARY OF SUBGENERA AND SECTIONS.

Subgenus I. Salvia Proper. Corolla with a hairy ring inside; anterior portion of the connective sometimes directed outward and bearing either a fertile or sterile anther cell, sometimes deflexed and acute, rarely reduced to a short tooth. Includes carduacea.

Section 1. Heliosphace. Bracts imbricated, spinescent; posterior lip of calyx 3-toothed; connective bearing a perfect anther cell on the posterior side. Includes carduacea.

Section 2. Hypenosphace. 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. Drumosphace. Herbs, usually tall and gluttonous; teeth of calyx scarcely enlarged in fruit; posterior lip of the corolla falcate, compressed. Includes hians.

Subgenus II. Callesphace. Corolla with a hairy ring inside; anterior portion of the connective deflexed, aecently dilated, connected at the calyx extremity. All Old World, herbaceous species. Includes argentea and Scarea.

Section 1. Callesphace. By far the largest section, characterized as above, and within these limits, immensely variable. Over 250 species, including azurea, cacaliafolia, cocinea, farinacea, fulgens, involucrata, lanceolata, leucantha, patens, Sessei and splendens.

Subgenus IV. Leonia. Corolla with a hairy ring inside; anterior portion of the connective sometimes directed outward and bearing either a fertile or sterile anther cell, sometimes deflexed and acute, rarely reduced to a short tooth. Includes Columbariae.


Section 10. Neurospace. Bracts deciduous; posterior lip of calyx trunca.te, the teeth small and remote; posterior lip of corolla straight, concave. Includes Horminum.

Section 11. Notiosphace. Bracts small or minute; posterior lip of corolla entire or with 3 minute connivent teeth. Includes no species cult. in America.

Section 12. Hemiosphace. Bracts small; posterior lip of calyx 3-toothed; connective somewhat continuous with the filament and produced into a very short tooth. Includes verticillata.

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**KEY TO SPECIES.**

(Based on garden characters.)

| A. Color of corolla dull purplish, without a trace of purple.
| B. Tube of corolla nearly colored; lower lip short.
| C. Diaphanous, with long hairs above the lips.
| D. Base of corolla, hairs usually found at base of corolla.
| E. Lower lip twice as long as upper.
| F. Whorls 10-20-fld.
| G. Leaf entire, very slightly narrowed above.
| H. Color of calyx and corolla not as above.
| I. Whorls about 2-fld.
| J. Duration annual.
| K. Duration perennial.

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1. **Greggii**, Gray. Distinguished readily from the common red-flowered kinds by the fact that only the lower lip is showy. This is rare, and the rest of the corolla dull purplish. The foliage also makes it highly distinct. Though a native of Texas and Mexico it is offered by several dealers in hardy border plants. John Saul considers it "nearly hardy in Washington." Figs. 224:1, 2. Shrubs, 3 ft. high: lvs. linear-oblong, obtuse, narrowed at base: racemes 2-3 in. long, 6-10-fl.: upper lip short; lower lip with the large middle lobe 2-lobed and 2 small, rounded lateral lobes. B.M. 1873; 250. — The plant figured in G.C. II. 15:117 as *S. pratensis* is probably due to a mistaking of F.S. 14:78. The present idea that the name is referable to *S. Rozelii* is probably due to a mistaking of the plant in having a raceme and more compact habit, with brighter and more numerous flowers. C.G. II. 14:781; III. 6:635. Gn. 21:236 (good picture). F.S. 5:351. Other trade names are var. compacta, compacta, *S. pratensis*. There are about a dozen varieties with personal names. Section 7.

2. **splendens**, Ker-Gawl. SCARLET SAGE. Figs. 221, 2242. The most popular of all red-flowered Salvia. Tender perennial herbs from Brazil, 2-3 ft. high, with scarlet fls. 2 in. or more long: borne in terminal pyramidal racemes 6 in. or more long, with 2-6 lvs. in a whorl and 20 or more lvs. in a raceme. Lvs. ovate, acuminate, serrate; calyx scarlet, large, loose, plaited; corolla tubular; upper lip divided; lower lip 3-lobed, the lower lobes much narrower and reflexed. B.R. 5:587. — Var. Braunti, Hort., int. before 1860, was an improvement on previous forms in having larger leaves and more compact habit, with brighter and more numerous flowers, C.G. II. 14:781; III. 6:635. Gn. 21:236 (good picture). F.S. 5:351. Other trade names are var. compacta, compacta, *S. pratensis*. There are about a dozen varieties with personal names. Section 7.

3. **rutilans**, Carr. A plant of unknown habitat which is probably a horticultural form of *S. splendens*, differing in having a small green calyx, whorls nearly always 2-flowered, and in florescence axillary as well as terminal and paniced rather than racemose. B.M. 1873:250. — The plant figured in G.C. II. 15:117 as *S. rutilans* has an unbranched raceme, with 6-flowered whorls and small calyx. Offered as late as 1893 by John Saul.

4. **fulgens**, Cav. CARDINAL SALVIA, MEXICAN RED SALVIA. Differ from *S. splendens* in the darker red of the fls., the corolla lvs., and the calyx, which is dull colored and conspicuously striate but hardly "scorched"; also the 3 lobes of the lower lip seem to be all about the same size and lineg in the same plane instead of having the lateral ones reflexed. Mexican shrub or herb, 3 ft. high: lvs. ovate, cordate, somewhat acute, not acuminate, B.R. 10:1256. This name seems not to be admitted in America to day, but in 1866 Gray stated that *S. splendens* is the true *S. rutilans* has an unbranched raceme, with 6-flowered whorls and small calyx. Offered as late as 1893 by John Saul.

5. **coccinea**, Linn. This name is said to be loosely used in trade catalogues for *S. splendens*, and it is doubtful whether the true *S. coccinea* is in cult. Perennial or annual, 2 ft. high: lvs. cordate: fls. deep scarlet, 1 in. or less long: calyx slightly reddish, lower lip twice as long as upper, the middle lobe very large and 2-lobed. Trop. America; also S. C. to Fla. and Tex. Var. lacteae, Hort., is advertised. Section 7.

6. **Pseudo-coccinea**, Gray (S. Pseudococcinea, Jacq.). A tall variety which is borne on stiff, sturdy, erect stems, instead of glabrate. B.M. 2564.

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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-cleft. Tex., Mex. R. H. 1854:301. B.M. 4939. F.S. 11:1080. - Considered hardy by Thorburn. Section 10.

7. **Sessed**, Benth. [S. Huculii, Schidlw.]. Fig. 2243. Richardson 2.2 in. long, with deeply 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 apex. Mexican subshrub; scabrous, serated, not coriaceous. F.S. 14:196.

8. **carduacea**, Benth. Fig. 2243. Unique among **Salvia** for its thistle-like foliage and fringed fls. The lvs. and the long-pinnate bracts are very prickly and the line-colored fls. much cut, the fringes of the lower lip being more numerous and deeper. Tender perennial from Calif., 1-11/2 ft. high, very woolly: lvs. all radially, densely woolly beneath. B.M. 4874. C. G. II. 19:56. - Offered by Calif.collectors and lately by eastern seedsmen. Section 8.

9. **Columbarium**, Benth. A common Californian annual hardly worth cult. for ornament, the blue fls. being about 1/2 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 obtuse. B.M. 6355 (fls. blue). - Offered by Orcutt.

10. **officinalis**, Linn. Sage. Woolly white, south European subshrub. Foliage greatly in breadth and woolliness of lvs.: fls. purple, blue or white, large or small: whorls few, dense, 10-20-fl.d. - The form commonly cultivated as a kitchen herb is var. *tenMor*, Alef., with lvs. 4-7 times as long as broad: var. *salicifolia*, Alef., with lvs. 3-4 times as long as broad: var. *lati-folia*, Alef., with lvs. 3-4 times as long as broad: var. *salicifolia*, Alef., with lvs. 4-7 times as long as broad: var. *latifolia*, Alef., with lvs. twice as long as broad: var. *crispa*, Alef., with crisped and variegated foliage: var. *starkiana*, Alef., lvs. green and white: var. *icteria*, Alef., lvs. green and gold; var. *purpurascens*, Alef., with such a reddish foliage which is said to have the strongest and pleasantest f. and is preferred in England for kitchen use; var. *Milleri*, Alef., with lvs. somewhat red and spotted; var. *aurora*, Hort., with greenish upper foliage and coppery habit: var. *violina* (S. *trieler*, Hort., not Linn.), with lvs. of three colors, gray-green, yellowish white and pink, becoming rosy or deep red. Section 1.


13. **hiana**, Cav. Fig. 2243. Handsome hardy perennial herb from the Himalayas, with large blue or purple fls., the lower lip often white, prettily speckled with blue or purple: plant villous, 2-3 ft. high: lvs. 3-3 in. long, deltoid or ovate, base truncate or hastate; petiole to 3 in. long: raceme 3-4 in. long: fls. 1-1 1/2 in. long; upper lip 2-lobe'd, lower lip with long labiolar midlobe and broad revolute side lobes. B.M. 6157. B. R. 27:39. R. H. 1845:145. - Section 3.

14. **Scalrea**, Linn. Clay. Biennial (according to Bull. Ivs. broadly ovate, coriaceous at the base, the largest 8-9 in. long, 4-5 in. wide: fls. pale purple or

the light blue maely calyx. Botanically close to S. *azurea* but easily distinguished by color of fls. Perennial herb, 2-3 ft. high: lower lvs. ovate-lanceolate, coarsely and irregularly serrate; upper lvs. lanceolate or narrower. R.H. 1872:90. G.W. 9:19. P. 86. - Although native of Texas, it is offered by several dealers in hardly herbaceous perennials. It is also treated as a hardy annual. Section 7.

15. **leucantha**, 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. 1-1 1/2 in. long, calyx densely lanate. According to De Piccoli the whorls are many-fl.d., but in B.M. 4318, F.S. 22:2318, and G.W. 21:336 they are mostly 6-fl.d. - Section 13.

16. **argentea**, Linn. Biennial. 2-4 ft. high, viscid: lower lvs. 6-8 in. long, oblong, crenate, rugose: indor-escence a panicle 2-3 ft. long, usually composed of 3 branches: whorls distinct, about 6-fl.d.: 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 woolly white foliage alone. Section 5.


18. **involuta**, Cav. This has just enough purple in its fls. to exclude it from the scarlet-fl.d. 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: indorscence dense. B.M. 2872. B. R. 14:1205. R. H. 1858, p. 239. - Var.

2244. Habit of Salvia farinacea. No. 36.

21. Ianthina, Otto & Dietr. (S. Howeij, Hort.). Tender herb, doubtless perennial, with the habit of S. splendens, but the fls. purple-violet, the calyces colored still deeper. Supposed to be native to Mex. or Peru. F.S. 9:881. R.H. 1841:61. — S. anathros is not advertised, but S. Howeij, said to be a sport from S. splendens originating with C. M. Howeij, is probably synonymous with S. anathros. G.C. H. 15.145. — Section 7.

22. Aurea, Linn. Blue-fl. perennial, 1-5 ft. high; lower lvs. petioled, upper ones sessile, all oblong-lanceolate, rounded or cordate at base; whorls 6-10-fl.; corollas twice as long as calyx. En., N. Asia. — Section 6.

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. En., N. Asia. — Section 6.

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. petioled, oblong-lanceolate, rounded or cordate at base, glabrous above, pubescent beneath along the petioles and nerves; stem lvs. few, sessile; uppermost lanceolate bracts shorter than the calyx, reflexed, ciliolate at the margin: fls. about 1 in., long, blue, calyx-sticky villous; corolla three as long as calyx. — Var. rubicunda (S. rubicunda, Wendel.) is a name which may be used for the reddish-fl. form cult. in America. Var. alba, Hort., has white flowers. The following forms are given by Yoss, and are probably procurable from German var. atroviolacea, albiflora, and variegata; the last has pale blue fls., with the inside of the lower lip white.

25. Venenacea, Linn. (S. Spirochlamys, Will.). Hardy perennial herb with blue, rarely whitish fls. Here probably belongs S. speciosum of the American trade, which is presumably an error for S. speciosum. 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. En., Orient.

26. Lanceolata, Bronn. A plant has been cult. under this name in American nurseries, but it is believed to be a rarely pubescent, and is probably some common species. The true S. lanceolata is an annual with blue or purple flowers about 1 in. long. Prairies, Neb. to Tex., Ariz. and Mex.; also E. Fla.

27. Patens, Cav. The most popular tender blue-fl. salvia, Perennial herb: stem phloes. 1-2 ft. high; lvs. petioled, ovate-lanceolate, ciliolate, hasteate at the base, or the uppermost lvs. rounded at the base, hispid on both sides; bracts lanceolate, spreading, few, remote; whorls 2-fl.; 5 ft. in longer blue, more blue; calyx villosus. Mts. of Mex. B.M. 5108. B. 3:109. F. 1816:222. Var. alba, Hort., is advertised in Europe. Section 7.


S. anathros. B. 3:109. Patna, Peruvian blue-fl. shrub, the lower lip of corolla white toward the base. R.H. 1841:61. — S. amarum, Steud., is a synonym of S. lamelliflora. S. amarum, Cav. Mexican blue-fl. perennial herb, the lower lip longer than the upper and more or less white toward the base. R. 1841:154. — Section 7. — S. alterniflora (S. speciosa) is a remarkable South. African shrub, with large, bronzy yellow fls. Lvs. white-woolly, petioled, ovate or roundish, calyx exceptionally large and broad, base, bell-shaped and blunted. R. 1841:154. — Section 7. — S. pratensis, Linn. A perennial from southeastern En.; with yellowish fls., the upper lip spotted red. R. 1841:159. Section 7. — S. Boliviana, Planch. One of the most desirable Salvias, not cult. in America. It is a splendid red-fl. shrub found in the Bolivian Andes at 10,000-12,000 ft., and has a remarkably dense raceme of tubular fls., each 2 in., and about 12 in. long. It is close to S. rubicunda, but, Hooker says, "the petals of S. Boliviana are much denser-flowered, the leaves larger with longer lvs., and the corolla long and straighter, with a smaller lower lip." B.M. 6714. F.S. 11.148. — Section 7. — S. crassifolia, Bess., is a native of Arizona and California, and a plant of the desert which has a curious beauty, and a very beautiful corolla, for which it is excellent in the collection. It is found in the southern part of the state, and is a beautiful plant for the garden, and is very hardy, and is excellent for the southern part of the state.
Section 14 - Sambucus. B.M. 6880. Section 11 - S. sachleri. Benth, has white fls. 2 in. long and is one of the few desirable plants from Abyssinia. It is a mountain plant, presumably a tender perennial herb with promise of future cultivation, and was grown in the Royal Botanical Gardens, Kew, B.M. 6590. Section 5 - S. strictifolia. Hook., is exceptionally interesting by reason of its stiffly erect, tubular fls., the lower lip not at all broad and with the white, borders of the lip not a good yellow that Saffron affords. F.A. 15, p. 35. Section 15 - S. chamissonis, Cav., is a blue-flowered Mexican shrub, the lower lip broad and with the white, borders and the mouth of the lip not only broad but long, and the upper lip pointed at the tip. Also found in Mex. B.M. 998.

Section 7 - S. canadensis. Pohl, is a unique and most desirable plant in the genus, as it is extensively branched, having 2 dozen distant wheels of fls.; wheels many-fl., fls. small, club-shaped, not widely gaping, white at base and with the white, borders and the mouth of the lip not at all broad, the mouth of the lip rounded and the lower lip long, the calyx teeth long, the lower lip not at all broad and with the white, borders and the mouth of the lip not a good yellow that Saffron affords. F.A. 15, p. 35. Section 7 - S. chamissonis, Cav., is a blue-flowered Mexican shrub, the lower lip broad and with the white, borders and the mouth of the lip not only broad but long, and the upper lip pointed at the tip. Also found in Mex. B.M. 998.

Salvia (V. Heer, Kegel) f.l., Tales of the love of the plant, the water, and the plant. S. hancockia, Huis. is a shrub found in thistles belonging to a group remarkable for their density woody canes. It is figured in K.H. 1844 with white corollas and purple canes. Section 7 - S. forskholii. Lindl. is a hardy perennial from Asia Minor. It is worth cultivating it is for the beauty of its variegated fls., which are curiously marked with violet, blue and white, the filaments red and the anthers blue. B.M. 9387. Section 8 - S. canadensis. Pohl, is a unique and most desirable plant in the genus, as it is extensively branched, having 2 dozen distant wheels of fls.; wheels many-fl., fls. small, club-shaped, not widely gaping, white at base and with the white, borders and the mouth of the lip not at all broad, the mouth of the lip rounded and the lower lip long, the calyx teeth long, the lower lip not at all broad and with the white, borders and the mouth of the lip not a good yellow that Saffron affords. F.A. 15, p. 35. Section 7 - S. chamissonis, Cav., is a blue-flowered Mexican shrub, the lower lip broad and with the white, borders and the mouth of the lip not only broad but long, and the upper lip pointed at the tip. Also found in Mex. B.M. 998.

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A. Color of fruit black or blackish.
B. Fruit and glaucous.
C. Height 12-25 ft. when full grown.

nigra, Linn. Common European Elder. A large shrub or small tree, 12-25 ft. high, with rough bark; old wood hard, yellow, fine grained; lfts. 5-9; fls. in flat 5-rayed cymes; fr. black.

Samphire (Crithmum maritimum) is the name corrupted from samewre, itself a corruption of the French Samier Pierre (St. Peter), given to a succulent-stemmed, half-hardy perennial, well known upon rocky coasts above high tide in Great Britain as sea-fennel, parsley-root, and St. Peter's herb. It belongs to the family Umbelliferae. The plants, which attain a height of from 1-2 ft., have somewhat linear, acuminate green, fleshy leaves, ½ in. long, small, white or yellowish flowers, which appear in umbels during July, and oblong, yellowish, fennel-like, smallish seeds of light weight, which ripen in early autumn and lose their germinating power within a year. For more than three centuries the crisp and aromatic leaves and young stems gathered in August or September have been used in salads and vinegar, upon which samphire rarely reaches perfection in gardens far from the sea-coast, unless grown upon sandy or gravelly soil, and watered frequently and plentifully with weak salt and soda solutions. It may be propagated by cuttings in August, but better by sowing the seed as soon as ripe, the plants being thinned to stand from 1½ ft. at a distance of 2-2½ ft. apart.

Golden Samphire (Suaeda crithmoides), a native of the marshes and sea-coast of Great Britain, is an erect, hardy perennial, 1½ ft. tall, with small, fleshy leaves.
and yellow flowers in small, umbel-like clusters. Though grown and used like true Samphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family Compositae.

For Marsh Samphire, see Salicornia. M. G. Kains.

SANCHÉZIA (after José Sánchez, professor of botany at Cadiz). Aracáthraceae. Strong, erect herbs or half-shrubby plants; lvs. large, opposite, entire or slightly toothed; fls. orange, red or purple, united into heads or spicate at the ends of the branches, or rarely paniculate; calyx deeply 5-lobed, segments oblong; tube of the corolla long, cylindrical, somewhat ventricose above the middle, limb of 5 equal, short, rounded 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.

noël: Hook. Plants stout, erect, smooth, except the inflorescence: stem 4-angled; lvs. 3-9 in. long, oblong-ovate to oblong-lanceolate, obtusely toothed, narrowed into winged petioles, connate; fls. 2 in. long, yellow, in heads subtended by bright red bracts, the heads forming a panicle. Ecuador. B.M. 5.395. F.S. 23:2437. Var. glaucofylla, Lem. (var. variiquea, Hort.). Lvs. variegated with pale yellow or white along the veins. 1867, p. 134. I.H. 14:528 (as S. noél): 16:586.—A hot-house plant which is very attractive when well grown, but which becomes straggling and weedy if neglected. Grown mostly for its foliage.

Hennrich Hasselbring.

SANDAL-WOOD. See Adenanthera.

SAND-BUR. See Ceratococcus.

SANDESONIA (John Sanderson, discoverer of S. aureaunca). Liliaceae. A genus of 1 or 2 species from Natal; tuberous plants growing 1-1½ ft. high, slender, with many sessile stem-leaves and yellow or purple globular bell-shaped flowers, pendulous from a number of the upper leaf-axes, the segments with pointed nectaries at the base. Perianth gamophyllous, urceolate: segments deltoid or lanceolate: stamens 6; filaments filiform; anthers linear-oblong, the cells mucronate in front. Style long, nearly equal to the filaments. Ovary 3-loculed. Glass-house plants, to be treated like Gloriosas.

SAND SORREL. See Parietaria.

SAND-WORT is an English name for Arenaria.

SANGÜINÁRIA (Latin, blood; referring to the yellowish red juice of the plant). Papaveraceae. Blood-root. A single species common in woods of eastern North America. Rootstock several inches long, about ¾ in. thick, horizontal: lvs. radical, cordate or reniform, usually one to 1½ in. from each root bud, on petioles about 8 in. long: fls. white, often tinged with pink, 1–3 in. across, mostly solitary, on scapes about 8 in. long, appearing just preceding the full grown leaves; sepals 2, fugacious; petals 8–12, in 2 or 3 rows, oblong or obovate, early deciduous: calyx 1 in. long, oblong, 2-valved. The Bloodroot is a showy spring flower usually found in woodland, but not a true shade-loving plant, since its growth is, to a great extent, made before the foliage of the trees expands. In cultivation it prefers a rather light soil, but will grow anywhere. It will do as well in sunlit as in shade and will even grow amongst grass, if care be taken not to mow down the leaves until it has perfected the root growth and buds for the following season. The roots are best transplanted after the leaves have ripened, until the autumn root growth commences, but they may be moved when the plants are in flower. The roots are offered at such low prices by collectors that the plant should be used to a much greater extent for spring gardening.


F. W. Barclay.

SANGUISORBA (Latin name referring to reputed medical properties, connected with sanguis, "blood"). Rosaceae. About 30 species of upright mostly perennial herbs, with compound leaves and greenish, small flowers in heads; flowers usually perfect (sometimes part of them imperfect), the stamens numerous (rarely 2 or 4), the pistils mostly 1 or 2, the petals none, the uncolored calyx inclosing the mature achenes. The Sanguisorbas are natives of the northern temperate zone. Two species are sparingly cultivated in this country. See Poterium.

minor, Scop. (Poterium Sanguisorba, Linn.). Burnet. Perennial, growing in clumps, glabrous or sparsely hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6-10 pairs and orbicular to oblong and deep-toothed: stems 1-2½ ft. tall, terminating in small globular or oblong heads; lower fls. in the head, stem stipules, the others perfect, the stigmas purple, tufted and exserted. Eu., 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, obtuse, sharp-toothed: fls. heads cylindrical, 2–6 in. long, the fls. all perfect, white or yellow. Low grounds, Mich. east and south. An interesting plant, worthy a place in the hardy border, and sometimes sold for that purpose. It produces much foliage. Grows 5–6 ft. tall. L. H. B.

SANICULA (Latin, to heal). Umbelliferae. Sanicle. Black Snake-root. About 20 species, nearly all American, mostly perennial, glabrous herbs with alternate, palmately divided lvs. and small yellow, white or purplish fls. in compound, usually few-rayed umbels; fr. nearly globular, small, covered with hooked bristles. Woodland plants with insignificant fls. Useful occasionally as a ground cover in waste shaded places. The following species have been offered by collectors.
SANICULA (F. W. Barclay). Fls. yellow.

Ménziesii, Hook. & Arn. Stem solitary, 1-2½ ft. high, branching; lvs. compound, 2-3 in. across, very deeply 3-5-lobed; fr. about 1 in. long, becoming distinctly pellucide. C Calif.

AA. Fls. purple, rarely yellowish.

bipinnatifida. Doug. About 1 ft. high, with a pair of opposite lvs. at the base and 1-3 above, long-petioled, triangular to oblanceolate in outline, 2-3 in. long, pinately 3-5-lobed. fr. sessile. Calif.

AA. Fls. greenish white.

Marylandica, Linn. Stem stout, 1½-4 ft. high; lvs. bluish green, the basal long-petioled, the upper sessile, 5-7-parted; fr. sessile. Atlantic to Rocky Mts. Common in woods.

SANSEVIERIA (after Raimond de Sangro, Prince of Sansevierio, born at Naples 1716. The spelling Sansevieria is not the earliest). Hemiepiphyllum. Bow-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, fleshly, somewhat stout-stemmed; lvs. terminal, in clusters or rosettes, fleshy, firm, often long, 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, 3-5-lobed, often with a broad base. Sansevierias are easily propagated 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, and if they are then planted with the basal part of the root bare, 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.

A. Lvs. flat.

Guineensis, Willd. Lvs. 1-3 ft. long, 3-6 in a cluster, oblongate, radical, dark green with lighter transverse markings, some with inflorescences 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.


AAA. Lvs. cylindrical.

Cylindrica, Boj. Lvs. often 2-4 ft. long, 8-10 in a tuft, terete, solid within, dark green, often banded with paler lines, acuminate, occasionally furrowed; fls. with flore-pleno, Hort. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1860, p. 127.-Var. flore-pleno, Hort. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1860, p. 127.-Var. incisa, Willd. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1860, p. 127.-Var. flore-pleno, Hort. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1860, p. 127.

F. W. BARCLAY.

SANTOLINA (derivation of name doubtful). Compositae. About 8 species of shrubs or rarely herbs, natives of Europe and Asia, mostly in the Mediterranean region. Lvs. alternate, aromatic; margins tuberculeously dentate or pinately lobed: fls. heads yellow or rarely white, of disk fls. only, many-fld.; involucre mostly campanulate, squarrose, indurated, appressed. Santolina is valuable for its distinct foliage and is used for large specimens in shrubbery or as a carpet bedding plant. Cuttings for the latter purpose are usually taken in the spring from plant wintered in a frame but may be taken before frost in the fall. They are easily rooted in sand.

Chamaecyparis, Linn. (S. incana, Linn.). LAVEN DE COTTON. A hardy half-shrub, 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. canescent. Var. incana differs but little from the type: involucres pubescent.

S. alpina, Linn. is Anithemis montana, Linn., which makes a pretty ground cover and has yellow fls., but appears not to be in the true.

SANVITALIA (after a noble Italian family). Compositae. A genus of about 4 species, natives of the Mediterranean region and United States and Mexico. A rather low, much-branched herb, with opposite, petioled, mostly entire leaves and small solitary heads of fls. with yellow or sometimes white rays; involucre short and broad, of dry or partly dry, andless, with the angles produced into spiciform processes from flat to subulate-conical, at least in fruit; its chaffy bracts concave or partly compound: achenes all or only the outer ones thick-walled, those of the rays usually 3-angled, with the angles produced into inconspicuous spreading awns or horns, those of the disk often flat and winged.

procumbens, Linn. A hardy floriferous annual, growing about 6 in. high, trailing in habit; lvs. ovate, about 1 in. long; fls. heads with dark purple disk and yellow rays, resembling small Rudbeckias, less than 1 in. across, numerous: achenes of the disk flattened and often winged and 1-2 aristellate. Summer to very late autumn. Mexico. B.R. 9:707. R.H. 1860, p. 127. — Var. fiore-pleno, Hort. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1866, p. 76. Sanvitalias are of easy culture but prefer a light or sandy soil in full sunlight.

F. W. BARCLAY.

SAP. The term sap is applied to the juices of the living plant. Sap is composed of mineral salts absorbed from the soil and organic substances constructed within the living plant. The water taken from the soil by the roots or other absorbing organs contains potassium, sodium, calcium, iron, and nitrates, phosphates, sulfates, and chlorides. As the fluid passes from cell to cell in the living plant, the water taken up from the soil and the water taken up from the air, their proportions have been formed by protoplasm. As a consequence of 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 90 or even 96 per cent of its 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 proteids or albumens. 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 sugar beet, and the 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 water from the leaves demands an enormous supply of 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 accompanies 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 most noticeable at the beginning of the growing season, and is also especially noticeable in the vine, dahil, castor-oil plant, cactus, pisoniana 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 1 lb. of water in 24 hours; Agave Americana, 12½ lbs. in 2 days. Sap may bleed from one to two buds daily, while the cucurbits 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 out. Wild or native saponins are used for the living matter of plants. Saponarinas, of the family Saponariaceae, are 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 2, rarely 3: capsule ovoid or oblong, rarely nearly globose.

Saponarinas are readily established in any soil and require little care. S. angustifolius is an attractive plant for the rockery or for edging. Propagated by seed or division.

**SAPONARIA (Latin for soap; the roots can be used like soap for washing). **

Coryophyllaceae. SOAPWORT. A genus of about 25 species of annual or perennial herbs, natives of Europe and Asia, allied to Silene and Gypsophila. Calyx ovoid or oblong-tubular, 5-toothed, obscurely nerved: petals 5, narrowly clavate, limb entire or emarginate, scaly at the base or naked; stamens 10: ovary many-seeded; style 2, rarely 3: capsule ovoid or oblong, rarely nearly globose.

Saponarinas are readily established in any soil and require little care. S. angustifolius is an attractive plant for the rockery or for edging. Propagated by seed or division.

**Stem stout, erect. **

**Officialins, Linn. Bouncing Bet. **Fig. 2230. A perennial: stems 15-25 ft. high, leafy, simple, clustered, glabrous: lvs. mostly oblong-lanceolate, 3-nerved: fls. light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petals lobes oblongate, entire, notched at apex. July, Aug. Europe. — Var. flore-pleno is quite double-flowered. S. Caudicis, Hort., is said to be a deeper-colored double form.

**SAPINDUS (Latin for soap; meaning soap in Indian). **Sapindaceae. SOAPBERRY. A genus of about 12 species of trees, shrubs or woody vines inhabiting the tropical regions of the whole world. Wood yellow: lvs. alternate, exstipitate, abruptly pinnate: lvs. white, small, in lateral or terminal racemes or panicles: sepals 5, obtuse, rarely petaloid: petals more or less pubescent and bearing just above the short claw a villose or ciliated comb or appendage: disk annular, usually crenate, bearing 8-10 stamens: seeds with long tests and a small 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 early modern countries before the introduction of soap and is still preferred for washing the hair and cleansing delicate fabrics like silk.

**SAPINA (from Latin sapo, soap). **

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SAPONARIA in a loose corymbose panicle; calyx-teeth ovate, ob Rowe, membranous-margined. Spring. Italy, Greece. R.H. 1831:281. - Var. alba is also in the trade. Seed should be sown in the fall for spring bloom or in April for summer flowering.

SAPOPHYTYGE (Greek, cultura, and plant, i.e., living on dead organic matter). A plant (whether bacteria, fungi 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 integrity of the classification has been destroyed by the discovery of certain bacteria in the soil, as the nitrifying bacteria, which are able, even without sunlight, to appropriate the carbon dioxide of the atmosphere. 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. 225a]. Some of the flowering plants possessing ectotrophic mycorhiza (Indian pipe, Monotropa uniflora) and endotrophic mycorhiza (Yestrella maras- ciria, Cortorta tinuta, Euphyllum phylle, snow plant, Sarcodes sanguinea and Thlasvis aescerv) are also classed as saprophytes.

SARACA from Sarac, the name of the genus in India). Leguminosae. About 6 species of tropical Asian trees, with glabrous, rigid-oval-circular leaves; petiole long, yellow, rose or red, in dense, sessile, axillary, corymbose panicles with somewhat petal-like, redshaded bracts; calyx-cylindric, with a disk at its summit; limb 4-dimpled; lobes oblong, unequal, petal-like; corolla wanting; stamens 3-8, exserted; filaments filiform; anthers versatile, opening longitudinally; fr. a coriaceous flat pod.

SARACenia (Dr. Jean Antoine Sarrazin, an early botanist of Quebec, who sent S. purpurea to Tournefort). Saraceniaceae. Pitcher Plant. Side-saddle

SARCANTHUS (name from Greek words signifying flesh and flower, in allusion to the dense nature of the blossoms. 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 long concave middle lobe. Foliage and habit of Vanda.

SARRACENIA has flowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Procurable from southern Florida.
FLOWER. Three small genera and 8 or 10 species comprise the family Sarraceniaceae. All the plants are of the order Hydrocharitales, the main features of which are that the leaves are often modified into pitchers or traps, and that the flowers are generally sessile and hidden within the pitchers.

The pitchers are usually brightly colored, being green, red, yellow, orange, or maroon in color. The flowers are mostly small, yellow, or white, and are often very showy. The fruits are usually small and dry, and the seeds are minute.

A few species are grown as greenhouse plants, and some are cultivated in outdoor ponds or bog gardens. The pitchers are used for holding water and for containing small pond life, and the plants are often used as decorative features in garden designs.

SARRACENIA

INDEX.

1. Specific Types.

a. Pitchers spreading horizontally or obliquely.

b. Hood concave and covering the orifice.


b. Hood flatish, erect or soon becoming so.

2. purpurea, Linn. Common Pitcher Plant. Tall, with the one on which the genus was founded. Side-Saddle Flower. Fig. 2233. Pitchers ascending, relatively short and thick, 8-12 in. long, enlarging upwards, more or less purple-veined, broad-winged, the large, rounded-cordate hood hairy and purple-veined within: scape 1-2 ft. tall, bearing a flower 2 in. across, with lurd purple petals. Sphagnum bogs, Labrador to Florida, and west to Canada. Rocky Mts. B.M. 4093. L.B.C. 4308. G. C. II. 15:821. F. S. 19:1076. Mn. 1:81. G. W. F. 50. —Variable. In some forms the fl. are yellowish and the lvs. are not purple-veined. According to Robins, writing in 1823, this species was "cultivated before the year 1640, by Tractsen, who was gardener to King Charles the First."

AA. Pitchers erect and slender.

B. Hood concave, standing over the orifice.

3. variolaria, Michx. Fig. 2254. Pitchers narrow, sometimes ½ ft. long, either broadly or narrowly winged, more or less variegated and veined with purple (the under color yellowish white), the eunciliate hood covering the orifice and purple-veined within: petals 1 in. or more long, yellow or yellowish green. Low grounds, N. Car. to Fla. B. M. 1710. L.B.C. 9:803. Mn. 4:1. G. W. F. 263.

BB. Hood expanded, crenate or soon becoming so.

1. alba, Linn. Tall, the narrow, trumpet-like pitchers 2 ft. long, which are yellowish green and not spotted, the wing very narrow, the hood ovate and soon becoming hairy and purple and purple-spotted: petals ½ in. long, but enlarging shortly or quite twice that length, oblong and drooping, light yellow. Bogs and swamps, N. Car. (Va.) to Fla. B. M. 780. L.B.C. 20:1967. F. H. 182:121. F. S. 1868-8. G. C. 30, p. 367; 48:1631; 57, p. 336. Mn. 2:113.—This seems to be the most variable of the Sarracenias, and some of the forms referred to it may be distinct species. Var. atrosanguinea, Bull. (S. atrosanguinea, Hort.). Small lid or hood ovate-acute, deeply stained with red. G. C. II. 16:13. I. H. 27.
p. 86 bis. Var. crispa, Hort. (S. crispa, Hort.). Differs from the species in the deeper wing to the pitcher, the strongly red-dotted margins of the sepals, the white petals, the blunter, less conical ovary and the shorter and blunter lobes to the disk of the style. Pitchers about 2 ft. long. G.C. II. 15:629; 16:9. I.H. 41, p. 361. Said by some to be a hybrid of S. rubra and S. flavum, but Masters does 'not see any grounds for the supposition.' var. Rogetii, Shutt. 1. Large, the lid or hood, blotched with crimson at the base. Var. limbata, Bull. Large, livid, the lid or hood bordered with band of brownish crimson ¼ in. wide. Var. maxima, Hort. Pitchers large, with green lids. Var. minima, Hort. Smaller, all its parts var. ornata, Bull. Pitchers large, green, red-veiny, the inner face of the long stalked lid or hood bluish, the wing red veins: fs. said to be 8 in. across, canary yellow. G.C. II. 15:629; 16:12. Var. pieta, Bull. (S. Catesbiana, Ell. S. flavum, var. Fideli, Williams, S. Fideli, Hort.). Pitchers very large, red-veiny, with flat roundish wing.

cc. Base of hood broad, or only moderately contracted.

d. Lid or hood subangular.

5. Drummondii, Croom. Pitchers large and erect, 2-3 ft. long in well-drained, free-draining, humus-laden, green and prominently margined, the upper part of the pitcher richly variegated with purple reticulations and creamy white inter-spaces, the wing narrow: lid roundish, the base somewhat contracted, flatish or with recurved mostly wavy margins, becoming undulate on the inner face: fs. 4 in. across, red brown, Pine barrens. N. W. Ga., and adjacent Fla. G.C. II. 15:629; 16:656; 10:1071-2. I.H. 41, p. 363. — A very striking species, with its tall pitchers strongly variegated at the top. Var. rubra, Hort., has pitchers with red margins. Var. alba, Hort., has pale variegations and flowers. Var. undulata (S. undulata). Decumbent, less elongated pitchers, and strongly undulate lid. S. Mexicana, Hort., is said to be a small form of this species.

6c. Lid wholly or partially 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-acuminate or nearly obtuse to acuminate, becoming erect and concave, veined and tinted with red, the inner face somewhat pubescent: fls. 3 in. across, the pendulous petals white at the base and red-brown above, but differing in habit to hybridize in the wild with S. purpurea. var. acuminata, DC. Lid long-acuminate. B.M. 3545. L.B.C. 12:1663. Var. Sweetii, Mast. (S. minor, Sweet, not Walt. S. Sweetii, DC.). Smaller: pitchers cylindrical, with a narrow wing: lid ovate-acuminate. F.S. 10:1674.

II. Hybrid Types.


9. Courtii. S. purpurea × S. psittacina: "It has de- cumbent pitchers about 8 in. long and colored a rich deep crimson, their form being intermediate between those of the two parents." Raised by Mr. Court, at Veitch’s. S.H. 1:177.


11. Mandeliana. S. flavum var. ru.bra × S. Drummondii: Described as follows in Pitcher & Manda’s Novelty Catalogue of 1893: "A few plants of this rare and beautiful plant has been collected, growing in company with S. flavum and S. Drummondii, of which it is no doubt a natural hybrid, being intermediate between the two above-named species. The pitchers grow about two feet in height, are trumpet-shaped and broad at the opening: color light green with slight white mottlings. The lid is large and broad, slightly incurving, undulated at the edges, dark green shaded with red and blotted with white."

12. melanorrhöa. S. purpurea × S. Stevensonii, the latter a hybrid of S. purpurea and S. flavum: "In habit it is like S. purpurea, the pitchers being obliquely ascending and distended like those of purpurea, 6-7 in. high, with a deep wing, narrowing to either end, and a roundish to semi-lid 2½ in. across. The color is like that of S. Chelonei," Masters. Raised at Veitch’s.


15. Williamsii. Supposed natural hybrid of S. purpurea and S. flavum: "The pitchers are 9-12 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. flavum."


L. H. B.

SARSAFARILLA of commerce comes from various species of Smilax. Wild Sarsaparilla of America is Smilax rhizophora.

SASSAFRAS (Spanish, Salsa fras, Saxifraga; medicinal properties similar to those of Saxifraga were attributed by Spanish discoverers). Lawsonia. Ornamental deciduous tree, with alternate, simple or 3-lobed leaves and small yellow flowers appearing in few-flowered racemes in early spring and followed by ornamental dark blue fruit on red stalks. The Sassafras usually affects light lands, although it may grow in clay loams. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright-red colored fruit. It prefers, at least in the North, a warm and sunny position. It is not easily trans-
planted when old on account of its long tap-roots. Prop. by seeds sown as soon as ripe; also by suckers, which are often freely produced, and by root-cuttings.

One species in eastern N. America. Fls. dioecious, rarely perfect, apetalous; calyx 6-parted; stamens 9. the 3 inner ones furnished at the base with 2 stalked, orange-colored glands; anthers opening, with 4 valves; ovary superior, loculicid; fr. an oblong-ovoid, 1-seeded, dark blue drupe surrounded at the base by the thickened scarlet calyx.

**SAUROMATUM (saura, lizard; referring to the spotted flower).** Araceae. Perennial herbs, with unilobed, naked roots. Tubers bearing a single pedate leaf one year, the next year 1v, and fls.; petals cyindrical, spotted below; blade pedately parted; petalule short; spathe soon withering, its tube oblong, swollen at the base, more or less ciliate, its blade or lamina long-lanceolate, black-purple, variously spotted. Species 6. India, Java and Trop. Africa. DC. Mon. Phan. vol. 2.

The following are hardy bulbous plants, with large and glorious flowers, the planting of which is best done in 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.

**SASSAFRAS**. Liliaceae. Tree, 30-50 or occasionally 90 ft. high; young branches bright green; lvs. oval and entire; or 3-lobed, moist to the middle, obtuse, silky-pubescent when young, gla-

At a later stage, the young branches become covered with a thick, red-brown sheath. The flowers are small and inconspicuous, appearing in several-flowered racemes, umbellate when unfolding, afterward at the base of the young branchlets: fr. ½ in. high. April, May. Mass. to Ont. and Mich., south to Fla. and Tex. S.S. 7:304-305. Em. 2:360. (_S. officinalis_, Linn.). Figs. 2255, 2256 (winter tree). Described in 1850 by Alfred Rehder. Possibly planted when old on account of its long tap-roots.

**SAVORY**. Labiatae. Cultivated in kitchen gardens for its aromatic green parts, which are gathered in midsummer for flavoring meat, dressings and other culinary preparations. The slender, erect, branching, herbaceous stems, 10-12 in. tall, bear soft, narrow, green leaves and clusters of pink, purplish or white flowers in summer, which are followed by brown, aromatic 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, meadow, well-drained loams of moderate richness. When 2-3 ft. tall the plants are cut down to 5-6 in. in height, to form early crops, or they may be transplanted from the hotbeds sow in March.

Winter Savory (_S. montana, Linn._) is a hardy European perennial species, having much the qualities of

**SATIN FLOWER.** See *Sisyrinchium*.

**SATUREA,** or **SATUREJA.** See *Savory*.

**SAUNDERS, WILLIAM** (Plate XLI), horticulturist and landscape gardener, was born at St. Andrews, Scotland, in 1822; emigrated to America in 1846; was appointed botanist and superintendent of planting gardens, U. S. Department of Agriculture in 1862, and died at Washington, D. C., Sept. 11, 1900. When Mr. Saunders first came to America he served as gardener in a number of places, first at New Haven, Conn., and later near Germantown, Pa. He was instrumental in this time of the improvement of a number of important private and public properties, such as Clifton Park in Baltimore, an estate of 400 acres; Fairmount and other properties in Philadelphia, and cemeteries at Ambrose and Railway, New Jersey. Mr. Saunders' most important piece of work in landscape gardening was in connection with the planting of the streets of Washington in 1855. He was thought to succeed. One of the most important introductions was the navel oranges now at Riverside and elsewhere. While Mr. Saunders had been known best as a horticulturist, he was prominently identified with many other important movements looking toward the advancement of agriculture in this country. As early as 1850 the state was actively engaged in an effort to organize an association of farmers, and this work eventually resulted in the formation of the Grange, of which he is often called the father. His sturdy character, sympathetic nature and kindly disposition endeared him to all who came in contact with him. B. T. Gallaway.

2255. *Sassafras* _tree_.

2256. *Sassafras officinalis_.

**SAUROMATUM** (saura, lizard; referring to the spotted flower). Araceae. Perennial herbs, with unilobed, naked roots. Tubers bearing a single pedate leaf one year, the next year 1v, and fls.; petals cyindrical, spotted below; blade pedately parted; petalule short; spathe soon withering, its tube oblong, swollen at the base, more or less ciliate, its blade or lamina long-lanceolate, black-purple, variously spotted. Species 6. India, Java and Trop. Africa. DC. Mon. Phan. vol. 2.

The following are hardy bulbous plants, with large and glorious flowers, the planting of which is best done in 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.
SAVORY is a kind of cabbage.

SAVOY is a kind of cabbage.

SAW PALMETTO. Serenoa serrulata.

INDEX.

1. ligulata
2. Stracheyi
3. Milesii
4. cordifolia
5. purpurascens
6. Purpurasceus
7. Huertiana
8. oppositifolia
9. lingulata
10. Hostii

SAXIFRAGA: Latin, rock and to break; said by some to refer to the fact that many of the species grow in the crevices of rock, by others to the supposition that certain species would cure stone in the bladder). Saxi-fragaceae. SAXIFRAGE. ROCKPOUL. As outlined below (including Megasea), the genus consists of upwards of 150 species, mostly distributed in the northern temperate zone, many of them alpine and boreal. In the southern hemisphere they seem to be known only in South America. The Saxifrages are herbs, mostly perennial, with perfect small white, yellow or purplish flowers in panicules or corymbs; cilia 3-8, usually different; stamens 10, 8, sexes; ovary 3, usually 5; styles 1; fr. a 2-seeded or 2-valved capsule; or sometimes the capsule nearly or quite separate at maturity, with numerous seeds. See Engler, "Monographie derGattung Saxifraga," 1872.

Saxifrages are various in habit and stature, but they are mostly low and spreading with resolute 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. Owing to the small attention given to rock and alpine gardening in America, the Saxifrages are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are likely to suffer from the dryness and heat of the American summer. Partial shade in summer is essential for the best results with most of the species. In winter the stools should be given ample covering of leaves. The most useful kinds for this country are the species of the Megasea section. These are low plants of bold habit, and are admirably adapted for rockwork and for spring forcing under glass. Fig. 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. Aizoon 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 silvery effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade.

Most Saxifrages make stolons and offshoots freely, and by these the plants are easily propagated; they are also increased by division. Some make bulblets.

The number of species of Saxifrage worthy of culture 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. Geum and S. Aizoon, is somewhat like the latter parent; its pale white with purple dots; its spatulate to ligulate, very obtuse, crenulate-dentate; stem erect, few-leaved, glabrous-hairy, 6-8 in. tall. S. hybrids splendens is perhaps a hybrid of S. Geum by S. rotundifolius.
SAXIFRAGA

EE. Leaf—margins spreading, serrate, sometimes both margins and upper face ciliate
11. Cotyledon
12. Aizoon

CO. Axil and margin of leaves without pines.
D. True stem all subterranen.
E. Plant propagating by means of solid roots, in the very short-jointed 
13. granulata
14. rivularis

EE. Plant propagating by
non-bulbiferous shoots.
F. Foliation peltate, large.
G. Foliation not peltate, 

a. Petals yellow
16. chrysanthæ
b. Petals white (sometimes spotted).
H. Lower lvs. subterranen.

III. Lower lvs. erect or 

a. Splitting, oblong ot spatulate (olate in N. —271.
1. Shape of petals lanceolate or narrow.
20. bryophoræ
21. leucanthemifolia
22. Pennsylvanica
11. Shape of petals 

a. Lanceolate or 

b. Orbicular or
23. nivalis
24. Virginianæ
25. integrifolia

DD. True stem above ground, the plant propagating by evident stolons or offsets.
E. Petals all equal.
F. Petals more or less adnate to the calyx-tube at its base.
G. Foliation stiff and withering rather than falling, not divided, the margin usually setose.
H. azoidæ
26. bronchialis
GG. Foliation herbaceous, undivided or lobed. 
28. Camposæ
29. cæspitosa
30. aphylæ
F. Pistil free from the calyx-tube.
31. umbrosæ
32. Geum
EE. Petals unequal, the lower ones much larger than the others.
33. sarmentoæ

1. lingulata, Wall. (S. Schmidtii, Regel). Strong-growing plant, with large radical lvs. 8-9 in. across and orbicular or obovate in outline and coriace 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: frs. subglobose, drooping. Himalayan region. B.M. 3466, "the sepals too acute and the leaves too undulate," according to Hooker. L.B.C. 8:747. B.R. 1866:271. —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 bright rose-white fls.


2. Stracheyi, Hook. f. & Thom. (S. unguiculata, Hort., not Engl.). Fig. 2258. Habit of S. lingulata: lvs. glabrous on both sides, orbicular or obovate, usually not at all coriace at base, the margin ciliate and from crenate-serrate to nearly entire: pedicels and calices pubescent, the scape becoming 1 ft. or more tall: fls. white or rose (sometimes yellow), the calyx-teeth oblong and often wider above than below. Kashmir, 5,000-11,000 ft. B.M. 59677. B.R. 29:65 (as S. ciliata). G.M. 32:251.

3. Miletii, Leichtl. (S. Stracheyi, var. Miletii, Hort.). From S. Stracheyi it differs in having longer lvs. (9-12 in. long and 4-5 in. broad), white fls., oblanceolate, 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 coriace at base: scape 12 in. or less high, bright purple, hairy: fls. deep purple, nodding, the calyx-lobes very obtuse: fr. elliptic-lanceolate, erect. Sikkim (India), 10,000 to 15,000 ft. altitude. B.M. 5866. —Very handsome because of its purple scape and flowers.

7. Huetsiana, Boiss. 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 shallowly 5-7-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 oval or oblong: seeds small, tuberculate. Asia Minor. —Very effective little plant.

8. oppositifolia, Linn. Stem or caudex perennial and leafy, the branches rising 6 in. high and bearing many small persistent thick aequum-like 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, lilac or white, the obovate petals exceeding the stamens. Rocks, alpine and boreal parts of Europe and North America, extending into northern Vermont. L.B.C. 9:869. —An excellent little rock plant, making a sedum-like mat, the foliage of a purplish cast. There are several cultivated forms, as var. alba, fls. white; var. major, fls.
large, blue: var. *Pyreanaica* (or *superba*), fls. very large, rose-purple. *S. appositula* is evergreen. It makes a good carpet under other plants.

9. *lingulata*, Bell. Radical fls. in a rosette, numerous, linear-spatulate and somewhat acute, subulate above, the margin crese-crenulate and somewhat ciliate and crustate with lime; stem-fls. shorter, the margin carinate and less crustate and rising 1-2 ft., erect or flexuous; and bearing a thyrsoid panicle of small white fls. with obovate or oblong-obovate 3-nerved petals. Apenines and Alps.

Var. *Lantoscana*, Engler (*S. Lantoscana, Boiss. & Reut.*). Lvs. shorter, more or less attenuate below, but not at the apex, the margin thin. Maritime Alps. G.C. II. 15:109.

10. *Hostii*, Tausch. Radical or basal lvs. many, somewhat erect, flat above and the apex obtuse, ciliate at the base; stem-fls. obovate and nearly or quite obtuse, crenate-serrate: corymb 9-fld., the fls. white or the oblong-obovate and 3-nerved and the middle nerve usually bifid, the calyx glandular. Mountains of Eu. *Var. Lant03c4na*, Engler (*S. Lantosc&na, Boiss. & Heldr.*). Radical or basal lvs. many, somewhat erect, flat above and the apex obtuse, ciliate at the base. Eu., Asia, N. Amer., in this country occurring as far south as the White Mts. and Oolo.

11. *Cotyledon*, Linn. Tufted, the basal fls. forming attractive silvery rosettes, and sending up long panicles to a height of 1-2 ft.; basal lvs. lingulate or obovate, short-stalked, pubescent and bearing many pores; stem-fls. lingulate-lanceolate; fls. numerous, white, the petals cuneate-obovate and 3-5-nerved and the middle nerve usually bilabi, the calyx glandular. Mts. of Colo.—Has been offered by dealers in native plants.

12. *Aizoon*, Jacq. (*S. rosularis, Schleich. S. rieoto, Lap.*). Fig. 2260. Much tufted alpine plant, forming small dense rosettes and sending up a clump-like panicle, many-fl. scape 5-15 in. long; basal fls. spatulate, incurved, thick and persistent, the margins white and carinalgous and porose; stem-fls. smaller, spatulate or cuneate, directed towards the apex, the fls. small and many, cream color to nearly white, the petals obovate to elliptic and 3-5-nerved, and sometimes spotted at the base. Alpine and boreal parts of Europe, Asia and N. Amer., coming as far south in our eastern country, as northern Vt. and Lake Superior. — Very variable.

13. *granulata*, Linn. MEADOW SAXIFRAGE. Plant erect and branched when in bloom, 6-20 in. tall: radical fls. reniform, incised, clustered, pubescent: stem-fls. few, nearly sessile, cuneate: fls. white, somewhat bell-shaped, more or less drooping, about 1 in. across, the petals oblong-obovate and much contracted at the base and 3-nerved. Eu., N. Afr., 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. *rivulosa*, Linn. Matted little plant, with stems ascending 1-3 in. high; lower lvs. round-reniform, prominently 3-5-lobed, long-stalked; stem-fls. narrow-ovate to lanceolate, entire; lvs. ovate and spatulate. Eu., Asia, N. Amer., in this country occurring as far south as the White Mts. and Colo.

15. *peltata*, Torr. UMBRELLA PLANT. Strong plant, sending up large peltate leaf-blades or petioles 1-3 ft.
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 stem: fls. solitary on axillary pedicels near the top of stem, yelow: petal-margins spotted with orange, the petals obovate. En.: Asia, N. Amer., in the U. S. occurring in northern New England, northern New York, northern Mich., Rockey Mts., etc.

27. cinerea, Linn. Dwarf and cespitose, the scape a few inches high and nearly leafless but hairy at the base: lvs. linear to linear-lanceolate, mucronulate at the apex, ciliate or spinulose on the marcescent, stiff-h.: fls. solitary or corymbose, on a long, slender, peduncles, yellowish white with orange-red dots, the petals obovate-oblong. Asia and Arctic N. W., Amercia and Rocky Mts. Only var. cherlerioides, Engler (S. cherlerioides, Don.) has appeared in the Amer. trade: very dwarf, only 2 or 3 in. high, densely cespitose, few-flowered, the lvs. short and somewhat spatulate, the ped. and Alaska.


29. caespitosae, Linn. Exceedingly variable species: dwarf and cespitose, the fl.-stems erect and nearly leafless and somewhat glandular-pilosus (3-4 in. high): lvs. usually unequate but sometimes nearly equal, usually 3-5 and sometimes 5-fl., the lobes linear and obtuse, the leaflets spreading, oblong and obtuse, 3-7-nerve.

30. aphylla, Sternb. (S. leptophylla, Fr.); Small, loosely cespitéose 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 3-5 lobed: fls. light yellow, the petals linear and acute and about as long as the calyx.

31. umbrosa, Linn. LONDON PRIDE. ST. PATRICK’S CABBAGE. Erect-growing plant, the nearly leafless branching fl. stems reaching 6-12 in. high and springing from a dense rosette of lvs. 6-12 in. across: lvs. thick and mostly glabrous, oblong, crenate-dentate, the stalk-like base ciliate: fls. small, pink, with darker spots, in a loose panicle, the petals obovate and oblong and spreading. En.: in shady places.—A very neat and attractive plant, frequent in European gardens, but rarely taken care of. There is a var. variegata, Hort.

32. Geum, Linn. (S. hispidum, Linn.). Differs from S. umbrosa in being hairy, in having orbicular lvs. that are unequately notched at the base and on the long-stalks. Range: of moist, bogs, to our in New-England.

33. sarmentiflora, Linn. (S. japonica, Hort. S. Chinesis, Loud.). STRAWBERRY GERANIUM. In England known in Mother-of-Thousands, a name also applied to Eratosthymus Frida. OLD MAN’S BEARD. Fig. 220. True stem or caudex scarcely rising above the ground, but the fl. stems rising 1-2 ft. and much branched, whole plant sparingly hairy: stolons many, long and rooting freely at the joints after the manner of a strawberry: roots nearly orbicular, shallowly crenate lobed, the lvs. apiculate, all radical and long-stalked: fls. many, white, the 2 lower hanging petals lanceolate pointed or lanceolate, the 3 upper ones small and inconspicuous and pinkish and spotted. Japan and China. B. M. 92. [C. C. III. 7257 (showing irritability of plant to light)]. (26, p. 363; 32, p. 376, p. 427.—An old-time greenhouse plant, and also one of the commonest window-garden subjects. Of easiest culture. Var. tricolor, Sieb. (S. tricolor scoparia, Hort.), has lvs. bandedly marked with creamy-yellow and red variegations. F. S. 21:222-5 (as S. Fortunei tricolor). S. Fortunei; Hook. (B. M. 3577), is a closely allied spece., but is less (if any) sarmentose, the lvs. are more sharply toothed, the fls. are white and the lower petals are dentate.

L. H. B.

SAXIFRAGE. See Saxifraga.

SCABIOSA (Latin, itch: referring to medicinal use). Dipsacaceae. SCABIOUS. SCABIOUS. MOORINE BRIDE. About 52 species (from En., Asia and Afr.) of annual or perennial herbs, often somewhat waxy at the base, with entire, lobed, or dissected lvs. and blue, rose, yellow or white fls. in mostly long-peduncled globular or ovoid-conic heads. Branches of the involucres in 1 or 2 rows, foliaceous, mostly free: scales of the calyx small, narrow or none: corolla 4-5-toothed: stamens 4, rarely 2, all perfect. For a related plant, see Cosmos.

In any moderately good garden soil a succession of flowers is produced from June until frost. The flowers are very serviceable for cutting purposes. Propagated by seed or division. Many of the perennial species act like biennials in cultivation, and often flower the first year from seed. 8. atropurpurea is a common garden annual.

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2261 Saxifraga sarmentosa (L.)

A. Radical leaves dentate or lobed.
B. Fls. yellow
BB. Fls. dark purple, blue or white
C. Calyx-limb sessile or nearly so.
D. Lvs. linear or sub-linear.
E. Lvs. petioled.
F. Calyx-limb plicate.
G. Plant 2 ft. high.

2. arvensis

3. atropurpurea

4. stellata

AA. Radical leaf entire.
B. Lvs. ovate-longoblong.
C. Calyx-limb linear.
D. Heads 3 in. across.
E. Heads smaller.

1. ochroleuca

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1. ochroleuca
late; those of the stem pinnately divided with linear lobes, the upper linear-lanceolate: involucral bracts ob- tuse: fls. blue or white, 1-2 in. across. June–Aug. Not known to be in the trade, S. varia, Hort., being presumably mixed varieties of S. atropurpurea.

3. Columbària, Linn. A hardy perennial quite variable in character, 2 ft. high: stem branching, glabrous or nearly so: radical Ivs. ovate-obtuse, crenate, membraneous, pubescent on both sides; stem Ivs. 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. iba is cult.

4. atropurpurea, Linn. (S. majoor, Hort.). Sweet ScABions. Fig. 2262. An annual branching plant about 2 ft. high: radical Ivs. ovate-obtuse, crenate, membraneous; peduncles, becoming oblong or in fr. July–Oct. Eu. Gn. 21, p. 118. B.M. 247. F.S. 12:120–1. — Vars. candidissima, coocinea, compacta, major, mana and pumila are often offered as if they were distinct species, as S. mana, etc.

5. stellàta, Linn. An annual plant, hairy, simple or somewhat branched, 6–18 in. high: Ivs. cut or somewhat lyrate, the terminal lobe large, obovate, dentate, the upper ones pinnately parted; fls. blue, in long-peduncled heads; corolla 5-cleft, the lobes radiate. June and later. S. Eu.

6. brachiàta, Sibth. & Sm. An annual species about 1 ft. high: lower Ivs. ovate-oblong, the upper pinnately cut, lyrate; the lower lobes decurrent, the terminal large, obovate-oblong; fls. light blue. June and later. Eu., Asia.


J. B. Keller and F. W. Barclay.

SCABIOUS. For Common Scabious, see Scabiosa. For Shepherd's or Sheep Scabious, see Jasione perennis.
SCHAPHOSEPALUM

ish, thickly speckled with crimson; dorsal sepal broadly ovate, concave, strongly 5-ribbed, ending in a stiff incurved tail; lateral sepals spreading horizontally, falcately incurved, with a filiform process near the tip. Colombia. B.M. 7165.

SCARLETT ACHIMENES (after J. C. Schauer, professor at Greifswald, 1813-1848). Acanthaceae. Erect, half-shrubby herbs, with entire lvs.: fls. yellow or red, in a terminal thyrse or spike; calyx 5-parted, segments linear or setaceous; corolla-tube long, gradually broadened upward; limb 2-lipped, the upper lip interior narrow, entire or emarginate, erect, lower lip cut into 3 parallel anthers, about as long as the upper lip; aborted stamens wanting; style filiform: ovary seated on a disk, 2-loculed, with 2 seeds in each locule. About 8 species from Brazil. Closely related to Jacobinia, from which it differs by the equal parallel anther cells. It is distinguished from Anisacanthus by its setaceous calyx-lobes, and from Fittonia by its habit. Nees, Hort. (Justicia flava, Hort., not Flava, L.B.C. 1623).

SCARLET BUSH. Hamelia.

SCARLET LIGHTNING. Lycopsis Chalcedonica.

SCARLET PLUME. Euphorbia calyxus.

SCARLET RUNNER. A red-flowered variety of Phaseolus multiflorus.

SCENTED VERBENA. A name found in some books for the Lemon Verbena. See Lippia.

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SCHINUS (Greek name for the Mastic-tree, Pistacia Lentiscus; applied to this genus on account of the resinous, mastic-like juice of some species). Anacardiaceae. Resinous, dioecious 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 except one in the Sandwich Islands, one in Jamaica and one in St. Helena. Only two are cultivated; they are semi-tropical and grown in the 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.

SCHECHELIA (after Scheele, distinguished German chemist). Palmaceae. About 10 species of pinnate palms from tropical South America. Their large spines are armed in regular series or grouped, linear, in young plants unequally and obtusely 2-cut at the apex: fls. yellowish, dioecious or monoeious, 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. 1-5-seeded.

Schima (said to be an Arabian name). Ternstroemiaceae. About 9 species of tender evergreen trees and shrubs, with 5-petaled white fls. about 1½ in. across. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as Gordonia Javanica. Schima and Gordonia are closely related genera, distinguished by Bentham and Hooker as follows: Schima has inferior radicles, sepals scarcely unequal, ovules few in each locule and laterally axiled; Gordonia has superior radicles, sepals markedly unequal, ovules numerous in each locule and pendulous.

SCHMELZERIA (after W. Schmelzer, contemporary of Linneus, a German botanist). A name proposed for four Mexican and tropical American herbs which are now referred to Achimenes (which see). From Achimenes, Seeman, its founder, distinguished it "by its truly infundibuliform, not bilobed, stigma." In habit, the genus suggests Achimenes hirsuta, A. pedunculata and A. multiflora (see p. 18, Vol. 1). In the American trade one species is offered, S. Mexicana, Seem. (S. carvalhoana, Hort.), now more properly known as Achimenes Scheeri, Hemsl. Stem erect, hairy: lvs. ovate, hairy, dentate, stout-stalked, opposite: fls. solitary in the axis, stalked, the corolla 2-2½ in. long, the tube inclined or drooping and curved, the wide-spreading 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743. L. H. B.

SCHINDEN (after Schindele, distinguished German botanist). Compositae. About 10 species of pappose composites, 2-cut at the apex: fls. yellowish, di- or monoecious, 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 0, shorter than the petals: fr. 1-5-seeded.

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M611e, Linn. Peruvian Mastic-tree. Californian Pepper-tree. Figs. 2265, 2366. 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, 11-2 in. long; fls. in conical panicles, yellowish-white; ripe fruits the size of peppercorns (where the popular, but misleading, Californian name), of a beautiful rose-pink. Persoon, 1819, 2:366. - In southern and middle California more extensively cultivated than any other ornamental tree except, perhaps, the Blue Gum (Eucalyptus globulus), and thriving best in the warm interior valleys, though hardy on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. M. molle was a generic name used by Tournefort, and placed in apposition with Schinus by Linnaeus (explained above).

*Schismatoglossis* Schott. (Duranta depinum, DC.), is a shrub or small tree, with more or less drooping branches; lvs. 1-1 in. long, oblong or oblanceolate; fls. yellow, 1 in. long, produced in great numbers in racemes about as long as the leaves. Western S. Amer. B.M. 3267. B.R. 19:1566 (Duranta ovata); 19:1573 (D. depinum). - The genus *Duranta* was distinguished from Schinus chiefly by its simple foliage, but it is now considered a subgenus of Schinus. JOS. BURTT DAVY.

Schinus Malle 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 just so. Next to an oleander the black scale loves a Pepper-tree. Hence the Pepper-trees, being large and numerous, have been indirectly a serious menace to the orchards of citrus trees in recent years as long as the leaves. Western S. Amer. B.M. 3406. B.R. 19:1566 (Duranta ovata); 19:1573 (D. depinum). - The genus *Duranta* was distinguished from Schinus chiefly by its simple foliage, but it is now considered a subgenus of Schinus. JOS. BURTT DAVY.

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white, the total mass of green being less than the variegation; petiole 3-4½ in. long; blade 4½ x 1¼-2½ in. Borneo. I.H. 31:520. G.C. II. 24:361. — S. decorum, var. Wilttimanii, was offered in 1893 by John Saul, Washington, D. C.

S. Rubelium, Pitcher & Manda, 1895, p. 128. "Lvs. beautifully marked with silvery white in a broad featherly variegation. 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 1895-114, and the something is used in A.G. 19:569 (1898) as S. piets and in V. M. 21:71 (1890) as S. crispata. The plant so pictured is distinct from any species described above. There is more white than green in the leaf, only the edges and midrib portion being green. Some growers believe it to be a sport of S. crispata. — S. Seemanii, Hort. Bull. was advertised by the U. S. Nursery Co. 1895, but seems unknown to botanists. — S. vonapensis. Hort. Bull. still in cultivation, but imperfectly known to botany. Possibly a species of Aeghamena. W. M.

SCHIZEA (Greek, to split). Schizaea. A genus of small ferns, with twisted grass-like lvs. and sessile-like sporophylls formed of a cluster of closely compacted pinnae, each with two rows of sporangia, which in common with the family are pteridinoid, with an apical ring, opening by a vertical fissure.

pusilla, Parish. Our only native species, growing in sand barrens mainly in New Jersey. Lvs. an inch long, grass-like: sporophylls 2-3 in. long, with 6-8 closely compacted divisions, forming a spike at the apex. Known locally as Curly-grass. The prothallus only recently studied is found to resemble protonema. being given plenty of root room as they need it. Early fall and the plants kept in a light house and given plenty of root room as they need it.

SCHIZANDRA (Greek, split and flower; from the incised corolla). Schizandropsis. BUTTERFLY FLOWER. About 6 species of annual herbs from Chile, with mostly finely cut leaves and terminal open cymes of variously and highly colored fls. 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 pinnaflatt: 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, linear, longer than the middle segment. B.M. 3045. R.H. 18:1544. — The portions of the flower which are rose-colored in the type are white in var. alba.

b. The middle segment of the anterior lip not notched at apex.

Grahami, Gill. Lvs. 1-2-pinnatisect; segments entire or dentate pinnaflatt: fls. typically blue or rose, with the middle half of the middle segment of the upper lip yellow or orange at the tip, the lateral segments of the posterior lip falcate, linear, acute, shorter than the middle segment. B.M. 3044. R.H. 18:1542.

AA. Corolla-tube shorter than the calyx; stamens long-exserted.

pinnatus, Ruiz and Pav. In Porrígeno, Gral. S. Pauhiti, Paxt. Fig. 2265. The largest 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 pinnatilid: fls. varying in depth of color, the lower lip usually violet or blue; upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B.M. 2404, 2521 (as S. pinnata); B.M. 1532 (as var. humilis). - Var. nana, Horta, is somewhat lower-growing. Var. niveus, Horta, has pure white fls.

2267. Schizanthus pinnatus (X 1/2).

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 Soldanellas 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 brazenly fringed, like those of Galax, but their form is not so pleasing. The plant is only a few inches high, and the fls. are borne to the number of 4-6 on a scape. The scapes are numerous and the fls. about 1 in. across. Since 1892 this plant has excited an amount of interest comparable to that caused by the introduction of Shurtia, in 1889.

Schizocodon is distinguished from allied genera by the following characters: corolla funnel-shaped, 3-lobed, the lobes fimbriate; stamens a little bifid; the lobes of the corolla, and separate from the staminodes, which are long and linear. Other characters: ovary 3-loculed; capsule globose, 3-celled, locally 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 suborbicular at the base, coarsely toothed, the teeth spicate; fls. nodding; sepals 5, oblong, obtuse; corolla deep rose in center passing into bluish or white at the edges; staminodes linear. Japan. B.M. 7166. (as S. excelsum, Vog. A large Brazilian tree, with fern-like bipinnate leaves about 4½ ft. long, with the ultimate leaflets, about 1¾ in. long: fls. yellow, in large panicles. R.H. 1874, p. 113. F. W. Barclay.

2268. Schizocodon soldanelloides (X 1/2).

SCHIZOLOBIUM (Greek, to cleave and hull; alluding to the manner of dehiscence). Leguminosae. 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 tubulate; segments imbricated, reflexed; petals 5, clawed, ovate or roundish, imbricated; stamens 10, free; filaments somewhat scabrous at the base, urceolate, 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.

excelsum, Vog. A large Brazilian tree, with fern-like bipinnate leaves about 4½ ft. long, with the ultimate leaflets, about 1¾ in. long: fls. yellow, in large panicles.

SCHIZONOTUS (Greek, schizo, to split, and notos, back: the capsules were thought to split on the back, which, however, is not the case). Rosaceae (Syn. Holodiscus). The name Holodiscus (meaning an entire disk) may be recommended for this genus instead of Schizonotus, to avoid confusion, since the latter name has been used for two other genera. Ornamental tree flowering deciduous shrub, with alternate, pinnately lobed, petiolated lvs. and small, whitish fls. in ample showy panicles; fruit insignificant. Very graceful plants, with their drooping feathery panicles of creamy white fls., and well adapted for borders of shrubbery or for single specimens on the lawn, but not quite hardy north. They grow in almost any well drained soil, and do best in a sunny position. Prop. by seeds usually sown in boxes in fall and only slightly covered with soil, or by layers; sometimes also increased by greenhouse cuttings under glass taken with a heel, but usually only a small percentage of them take root. Two or perhaps only one species from Oregon to Columbia. Lvs. without stipules; calyx 5-lobed, almost rotate; petals 5; stamens about 20; ovaries 5, surrounded by an entire disk, developing into 5 distinct pollen-bearing achenes. Formerly usually referred to Spiraea, but it shows closer affinity to Corocarpus and other genera of the Potentilloideae group. If all forms of this genus are united in one species it must bear the name Schizoneotus argenteus, Kunze. By some the genus is still retained under Spiraea.
G.C. III. 25:21.—A very variable species, of which the following are perhaps the most important forms: Var. ariatolius, J. G. Jack (Spiraea ariolata, Sm.). Large shrub, with arching branches: lvs. usually truncate at the base, ovate, with dentate or entire lobes, pale green and pubescent beneath; panicle drooping, simple, long. B.R. 16:1365. (I.G. 4:67). Var. Purshianus, Rehd. (Sp. discolor, Pursh). Similar to the former, but lvs. whitish-tomentose beneath. Var. Issus, Rehd. (Sp. Issus, Lindl., and probably Holodiscus australis, Heller). Similar to var. ariatolius in habit, but smaller: lvs. crenate at the base, narrower, with entire lobes, whitish-tomentose beneath; panicle drooping, simple, long. Var. dumosa, Dippel (Sp. dumosa, Nutt. Sp. Borsverti, Carr.). Erect shrub, 8 ft. high; lvs. cuneate, coarsely toothed, pubescent above, whitish-tomentose beneath, 3-1 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. purpurea, Gray, in Solano purpureascens Greene, a Californian Arcto-lepia, not in cult. It is a perennial with ascending stems 1 ft. high, coriaceous-ovate lvs., and small red-purple fls. in compact umbels.—S. tomentosa, Lindl.—Sorbaria Lindleyana

ALFRED REHDER.

SCHIZOPÉTALON (Greek, cut and petal; in reference to the pinnately cut petals). Cruciifera. 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: lvs. sessile, sinuate, dentate, the upper linear: fls. white, fragrant. B.M. 2379. R.H. 1880, p. 355.—A very pretty annual of quick growth

F. W. BARCLAY.

SCHIZOPHRAGMA (Greek, schizexen, to cleave, and phagma, wall; the inner layer of the wall of the values is cleft into fasciolated fibers). Saxifragacea. Ornamental climbing deciduous shrub with opposite, long petioled, rather large, dentate leaves, and loose terminal cymes of small white flowers with enlarged sterile ones at the margin. It has beautiful bright green foliage and attractive flowers. The plant is useful for covering walls and trunks of trees. It climbs 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 smaller lvs. and make little growth if unsupported and suffer to fall on the ground. One species in Japan and another in China, allied to Hydrangea and Decamaria: fls. in loose cymes: sepals and petals 4-5; stamens 10; style 1; ovary 4-5-loculed; marginal sterile fls. consist only of one large white sepal, terminating the branches of the inflorescences: fr. a small, 10-ribbed capsule.

Hydrangeoideae, Sieb. & Zucc. Climbing Hydrangea. Climbing to 20 ft. more: lvs. on petioles 2-3 in. long, red-bish, orbicular or broadly ovate, shortly acuminate, rounded or ovate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2-4 in. long: cymes peduncled, 8 in. broad: marginal fls. pedicelled, consisting of an oval to broadly ovate white sepal about 1/2 in. long. July, Japan. S. Z. 1:26, 160. Gn. 15, p. 301; 34, p. 281.—The species is often confounded with Hydrangea petiolaris, which is easily distinguished by its marginal fls., having 4 sepals. It has been once introduced under the name Cornelia integrerrima, which is a Chilean plant with entire evergreen leaves. The plant usually thrives best in a shady exposure.

ALFRED REHDER.

SCHIZOSTYLIS (Greek, to cut, and style, alluding to the filiform segments of the style). Iridaceae. Two species of South African perennial herbs with tufted, sometimes desby roots, narrow equitant leaves, and a slender scapes bearing 6-12 red sessile flowers in a distichous spike. Perianth with a cylindrical tube and bell-shaped limb divided into 6 nearly equal oblong segments: stamens inserted on the throat of the capsule: capsule obovoid-oblong, obtuse.

SCHOMBURGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). Orchidaceae. This genus contains about 12 species, inhabiting tropical America. They have the habit of Cattleya or Laelia, except that they are less compact. Pseudobulbs long, fusiform, bearing several brown scales and 2-3 leafy lvs. at the summit: fl-stems from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls. The fls. are like those of Laelia except that the sepals and petals are narrow and undulate and the labelium does not completely envelope the column. The labelium is always 3-lobed.

Give Schomburgkias plenty of heat and a light place near the glass, which should be slightly shaded during the hot summer. Give them plenty of water in the growing season. Rest them in a temperature of 55°. S. tibicinis and S. Lyonsii are to be classed amongst the showy easily grown orchids, resembling Laelias.

tibicinis, Batem. (Epipodium tibicinis, Batem.). Fig. 2279. Pseudobulbs 1-1½ ft. long, tapering upwards: lvs. 2-3, oblong, leathery: raceme 4-8 ft. high, bearing

coccinea, Backh. & Harv. CRIMSON FLAG. A winter-blooming tender plant: stem 1-2 ft. high, bearing 2-3 lvs.: basal lvs. 2-3, about 1½ ft. long: fls. bright red, about 2 in. across. B.M. 5422. F.S. 16:1657.—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."
numerous fls., each 3½ 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-colored middle lobe. Summer. Honduras, Cuba. G.C. III. 4:212. B.M. 1133 (as S. tanamadentedata).—Advertised in southern California.

bb. Petals shorter than the calyx.

brachypétala. Sendt. A large shrub or small tree: fls. 8-10, larger than in S. speciosa, ovate-oblong or obovate; petals many-fl., axillary and terminal; calyx-tube conical, crimson; petals very small, linear, hidden by the calyx.—Cult. in southern Florida.

AA. Fls. nearly sessile.

latilólía, Jacq. Becoming a tree 29-30 ft. high: fls. 4-8, ovate-oblong or obovate, usually 1½-2½ in. long, ¾-1 in. wide; fls. rosy or flesh-colored, in much-branched panicles; petals longer than the calyx.—Advertised in southern California.

SCHRANKIA (F. P. Schrank, director of the botanic gardens in Munich). Leguminosae. Sensitive Brier. About 10 species of perennial herbs or shrubs, mostly American, with bipinnate, usually sensitive leaves and small pink or purple fls. in axillary peduncled heads or spikes. Calyx and corolla regular, 1-5-parted; stamens 8-12; pod linear, acute or acuminate, spiny all over, becoming 4-valved, several-seeded.


SCIADOPITYS (Greek, skias, skiados, umbrella, and pitys, spruce; alluding to the position of the leaves). Coniferae. Umbrella Pine. Evergreen tree, of narrow spreading habit, with narrow, needle-like leaves in whorls and oval cones 1½-2 in. long. The only species is hardy 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. Monotypic genus from Japan. Lvs. linear, deeply furrowed on both sides, disposed in whorls at the ends of the short annual shoots; they are of two kinds: the true lvs. are small and bract-
like; the upper ones, crowded at the apex of the shoot, bear in their axils needle-like lvs., of another kind, which, however, are considered by some botanists to be leaf-like shoots, or cladophylla, but linear and conate in 2's, while others believe them to consist of two conate lvs. corresponding with the fl. clusters in Pinus. Their morphological structure points towards the first explanation, while they are lvs. in regard to their physiological function. Fls. monoecious; the staminate ovate, consisting of spirally disposed 2-celled anthers; ovules 2 in each cell, rarely 8-10, ascending; capsule oblong oblong-ovate, woody, the bracts connate, with the broadly orbicular, thick scales, spreading at the margin; seeds ovate, compressed, with narrow wing, emarginate at the base or very nearly so. Great Britain possesses three species of Scilla, S. verna, S. autumnalis and S. nutans, while Germany has, in addition to S. autumnalis, three others, viz., S. bifolia and S. italica.

Among the early flowers there are none more valuable than the Scillas. They vary considerably in form of flower and foliage, and although typically they have blue or blue-purple flowers, most, if not all of the species in cultivation have white and red-purple forms. Scilla bifolia and S. bifolia are the earliest flowering and of these forms the Asian Minor or Taurian forms are in advance. The form of S. bifolia known as multiflora is nearly over before the usual type begins to expand. There is also sometimes cultivated in the garden a pleasing white Scilla, with hyacinth-like flowers, known to the trade as S. amara. But these white forms are mostly oddities; the effective ones are the blue-flowering kinds. Occasionally hybrids between Scilla and Chionodoxas are met with (see p. 308). Chionodoxa Alba is the accepted name for a natural hybrid between Chionodoxa lucila and Scilla bifolia, first obtained by Mr. Allen, of Shepton, Mallet, in 1801.

None of the hardy Squills require special culture, and if planted where they can remain undisturbed for a series of years, they seldom disappoint one if the soil is occasionally enriched by top-dressings of manure, etc. The bulbs should be planted as early as possible in autumn. The varieties may be increased by offsets taken after the foliage has matured. For the cool greenhouse or conservatory, many of the Scillas are ideal subjects. For this culture, 5 or 6 bulbs may be put in a 5-in. pot and the vessel afterwards transferred to a coldframe and covered until growth commences. Up to this period very little water will be required, but as the flower-cluster appears the quantity should be increased and the pots transferred to the greenhouse, giving them a position near the glass. The foliage matured, the bulbs may be shaken out of the soil and stored.

'Urgeina 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 of the hardy Squills, and has obtained relief from its use in severe colds. The scales of the bulb contain mucilage, saintrin, sugar and crystals of calcium oxalate-—mucilaginous to wavy off—mucilaginous to saintrin—secellin and selin (the latter producing numbness, cold, etc.). Scilla bulbs or roots should never be used unless under proper direction, as, in their fresh state they are extremely acid, and might prove dangerous.

The trade names are considerably confused. Many of the so-called horticultural species and races may be united as mere varieties, or species, that have been defined botanically. The following names are believed to include all those in the American trade, but other species are known to fanciers.

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2271. Tree, 10 ft., with ascending branches forming a narrow pyramidal, compact head, in old age loose and with pendulous branches: scale-like lvs., dark brown, 3/5 in. long; needles 15-35 in each whorl, linear, stiff, obtuse, deeply furrowed on both sides, dark green grained.

Verticillata, Sieb. & Zucc. Umbrella Pine. Fig. 2271, 2272. Tree, attaining 100 ft., with ascending branches forming a narrow pyramidal, compact head, in old age loose and with pendulous branches: scale-like lvs., dark brown, 3/5 in. long; needles 15-35 in each whorl, linear, stiff, obtuse, deeply furrowed on both sides, dark green and glossy above with a white line beneath, 3-6 in. long; needles 15-35 in each whorl, linear, stiff, obtuse, deeply furrowed on both sides, dark green grained.

2272. Umbrella Pine—Sciadopitys verticillata (trimmed).
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 (Agraphis, Link; Endymion, Dumort.), either alone or with other species which connect it with the other Scillas.

2. *puschkinioiides*, Regel. Bulb ovate, tunicate; lvs. radical, 2-4, glabrous, broadly linear, obtuse, 2½-3 in. long; scape low, glabrous; pedicels erect, strict, short, base subulate; bracteoles scarious, hyaline; perianth campanulate, pale blue, middle nerve deeper blue; base of filaments united; anthers linear-oblong; style filiform. Turkistan.

3. *Hispanicus*, Mill. (*S. campanulata*, Ait. *S. pultura*, DC.). S. JACINTH. BELL-FLOWERED SQUILL. Lvs. 5 or 6, glabrous, ascending, lanceolate, ½–1 in. broad, subobtuse, convex at back; scape long; raceme cymosum-campanulate; perianth usually blue but often becoming rose-purple, or white; pedicels 1½–2 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. purpurea*, Desf.). Bulb ovoid, 1–2 in. thick; lvs. 4–6, fleshy, herbaceous, linear, 6–8 in. long, ½–1 ft. high; racemes dense, 30–60-lfd.; pedicels short, ascending, 3–5 lines long; bracts minute, linear, evanescent; perianth rose-purple, ½ in. long; single ovule in each of the ovarian cells; capsule small, globose, grooved. Flowering in winter in its native home, Algeria.

5. *Chinensis*, Berth. (*Barnarda scilloides*, Lindl.). CHINESE SQUILL. Leaves 2 or 3, equaling or exceeding the scapes, rather hard, acute, channeled; bulb small; ovate; scape erect, slender, or wand-like; raceme spike-like, dense, elongated; pedicels short; bracts white, minute; perianth rose colored tipped with green; stigma a mere point. June. China. B.M. 3788.–Half-hardy. A beautiful species with the dense elongated raceme of rose-colored flowers, worthy of cultivation in any rock garden.

6. *autumnalis*, Linn. AUTUMN SQUILL. STARRY HYACINTH. Lvs. several, obtuse, channelled, ½ in. broad, subacute, concave; scape solitary, tall, stout; raceme 6–12-fl.; bracts in pairs; lvs. blue, purple, white or pink, drooping. April to June. Western Europe, great Britain. B.M. 1161.–Among the garden forms are alba, white; caerulea, blue; lilacea, Ilacinæa, Ilac-blue; rosea, rose or pink colored, fragrant, 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

1. *festalis*, Salis. (*S. sibirica*, Sm. *S. rossica*, Hoff. and Link. *S. autumnalis*, Salisbi.). COMMON BLACKBELL. BLACK-BELL. Lvs. 10–18 in. long, ½ in. broad, subacute, concave; scape solitary, tall, stout; raceme 6–12-fl.; bracts in pairs; lvs. blue, purple, white or pink, drooping. April to June. Western Europe, great Britain. B.M. 1161.–Among the garden forms are alba, white; carnea, blue; lilacea, Ilac-blue; rosea, rose or pink colored, fragrant, 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

2273. Scilla Peruviana in full bloom (X 1). Also known as *Sella celatia*. 

6. *autumnalis*, Linn. AUTUMN SQUILL. STARRY HYACINTH. Lvs. several, obtuse, channelled, half-terete, growing on through the winter and dying away in the spring; racemes several; racemes corymbosæ, spike-like, open; perianth rose-colored, ½ in. across. July–September. Europe (Great Britain), North Africa. B.M. 919.–Hardy. The flowering stems generally precede the
lvs. but occasionally the two come up together. As the flowering advances, in most cases a tuft of lvs. similar to those of *S. verna* shoot out by the side of the stem for the following year.


*2274. Scilla Peruviana, at the end of its flowering season.*

2273, 2274. Bulb large, ovate, tunicle: lvs. many, broad-linear, 6-12 in. long; margins ciliated with minute white bristles, channelled: scape robust, terminated by a many-fl.-conical, broad and compact raceme of purple, filiform, reddish or whitish lvs.: fs. rotate; corolla persistent; authors short. May, June. Region of Mediterranean, not Peru. B.M. 749. Gn. 27, p. 288. R.H. 1882, p. 308. — The Hyacinth of Peru is not hardy in Mass. It propagates freely by offsets. It flowers all through May and June and forms a most attractive object in the herbaceous border or bed. *S. Peruviana*, however, has one fault that may tell against it in the opinion of many cultivators—it never flowers two years in succession; it seems to need a whole year's rest after the effort of producing its large spike of flowers.

8. **monophyllos**, Link (*S. monophyilla*, Planch. *S. púllula*, Hook.). DWARF SCILL. Leaf solitary, inclosing the base of the scape, 2 in. long, ¼ in. broad, involute, ovate-acuminate, with a callous apex, glabrous: scape erect, slender, usually 5-20-fl.; pedicels long, ascending, from a small sheathing bract; perianth bright lilac, ¼ in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May, June. B.M. 3023. — Hardy.

9. **bífolia**, Linn. Fig. 2275. Bulb tunicate, oblong-ovate: lvs. 2, seldom 3, cucullate, 4-8 in. long, ¾-1 in. broad: scape 2-8-fl., ebractate: fs. stellately rotate; perianth bright, sometimes reddish or whitish: anthers blue, versatile. March. Native to Europe, Asia Minor. B.M. 746. — Hardy. Several varieties of this exquisite little plant are in the trade: *Alba*, white-fl.; *Rosea*, pink-fl., etc. Cultivators would do well to obtain all the varieties possible; also as many bulbs of this beautiful species as they can afford. It is one of the most charming of hardy, early spring-flowering plants.


It is a graceful and elegant species, suitable for cultivation in pots.

11. **hyacinthoides**, Linn. (*S. parviflóra*, Salisb.). **HYACINTH SCILL. LVS. 10-12, spreading, 1-1½ ft. long, ½-1½ in. broad, narrowed at both ends, minutely ciliate-denticulate on the margins: scape straight, long; racemes many-fl., broad, open; pedicels long, 1-½ in.: bracts whitish, minute, persistent; perianth bluish, open, campanulate. Aug. Region of Mediterranean. B.M. 1140. — Hardy. This species is noted for its extreme shyness in flowering. The bulbs are sometimes 2 in. in diam. and produce a profusion of offsets. In Fish's *"Bulb Culture"* several varieties are mentioned: *Céreole*, fine blue; *Alba*, fine white, free-flowering; *Rosea*, distinct flesh-colored; *Rubra*, deep red, large and fine.

12. **Sibirica**, Andr. (*S. aména*, var. *prícea*, Don). **SIBERIAN SCILL.** Fig. 2276. Lvs. 2-4, ascending, narrow, 4-6 in. long: scapes 1-6, 3-4 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. F.M. 14:160. 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-lóra*, *gaiélia*.

13. **aména**, Linn. **STAR HYACINTH.** Fig. 2277. Lvs. 4-7, flaccid, ascending, glabrous, 6-9 in. long, ¼-½ in. broad: scapes several, equaling the lvs.; racemes several-fl., 4-8 open; fs. distant, ½-¾ in. in diam., blue; pedicels ascending or spreading. March. Austria, Germany. B.M. 341. — Hardy. It grows luxuriously, several flowering stems being found on the same plant.

14. **Itálica**, Linn. **ITALIAN SCILL.** Bulbs ovate, clustered together: lvs. radical, several, flaccid, spreading, lanceolate, acute, 4-8 in. long, ½-¾ in. broad: scape solitary, slender, longer than the lvs.; raceme dense, many-fl.; pedicels filiform, spreading; bracts in pairs: fs. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segments puberulous at apex; filaments white; anthers sagittate, dark blue. March-May. B.M. 663. L.B.C. 15:1483. — Hardy. This plant has less brilliant flowers than either *S. Sibirica* or *S. latéola*, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.

15. **Japónica**, Baker (*Ornithogálum Japónicum*, Thunb. *Barcarola Japónica*, Schultes, f.). **JAPANESE HYACINTH.** Bulb ovoid, 9-12 lines thick: lvs. 2-3, flaccid, ascending, lanceolate, acute, 4-8 in. long, ½-¾ in. broad: scape solitary, longer than the lvs.; raceme dense, many-fl.; pedicels filiform, spreading; bracts in pairs: fs. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segments puberulous at apex; filaments white; anthers sagittate, dark blue. March-May. B.M. 663. L.B.C. 15:1483. — Hardy. This plant has less brilliant flowers than either *S. Sibirica* or *S. latéola*, 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. **vérna**, Huds. **SEA ONION. SPRING SCILL.** 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 fls. in a short, terminal raceme, almost flattened into a corymb; perianth segments scarcely above 3 lines long, spreading. Spring. A plant occurring in stony and sandy wastes near the sea in western Europe, reappearing farther east in Denmark, on the Rhine and Sardinia. – Hardy.

John W. Harshberger.

SCINDAPSUS (an old Greek name, transferred to these plants). Araceae. 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. Scindapsus comprises one popular and worthy greenhouse plant, that known to gardeners as S. argyraeus. For culture, follow directions given under Philodendron.

Pothos argyraeus, Engl. (S. argyraeus, Hort.) is the cult form, with broad, deeply cordate leaf-blades which are spotted and blotched above with silvery white. Celebes, Philippines, Nova Zembla.

SCILLA (Latin for bulrush). Ciperacea. Bulrush. Scilla. A genus of rush-like or grass-like plants inhabiting moist situations, and characterized by perfect flowers in spikes which are solitary, clustered or imbedded: scales spirally arranged; perianth of bristles or none, not exserted in fruit; ovary one-celled, 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 much confused.

A. Stem leafy.

stróviérens. Muhl. Stems clustered, tall and stout, 2-4 ft. high, bluntly triangular: lvs. long, course and firm, 3-4 lines wide, spreading; involucro foliaceus; umbel sparingly compound; rays stiff, very unequal; spikes ovate-oblong, petrifoide; petioles of 5-25; scales oblong, cuneate; perianth bristles 6, downwardly barbed above; styles 2-3-cleft. Ea., Asia, – The form in cultivation is var. variátus. Hort., with stems alternately banded with green and yellowish white. Dampt or dry soil.

Holoschoenus, Linn. Stiff and rush-like, from stout rootstocks; stems clustered, slender, cylindrical, 1-3 ft. high: lvs. 1-2 basalt, stiff, erect and narrow, narrowed: bracts several, the larger one appearing as a continuation of the stem; spikes very numerous and small, closely packed in a several-flowered globose, pale brown, 2½-3 lines long; scales ovate-oblong obtuse, rarely mucronate; perianth bristles 4-6, downwardly barbed throughout; styles 2-3-cleft. Ea., Asia. – The form in cultivation is var. diénynus. Godr. (S. Tabernamontanus, Gmel., and Hort.), but is scarcely distinct. Var. zebra, H.R., is a form with alternate bands of green and yellowish white; often known as Jaénus scindapsus.

cérnus. Vahl (S. ricinárum, Spreng., not Hort. Isolépis gracilis, Hort. I. scindapsus, Hort.). Fig. 2278. Densely cespitose, forming turf; stems 3-12 in. long, very slender or filiform, cylindrical, erect or more often drooping; basal sheaths leafless or with a very short filiform blade; involucral bract subulate, about equaling the spikelet, the latter usually solitary, oblong-lanceolate, 1½ lines long; scales oblong-obtuse, pale brown or whitish; bristles none; styles 3; akene 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. Symonony much confused.

K. M. Wieband.

SCLEROCAJ/'PUS (Greek, hard and fruit: referring to the bony, fructiferous bracts). Composita. A genus of about 11 species of mostly Mexican herbs, with branching stems and terminal pedunculate head or yellow flowers in summer.

uniseriális, Benth. & Hook. (Gymnúpis uniseriális, Hook.). An annual herb 1 ft. or so high, loosely branched, with alternate, deltoid or rhombic-ovate, dentate, petiolar lvs. and fragrant fl.-heads, with 3-9 oval or oblong, orange-yellow rays. Moist or shady ground, Texas and south. R. H. 1833:261. F. W. Barclay.

SCOKE. A name for Phytoleca decandra.

SCOLOPÉNDRUM. See Phylitis. Many garden forms are cultivated under a variety of names, all derived from Phyllitis Sclopendrium (the Sclopendrium vulgare or the S. officinale of Europe).
SCOLYMYOS (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 parsley. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish Oyster Plant, aside from affording a variety in the kitchen garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and sow than those of salsify. They are sown in March or April. The seeds, or rather akeues, are flat and yellowish, sur- 

SCORZONÉRA (old French scorzon, serpent; S. His- 

SCROPHULARIA (a reputed remedy for scrofula). Scrophulariaceae. Figwort. A genus of about 100 spe-

SCREW BEAN. Prosopis pubescens.

SCREW PINE. Pandanus.
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.

SCULLION. See Scallion.

SCUPPERNONG. A variety of grape grown in the South. See Vitis rotundifolia and Grape.

SCURFY PEA. Purslane.

SCURRY-GRASS (Cochlearia officinalis, Linn.), a common European perennial, is so called from its anti-scorbutic 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, pungent, and has a strong suggestion of tar. Bruising reveals a disagreeable odor. When cultivated it is treated as an annual, the seed being sown upon garden loam in a cool, shady place where the plants are to remain. It is escaped from cultivation, but so far has not become obnoxious as a weed like water cress.

M. G. Kains.

SCUTELLARIA (Latin, dish: referring to the form of the persistent calyx). Labiate. SKULLCAP. A genus of nearly 100 species of annual, perennial or shrubby plants widely scattered about the world, with simple leaves and blue, yellow or red, tubular 2-lipped flowers in terminal spikes or racemes or in the axils of the stem-leaves. Calyx in anthesis bell-shaped, gibbous, with a helmet-shaped projection; stamina 4, ascending and parallel, all fertile, the two anterior longer: anthers ciliate, pilose.

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1. alpina, 5. brevifolia, 2.
2. angustifolia, 8. grandiflora, 11.
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4. B. nana, 11. macrantha, 1.
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9. resinosus, 3.
10. Wrightii, 4.

4. Wrightii. (gray). A tufted perennial, about 6 in. high, with numerous oval, ovate or spatulate-oblong lvs. about ½ in. long and violet or rarely white fls. ½ in. long. Kansas to Texas.

5. alpina, Linn. A hardy spreading perennial, about 1 ft. high, with ovate, somewhat dentate lvs. and large, purple and white or somewhat yellowish fls. in dense, terminal racemes. July and August. Europe. R. H. 1880:12. A hardy stone rock or low border perennial.


7. Mociniana, Benth. A tender, moderately low shrub, probably the most showy of the genus, with opposite, long-elliptical, acute lvs. and long, tubular, red fls. with a yellow throat, about 1½ in. long, in dense, terminal spikes. Autumn. Mexico. R. H. 1872:350. —According to G. 10, p. 606, the plants are of easy culture with warm greenhouse treatment and may be grown as bush specimens or in smaller pots with a single stem, when they will flower at about 1 ft. in height. Cuttings are easily rooted.

8. angustifolia, Pursh. A hardy perennial, about 6 in. high, with lvs. ½-1 in. long, narrowed at the base, and violet-blue fls. ¼-1 in. long, with the corolla-tube slender. Moist ground, north-western United States.

9. antirrhinoides, Benth. Resembles the larger-leaved forms of S. angustifolia, but with longer petals and the lvs. mostly obtuse at base and also shorter and broader fls. 7-10 in. long. Moist, shaded ground, north-western 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 or terminal, narrow, leafy bracted: fls. blue to nearly white. Moist soil throughout the United States.


J. B. Keller and F. W. Barclay.

SCUTICARIA (Latin, scutica, lash or whip). Orchidaceae. This genus is remarkable for its long whip-like leaves, which are channeled on one side. No evident pseudobulbs are formed, but each shoot terminates in a long, pendulous leaf. The lvs. are rather crowded on the short rhizomes. Fls. solitary or several, on short peduncles. In structure the lvs. resemble Maxillaria, but the plants are easily distinguished by the terete leaves. Sepals and petals similar, the lateral ones forming a mentum: labellum movable, 3-lobed, with large, erect, lateral lobes: pollinia on a transversely elongated stipe. Two species from South America.

These plants require a temperature similar to Cattleya and Ladita, but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. S. Steeii 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.


HENRICH HASSELBERG and R. M. GREY.

SCYTHIAN LAMB. Refer to Cibolium.

SEA BEAN. Consult p. 135, second column; Sea Buckthorn is Hippophae; Sea Daffodil is Hymenocallis.

4629. F. s. 1-2.5 ft. tall. & as Bifrenaria Hadwenii). G. M. 4:5.
SEAFORTHIA (Francis Lord Seaford). — Palmææ. 

Seafordia elegans is a name familiar to every gardener who has room in his conservatory for tall specimen palms. Twenty years ago this palm was grown to a greater extent in smaller sizes and for a greater variety of purposes, but it has been superseded for such uses by the Kentias (Hovest Belmoreiæ and Forschvern). Seafordia elegans is often called the Australian Feather Palm. Whether more than one thing is cultivated under this name is doubtful.

According to Flora Australiensis 7:141 (1878) the proper name of Seafordia elegans, R. Br., is Psychosperma elegans, Blume. It isvariously described as a low or very tall palm: lvs. attaining several feet; segments numerous, more or less toothed or irregularly jagged at the end. Probably the plants cult. as S. elegans are Archontophoenix Cunninghamiana.

For S. robusta, see Shoepalostylis. — W. M.

SEACRAPPLE. — Cocos loba, var. wimmeri.

SEA HOLLY. — Eryngium.

SEA-KALE (Crambe maritima, Linna.) is a large-leaved, strong, cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home garden, for it supplies an excellent of good quality at a season when vegetables are scarce. Sea-kale demands a deep, rich and rather moist soil, in order to give the best results and to maintain its vigor for a series of years. The plants require about as much room as rhubarb; that is, a space of about 3 to 4 feet apart each way. The culture and general requirements are much the same for rhubarb. The young shoots are blanched before they are large enough to be used as they grow, in early spring. The blanching is accomplished by heaping fine, loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower pot so that the light is excluded from the growing shoots. These shoots are eaten before they have begun to expand to any extent, and whilst they are crisp and tender. The vegetable is prepared in the same manner as asparagus.

Sea-kale is propagated by root cuttings, and also by seeds. Quicker results are secured from cuttings. If strong cuttings, 1 or 3 inches long, are taken in early spring and grown in strong and rather moist soil, the plants may be strong enough for cutting the following spring; but it is usually better not to cut them until two years from starting. The cuttings may be placed where the plants are to stand permanently, or they may be grown in drills in a seed-bed. The latter plan is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year, if grown in drills; really fruits or pods, and each fruit may produce two or three plants. Usually the fruits are sown without shellings. The seedlings are raised in the seed-bed and transplanted when one year old to permanent quarters. On good soil, plants of Sea-kale should maintain their vigor for five to eight years after they have come to cutting age. As soon as they begin to show signs of decline, new plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Pot the greenhouse benches, as recommended for rhubarb. Sea-kale has large, glaucous, cabbage-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. Sea-kale grows wild on the seacoasts of southwestern Europe.

L. H. B.

SEA LAVENDER. — Statice.

SEA ONION. — Allium maritimum; also applied to Ornithogalum caudatum.

SEA PINK. — Armeria.

SEASIDE GRAPE. — Convolvulus.

SEASON VINE. — Cissus sicyoides.

SEA-URCHIN CACTUS. — Hylocereus.

SECALE (the ancient Latin name, said to be derived from seeo, to cut; according to some, applied to spelt). Gramineæ. Species 2, S. fragilis, a perennial 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. Spikelets with 2 perfect fls. sessile on opposite sides of a zigzag rachis opposite a 3-nerved, terminal spike, empty glumes subulate and 1-nerved, by which characters the genus differs from Triticum, in which the empty glumes are ovate and 3-nerved. cereale, Linna. Rte. 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.

A. S. Hitchcock.

SECHIUM (by some said to be derived from Seycos, with which the genus was once united, by others to have come from the Greek sekos, a "fold." because swine are fed on it). Cerebelbrosea. One very odd tendril-climbing vine, probably native to the West Indies and adjacent South America. This species, S. edule, Swartz. Fig. 2281, is known under a variety of names, as Chocho, Chucho, Chou-Chow, Chayote, Ch Honda, Papinida. The vine itself, with herbaceous annual stems, is useful for covering arbors in warm countries. The root becomes a large corky tuber, sometimes weighing 20 lbs., and is edible. The fruit is irregularly ribbed, 3-6 in. long (Fig. 2281, from nature), and edible. Sechium belongs to that group of the Cucurbitaceæ which comprises Issued 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 fruit, and the 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 dries; may be forced in hotbeds or under the greenhouse benches, as recommended for rhubarb. Sechium has large, glaucous, cabbage-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. Sea-kale grows wild on the seacoasts of southwestern Europe.

A. S. Hitchcock.

2280. 

Head of Rye.

Natural size.
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 scabrous above. The plant grows 50 feet in warm climates. G.C. 1805; III. 24:470; 28:450. L. H. B. Fruits of Sechium edule (Curt. & G. Mey.) Flügge.
Section I. Herbaceous Perennials, 1. e., plants that die down to the root during winter. (In greenhouse culture some become evergreen.)

A. Flowers bisexual.................. 1. roseum

AA. Flowers bisexual.

B. Leaves evergreen.

CC. Arrangement of leaves alternate.

D. Height about 1 in. 3. Middendorffianum

DD. Height 1 1/2 in. or more.

EE. Stem rhizomatous; foliage tufted or scapose. 31. Lydium

EE. Stem erect; foliage roundish. 35. Monregalense

BB. Leaves deciduous.

CC. Arrangement of leaves opposite.

D. Base of leaves narrowed into a long beck above. Desirable for borders; suitable for the hardy border and for rockeries. 3. Middendorffianum, Maxim. Lvs. alternate, oblong-lanceolate, veined toward apex; yellow, in a flat-topped cyme. Summer. Amurland. — According to J. W. M. 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 1 1/2-2 ft. Lvs. alternate, oblong-lanceolate, coarsely and irregularly toothed for the greater part of their length, 2 1/2-3 1/2 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: yellow, in a dense, flat cyme. July, Aug. Japan, Amurland. — 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 flask-shaped fl.-buds, which are dilated below and narrowed into a long beck above. Desirable for borders; also used for carpet beds. Seeds, as well as plants, are offered.


7. Telephium, Linn. Ordine. Live-forever. Fig. 229. Height 12-18 in.: lvs. scattered, rarely opposite, oblong-ovate, obtuse, dentate: pink, spotted red, or white.
sometimes pure white, in dense, terminal and lateral subglobose cymes. July, Aug. En., N. Asia. Gn. 27, p. 316. —Naturalized in America, where it spreads much but blooms little. Vars. hybridum, purpureum and rubrum are live American trade names representing forms with dark purple foliage, the last-named variety being said to retain its purple color through the summers. All the forms are suitable for the front rows of borders and for rockeries. The young shoots in spring are pretty objects and differ with the different varieties. The larger forms with bright fls. are preferable. S. purpureum and purpureascens, Koch, are varieties of S. Telephium. Subspecies Fabaria, Masters (S. Fabaria, Koch, not Hort.). This is regarded by Masters as a subspecies of S. Telephium, with fls. narrower than in the type, the cymes always terminal and shorter peduncled; fls. smaller and earlier; petals less scarlet. It is doubtful whether this is really in the trade. See N. spectabile.

8. teleboles, Miueh. Height 6-12 in.; fls. scattered, 2 or 3 in., oblong obovate, nearly entire or sparingly toothed; fls. flesh-colored, in small dense cymes 1-1½ in. across. June. Alleghanies from Md. south. —Offered 1881-82 by H. P. Kelsey.

9. maximum, Suter. A stout, bushy plant 2 ft. or less high, with either green or purple stems; lvs. opposite, ovate-oblong, more or less cordate, crenate-dentate; cymes terminal and lateral on long peduncles, forming a loose panicle; petals white, spotted red towards tip. Aug.-Oct. En., Caucasus, northwestern Asia. Gn. 27, p. 316. —Var. variegatum, Hort., has gold and green foliage, according to J. W. Mungo. F.S. 18:6169 (as var. perculat) 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 redish, lvs. cordate or tapering at the base, spreading or recurved, variegated or not. It is the best for borders, but in the autumn it is apt to turn strangely and needs support. Var. hematodes, Mast. Stems 2-2½ ft. high, deep purple; lvs. 3¼ in. long, oblong-obovate, obtuse, coarsely and irregularly toothed, purplish; petals whitish, tipped red. September. Here belongs S. atropurpereum, Hort., according to Masters, but the plant or plants passing as such in America are very different. S. atropurpereum, Franzi., which appears as a good species in Index Kewensis, is probably a synonym of S. roseum.

10. spectabile, Bar. [S. Fabaria, Hort., not Koch.] Showy Sedum. Fig. 2281. This is the most popular of all Sedums and is used for the greatest variety of purposes. Robust, glaucous, 1 or 2 ft. high; lvs. opposite or in 3's, 3½ in. long, oblong, obtuse, entire or obscurely wavy-edged; lvs. ¾ in. across, in flat-topped, inversely perminal, leafy, umbellate cymes 1 in. across. Sept.-Oct. —Possibly from Japan. Gn. 25, p. 315. 11. H. S. 21. The lvs. vary from rose to purple, and perhaps to white. Pitcher & Manah offered var. album. Var. purpurescens 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-still clay, and does not do so well in lighter soils.

SECTION II. EVERGREEN PERENNIALS. (Species 11-25.)

11. spathulifolium, Hook. Barren stems creeping, with terminal rosettes of obovate, 1½ to 2 in. across, in terminal cymes; sepals oblong-obtuse. May, June. N. S. Amer. G.C. II. 1837. Gn. 55:115. —Offered in 1881 by Gillett, but lvs. probably not cult. in eastern states, and probably requires pot culture indoors. Here may belong Franceschi's S. spathulatum, a California species, which he calls a "grand among Sedums, growing several ft. high." Masters' plant is not over 1 ft. high.

12. obtusatum, Gray. Barren stems prostrate, with rosettes of spatulate lvs.; lvs. stems erect, ultimately leafless and then scoured; lvs. yellow, in terminal, umbellate cymes 1½-2 in. across; sepals oblong-obtuse. June, July. Calif. —Once offered in America, but probably not now in cult.


14. Nevii, Gray. Barren stems prostrate, with terminal rosettes of obovate-spatulate lvs., tapering into a short stalk recurved at the base, sprinkled with pink dots; lvs. stems erect, with appressed, scattered lvs. similar to, but smaller than those of the barren stems; lvs. white, ½ in. across, in forked cymes whose branches

2281. Sedum ternatum.

15. populifolium, Pall. A very distinct species by rea- son of its shrubby base, stalked, pappus-shaped lvs. and corollas of whitish lvs., which have the scent of hawthorn. Roots rhizomes; stems 6-10 in. high, branched; lvs. alternate, ovate, acute, coarsely and irregularly toothed; lvs. nearly 1 in. across, whitish or pinkish, in corollas cymes; Stamina pinkish; anthers purple. Siberia. B.M. 211. Gn. 25, p. 316. 2. H. 1887. E. Asi. —Hardy in cult., but desirable for borders and rockeries and makes a charming pot plant.

16. Kantschaticum, Fisch. & Mey. Height 4-6 in.; lvs. alternate or opposite, obovate, coarsely, but regular- ly toothed above the middle; lvs. yellow, ¼ in. across, in umbellate cymes 1-3 in. across; petals lanceolate. Late summer. E. Asia. Gn. 25, p. 315; 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, in terminal and lateral panicked cymes; petals lanceolate. Var. *variegatum*, Hort., has lvs. with golden blotches, according to John Saul. "S. *nemorosum aureum-marginatum*," Hort., is probably a variegated form of this species.


20. *oppositifolium*, Sims. Very close to *S. stoloniferum*, but the lvs. are brighter green, more regularly decussate, and as they are broader at the base they overlap one another a little and produce a neater appearance than in *S. stoloniferum*. Fls. white or whitish. Anthers orange. According to Masters, but yellow in R.M. 1867. Aug. Caucasus, Persia.


22. *Anacampseros*, Linn. Glaucescent, barren branches rooting at nodes; fls. stems erect, reddish; lvs. bluish green, orbicular or ovate-obtuse, coriaceous, auricled, greenish with reddish margins; fls. violet, ¾ in. across, in dense, globose cymes. Central Eu. B.M. 118. —Suitable for rockeries and edgings. The fls. are comparatively rarely produced.

23. *Sieboldii*, Sweet. Glaucescent, 9 in. high; branches purplish, erect, afterward decurved; fls. in wheels of 3, sessile, sinuate, bluish green, pinkish at margins; fls. pinkish, ½ in. across; petals reddish, ovoid or nearly globose; fls. ⅔ in. across, in 1-sided cymes, with erect fls. crowded, thick, ovate or nearly globular; fls. ⅔ in. across, in 1-sided cymes having 2-5 forks. June. July. Eu. E. Asia. B.M. 2276. 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 bears the yellow tint in summer and is never so robust as the green form. Var. *elegans*, Mast., has the tips and young lvs. pale-silvery colored. Not as effective or hardy as var. *aureum*. Var. *maculatus*, Mast. Larger and more robust than the type; lvs. 5 in. long instead of 3; fls. ¼ in. across, in a 2 parted cyme. Morocco.

24. *sexangulare*, Linn. Very close to *S. acre* but the lvs. not so bitter to the taste, more slender.

25. *stenopetalum*, Pursh. Glabrous; stems 3-4 in. high, erect from a decumbent base; lvs. crowded on barren shoots, sessile, fleshy, lanceolate, ¾ in. long; fls. bright yellow, in several cymes, floral parts in 5's. Rocky Mts. —Offered by Gillett in 1881. Rare in cult.

26. *sarmientosum*, Bunge. Glabrous; lvs. opposite or whorled, linear; fls. yellow, ¼ in. across, in a flat-topped, umbellate, 3-5 forked cyme. China. —Var. *carneum* (*S. carneum variegatum*, Poir.) 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*, Michx. Glabrous; fls. 3-6 in. high; lvs. linear, terete-pointed, gibbous at base, scarcely ¼ in. long; fls. rosy purple, ¾ in. across; inflorescence a 3-4 branched cyme, with erect fls. crowded in 2 rows along the upper surface and each provided with a leafy bract. June. July. Eu. U. S. B.M. 6223. Gn. 27, p. 315. G.C. II. 10:685. —The minute foliage assumes rich tints of red, brown and purple. The branches of the inflorescence are 3-4 in long and gracefully arched.

28. *acre*, Linn. SEDUM. WALL PEPPER. LOVE ENTANGLE. Fig. 2285. Barren stems creeping, branched, about 2 in. long; fls. stems 2-3 in. high; lvs. minute, ¼ in. long or less, crowded, thick, ovoid or nearly globose; fls. ⅔ 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 bears the yellow tint in summer and is never so robust as the green form. Var. *elegans*, Mast., has the tips and young lvs. pale-silvery colored. Not as effective or hardy as var. *aureum*. Var. *maculatus*, Mast. Larger and more robust than the type; lvs. 5 in. long instead of 3; fls. ¼ in. across, in a 2 parted cyme. Morocco.

29. *sexangulare*, Linn. Very close to *S. acre* but the lvs. not so bitter to the taste, more slender.

30. *dasyphyllum*, Linn. Glaucescent; lvs. oblong or roundish, studded with crystalline pinpoints; buds oblong, obtuse; fls. pinkish; anthers black. Eu., N. Africa. B.M. 5989. —Watson says it grows 3-6 in. high, and is suitable for edgings.

31. *Hispanicum*, Linn. Glaucescent; fls. stems 3-4 in. high, reddish; lvs. ¼ in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pinpoints at
the tips: cymes 3-7-branched, umbellate; buds 5-6-angular; fls. pinkish white, in across. July. Central and southern Europe. — Readily distinguished by having the floral parts in b's.

32. brevifolium, DC. Glabrous; lvs. in 4 rows, a tenth of an inch long, narrow-oblong, acute, covered with a mealy pubescence; fls. 1 in across; petals-white, with pink midrib; anthers pink. Western Mediterranean region. — Manning says it grows 4 in high and blooms in July and August. Said to be exceptionally sensitive to superfluous moisture at the root.

33. Lydium, Boiss. Glabrous; lvs. 3-4 in. high, blade-elliptic, acute, covered with numerous pinnules at tip when seen with a lens; buds 2-angular; fls. 1 in across; petals-pinkish; anthers reddish. Aug. Napt. Asia Minor. — Var. aureum. Hort., was offered by John Saul in 1893.

31. album, Linn. Glabrous; 4-6 in. high, blade-lanceolate, 1-1 in. across; fls. in b's, white; buds oblong, in across, white; anthers reddish. July. Eu., N. Asia. Gt. 27, p. 315.

30. sempervivum, Linn. Glabrous, except inflorescence, which is glabular; lvs. linear; fls. 1 in. across, white; buds roundish, pointed; stamens pinkish. N. Italy, Corsica. L.B.C. 3:361.

SECTION III. ANNUALS OR BIENNIALS (Species 30-39).

37. Fornosii, N. E. Br. Height 6 in.; stem repeatedly branched in a dichotomous or trichotomous manner; lvs. 1 in. in whorls at branchings of stem, with occasionally 1-3 on internodes, flat, spatulate; fls. yellow. Fornosii. Int. into S. Calif. in 1900.

38. carileum, Linn. (S. aschersonii, DC., not Royle). Fig. 2286. Glabrous, or pubescent in inflorescence, 2-5 in. high; lvs. 1.4 in. long, oblong-obtuse, pale green, spotted red; fls. 1 in. across, pale blue, 5-merous. S. Afr. B. M. 2224. B.R. 6:529. Gt. 27, p. 315. — Carpet beds. Sandy soil.

39. villosum, Linn. Glabrous or 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 rills, mountains of N. J. This is one of the very few that fare well in pots. The white, flat form is advertised by one dealer in perennials. The species, however, is annual.

Oregon which is now offered in the East, but is probably not cult in Eu. It grows 4 in high, and flowers from June until Aug. Said to be annual, but is probably not cult in Eu. It grows 4 in high, and flowers from June until Aug. Said to be annual, but is probably not cult in Eu.

2287. Seed-like fruit of Hop-tree.

Natural size.

The winged seeds ashes are really fruits containing one or two seeds. Acorns, walnuts, butternut, and the "seeds" of strawberries, are grains of corn, wheat, and "seeds" of strawberries. The keys which open when the seed falls contain the embryo which consists of the shoot in its early stage. Thereafter the integument is ruptured, and the caulebricule appears. When the caulebricule protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 2289). Sprouting tests are made to support itself (Fig. 2289). See also, Figs. 2291 and 2292. Seeds that have sufficient light to sprout may still be too weak to carry the process to complete germination. The ideal test for the viability of seeds is to plant them in soil in conditions that somewhat nearly approach those in which they are thought to be stored. This eliminates the seeds which are very weak and are not able to grow under ordinary conditions and to push themselves through the soil. The sprouting test made in a specially prepared test dish, 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 speed of the actual germination power: but one must not expect that the actual germination will always be as great as the percentage of sprouting. In many cases, the differences in results between the actual germination and the sprouting tests in well-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 higher the viability, yet the reverse may be true within narrow limits. Sometimes lettuce and melons that germinate only 50 per cent in December, germinate 70-80 per cent in April.

When the soil is well prepared and is kept watered, the young plants in seed-beds, one must take pains that they do not become "drawn" and be practically worthless. In greenhouses and hotbeds, the soil is so shallow that it can be kept in uniform conditions of temperature and moisture. The seeds of some of the finer and rarer kinds of ornamental plants require special treatment. These treatments are usually specified in the articles devoted to those plants. Details of the handling of very delicate seeds are well discussed in the article on *Orchids*.

As a rule, seeds germinate best when they are fresh, that is, less than one year old. Some seeds, however, of which those of melons, pumpkins and cucumbers are examples, show the viability impaired for a number of years, and gardeners do not ask for recent stock. Seeds of corn salad should be a year old to germinate well. Very hard, bony seeds, as of haws and viburnums, often do not germinate until the second year. In the meantime, however, they should be kept moist. Seeds of most fruit and forest trees may be kept moist and cool, otherwise they lose vitality; yet if kept too moist, and particularly if kept too close or warm, they will spoil. Nuts and hard seeds of hardy plants usually grow by being buried in sand and allowed to freeze. The moisture and the moisture content of the medium, and split the interments. Sometimes the seeds are placed between alternate layers of sand or sawdust: such practice is known technically as stratification.

L. H. B.

Seed-Breeding — The marvelous industrial and commercial development which has characterized the latter part of the nineteenth century is nowhere more marked than in the art and practice of seed growing. Whatever may have been their intellectual belief, most planters have acted, up to within a few years, as if seed was indeed essential to the production of a crop, but only in the way that water and manure are essential. The only question was whether or not the seed would grow. It might be desirable that the seed all be of some particular kind so that the possibilities and limitations of a crop are as positively determined by the seed used as is the character of the fruit of an orchard by the trees of which it is composed. There have always been exceptional men, who fully appreciated the importance of seed selection and breeding, which they practiced within their own gardens to secure a supply for their own use, but even professional seedsmen formerly gave little heed to scientific seed breeding, being quite content to "rouge" out mixtures or poorer plants rather than to select and breed only from the best. Now, every seedsmen who values his reputation maintains more or less extensive stock seed farms where plant-breeding is conducted on the same principles and with the same sort of skill and care that is used in the breeding of animals.

The general method followed is first to form a clear conception of just what points or qualities give value to a variety and what a perfect plant of that sort should be. Then a few plants — say ten — which come as near this ideal as possible are selected and the seed of each saved separately. These separate lots are planted the next spring in contiguous blocks, and the plants given an opportunity for their most perfect development. As they approach maturity the lots are carefully examined.
and if those in one or more blocks show either general inferiority or a large portion of inferior plants, the entire block is condemned and rooted out, even if in doing so some very fine individual plants are destroyed. The remaining blocks are carefully examined, and those selected which shows the closest adherence to the desired type, and from it a few plants are selected and their 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 certification. At the present time 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 (freedom from foreign matter), (2) vitality, and (3) genuineness, or trueness to name. The latter is known to seedsmen and growers as purity of stock. Unless seeds possess a high requirement in all these respects their use will entail great loss to the planter.

Purity Test. — The percentage of purity is determined by weight, from a fair average sample of seed selected from different parts of the bulk lot. Wheat and other grains are taken with a sampler, consisting of two hollow cylinders of metal, one inside the other, and about 36 in. long by 1 1/2 in. in diameter. They are pointed at the bottom and contain a series of openings along one side, which may be turned at will to open or close the holes. The sampler, with the holes open, is thrust into the grain in the ear or open bag for its entire length. While filled with seeds the inner cylinder is turned so as to close the holes, and the sampler removed. For clover and other small seeds one uses a "trier," consisting of a single short cylinder open at one end and tapering down to a sharp point, just above which on one side is a long, elliptical opening (Fig. 2294). The trier is thrust through the side of a bag of seed at different points until the aperture is covered, the seed being allowed to run out at the other end into a dish.

The seed thus taken is thoroughly mixed and a given quantity weighed out for testing. The amounts used in the purity test vary with the size of the sample, ranging from 15 grams of large grain, red top, and tobacco to 1 ounce of peas and cereals. If the sample is suspected to contain any seeds of such serious pests as dodder, Canada thistle, wild mustard, 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 the impurities are removed. This includes crowd and other weeds, and foreign seeds and useful plants. Under the latter designation are embraced seeds of both weeds and useful plants, that is, any seeds of a different name from that under which the sample was purchased for the purpose of providing a given kind of first-class cotton seed. The percentage of purity thus determined.

The purity which a given kind of first-class commercial seed should show depends largely upon the habit of growth of the species and the difficulty of obtaining pure seed of that species. Most vegetables and cacti are grown devoid of weeds, and therefore their seeds are easily cleaned, hence they should be practically pure. Grasses and clovers, on the other hand, are more or less liable to be mixed with other species in the field. Furthermore, the cleaning of such seeds is very difficult, often entailing a considerable loss of good seed, hence the proportion of pure seed to be expected in such samples is less than in the former case. An extensive experience in testing agricultural seeds, together with a comparison of the results of other tests made in this country and Europe, has enabled the United States Department of Agriculture to fix a table of standards of purity for the several kinds sold by dealers. These standards, however, are subject to future revision if found necessary.

By means of a hand lens and by reference to a standard collection of economic seeds, the foreign seeds in the sample are next determined. If dodder, Canada thistle, etc., are present the seed should be rejected.

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. Seed saved separately for planting in blocks the succeeding year. Then the remaining plants of this and 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 seedsmen 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, and in five or six 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 seedsmen contract with some farmer, located in a section where soil and climate are favorable to the 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 seedsmen furnish his customers. This plan enables the professional seedsmen not only to produce cheaper seeds, but seeds of better quality than the ordinary planter, or at least is likely to produce in his own garden, and in consequence gardeners have come to get more and more of their seed from the seedsmen whose business has correspondingly increased.

In 1890 a single seed firm contracted for the growing of more than 200 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 fruits 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 mark that had resulted from accidental causes. The same firm had 20 and 50 acres of beans, peas, corn and other vegetables in which every plant was, as it were, the grandchild of the same 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.

Seed Testing. — Scientific seed testing was inaugurated in 1898 by Dr. F. Noble, director of the Experiment Station at Tharand, 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 certification. At the present time 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.

2294. Clover seed "trier."
Germination Tests.—The seeds used in germination tests must be taken indiscriminately from pure seed material. The selection of plump, nice-looking seeds for these tests, as frequently practiced, impairs the authenticity of the result. Which has been thoroughly mixed for that purpose. The same is true of any species of seed whose conditions of germination are not well understood.

While damp blotters serve as the best substratum under ordinary circumstances, and especially where a large number of tests are to be made, they do not answer as well for slow, germinating seeds which have been thoroughly mixed for that purpose. This may be remedied to a certain extent by placing narrow strips of glass between the folds, but main reliance in such cases should be placed upon soil tests.

All tests are made in duplicate, using two lots of 100 seeds each of peas, beans, corn, cucurbits 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, 3 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 using damp blotters placed in a metal chamber heated by gas, the heat being controlled by a thermo-regulator. The blotters must be free from soluble chemicals. Blue blotters will be found less trying to the eye than white. The germinating chamber may be of any form which allows proper control of the conditions of light, heat, air and moisture. The standard chamber adopted by the association of American Agricultural Colleges and Experiment Stations for seed testing (see Fig. 2296) is made in 2 panels, each consisting of 2 movable shelves, placed 2 in. apart, and 2 feet high, outside measurements. The outside, except the bottom, is covered with two layers of reddish brown paper. A water space is afforded by the double walls, which extend on all sides except the front and are 2 inches deep, outside measurements. The inside walls are 2 in. deep, and the sides are 2 inches deep, inside measurements. Each shelf is 12 in. deep. The bottom of each shelf is 1 inch deep and is divided into 3 sections, each 1 inch deep by 1 inch wide, with a 1-inch opening 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 2 plates of thick glass set about ½ in. apart, in a copper frame, which is covered inside with felt. The inside margin of the door is provided with a projection (Fig. 2297, c) which fits snugly into a felt-lined groove (Fig. 2297, b), extending around the front side of the chamber. The door slides short of the front of the chamber, the remaining space being closed with copper and provided with a ventilator (Fig. 2296, h), 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, l, j). By this arrangement 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 ¾ in. wide. These shelves are made of brass rods ⅛ 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 water can be burner (Fig. 2296, c). One of the opennings into the water jacket (Fig. 2296, a) is 2 in. in diameter to admit a Roux thermo-regulator, if a very
SEEDAGE

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, f). Each of the openings at the end (Fig. 2296, f, g) is closed with a screw cap. The chamber is provided with three tin-lined copper pans, each having a narrow ledge around the inside near the top, which serve to hold copper rods, with folds of cloth, if the experimenter wishes to test seeds according to the Geneva pan method. A strip of sheet-iron is used 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 blower 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 pellet.

Other Forms of Germinating Apparatus.—The so-called “Geneva tester,” invented at the Experiment Station at Geneva, N. Y., consists of an oblong pan of galvanized iron or tin with ledges around the inside near the top upon which are suspended metal rods, Fig. 2298. Over these rods (a, b) 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 c) to hold them in place. A very simple apparatus for spraying seeds is shown in Fig. 2299. It consists of a shallow tin basin “re-dipped,” 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. This serves to hold copper rods which consist of 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 partly opened from time to time to permit exchange of air and gases. By using a good-sized dish with small saucers, and removing the water occasionally, several kinds of seeds may be tested at one time and the temperatures of temperature and excessive moisture must be avoided.

A still simpler germinating outfit than this and quite satisfactory for most cereals and vegetable seeds consists of two soup plates, one used for the seed and two layers of cloth to hold the seeds. The clothes should be kept moist but not too wet. (See Fig. 23, Yearbook of the U. S. Department of Agriculture, 1895, p. 181.)

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: 10 full days for cereals, spurry, peas, beans, vetches, lentils, lupines, soya beans, sunflower, buckwheat, cruciferous, Indian corn, and cowpeas; 11 full days for sarradela, esparrage, beet roots, rye grass, timothy, unblighted, and myrtle, and pils, lentils, and okra; 12 full days for Bermuda grass, ryegrass, and timothy; 28 full days for peas 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, okra, and onion may be soaked to advantage. Asparagus should be placed in distilled water for 5 hours, then transferred to blotters which should be kept very wet for the first 48 hours; okra may be soaked in water at 50° C. for 5 hours. Owing to the readiness with which moulds develop upon onion seed, it should be soaked for an hour in a solution consisting of one part bichloride of mercury to 1,000 parts of water. Such seeds as okra, asparagus, zucchini, camas, and beet roots should be soaked better if previously clipped, care being taken not to injure the germ. The local assertions often made of the value of treating seeds with certain chemicals to hasten germination, are, in the main, not worthy of notice.

Testing Grass Seeds.—Most grass seeds require special treatment, both in purity and germination tests. For the latter neither blotters nor cloth can be depended upon as a seed-bed, hence soil tests are advisable. Care must be taken not to plant the seeds too deeply. Seed of red-top and June grass should be sown upon the surface and the lightest possible cover of soil or sand given it. Before planting the soil should be thoroughly watered, and after sowing a fine rose spray should be used to avoid disturbing the seeds. The same remarks will apply to soil tests of other fine seeds.

To prevent counting empty spaces (chaff) a mirror-box (Fig. 2302) is useful. This consists of a box of hard wood, half an inch thick. It is 12 in. long, 8 in. wide and 3 in. high, the front being open, and the top consisting of an ordinary piece of glass. The sides are laid in 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 mirror-box is set partly open from time to time to permit exchange of air and light. The operator places the
apparatus with the open side opposite to him and toward the light. The mirror should be so arranged that it will not throw any light into the operator's face. With this apparatus the outlines of grass seeds within the glumes can be clearly seen, and the chaff can be removed with the other terminal parts of the sample. A much simpler method of identifying the sound seeds in grasses consists in the use of a pane of glass, 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 foxtail, awnless brome and velvet grass, to make use of this simple test. For laboratory purposes the mirror box is to be greatly preferred, since the seed can be handled much better when dry.

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 6-15 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 examination the sprouted seeds are again cut out and the clusters removed to a second 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 seed of each lot of 100 clusters, together with the number of unsprouted seeds, is ascertained. The average of all the clusters is taken into account, special care being exercised not to count as seeds any cavities which were empty at the beginning of the test.

Test for Gruminness or "Purity" of Stock.—The genuineness of the seeds of vegetables and other horticultural varieties of plants can only be told by means of a field test, which should be made in such cases whenever possible. The purity of stock of such seeds is of far more importance than a high percentage of purity and germination. In making field tests of different varieties of seed a check test should be conducted, using a sample, for purposes of comparison, which is known to be authentic. The different tests must be subjected to the same conditions of soil, etc. The genuineness of the seed of grass, clovers, and other forage plants can usually be ascertained by mere inspection and comparison with a standard collection.

GILBERT H. HICKS.

[The preceding article was prepared for this work by the late Gilbert H. Hicks, of Washington, D. C., in 1889, 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 undergone some changes since the foregoing was written. These changes have been the necessary result of experience and are in substance the following:

While purchasers are urged to buy the best seeds, it is doubtful whether, under the conditions of trade in the United States, arbitrary standards have much value. The comparison of the price and quality of different grades offered means more than an ideal standard which is seldom practicable to enforce. A system of inspection that would certainly detect all weed seeds would make the seed too expensive for practical use.

The standard chamber is now covered with asbestos lagging instead of with felt; a single door covered with the lagging has been substituted for the double doors. An air-bulb regulator, devised by Mr. E. Brown, has been substituted for the mercury bulb regulator.

The temperatures needed for the successful germination of seeds depend on the kind of seeds tested. Lettuce must have a low temperature, 15° C, giving best results. A temperature of 25-30° C, will almost entirely inhibit germination. Seeds of teasote, 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 once. Kentucky blue-grass seed is not tested in the greenhouse, better results being obtained in the chamber by means of alternating temperature. When seeds, as of sugar beet, are sold on a guarantee, the re-test should be made under conditions similar to those under which the original test was made. The energy of germination, that is, the percentage of seeds that sprout in about one fourth the full time, nearly represents what the seed will do in the field and is of greater importance than the full time test.

A. J. PIETERS.

The Seed Trade of America.—Early History.—The history of the seed business in colonial times is largely one of importation from Holland and England, when small hucksters carried a few boxes of popular seeds with an assortment of dry goods, foodstuffs or hardware. Corn, barley, peas, onions, fruits and vegetables, necessaries in fact for direct use, first claimed the attention of the colonists. Towards the end of the eighteenth century we begin to find references to the saving of stock seeds, and in the newspapers of the day are a number of advertisements of shopkeepers who dealt in seeds. Agricultural seeds were an article of commerce as early as 1574. Pieters, a Miller, of London, kept "colly-flower" seed in 1775; while David Reid kept a general assortiment in the same year.

Development of American Trade.—It was not until the opening of the nineteenth century that we find that seeds could be grown here as profitably as they could be imported. Grant Thoburn, 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 descendents of David Landreth. Thorburn, in his autobiography, says that he began his business by buying out the stock of one George Inglis for fifteen dollars, Inglis agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small beginnings from which has grown a trade which now amounts to many millions, and this relation between seedsmen and growers is largely typical of relations which have obtained in the trade ever since.

Railway and Postal Service. — With the development of the railway and the postal service the business grew by leaps and bounds, new land was found suitable for different varieties of seed, and a letter could carry to the countryman the garden seeds for his yearly consumption. There is probably no trade which has been more widely benefited by cheap postage and improved mail facilities, but of late years the abuse of their privileges by members of Congress has largely tended to negative this benefit. The originally beneficial distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no adverse criticism, but it has degenerated into an abuse, which is estimated to have taken a trade of some $4,000,000 during the past two or three decades out of the hands of the men who have built up the business.

Catalogues. — Grant Thorburn's catalogues of 1822 was the first to be issued in pamphlet form, and it was the pioneer of the many finely and carefully illustrated catalogues with which we are familiar to-day. These catalogues have been largely instrumental in facilitating the specialization of the industry and its subdivision in the hands of the country dealer, who buys seeds at wholesale, combining as they do the most complete lists and illustrations of varieties with directions as to methods, conditions, and seasons for planting. They are distributed literally in hundreds of thousands. It is of interest to remember that up to 1844 the wording on the bags was written by hand, a laborious and expensive process, which of itself is an indication of the small volume of the trade at that date.

Imports and Exports Statistics. — With regard to the export of seeds, A. J. Pieters' admirable report for 1889 in the Yearbook of the Department of Agriculture may be taken as the latest information. He says in part: "The statistics of exports date from 1835, and no separate records of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always been the chief export article. From 1855 to 1884 there is no record of any seeds exported except clover, but the value of these increased from $13,570 in 1855 to $5,393,663. During the decade ending with 1880 clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $20,739,277. The aggregate was increased by more than $5,000,000 from 1879 to 1880. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad."

Development of Home Industry. — The importation of staple garden seeds had largely decreased by 1870, and with the exception of a few staples in agricultural and flower seeds, America may be said to have become a great exporter of self-supplying. The greatest development of this industry has taken place since the close of the war. In 1878 J. J. H. Gregory estimated that there were in all 7,000 acres devoted to garden seeds, while the census of 1890 showed that there were 596 seed farms, containing 169,830 acres. Of these farms, 200 were established between 1880 and 1890, and it is likely that about 150 more were started during the same period. The census returns, however, do not give the actual acreage devoted to growing seeds. As many seeds are grown by those not regularly in the business, it is probable that census returns as to acreage are under rather than over the mark. The statistics available in the United States Census are very imperfect, partly owing to the lack of a continuous system in presentation, both in the returns of home industry and also in customs house returns, but chiefly in the unimportant publication of the United States Census, which is entirely in the hands of the country dealer, who buys seeds for self-supplying agents and for retailing. As a rule, one farmer will grow only one or two varieties. A saving in the expense of supervision has been made by the growth of the system of subletting a contract. The middleman being posted on the abilities of his neighbors and the quality of their seeds for many miles around, can often place and keep sight of the growing of many more varieties than he himself could handle on his own land. Many of these middlemen do not grow seeds themselves, but act merely as the seedsmen's growing agent among the farmers of a large district. Excepting in California, where the growers as a rule devote their whole capital to the business, it is a frequent custom throughout the country for seedsmen to make cash advances against crops. Few seed houses grow their own seeds.

Values of Staples, Home-grown and Imported. — The following table will give a close an estimate as can be made of the annual cost of the chief staple garden seeds handled in America:

<table>
<thead>
<tr>
<th>Seed</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden peas</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Garden beans</td>
<td>300,000</td>
</tr>
<tr>
<td>Onion seed</td>
<td>300,000</td>
</tr>
<tr>
<td>Lettuce seed</td>
<td>250,000</td>
</tr>
<tr>
<td>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>30,000</td>
</tr>
<tr>
<td>Turnip seed</td>
<td>25,000</td>
</tr>
<tr>
<td>Beet seed</td>
<td>15,000</td>
</tr>
<tr>
<td>Celery seed</td>
<td>7,000</td>
</tr>
<tr>
<td>Miscellaneous seeds, Flower seeds</td>
<td>$2,175,000</td>
</tr>
<tr>
<td>Probable invested cost of exported seeds</td>
<td>$1,700,000</td>
</tr>
</tbody>
</table>

Total growers' value $4,025,000

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 time in practice there, but would not amount to more than $5,000,000, but would adapt itself to almost any of the older states of the Union.

Staples and Localities of Production. — The following may be taken as the present principal garden seed staples and the localities where they are most profitably raised (See, also, Bailey, 'Principles of Vegetable Gardening,' p. 170):


Beets: Imported chiefly from France, owing to better methods, amounting to about $15,000,000, but would adapt itself to almost any of the older states of the Union.
SEEDAGE

SELAGINELLA (diminutive of Latin Selago, old name of a club moss). Selaginellaceae. Club Moss. A large genus of mostly tropical plants of diverse habit, ranging from minute, prostrate annuals to erect or even climbing peripherals. Easily recognized by the production of two kinds of spores—powdery microspores from which the male prothallus arises and larger microspores produced four in a sporangium just within the axil of the terminal leaves of the stem, which often form a 4-angled spike. In all our cultivated species the lvs. are in four ranks, the two upper smaller and pressed against the stem, giving it a flattened appearance. Selaginellas are graceful fern-like greenhouse plants, often known to gardeners as Lycopodiums.

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sarmentosa, 4.
serpens, 3.
serrulata, 7.
setosa, 33.
stoniifera, 8.
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vaginata, 9, 17.
Victoriae, 24.
viticulosa, 29.
Vogelli, 31.
Waliachtsch, 23.
Wilckii, 17.

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B. Lvs. 4-ranked, of two sorts, forming an upper and a lower plane.

C. Mostly holohem erbs.

D. Plants perennial; lvs. firm.

E. Stems continuously 1. e., without joints.

F. Branches one-eighth in. or less wide; stems 6-9 in. long

1. rupestris

2. denticulata

3. serpens

4. patula

5. uncinata

6. plumosa

7. concinna

8. stoniifera

9. Kraussiana

10. Cunningham

11. brasiliensis

12. apus

13. alo-nitens

SEED-BOX. Luedea alternifolia; probably also sometimes applied to plants that have loose seeds in inflated pods, as Crotalaria.

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SEED-BOX. Luedea alternifolia; probably also sometimes applied to plants that have loose seeds in inflated pods, as Crotalaria.
1. rupéstria, Spring. A small, rock-loving perennial, with branching stems 4-5 in. long, many-ranked Ivs. ending in a whiteawn, 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. denticulata, Link. Fig. 2363. Stems less than 6 in. long, matted: Ivs. of the lower plane slightly spaced. Denticulate, cordate on the upper side at base and imbricated over the stem; Ivs. of upper plane crowded, bright green, much imbricated. Mediterranean region throughout.—Trade names are var. aurea and foliis variegatis.

3. sérpen, Spring. Stems 6-9 in. long, trailing; bright green, spuriously-branched; Ivs. of lower plane crowded, obtuse, spreading, ciliate at the rounded base; Ivs. of upper plane obliquely oblong, acute. West Indies.—Long in cultivation.

4. pátula, Spring (S. arvenstans, A. Br.). Stems slender, trailing, pale green, 6-9 in. long, with long, tail-like tip, and fewer short pinnate branches; Ivs. of lower plane crowded, erect-spread, oblong-lanceolate, somewhat acute; Ivs. of lower plane one-third as long, acute. Japan.

5. uncináta, Spring (Lycopodium cæsium and Selaginella cæsa, Hort.). Stems 1-2 ft. long, extending in a somewhat naked tip beyond the branches, doubly grooved above, with short, alternate branches; Ivs. thin, blue-green, with a distinct midrib, slightly more produced on the upper side; Ivs. of upper plane cuspidate, much imbricated. China.—In 1893 John Saul offered "S. cæsa arbore" with the remark that S. lacunata was a synonym thereof.

6. plumósæ, Baker. Stems 6-12 in. long, flat above, often forked near the base: Ivs. of lower plane close, bright green, much more produced on upper side of midrib, ciliate on both sides at base; Ivs. of upper plane half as long, obvate, much imbricated. India, Ceylon, China, Malay Isles.

7. concinna, Spring (S. serrotubæ, Spring). Stems 1 ft. or more long, copiously pinnately branched, with more or less fan-shaped compound branches; Ivs. of lower plane crowded, bright green, glossy, much dilated and rigidly ciliate on the upper side at base; Ivs. of upper plane one-third as long, long-cuspidate, much imbricated. Madeira Islands.—Var. foliis variegatis, 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: Ivs. of lower plane densely set, rigid, acute, short-ciliate and minutely muricled at base. West Indies.

9. Kraussiana, A. Br. Stems 6-12 in. long, flat on the back, rounded on the face, copiously pinnate, with compound branches: Ivs. of upper plane spaced on the branches and main stem, acute, slightly imbricated over the stem; Ivs. of upper plane obliquely obvate, acute. Africa. Madeira.—S. Brynhild, Hort., is a dwarf form from the Azores. Vars. aurea and variegatae are American trade names.

10. Cunninghami, Baker. Stems copiously pinnate, the lower branches compound: Ivs. of lower plane ovate or oblong, cordate and very unequal-sided at base, much imbricated over the stem; Ivs. of upper plane distinctly cuspidate. Brazil.

11. Brasiliensis, A. Br. Stems copiously pinnate, the lower slightly compound: Ivs. of lower plane mostly spaced, acute, cordate at base, ciliate and imbricated over the stem; Ivs. of upper plane half as long, cuspidate. Brazil.—Similar to preceding, but with longer leaves.

12. ãpus, Spring. Stems 1-4 in. long, angled above, with short, simple or forked branches; Ivs. of upper plane pale green, serrate but not ciliate, cordate on the upper side; Ivs. of the upper plane ovate. Canada to Texas.—Lycopodium densus, cultivated at the Harvard Botanic Garden, is said to belong here.

13. abó-níteens, Spring. Stems slender, trailing, the lower branches slightly compound: Ivs. of lower plane spaced on main stem, short-ciliate, bright green; Ivs. of upper plane one-third as long, cuspidate. West Indies.

2363. Club Moss used to cover the soil of an orchid pot—Selaginella denticulata (A. Br.).

14. atroviridis, Spring. Stems 6-12 in. long, ascending, doubly grooved above, rather acute, 3-angled, firm, broadly rounded; Ivs. of the upper plane half as long, long-cuspidate, much imbricated. India.

15. Californica, Spring. Stems 4-6 in. long, 4-angled, copiously pinnate: Ivs. of lower plane ovate, minutely
Selenigella

cuspidate, denticulate on the upper side at the base; lvs. 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.

23. Wallichii, Spring. Stems 2-3 ft. long, with lanceolate branches and simple crowded branchlets; lvs. of lower plane crowded, smaller towards the end of the pinnules; lvs. of upper plane one-fourth as long, cuspidate: spikes ½-1 in. long. India and the East Indies.

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

25. gracilis, Moore. Stems 2-3 ft. long, somewhat roughened, with lanceolate branches and simple branchlets; lvs. of lower plane ovate-falcate, adnate to stem on lower side at base; lvs. of upper plane ovate-lanceolate, cuspidate. Polynesia.

26. Lobbi, Moore (S. cognata, Hort.). Stems 3-4 ft. long, with lanceolate-deltoid branches and contiguous simple or forked branchlets; lvs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Borneo and Sumatra.

27. Willdenovii, Baker. Stems reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguous: lvs. of lower plane crowded, ovate or oblong, tinted with blue, obscurely petiolated; lvs. of upper plane one-third as long, obliquely oblong, not cuspidate. India and the East Indies.


29. viticulosa, Klotzsch. Stems with deltoid 2-3-pinulate branches: lvs. of lower plane ascending, acute, short-ciliated and much imbricated over the stem; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Central America.

30. caulescens, Spring (S. amaua, Hort.). Stems stiff, erect, the short final branchlets curling when dry: lvs. of lower plane crowded, ovate, falcate, bright green; lvs. of upper plane one-third to one-fourth as long, cus-

2304. Poorly grown specimen of Club Moss, unsuitable for table decoration (× ¾).

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; lvs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly imbricated over the stem at base; lvs. of upper plane obliquely oblong, long-cuspidate. 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: lvs. of lower plane dark green, becoming reddish with age, obtuse or obscurely cuspidate, ciliated and imbricated over the stem at the upper side of base; lvs. of upper plane ovate-cuspidate. Native country not known.—Has been in cultivation since 1870. Var. variagata, Hort., is cultivated.

18. Poulteri, Hort. Veitch. Stems densely tufted, slender, suberect, 2-3 in. long, three to four times dichotomously forked: lvs. of lower plane spaced, suborbicular, obtuse, bright green; lvs. of upper plane nearly as long, but ovate and acute. Azores.

19. involvens, Spring. Stems densely tufted, 2-6 in. long, deltoid, branched nearly to the base; lvs. of lower plane crowded, ovate, with a distinct cusp, bright green, thick, rigid, serrulate on both margins; lvs. of upper plane nearly as long, ovate-lanceolate, cuspidate. Japan to India and the Philippines.

20. lepidophylla, Spring. Resurrection Plant. Stems 2-4 in. long, densely tufted, spreading in a close spiral so as to form a flatter expanse, curling closely into a ball when quite dry: lvs. of lower plane oblique, obtuse, minutely ciliated, green on the face, paler below; lvs. 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; lvs. of lower plane obliquely ovate, cuspidate, dilated and ciliate on the upper side at the base, pale green edged with white; lvs. of upper plane nearly as long, obliquely ovate, cuspidate. A plant occurring under the horticultural name Lycopodium cornitulum has the stem a foot or more long and simple in its lower part, and doubtless represents a distinct species. Cuba and Mexico to Venezuela.

22. Emmeliana, Hort. Fig. 2305. Stems 6-12 in. high, the primary branches ascending, bipinnate; lvs. of lower plane close, obliquely ovate, those of the branchlets narrower and minutely spinulose; lvs. of upper plane raised above those of the lower, one-half as large, spinulose-serrulate, short-cuspidate. S. Amer. † Named for Th. Emmel, a German gardener.


pidate. Japan, China and East Indies.—Var. argentea, Hort., is advertised.

32. *Habellata*. Spring. Stems erect, deltoid, decompound, with contigous final branches. Lvs. of lower plane oblong-lanceolate, acute, narrowly rounded and ciliate at the base; lvs. of upper plane obliquely ovate, cuspidate. Widely distributed in tropical regions. One of the forms of this is cultivated as *S. Africana* (Spring, A. Br., N. Penicillus, Spring). Stems decompound above, the lower pinna deltoid, petiolate, 3-4-pinnate: lvs. of lower plane lanceolate, ascending, often revolute on both edges, truncate, acute, lvs. of upper plane minute, strongly cuspidate. Panama.

33. *Lyallii*. Spring. Stems deltoid above, the lower pinna bipinnate, the final divisions ½-1 in. long, ½-3 in. wide; lvs. of lower plane oblong-lanceolate, falcate, acute, lvs. of upper plane minute, acute. Madagascar.

34. *Erythropus*. Spring. Stems under a foot long, deltoid and decompound above, the lower pinna 3-pinnate, the ultimate divisions one-twelfth to one-eighth in. wide; lvs. of lower plane oblong-lanceolate, acute, strongly ciliate; lvs. of upper plane one-half as long, cuspidate. Tropical America. — N. Nelson, Hort., is said to be a starved form of this species.

35. *Hamatodes*. Spring (H. Caletra, Spring). Stems 1-2 ft. long, the decompound pinna 3-pinnate, the ultimate divisions ¼-6 in. wide; lvs. of lower plane ascending, oblong-robloid, acute, dilated on upper side at base, not ciliate; lvs. of upper plane minute, cuspidate. Veracruz to Peru.


38. *Mohiiceps*. Spring (M. publicus, A. Br.). Stems erect, 6-9 in. long, lanceolate-above, much compound: lvs. of lower plane oblong-lanceolate, dark green, very unequal-sided, serrulate on the upper edge; lvs. of upper plane one-half to one-third as long, ovate or ovate-lanceolate, cuspidate. Africa.

The following American trade names cannot be satisfactorily accounted for as species: *S. acuta* is said to be one of the most important commercial species of all ferns. *S. wildi-nervis* is a very close relative of *S. frondosa* and *S. luzincta* is another. The plant of *S. Luzincta* is usually red or purple, and the plant is often considered to be a variety of *S. Luzincta*; but the latter is usually a variety of *S. Luzincta*, and is therefore not considered to be a variety of *S. Luzincta*.

39. *Solenophylla*. Spring (S. frondosa, A. Br.). Stems erect, 6-9 in. long; lvs. acute, covate, one-third as long, ovate or ovate-lanceolate. The above three species are native to America.

**SELENIPEDIUM**

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. dentiventula*, *Krammatina*, *Martensii*, and some other commercial favorites may be propagated only by division. *S. dentiventula* is one of the smaller and more delicate species. It is a popular plant that may be easily cultivated in pots and cuttings, and is very suitable for hanging baskets or other similar plantings.

*SELENIPEDIUM* (from selene, moon, and pedion, ground; analogous to Cypripedium. It was evidently intended to derive the second part of the name from pedion, foot, and some botanists and horticultural writers use the word thus derived, but Reichenbach
SELENIPEDIUM

wrote Selenipedium. Orchidaceae. The genus Selenipedium comprises the South American Cypripediums. 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 can become paniculately branched. In general habit the Selenipediums are more robust and luxuriant. The lvs. are crowded in dense tufts on short, creeping rhizomes. As in many orchid genera, the species of Selenipedium are more remarkable for the number of color variations of their flowers. There are many varieties that form connecting links between species, thus making the genus a very difficult one for satisfactory description. The following account, however, will serve to distinguish the leading types.

This genus, like the true Cypripediums, has been a favorite one with hybridizers. Some of the best-known species, as S. Sedeni and others, are the products of crosses. The total number of hybrids far exceeds the number of original species. A part of the genera Cypripedium and Selenipedium has been separated by some botanists as a distinct genus, Paphiopedilum, which is now sometimes found in horticultural writings.

For culture, see Cypripedium.

ERNST HASSEBING.

All Selenipediums enjoy plenty of heat and moisture in the growing season (March to November). Give good drainage. Use chopped sphagnum with a little leaf-mold, raising the material as high above the glass 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. Donatianum, S. Sedeni, S. Schilmi and S. Schisandrum, should not be overwatered. 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 2:3; to 3:4, in top with chopped sphagnum and leaf-mold mixed with coarse sand or pulverized coal clinker. Keep the moss in a growing condition.

WM. MATTHEWS.

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(Including some names advertised under Cypripedium.)

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albiflorum, 1.

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calcarum, 12.

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Petals ovate at lanceolate, plane or sparingly twisted.

bb. Fls. white or pink.

1. Schilmi.

2. Sedeni.

3. Weidlichianum.

4. porphyreum.

5. cardinalæ.

6. Ainsworthii.

7. vittatum.

8. Sargentianum.


10. longifolium.

11. albo-purpureum.

12. calcarum.

13. Schreuderiana.

14. Selenipedium Schilmi (x ½).

15. cardinalæ. Reichb. (Cypripedium cardinale, Reichb., f.). Lvs. long, straight; dorsal sepal bluish.

2. Sedeni, Hort. Fig. 2307. Lvs. numerous, crowded, 1-2 in. long, tapering to a point; scape 12-18 in. high, about 4-fld, but often sending out secondary flowering branches from the axils of the bracts after the first fls. have fallen: fls. 3:4, 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. Schilmi. A very luxuriant free-flowering plant. F.M. 1875: 296; 1876: 302. R.H. 1873: 470. Vari. candidulum, Reichb. Lvs. white; petals white tinged with rose; labellum darker rose. A hybrid between S. longifolium and S. Schilmi, var. albiflorum. The following names are also in the trade: grandiflorum, sanguineum, supèrbum.


4. porphyreum, Reichb. Lvs. broadly strap-shaped, acute, about 1 ft. long; fls. mostly purple, resembling those of S. Sedeni, but without protuberances on the open sides of the lip. The sepals and petals are oblong and more acuminate. Garden hybrid between S. Razlii and S. Schilmi.

5. cardinalæ, Reichb. (Cypripedium cardinale, Reichb., f.). Lvs. long, straight; dorsal sepal bluish.
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. H. 27; 1495.

6. Ainsworthii, Reichb. f. (Cypripedium Ainsworthii, Reichb. f.). Lvs. ligulate, numerous, 1½ ft. long: scape shorter, pubescent, few-fld.: sepals acute, undulate, whiteish or yellowish-green with a pale purple border; lower sepal very broad and con-
eave with a reflexed margin, shorter than the lip; petal broad, purple, with a green midvein and a pale area near the base; side lobes of the lip yellow, with numerous spots. A garden hybrid between S. Sedeni and S. Roxii.

7. vittatum, Reichb. f. (Cypripedium vittatum, Vell.). Lvs. 1 ft. long, linear lanceolate, acute, margined with yellow: stems few-fl., 12-18 in. high: dorsal sepal oblong, subacute, greenish-striped with red: lower sepal about twice as broad as the upper, green; petals linear, long-petalled, white, reddish brown, spotted with bright red along the back of the lip; labellum shorter than the sepals, brown, greenish spotted with reddish brown inside. Brazil. L.H. 23: 238.

8. Sargentianum, Rolfe. Fig. 2368. Lvs. tufted, 6-8 in. long, oblong-lanceolate, acuminate, with golden margins; scape 6 in. high, 2-3 ft. high: dorsal sepal oblong, acute, pale yellow with red veins; lower sepal ovate, subacute, shorter than the lip; petals longer than the sepals, strap-shaped, slightly twisted, undulate, ciliate, pale yellow streaked with red and with bright red margins; labellum yellow, with pale red veins, deflexed side lobes speckled with red. Brazil. B.M. 7446. G.C. III. 15: 781. A.G.I. 21: 423.

9. Lindleyanum, Reichb. f. & Warsc. (Cypripedium Lindleyanum, Schomb.). Lvs. 13-20 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, deflexed, green with brown veins, ciliate; labellum olive-green, with brown veins and much spotted on the side lobes. Guiana.


11. Albo-purpureum, Reichb. f. (Cypripedium albo-purpureum, Reichb. f.). Lvs. long, strap-shaped and recurved: ft. 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 indented lateral lobes nearly closing the mouth, white, with dark purple spots. Garden hybrid between S. Schlimii and Donumamum. H. 21: 1592. —A var. superbum has been advertised.

12. caifum, Nichols. (Cypripedium califum, Reichb. f.). Lvs. numerous, tufted, long, acute, channelled: scape much taller than the lvs., brownish red, branching: ft. 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. longifolium and S. Sedeni. F. 1884: 145. —There are several horticultural forms, one known as Roulisii.

13. Schraderi, Hort. (Cypripedium Schroderi, Hort. Veitch, ex-Reichb. f.). Plant of the habit of S. Sedeni, with ft. taller, long, acuto-ovate, channelled, blue-green, nodding those of S. albo-purpureum but larger; upper sepals nearly ovate-elliptical; petals purplish, in the middle, crimson-purple around the margin: labellum pale purple outside, inflexed lobes yellow, with brown blotches. Garden hybrid between S. Sedeni and S. albo-purpureum.

14. candatum, Reichb. f. (Cypripedium candatum, Lindl. Cypripedium Lindl., Van Houtte. Cypripedium Wurzensecum, Reichb. f.). Lvs. strap-shaped,

SELENIPEDUM

SELF-STERILITY

SELF-STERILITY OF FRUITS. Self-sterility may be roughly defined as the inability of a given plant to produce fertile seeds when pollinated with its own pollen. With the rapid strides in plant-breeding, propagation and cultivation, self-sterility and sterility have become important subjects in determining the value and adaptability of new varieties to the various needs and purposes of the planter. The study of self-sterility in more recent years has been confined mostly to fruit trees and small fruits, and has been conducted by a number of experiment station workers. The list of self-sterile and unisexual varieties is now so large for fruits, vegetables, grains, legumes, vines, grapes and strawberries, that the ease of planting, pruning, training, feeding, and theitable of the pollens is still a subject of investigation.

- One of the largest of the Selenipedums and remarkable on account of the extremely long petals. Peloric forms with the third sepal (labelum) resembling the other two have passed under the name of *Cypripedium Lindeni*, Lindl.

15. grüne, Reichh. f. (Cypripedium grüne, Reichh. f.). A garden hybrid between *S. Rozeti* and *S. canda- tum*, resembling in the 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.

SHELONPIEDUM

SELF-HEAL. See 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 pollen. With the rapid strides in plant-breeding, propagation and cultivation, self-sterility and sterility have become important subjects in determining the value and adaptability of new varieties to the various needs and purposes of the planter. The study of self-sterility in more recent years has been confined mostly to fruit trees and small fruits, and has been conducted by a number of experiment station workers. The list of self-sterile and unisexual varieties is now so large for fruits, vegetables, grains, legumes, vines, grapes and strawberries, that the ease of planting, pruning, training, feeding, and theitable of the pollens is still a subject of investigation.

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Var. roseum, Hort. (S. canda- tum, var. War eens, Godfroy). Sepals yellow, with orange veins; petals deep purple; labelum deep yellow in front, green behind. I. H. 23:596. Var. Wallisii, Hort. (S. Wallisii, Reichh. f. Cypripedium Wallisii, Hort.). Lvs. paler green; fls. pale, and in every way more delicate than the type. C. N. 49, p. 140. Numerous other varieties of this species are distinguished in cultivation. The following names occur in trade lists: aureum, Luxembourg- gese, rubrum, superbum, Seegeri, splendens, nigres- cens.

16. Dominianum, Hort. (Cypripedium Dominianum, Reichh. f. Fig. 2296. Lvs. numerous, about 1 ft. long, acuminate; fls. yellowish green, with copper-brown shades and markings; labelium deep reddish brown, reticulated in front and yellowish green behind. A hybrid between *S. Bearei* and *S. canda- tum*. It is intermediate between the parents, but differs from *S. canda- tum* by its acute bracts and narrower lvs., from *S. Bearei* by the transverse stamens and hairy ovary. G. M. 31:557; 33:765; 33:489.

17. Boissierianum, Reichh. f. (Cypripedium reticulá- tum, Reichh. f.). Plant of vigorous habit has about 1 ft. long, acuminate, scape few-fl., or sometimes paniculate, 4-7-fl.; fls. of peculiar light green tints, with a few sepals brown and green lobeces on the whis- tled part of the lip and with some brown spots on the margins of the sepals; ovary dark brown, with green apex and ribs; upper sepals ligulate-lanceolate, very crisp; lower sepals oblong, about equal to the labelium, crisp; petals spreading, long-linear, twisted and very crisp on the margins. Peru. G. C. III. 1:143; 21:54, 55. G. F. 4:960.

18. Klotzscheanum, Reichh. f. (Cypripedium Schom- bergianum, Klotzsch et Reichh. f.). Lvs. linear, 6-12 in. long, scarcely 1 in. wide, rigid, keeled below longer than the lvs., linsulate, purple, 2-3-fl.; dorsal sepals ovate-lanceolate, pale rose-colored, with reddish brown veins, the lower ovate, boat-shaped, colored like the upper one; petals 3 in. long, linear, twisted and very crisp, like the sepal; labelium greenish yellow, the in- flexed side-lobes whittish, spotted. British Guiana. B. M. 778. G. C. III. 15:625.

19. caraénum, Reichh. f. (Cypripedium Pierei, Hort. Cypripedium caraénum, Lindl. & Past.). 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; labelium oblong, the upper margins flat; staminodium provided with 2 hairy processes. Peru. F. S. 5:486. F. S. 16:1618. HEINRICH HASSELBRING.
tender develop any tendency towards self-sterility and separation of the sexes which the parent plant may possess.

(3) The careless practice of taking clones promiscuously from seeds grown in untrimmed sources may perpetuate self-sterile individuals.

(4) Breeding and selecting for other qualities than those associated with seed production may tend 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-sterility.

(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 are unable to produce seed when planted 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, almost self and 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-growers 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 plums, see the writings of F. A. Waugh. See Pollination for a complete discussion of the whole problem as it affects fruit growers 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 plums, see the writings of F. A. Waugh. See Pollination for a complete discussion of the subject.

**SELMINUM**

(derivation doubtful). *Umbrillaeor*. About 25 species of rather large perennial herbs, mostly from the northern hemisphere, with pinnately compound leaves, and compound radiate umbels of small white or rarely yellowish-white flowers; petals obovate-cordate, usually four to six in number, and achenes nearly quadrangular.

*teufeliiulium*, Wall (Overcome Canadlitt, Edgew.). A hardy perennial with finely cut fern-like foliage and stem often 8 ft high, with numerous umbels of white flowers; ultimate segments of leaves narrowly lanceolate, 2-3 inches long, with sharply toothed toothed dorsi-sy, four to six times as broad as thick; laterals ridges much the broadest. India. Gn. 38, p. 231. Offered as a novelty in America in 1899 and recommended as a foliage plant for single lawn schemes.

**SEMACARUS** (Greek, mark and fruit: referring to use of fruit juice). *Anacardium*. A genus of 20 species of tropical A-siatic and American trees with simple, leathery leaves, and small flowers branching panicles; drupe fleshy, oblong or nearly globose, 1-seeded.

*Anacardium*, Linn. The Buriti Nut. Brazil. A moderate-sized deciduous tree with large, oblong or obovate-oblong leaves, 8-24 in. long by 5-10 in. wide; fruits, greenish white or yellow, 4 in. across, nearly sessile, in stout branching panicles about the same length as the leaves; drupe 1 in. long, smooth, black. India. The black seed juice of the nut is used for printing cotton cloth. Cult. in S. Fla.

K. N. REASONER and F. W. BARCLAY.

**SEMMLE** (mother of Bacchus). *Lilíceor*. The Climbing Butcher's Broom is a tender evergreen vine which attains a height of 50-60 ft, and is remarkable for bearing its flowers on the margins of the leaves instead of on separate flower-stalks. These flowers are small, yellow, 4-lobe 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 function of leaves but not the morphology. Some belong to the small group of 4 genera known as the Asparagus tribe, all the members of which have cladophylla. Semmele differs from the Butcher's Broom (Asparagus) in having the flower-stalks inserted in the petiole of the cladophylla instead of along the midrib. Asparagus differs from both in having the flowers borne on the cladophylla and the filaments free instead of grown into a urn-shaped body.

Semmele is a genus of one species, a native of the Canary Islands. The plant is not known to be cult. in America, 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.

**Sempervivum**

Kaufm. Scabident, branching: cladodes ovate or ovate-lanceolate, acuminate, leathery; leaves small, yellow, elliptical: ovary 3-lobed: berry globose, indehiscent. B.M. 1809 and 23291 (Asparagus anagrotes). R.H. 1831, p. 216. 6 M. 31: 477. 479. 5: 292. - The numbers which have the position of leaves are in a multi- nate scale, in which are borne the cladophylla, the latter being 2-4 in. long.

W. M. **SEMPERVIVUM** (Latin, Living forever), Cross-Stone, 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 "Heaven-and-chickens." The flowers are small, short, and succulent. The fruits, which are borne in panicle-like cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual flowers are larger than those of Sedum, but the clusters are less showy. Houseleeks are 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 Escuehveria. The foliage remains green all winter. The flowers, often spotted with red toward the tip, and this color is brighter if the plants have half full sunlight. The names "Houseleek" and "Heaven-and-chickens" are loosely applied to the whole genus. If these names are to be restricted, the former should be used for Sempervivum tectorum and the latter for S. glaberrimum. The common species, which grows on the roofs of houses in Europe, is *S. tectorum*. In the case of *S. globiferum* the young rosettes are attached to the parent plant by a more slender thread than usual and more easily detach themselves and roll about. The spider-web species are the prettiest of them all, by reason of the webs that cover the young rosettes. These webs are made by the plants themselves and are incidental to development.

Sempervivum is closely related to Sedum, but the floral parts are multiples of 6 or some larger number, while the floral parts of Sedum are in 5's. The genus is a difficult one for the botanist. It has been monographed by J. G. Baker in "Gardener's Chronicle" for
1878. Baker’s scheme has been closely followed below, but some of the names have been changed.

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1. escamatum, 7. expansum, 1. montanum, 5.
2. arachnoideum, 8. flagelliforme, 6. pumilum, 7.
4. Atlanticum, 1. glauceum, 12. subtilatum, 12.
5. calcearium, 2. grandiflorum, 10. tectorum, 1.

SUBGENUS I. SEMPERIVUM PROPER. Floral parts in 10’s, 12’s or 14’s. Expanded petals widely spreading.

Group 1. Ciliata. Lvs. of the barren rosettes glaucous on the faces when mature, shortly ciliated on the edges only.

A. Red-brown tip of lvs. conspicuous.

1. tectorum

BB. Foliage very glaucous.

2. calcearium

AA. Red-brown tip of lvs. none or obscure.

3. glaucum

BB. Petals pale red

4. Atlanticum

Group 2. Pubescentia. Lvs. of the barren shoots decidedly pubescent on the faces as well as ciliated at the edges, not tipped with a Platt of spreading hairs.

A. Height 6 in.: lvs. numerous, the lowest subsessile.

5. montanum

BB. Height 3-4 in.: lvs. few, 3-8, all sessile or subsessile.

6. flagelliforme

A. Petals bright red

7. pumilum

BB. Petals pale red

8. arachnoideum

Barbalata. Lvs. of the barren rosettes strongly ciliated on the edge, and furnished with a tuft of similar, not hairy hairs 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 fleecy threads like those of a spider’s web.

8. arachnoideum

DIVISION 2. CHRYSTAGNATHA. Fls. yellow.

A. Fls. less than 1 in. across;

9. Ruthenicum

BB. Fls. 1-1¾ in. across;

10. grandiflorum

SUBGENUS II. DIOPOGON. Floral parts in 6’s. Co- cocktail permanently bell-shaped, with ascending close petals.

A. Petals not filibrinated; young rosettes not pubescent.

11. Heuffeli

AA. Petals filibrinated; young rosettes temporarily attached to the mother plant by a slender stalk.

12. gloriferum

BB. Less, oblanceolate...13. arenarium

1. tectorum, Linn. Houseleek. OLD-MAN-AND-WOMAN. Fig. 2310. Height 1 ft.; rosettes 2-3 in. across: lvs. obovate-cuneate, cuspidate, 1⅓-2 or finally 3 in. long, pale green, with a distinct red-brown tip an eighth to a sixth of an inch long: panicle 5-6 in. long, 3-4 in. wide, composed of 10-12 scorpioid branches: fls. ⅜-⅞ in. in across; petals pale red, keeled with deeper red; stamens often changed to pistils; filaments bright purple.

Eu., Orient.—Var. expansum, Hort., is said to have branched and more compact rosettes.

2. calcearium, Jord. (S. Califfeliwum, Hort.). Height under 1 ft.; rosettes 2-3 in. across: lvs. oblanceolate-cuneate, very glaucous, with a distinct red-brown tip, 1-1¾ in. long; panicle 3-4 in. long and broad, with 8-12 scorpioid branches: fls. ⅝ in. across; petals pale red, greenish down the keel both on the back and face. Calcareus Alps of Dauphiny.

3. glaucum, Tenore. Height 6-9 in.; barren rosettes 2-3 in. across: lvs. oblanceolate-cuneate, less glaucous than S. calcareum, with only a very faint red-brown spot at the tip; panicles 2-3 in. across: fls. 1 in. across; petals bright red. Northern Alps.

4. Atlanticum, Baker. Height nearly 1 ft.; barren rosettes 2-3 in. across: lvs. oblanceolate-cuneate, pale green, hardly tipped red-brown; panicle 3-4 in. across: fls. 1 in. across; petals pale red. Atlas Mts., B.M. 6055 (fls. bright red, var. limiflorum).—The lvs. of the flowering stem are brightly colored with red, excepting towards the base.

2311. Spiderweb Houseleek—Sempervivum arachnoideum.

(× 3½)

5. montanum, Linn. Height 6 in.: barren rosettes 1½-2 in. across, the new ones few, and borne on red pilose peduncles 1-1¾ in. long; lvs. 60-90 in a rosette: panicle very dense, 1½-2 in. across, the lowest fls. nearly sessile: fls. 1-1¼ in. across, bright mauve-red. Fls. about the end of June. Alps, Pyrenees.

6. flagelliforme, Fisch. Height 3-4 in.; barren rosettes 1-1½ in. across, the new ones long-peduncled: lvs. 40-50 in a rosette: fls. 4-8 in a dense head, all sessile or nearly so, 1 in. across or more; petals bright red. Fls. early in June, before any other species. Native country uncertain.

7. pumilum, Bieb. (S. annulatum, Hort.). Height 3-4 in.: barren rosettes at most 1 in. across, the new ones numerous and short-peduncled: fls. 4-8 in a dense head, all sessile or subsessile, 1 in. across; petals bright mauve-purple. Fls. in middle of June. Caucasus.

8. arachnoideum, Linn. CORWEB OR SPIDER-WEB HOUSELEEK. Fig. 2311. Height 3-5 in.; barren rosettes ¾-1½ 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-flowered: fls. less than 1 in. across; petals bright red. Pyrenees to Tyrol. B.M. 65.—S. montanum, C. B. Lehman, said to differ in having shorter, more oblong-cuneate lvs. and flatter and more compact rosettes and a denser web, could not be distinguished by J. G. Baker. R.H. 1860, pp. 490, 491; 1888, p. 737.

9. Ruthenicum, Koch. Height 6-12 in; barren rosettes 1½ in. across, new ones few: lvs. 40-50 in a rosette, slightly pubescent glaucous on the faces: fls. pale yellow, less than 1 in. across. Eastern Eu.—Rare in cult.

10. grandiflorum, Haworth. The yellow petals are set off by the red-purple filaments: height 3-4 in.: bar-
SEMPEVIVUM

11. **Sempervivum ren** rosettes 1-1\frac{1}{2} in. across, the new ones on stalks 1-2 in. long; lvs pale green and pubescent all over, only the very tip red-brown; fls. 1\frac{1}{2}-1\frac{3}{4} in. across, yellow. Eastern Eu., Asia Minor. B.M. 907 and 2115 (as S. globiferum).—The showiest of all the hardy species.

12. **Heidellii**, Schott. Height 6-8 in.: barren rosettes 1\frac{1}{2}-2 in. across, not peduncled: lvs. 30-40 in a rosette, obovate-cuneate, the upper third or even half tinted bright red-brown; panicle dense, many-fl., 2\frac{1}{2}-3 in. across: fls. an inch or less across, pale straw-yellow; petals with 3 small cusps, not fimbriate. Aug. Mts. of Transylvania and Greece, 5,000-6,000 ft.—One of the latest in flower.

13. **globoferum**, T. inii. {S. b.}—Hen-AND-CHICKENS. Heinzl. 1. Globular rosettes 1\frac{1}{2} in. across, the new ones attached to the parent only by a slender thread and easily becoming detached from it and rolling about: lvs. 60-80 in a rosette, obovate-cuneate, the outer ones tipped red-brown, especially on the back: fls. 1 in. across, pale yellow; petals obscurely tricuspidate, conspicuously fimbriated at the edge and on the prominent keel. Mts. of Austria. B.M. 1417.—One of the latest in flower. Under the name of S. globiferum, Linnaeus seems to have confused all the yellow-fl. hardy species which he knew.

14. **arenarium**, Koch. Very close to S. globiferum, having the same height, the same globular deciduous rosette, etc., but with narrower lvs. and the petals larger and more strongly fimbriated: lvs. oblong-cuneate: fls. 1\frac{1}{4}-1\frac{1}{2} in. across, petals pale yellow, distinctly tricuspidate, with a linear end tooth, strongly fimbriated at the edge and less so on the prominent keel. Tyrol. Gn. 49, p. 229.

**Senebiera** (after Jod. Senebier, a naturalist of Geneva). *Cruce*, About 6 species of perennial annual or biennial herbs from the temperate regions of Europe and Asia, and Australia, with alternate, entire or pinnately cut lvs. and small white or purple fls., in short, axillary racemes: sepals short, spreading, equal at the base: stamens free; siliques in pairs, small, laterally compressed; valves 1-seeded, indehiscent.

**Seneio** (Latin name for plants of this genus, ultimately from *Senex*, "old man"). *Cineraria*. The largest genus of plants, comprising some 1,200 species in all parts of the world. A genus comprising so many members and being so widely distributed is necessarily variable and therefore practically impossible of definition. A distinguishing mark of the *Seneio* lies in the character of the involucres,—scales in one series, and usually reinforced by the base, a cost of shorter scales that give the head the appearance of having a small calyx. The heads are usually radiate, the ray-fl.-beating pistillate and fertile; but sometimes the rays are abortive and the head is homogamous (flower-scales one kind, i.e., perfect). The disk-fl. are tubular and 5-toothed. The tuns or receptacle is usually naked. The akenes are mostly torted and ribbed; pappus of soft whitish, often coarsely hispid. According to Gray, "minute short hairs or papule on the akenes of most species swell and emit a pair of spiral threads when wetted. Before wetting, the akenes may be really or apparently glabrous, and after wetting become sessile." Most of the *Seneio* are yellow-rayed. Of the vast number of species, very few have gained prominence as cultivated plants. When grown the greenhouse *Cineraria* is technically a *Seneio* as understood by Bentham & Hooker; the most popular species are the *Farfugium* group, properly *Seneio Karrmanna* of florists, *S. microphyllum* or German ivy, *S. hypericum* or purple ragwort, and *S. Cineraria*, one of the plants commonly known as dusty miller. Various other plants are known as dusty miller, and one of them (fig. 2312) is sometimes confused with *Seneio Cineraria*.

All other species are of very minor importance to the horticulturist. Of the 60 or more species native to the

**United States and Canada** about a half dozen have been offered by dealers in native plants, but they are practically unknown horticulturally. Most of the species are wholly weeds, but in South Africa and South America many species are shrubby. Some species are even arborescent; others are climbers. In South Africa and the Canary is a set that has been separated as Kleinia, distinguished mostly by its habit, being for the most part shrubs or herbs, with entire or angular stems and white or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents, but they are little known outside of botanical gardens. *S. vulgaris*, Linnaeus, from Europe, is a common annual weed in various parts of this country. To *Seneio* belong the genera known to gardeners as *Erthrodontum*, *Farfugium*, *Jacobaea*, *Kleinia*, *Ligularia*. *Cineraria* is a synonym, but the fl. *Cineraria* is described under that name in Vol. I of this work. Bentham & Hooker refer to *Seneio* the genus *Caucal*, which is kept distinct by American botanists. Hoffmann (in Engler & Prantl's *Naturlchen Pflanzenfamilien*) refers the garden genus *Emilia* to *Seneio*, but keeps *Ligularia* (including *Farfugium*) and *Cineraria* distinct. For *S. conchaletum*, see *Emilia*.

Since *Seneio* 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 buds; the hardy species may be divided.
because of its being a reputed antidote against the ardor poison of the Cape Ephemerian." The names Kleinia spinulosa and K. susiana have appeared in the American trade, but they are unidentifiable.


— Var. aureo-maculatus, Hort. (Farfugium aureum, Lindl. f. maculatum, Hort.). LEOPARD PLANT. Fig. 2213. Differs in having the lvs. blotched with yellow or white and sometimes with light rose. The variety aureo-maculatus is the only form in general cultivation. It was introduced to England in 1866 "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 hardly 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. Japônicus, Sieb. (Ligularia Japonica, Less. Erythrocotale pulatifolia, 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: f-stems branched, bearing heads on rather long, naked stems: rays orange, spreading, 3 in. from tip to tip. Japan. Go. 22, p. 129.—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.

4. crusentus, DC. (Cineraria cruenta, Mass.). Low short-stemmed perennial, succulent-woolly; lvs. large, cordate-ovate to cordate-triangular, angled or undulate and sinuate-toothed, rather long-stalked; f-stems purple-red. Canary Isl.—The supposed parent of the florists' Cinerarias, for discussion of which see p. 318, Vol. I.
5. Elegans, Linn. (S. purpureus, Hort. Jacobina elegans, Mosch. PURPLE RAGWORT. Annual, viscid-pubescent, erect or diffuse, 1-2 ft.; lvs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinuses mostly broad and rounded, clasping at the base; heads in loose corymbs, the rays purple, disk-fls. yellow. S. Afr. B.M. 228. — Var. erectus, Harvey. Stem slender in loose corollas, the rays purple, disk-fls. yellow. S.

6. pucher, 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. 5,269. R.H. 1877, p. 94; 1896, p. 229. Gn. 49, p. 122. G.M. 41, 174. — A very bold species, with striking erect habit and large lvs. in summer. Perennial, although it has been described as annual. In protected places and well-drained soils, it is hardy in southern New England.

17. Dooglassi, DC. Fig. 2317. Woody or even shrubby at base, with many stems, 2-3 ft. tall, with the aspect of an aster; lvs. small and linear, or the lower ones partially divided into trifoliate divisions; heads numerous, 1/4-3/4 in. high, with 8-18 conspicuous yellow rays. Nebr., W.

2314. Senecio mikanoides, usually called German Ivy. (S.)

but erect, the lvs. pinnate or 2-pinnatifid. Senecio chrysos is an old garden plant. A common form of it has double fls. Var. albus, Hort., has white lvs.

23. 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, 1-3/4 in. high, with 5-8 rather long yellow rays. California, 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, 1-3/4 in. high, with 5-8 rather long yellow rays. California, Oregon.

15. fastigiatus, Nutt. Perennial: mostly pubescent, the stem strict and simple and 1-2 ft. high; lvs. all or very nearly so, lanceolate or spatulate-lanceolate, obtuse; heads 1/4-1/2 in. high, with conspicuous yellow rays.

The few rays light-yellow. S. Amer. B.M. 1536. — A striking plant for winter decoration, the star-like fls. (or heads) being produced in great abundance; now becoming disseminated in this country.

12. Dorcia, Linn. Erect, 3-4 ft.; radical lvs. oval-oblong, denticate, somewhat glaucous, stalked; stem-lvs. oblong-lanceolate, sessile and somewhat decurrent; heads yellow, with 5 or 6 rays. Eur. Hardy perennial.

13. iguens, Rich. Perennial: floccose-woolly when young but becoming nearly or quite glabrous, 6-24 in. tall, the stems practically naked above; lvs. capitulate to oval or oblong, repand-denticulate; rays 10 or 12, yellow, conspicuous. Western U. S., in the mountains and to Alaska. — Var. exaltatus, Gray, has been offered: 1-3 or 4 ft. tall; lvs. thicker, longer-petioled, abrupt or subcordate at base.

14. aureus, Linn. Perennial: an exceedingly variable and cosmopolitan group, by some authors split into several species; some glabrous, 1-2 ft. tall; lvs. mostly rounded and undivided, the cauline ones lanceolate and pinnatifid or incise; heads many, 1/2-1 in. high, with 8-12 conspicuous yellow rays. Idaho, Oregon, Washington.

18. Cineraria, Hort. (Cineraria Petasitis, Sims). Fig. 2315. Perennial, 2 ft. or less tall, branching from the base, very white-woolly throughout; lvs. pinnatifid, with oblong and obtuse segments; heads small, yellow, in small, compact corymbs, rayless. Europe. F.M. 1875-76. — Var. candidissimus, Hort., has very white foliage. Var. aureo-marginatus, Hort., has lvs. bordered with orange-yellow. S. Cineraria is an old-fashioned garden plant, sometimes known as Dusty Miller; the commoner Dusty Miller is Lychia Coronaria, and another one is Artemisia Stella-turfus (Fig. 2312).

2315. Senecio Cineraria.

One of the plants known as Dusty Miller.

SENECIO. See Cassia.

SENN. See Cassia.

SENN, BLADDER. Calotela.

SENSITIVE BRIER. See Schrankia.

SENSITIVE FERN. Onoclea 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, usually dimorphic (especially on young trees): fs. naked, monoecious, solitary, the staminate terminal or axillary; staminate small: cones worked material is desired. Most wooden buildings are constructed with this lumber in California, and it is also used for construction 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 be doing well in southern California.

*S. gigantea* has been more widely planted in the East and in Europe, and in sheltered locations has maintained itself for a number of years. The most notable examples are those in the Ellwanger & Barry grounds, at Rochester, N.Y., which are now about 40 yrs. old, 30 ft. high and 12 in. in diameter at base of trunks. When seen in the winter of 1900–1, however, these trees were beginning to show the effects of the rigorous climate by their dead and dying tops. This species is far more hardy than *S. sempervirens*, and even in the dry climate of southern California is reported to be doing very well. A weeping variety known as *S. pendula* is advertised, which originated some years ago in European nurseries, and is described as having "all pendulous branches, closely pressed against the stem." Both species are said to dislike heavy soils, and to thrive best when planted in deep sandy loam. Both are easily propagated from seed, which sprout readily in a few weeks.
but cut off, swept away and destroyed by the glacial age under the influence of great continental ice sheets, 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 region of Europe, appears in the miocene of Alaska, Greenland, Spitzbergen and Iceland, and it much resembles S. sempervirens. Another fossil species, S. Sternbergii, found in Greenland, seems to have been the ancient representative of S. gigantea. According to the investigations of the United States Geological Department, 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 every respect, except that when S. gigantea grew in Greenland, Siberia and Great Britain, we can measure that period only by vast and indefinite epochs. But the value and interest of the Sequoia are so great that its representatives may be regarded as the last modern survivors of so powerful an ancient family.

At the present time the Coast Redwood occupies only a narrow belt of country near the ocean, nor is it continuous even there; the Giant Redwood, or California Big Tree, exists only in a few small and isolated groves, covering in all less than fifty square miles along the western slopes of the Sierra Nevada range. Compared with the enormous territory once occupied by species of Sequoias, the modern representatives of this ancient and honorable family are reduced to a very small area.

The first known of the Sequoias, and much the more valuable species, economically speaking, was S. sempervirens, the Coast Redwood of California. This is one of the most important timber trees of the world, and its forests, comparatively limited in area, have yielded and are yielding the most easily obtained, the most durable and most profitable fencing and building lumber of the Pacific coast. The reproductive powers of the tree are enormous; no other known conifer so persistently sprouts from the stump, so rapidly makes new forest, or so well resists fire. But it does not thrive farther inland than the limits of the sea-fog, and a large part of the original area covered by this noble tree has been denuded by successive fires and destructive lumbering methods. Small Redwood forests occur in Monterey county, but the most southern forests of commercial importance are in Santa Cruz. The belt, broken by the Bay of San Francisco, extends north through Marin, Sonoma, Mendocino, Humboldt and Del Norte to the southern borders of Oregon. The real Redwood forests are all contained within a strip of coast lands 500 miles long and rarely more than 20 or 25 miles wide. The actual bodies of Redwood within this region are merely a chain of isolated groves separated by clearings or by large areas on which Redwoods never grow. A small grove, now practically destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda county. The botanists 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 southern California so that the range for ornamental uses can be greatly extended on the Pacific coast. It has been largely planted in Europe, particularly in English parks, and as was to have been expected, does best in well-drained rich soil near the ocean but sheltered from cold winds.

Endlicher's Sequoia gigantea (= the S. Washingtonii of Sargent) is undoubtedly one of the rarest of all living species of trees, and one of the most easily visited and studied. It is the best living representative of a geologic age long passed away. Besides this, it is the most impressive and noble of all known trees. But nearly all of it is small and at one reaches the plainly marked edge of the Sequoia sempervirens forest.
stroved. The famous Calaveras grove, which is historically and scientifically the most interesting of any Big Tree group, was in 1899 bought by a lumberman who, warily, after a week's search with a camera, "gets his price" from the state of California, the general government, or some public-spirited association. Several fine Sequoias are in the Sequoia and General Grant National parks, but private timber claims hold many of the best trees here, and sawmills are now at work in this region.

The resistance offered by this wonderful species to fire, old age and decay is enormous, 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 Tule 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 1,000 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, Deceuninck's name, S. gigantea, must be disregarded, because in 1847 Endlicher named the Coast Redwood Sequoia gigantea, excepting on the south fork of the Kaweah and on the branches of Tule 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 1,000 years old.

Charles Howard Shinn

SERANEA (after Sereno Watson, distinguished American botanist). Also written Serenéa. PalmAcce. Low, spineless, cespitose palm with creeping branched caudex. Leaves are to the base united. Leaflets, terminal, orbicular, coriaceous, deeply plicate-multifid, glaucous beneath, with narrow bifid infolded segments; racbs none; ligule short; petiole plano-convex, dentate on the margins; spadix long, tomentose, the

flexuous rachis covered with deeply obliquely fissured, tubular sheaths, the spreading branches branched, the alternate branches very slender; spaths many, sheathing the peduncle; bracts minute; fls. white; fr. ovoid, black, an inch long. Species 2. Florida to S. Carolina.

serrulata, 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, spiny-edged petiole; segments slightly lefth of the apex, with out-thread-like flaments; spadix densely tomentose, shorter than the lvs.; drupe black, 2-4 in. long.

SERRADELLA. See Serradella.

SERAPIAS (ancient name of an orchid derived from Serapis, an Egyptian divinity). Orchidaceae. Terrestrial herbs with the habit of Orchis. Four or 5 species are known from the Mediterranean region. Sepals convolvent in the form of a helmet; petals included, small; labium erect, lateral lobes with erect central lobes and a larger undivided middle lobe; pollinia with a common viscid disk; rostellum laterally compressed. The following species are among the best known.

The plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot them in leaf-mold, loam and sand.

Lingua, Linn. Stem erect, up to 1 ft. high, bearing several narrow, acute lvs.; sepals lanceolate, greenish or purplish; labellum much longer; lateral lobes dentate on the margins; rachis none; ligule short; petiole plano-convex, dentate on the margins; spadix long, tomentose, the

arborescens, Sarg. Tree, 20-40 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. Differes from above in arboreous habit, more elongated spadix, much smaller fls. and smaller, globose fruit and seeds. Southwestern Fla.

Jared G. Smith

The Saw Palmetto is the native creeping fan-leaved palm. Those who are clearing land in Florida consider it a nuisance. It is, however, of great interest to northern tourists, many of whom like to take home a small Florida palm in a pot or tub. This species does very well in pots, though it is of slow growth. Relatively speaking, it is very hardy, as it will stand a temperature of 10° F. The leaves of the Saw Palmetto, both fresh and dried, are sent north in great quantities for Christmas decorations. 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 3-5 ft. high are considerably used for large decorations at Christmas, Palm Sunday and Easter.

E. N. Reasoner

In clearing the land for the writer's garden one large clump of the Saw Palmetto was purposely retained. At present it makes a striking appearance, somewhat weird and grotesque. The fertilizer which the plant received has improved it wonderfully. Good specimens attain a height of about 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 Palmettos often consist of 10 to 20 low stems and end in hundreds of many-angled leaves. They are the hiding-place of many small birds, rabbits and even rattlesnakes.

H. NEmmings.

SERENOÀ. See Serenoa.

SERRICOCARPUS (Greek, silken fruit). Compositae. A genus of 5 species of perennial herbs from the northwestern United States closely allied to Aster and scarcely fingered leaves. They are the hiding-place of many small birds, rabbits and even rattlesnakes.

The flower-heads have wini.' raw avl.,ili- \\

Clumps of Saw Palmettos often consist of 10 to 20

was offered in 1881 in the eastern states by western col-

which sometimes beconn/ iHir|.li>li. N. minlt^, 

S. orientale, Linn. was offered in 1881 in the eastern states by western collectors, but it is doubtful if any member of the genus is in cultivation.

SERRISSA (from the Indian name). Rubiaceae. A single species from southeastern Asia, a tender shrub of moderate growth with small, opposite, nearly sessile leaves. The scientific name of Serrissa is Orthodonta sativa. The generic name means "bird's foot," referring to the clusters of long, claw-like pods. The genus contains about 7 species of slender, low-growing annuals with pinkish or white flowers, which are too minute to have any horticultural value. Lvs. odd-pinnate; hts. numerous.

SERVICE-BERRY is Amelanchier.

SERVICE-TREE. See Sorbus.

SESAME. See Sesamum.

SÉSAMUM (Greek name taken by Hippocrates from the Arabic). Pedaliaceae. A genus of annual herbs from India and Egypt, allied to 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 Benez. They yield about half their weight of oil of sesame (known also as benna, lin goat, or teelain), which is odorless and does not easily become rancid. This oil is universally used in India for cooking and medicating. Large quantities of colored oil are imported from India to Europe for the manufacture of soap and adulteration of olive-oil. Also cult. in northern states as a medicinal herb, the mucilaginous leaves being used in dysentery and diarrhea of children. The oil of Sesamum, however, which is expressed from the seeds is in large doses a laxative.

Indicum, Linn. (S. orientale, Linn.). Lvs. variable, 3-5 in. long, oblong or lanceolate, the lower often 3-lobed or parted; corolla pale rose or white, 1 in. long, tubular, 5-keft, 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.

SÉTARIA (seta, a bristle; referring to the bristles below the spikelets). Graminaceae. Hackel places the number of species at 10, but this is certainly too low. Several species from North America alone (under the genus name Chasechila), Warner counties of the world. Includes several weedy species, the foxtail grasses, S. graminea, S. viridis, and others, and the foxtail millets. The flower-heads are white, and the seed is a small black. The families of Millet dates from prehistoric times. At present it is raised extensively in parts of Asia as a food plant. In the United States, Millet is raised for fodder. There are several groups of Foxtails and Millets found here, Common German, Golden Wonder (all of which belong to Setaria italica), and Hungarian Grass (which is referred to S. italicum, var. Germanica. New Siberian Millet is probably a distinct variety. The "Japanese Barnyard Millets" belong to Setaria Italicum, while the "Japanese Barnyard Millets" belong to Paniceum Crassgliü.

Spikelets, as in Panicum, areless, but provided at base with a cluster of bristles which extend beyond the spikelets. The bristles persist on the axis after the spikelets have fallen. Inflorescence a dense, cylindrical, spike-like panicle, which becomes quite compound in some of the cultivated varieties. The seed is indented 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 was given by Linnaeus; Rea, who first determined the genera, referred them to Iophonurus, and by others, more recently, to Chaschila.

Italica, Beauv. Common Millet of the United States brought from Europe, which is known as Cheen acuticostata. An annual: culm 3-5 ft. high; spike yellow or purple; bristles 1-3, often shorter than the spikelet. Thought to have been derived from S. viridis, G. n. 12, p. 69.


macrostachya, H. H. (S. Acuarella, Fisch. S. at. peniculodes, var. mcca of the trade). An erect or ascending perennial; spike slender, tapering at apex; bristles 1 or sometimes 2, ½-1 in. long; spikelets one-tenth in. long; first glume smooth; second and third equaling the spikelet; flowering glume smooth; Marches to Gulf states to Central America. A. S. Hitchcock.

SHAD-BUSH. Consult Amelanchier.

SHADDOCK. See Citrus and Pounch.

SHADE TREES. See Trees.

SHADING. See Greenhouse, page 090.

SHAGBAEK. See Hiekorij.

SHALLOT is Allium Acaulonum, Linn., native of Syria. It is grown chiefly for the small oblong-pointed gray bulbs, which are used in cookery for flavoring; the leaves are sometimes eaten in a green state. The bulbs are of mild flavor. Shallots are little known as a food plant 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 produces several, all cohering by the base. The mature bulbs are 2 in. or less long and only about half that 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 sometimes sold as Shallots.

L. H. B.
SHAMROCK. Half the world is sure that Shamrock is the wood sorrel, Oxlalis Acris. The other half is equally certain that the true Shamrock is white clover, Trifolium repens. In the time of Spenser's Fairy Queen, Shamrock was said to be good to eat. This applies to the former plant, but not to the latter. Moreover, according to Sowerby, the wood-sorrel is in procession 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 worn in Ireland. Half a dozen other plants have their followers, and these are all plants with three leaflets. Nevertheless there are those who deny that Saint Patrick used the Shamrock as a symbol of the trinity. The reason is that the wood-sorrel is the true Shamrock. The question will always remain an open one.

W. M.

SHAMROCK, INDIAN. A name found in some English books for the Trillium.

SHAMROCK PEA. Parochetus communis.

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. After retirement from 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, either 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. Trelease.

SHEEP BERRY. Viburnum Lentago.

SHEEP'S BIT. Jasione perennis.

SHELLBARK. See Hicoria and Hickory.

SHELL FLOWER. See Cylobaloba; also Alpinia mutans; also Moluccella laevis.

SHELL LILY in Alpinia mutans.

SHEPHERDIA (John Shepard, an English botanist). Eléagnaceae. 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 opposite, petioled, entire. Flowers dicroeous or polygamous and apetalous, small and inconspicuous, borne in small sessile or nearly sessile clusters; calyx 4-parted; stamens 8, alternating with 8 lobes of a disk; pistil 1, nearly inclosed by the disk at the orifice of the calyx-tube, becoming a nut or achenes and invested by the fleshy calyx, forming a drupe-like fruit. In S. argentea, the Buffalo Berry, the fruit is edible when made into jellies and conserves, and is much prized in the upper Plains region for household uses.

The Shepherdias are hardy plants, withstanding extremes of cold and drought. They are of easy culture, and grow readily from stratified seeds. For ornamental planting, they are prized for bold positions in front of shrubbery masses, where their gray or white colors afford excellent contrasts. S. Canadensis is particularly well adapted for planting on dry, rocky, sterile banks, where most bushes find great difficulty in securing a foothold. S. argentea succeeds better in the upper Mississippi valley than in the eastern states. Stamineate and pistillate plants of it have different forms of buds.

The genus Shepherdia was founded by Nuttall in 1818. It is said that Rafinesque's Leparygraea, 1817, is equivalent, and the species have been placed under the latter name by recent writers.

A. Lvs. green above.

Canadensis. Nutt. (Leparygraea Canadensis, Greene). Spreading twiggy bush 3 to 6 or even 8 ft. tall, the young branches brown-scurfy: lvs. ovate, oval or elliptic, rather thick, green above but rusty beneath: fls. yellowish, in short clusters at the nodes: fr. small (½ in. or less long), oval, red or yellow, insipid. Along streams and on lake banks, Newfoundland to British Columbia and in the northern tier of states, and southward in the mountains to Utah. —Little known in cult., but has been offered by dealers in native plants.

SHOEBLACK PLANT. Hibiscus Rosa-Sinensis.

SHOEGLASS. Pyrola.
SHOOTING STAR. See Dolerocoeus.

SHORE GRAPE. See Cercisfar.

SHOREY GRAPE. See Cercisfar.

SHORTIA (named for Dr. Charles W. Short, a botanist of Kentucky). Diapensiac—a genus of small plants, of the Diapensiac—family Diapensiac.—a-, with its i; (,'i-ni-ra  and  S  spe-}

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Plate XXXVII. A colony of Snowballs, well placed. To illustrate the article "Shrubs."
ally has a number of stems springing from the ground and a tree usually has a single trunk, but this is not uniformly true in either case.

The chief value of shrubbery comes from its use in an artistic way, although some shrubs have edible fruits. Many shrubs, such as lilacs, some of the spireas, gooseberries and currants, produce leaves very early in the season and some, like Forsythia, Daphne, and the Juneberry are covered with a profusion of blossoms at this time. From early spring until November in temperate latitudes leaves and flowers are to be found on deciduous shrubs, and from June until the following spring ornamental fruits can be seen on their branches, the red berries of the elder beginning and barberries ending the list. Some of these fruits are so richly colored and so abundant that they can be seen from a long distance. Many shrubs, like some of the viburnums and dogwoods, attain a height of 10 or 15 feet, while others, like bunchberry and Daphne Canescens, grow to a height of only a few inches. The leaves of some, like the chokeberry, Thunberg's barberry, the hazels, viburnums, dogwoods, and sumacs are beautifully colored in the fall. The rhododendrons, laurels (Fig. 2326) and mahonias, and the daphne already named, are examples of shrubs having evergreen foliage. Some leaves, like those of the Salix lucida, are glossy; others, as those of the common hazel, are hairy; some are thick, and others are thin; some large, some small; some entire, and some lobed, serrated or compound. Throughout the season the foliage of a good collection of shrubbery will present the greatest variety of color, including all the hundreds of shades of green as well as yellow, white, gray and purple. Even in winter shrubbery is wonderfully attractive in appearance from the gracefulness of its stems and branches, and from the color of its bark. With the right selections, it will serve almost as well as evergreens to shut out from view fences or other low, unsightly objects.

This great variety in foliage, flower, fruit and habit of growth makes shrubbery adapted to very extended use in the development of landscapes. It is especially appropriate along the boundaries of ornamental grounds (Fig. 2324), upon steep slopes, and in the immediate vicinity of buildings where foliage and graceful lines are needed to connect the walls of a structure with the ground (Fig. 225), without making too much shade. It might with advantage replace the grass upon all surfaces too steep to walk upon with comfort. The foliage of shrubs that are well established remains green when dry weather turns grass brown. The broad mass of shrubbery will take care of itself when the grass needs frequent attention. Even some level surfaces might be improved in places by exchanging a lawn covering for the covering of low woody plants. Often a broad, open space over a lawn is an important feature of a landscape, since it allows extended views. Many times a landscape would be more interesting if the green underneath this open space were produced by a broad mass of shrubbery like a miniature forest instead of grass.

In planting borders or groups of shrubs, the ground to be occupied by such a group should be entirely spaded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should then be planted so that there is room for about two years' growth before their branches intermingle. If placed closer they would have a crowded appearance from the start and would not join their branches as harmoniously as when the new growth is allowed to choose its own position. If placed farther apart the effect is also bad. Occasionally a single shrub or small group should be placed in the center of the group, and the lower species along the border, the space being graded from the highest to the lowest. The reason for this arrangement is that the lower plants would be killed by the shade of the larger ones if placed back of them, and moreover would not be seen; but one should avoid too uniform a slope. For instance,
in a continuous border there should be places where shrubs of larger size occupy the full width so as to bring growth of considerable height into the lawn. The arrangement should be varied so as to avoid all monotony, but in securing this variation a mixture of miscellaneous shrubs of all kinds does not give as good an effect as broader areas of single species or genera slightly interspersed at the margin with shrubs of another kind. Straight rows should be avoided. A laborer or a novice when told this will arrange the plants in a zigzag manner, thinking that he is placing them irregularly, the result often being almost the same as that of two rows. If the group is being planted along a straight line, as the boundary of a lot, the distances of the successive plants from this line might be somewhat as follows: two feet, four feet, five feet, three feet, one foot, and the distances apart, measured parallel with a fixed line, should vary also.

The ideal condition of a group of shrubbery is to have all the individual plants healthy so that the foliage will appear fresh and of good color. This foliage should extend down to the surface of the adjacent lawn or walk, and shade the ground underneath so completely that nothing will grow there. The leaves which fall with the approach of winter should be allowed to remain as a perpetual mulch. The desired result cannot be secured the first year the shrubs are planted unless they are of large size and moved but a short distance. The aim in caring for a new plantation should be to secure thrifty plants, and this care, like the preparation of the soil, should be 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 mark of the knife will not be noticed. Such treatment will help to retain the winter beauty of the branches.

The value of shrubbery is not appreciated as it should be. Those who are interested in the subject will do well to read what is found in the various books on landscape gardening, Bulletin No. 121 of Cornell University Agricultural Experiment Station, the various articles on shrubs and shrubbery to be found in the ten volumes of "Garden and Forest" and in other horticultural journals.

O. C. Simonds.

*BIBBALDIA* (Robert Sibbald, Scotch naturalist). *Rosaceae.* About 5 species of alpine plants, one of which has been suggested as suitable for rock gardens. The genus is reduced by Bentham and Hooker to a section of Potentilia, but Britton and Brown keep it separate chiefly on the ground that the pistils are only 4-12 in number instead of very numerous as in Potentilla. Sibbaldias are densely tufted, hardy perennial herbs with woody stems. The lvs. have prominent stipules and 3 leaflets, each of which is characteristically 3-toothed at the apex. The fls. are about ½ in. across or less, and have 5 minute yellow petals much smaller than the remarkably calyx, which has 5 broad lobes, alternating with 5 smaller and narrower lobes or bracts.

**procumbens**, Linn., ranges from the arctic regions to the summits of the White Mts. and in the Rockies comes as far south as Utah. It is also found in arctic and alpine Europe and Asia. B. B. 2:217. — This plant is recommended by some persons, but it is not known to be advertised for sale in America.

W. M.

*SIBTHORPIA* (John Sibthorp, professor of botany at Oxford, author of *Flora Graeca*, published 1805-15). *Sibthorpiaceae.* 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-leaflet; corolla subrotate, with a very short tube, 5-8-leaflet; stamens usually equal to the number of corolla-lobes; anthers sagittate: capsule membranous, compressed, loculicidally dehiscent, the valves splitting to the middle.

*Europaea*, Linn. A hardy trailing perennial with very slender stems: lvs. orbicular, less than ½ 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 1863 by John Saul, Washington, D.C. *Var. variegata* is cult. abroad.

F. W. BRYAN.

*SICANA* (Peruvian name). *Cucurbitaceae.* Two or 3 species of tropical American tall-climbing tender-bearing vines, allied to Cucurbita, but differing in having wide-spread or reflexed calyx-lobes and the anthers not united. *S. odorilera*, 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-

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**2325.** Planting may relieve the angularity of foundations. — A bower of trumpet creeper.

**2336.** The common laurel of the East, *Kalmia latifolia* (× ¼)
brons, the stems angled: lvs. large (often 1 ft. across), nearly orbicular in outline, deeply cordate at the base, strongly 3 or 5-lobed and the lobes repent-toothed or angled: fls. solitary, monocious, the corolla small and yellowish, urn-shaped, with small reflexed lobes; stigmas 3, each 2-lobed: fr. like a slender vegetable marrow, 1-2 ft. long, smooth, nearly cylindrical, orange-crimson, with a very strong aromatic odor. R.H. 1890:516. — 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 afford edible preserves. The plant climbs 30-50 ft. It is well worth growing on summer arbors, or under glass if one has room for it. The fruits are very interesting, fruit and ornamental. Perennial.


SIDA (from the old Greek name for Nympaea alba; given without explanation by Linnaeus). Malvaeae. A genus of about 60 species of herbs or shrubs, mostly native of the tropical regions of the world, with usually 5-merous, 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-lobate or 5-cleft; staminal column divided at apex into many filaments: locules of ovary 5 or more, 1-seeded.

a. Lvs. large, lobed.

Naphea, Cav. A hardy herbaceous perennial 5-8 ft. high, from a stout root: lvs. 3-8 in. long, 3-7-parted; lobes triangular, long-acuminate, irregularly serrate: fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June-Aug. S. Pa., W. Va. and Va. F.B. 2:422. — Culture same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to Napaec dioica, Linn., but according to Gray's Synoptical Flora of North America the two species belong to separate genera, the fls. of the first being hermaphrodite, of the second dioecious. Napwa dioea 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. daisy-like, white, or yellowish, in heads of 1 in. diameter. Calif. For pictures of the two plants, see B.B. 2:420, 422.

aa. Lvs. small, linear.

Élliotii, Torr. & Gray. A hardy perennial herb, slender, 1-3 ft. high, with lvs. 1 in. long and yellowish-fls. Sandy soil in the southern coast states. Offered by western collectors in 1881.

F. W. BARCLAY.

SIDALCEA (compound of Sida and Attea, related genera). Malvaeae. 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 involucels 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.

cândida, Gray. Plant erect, from more or less creeping rootstocks, the stems somewhat branched above, 2-3 ft. tall, glabrous or nearly so: radical lvs. nearly orbicular, cordate, obtusely lobed or deeply crenate: stem-lvs. 5-7-parted, the divisions narrow and often notched: lvs. 1 in. or more across, white, in an erect spike-like raceme. Rocky Mts. Gn. 24, p. 396; 28, p. 29. R.H. 1891, p. 396.

aa. Fls. normally colored (rarely white forms).

spicata, Greene. One or two feet tall, sparingly branched or simple, often more or less hirs. 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.

malveflora, 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.

2237. Sicana odorifera, the Cassabanana (X 1/4)
campéstris, Greene. Two to 5 ft., often branching above, glabrous or sparingly hisrate-pubescent: lvs. green, the lower ones round and variably lobed, the upper ones 5-7-parted into narrow divisions: fls. about 1 in. across, in strict spike-like racemes, purplish, the petals often laciniate. N. Calif. to British Columbia.


L. H. B.

SIDERÓXYLON (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 1/4 in. through. West Indies; cult. in S. Calif. — Franceschi says it yields a sort of chewing gum.

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SILÈNE (Greek, seilanos, a god described as covered with foam, connected with sialon, saliva; referring to the saltiness 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-petaled 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-ovulate. Silene mostly has a generally 3:1 capsule dehiscing at the apex into 6 rarely 5 teeth or short valves. There is a full botanical monograph of Silene, with a key, in the Journal of the Linnean Society, vol. 32 (1896) by P.N. Williams, a specialist on the whole family of Caryophyllaceae. The account is mostly in Latin, and has few descriptions. Williams admires 300 good species. His revision has not been closely followed below. Williams refers to our common N. Virginica and Pennsylvania as well as the European S. viscosa to the genus Silene, characterized by a strictly uniovulate capsule with no trace of septation at the base. Only a few of the known species are in cultivation.

Silenes are of easy culture. They mostly bloom in summer, and a few continue well into autumn. By good management the season of bloom may be continued through spring and summer. Toward this end the seeds of the common annual kinds should be sown in early 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 description. The most popular kinds are the pink and rose-annuals, N. Armeria and pendula. Of the perennials the most popular among the white-flowered kinds are S. maritima and alpestris, while N. Virginica, Penn. silvestre and Schoenocaulon are amongst the most popular kinds with colored flowers. A good horticultural review of the kinds in cultivation is found in The Garden, Vol. 11, pp. 10-13 (1877).

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### a. Duration annual or biennial.
- Plants short and flowering... 1. pendula
- Plants low and trailing... 1. pendula
- Plants erect, 1-2 ft. high. 6. viscosa
- Plants sticky-hairy. 2. viscosa
- Plants glabrous. 5. Armeria
- Plants at rest, 6. compacta
- Plants at rest, 6. compacta

### b. Height a few inches.
- N. Virginica is about 2 in. tall. 6. maritima
- Silene is about 2 in. tall, inflated after anthesis. 5. Pumilio
- Silene is about 2 in. tall, 6. maritima
- Silene is about 2 in. tall, 6. maritima
- Silene is about 2 in. tall, 6. maritima

### c. Flowers white or pink.
- Calyx bell-shaped. 7. acaulis
- Calyx club-shaped. 8. petraea
- Lvs. oblanceolate or lanceolate. 9. Caucasica
- Plant velutina. 10. vallesia

### cc. Stems many-flowered.
- Petals 4-fld. 11. alpestris
- Petals 2-fld. 12. Schafta
- Petals 2-fld. 13. Pennsylvanica

### bb. Height a foot or more.
- Calyx inflated after anthesis. 14. inflata
- Calyx not inflated after anthesis. 15. stellata
- Petals not fimbriate. 16. Virginia
- Petals not fimbriate. 17. Californica

### e. Flowers white to pink.
- Inflorescence to 1 ft. 6. viscosa
- Flowers borne in forks of stems. 18. Menzingii
- Inflorescence composed of long peduncled flowers. 19. Douglasii
- Inflorescence verticillate. 20. Scouleri
SILENE

6. petraea, Wall. & Kit. Tufted subshrub, 4 in. high, with linear-linear-lanceolate, small, solitary, calyx club-shaped; petals biform, with a broad appendage, and ciliate on the claw. Caucasus. — Fls. white, according to J. Woodward Manning.

9. Caucasia, Boiss. This and S. Vallesia are perennial, white-flowered plants 4-5 in. high, with the flowering stems laterally arising from a terminal rosette of lvs.: the stems are usually 1-fld., sometimes 2-3-fld.; lvs. oblong or lanceolate; calyx 10-nerved, not inflated after anthesis. Caucasus. For distinctions from S. Vallesia, see that species.

10. vallesia, Linn. SWISS CATCHFLY. A very rare plant found in the highest and most sterile parts of the Alps, differing from S. Caucasia in being glandular, rather than velvety, the stem-lvs. long, the fls. long-peduncled and the calyx more widely inflated.

11. alpestris, Jacq. ALPINE CATCHFLY. Perennial white-flowered plant 6 in. high, the fls. borne on stems, which arise laterally from the rosettes of lvs.: lvs. ovate; fls. erect; calyx 10-nerved, not inflated after anthesis; petals 4-lobed at apex and provided with 2 teeth at the base of each petal in the throat: seed cristate-ciliolate on the margin. Eastern Europe. — It forms a dense mass of underground stems and is easily propagated by division or seeds. One of the best.

12. Schaffa, G. Gmel. AUTUMN CATCHFLY. Woody-rooted perennial 6 in. high, with rosy pink fls. borne on stems which arise laterally from the rosettes of lvs.: lvs. ovate-oblong or lanceolate; fls. 1 in. or more across, loose, cymose, nodding or reflexed after anthesis; petals broadly lanceolate, 2-toothed at apex. N. Y. to Minn., south Ga. to Ark. B.M. 3342. Gm. 22, p. 375.

17. Californica, Durand. Perennial, 4 in. to 4 ft. high, prominent or sunken, red with large, deep red, scattered fls. and a taproot descending 2-3 ft.: stems several, leafy: lvs. lanceolate or ovate-elliptic; fls. 1 in. or more broad; petals variously cleft, most commonly with 2 broad lobes, flanked by 2 narrower ones, appressed. 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.

19. Menziesii, Hook. Perennial: stems weak, dichotomously branched, 6-12 in. or more high; lvs. ovate-lanceolate; fls. white, "very small for the genus" (not ordinarily exceeding 6-8 lines in diam.), borne in the forks of the branches and forming a leafy inflorescence; petals white, 2 cleft, commonly but not always unappendaged. Rocky Mts. and Pacific slope. — Offered in 1881 by western collectors but probably not cultivated.

20. Scooteri, Hook. Perennial, 1½-2½ ft. high, with white or pink fls. borne mostly in long-peduncled, 3-fld. cymes: stems very slender, decumbent: lvs. remotely linear, 2-3 in. long; petals 2-lobed, appressed. June-Sept. — A common wild polytrophic species in the western or Mts. It is still found in one eastern catalogue. Var. Macounii, Robinson, was offered in 1881 under its synonym S. Latiii, Wats.

22. Perennis, Mill. is an old name which is not accounted for by Williams. Le Candolle, Boissier, Nicholson, Mottet or Yoss. According to Thorburn & 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 umbelliferous plant of northern Africa). *Silphium* apollinare, *S. Zinniense*, *S. SPPB*.

A genus of 11 species of tall-growing hardy perennial herbs native of the U. S., with somewhat coarse leaves, and rather large, sunflower-like heads of flowers which are yellow, except in one species: heads many-flowered, involucre of thick, somewhat foliaceous bracts: rays-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted deciduous ligules: 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 seeds.

1. Foliage much cut.

AA. Foliage not cut.

B. Stem-lvs. small.

15. stellata, Ait. STARRY CAMPION. Readily told by its fringed white and nodding fls. and lvs. in 4's. Perennial, 2-3 ft. high; lvs. ovate-lanceolate; 2-3 in. long; fls. in an open panicle; calyx inflated; petals lanceolate, unappendaged. Woods, Mass. to Neb., south Ga. to Tex. B.M. 1107.

16. Virginica, Linn. FIRE PINK. Fig. 3329. Perennial, 1-2 ft. high, with large crimson or scarlet fls., viscid-pubescent: stem unbranched: lvs. spatulate or ob lanceolate: fls. 1 in. or more across, loose, cymeose, nodding or reflexed after anthesis; petals broadly lanceolate, 2-toothed at apex. July-Sept. — A species in the highest and most sterile parts of the Alps, differing from S. Caucasia in being glandular, rather than velvety, the stem-lvs. long, the fls. long-peduncled and the calyx more widely inflated.
SILPHIUM

DD. Stem-lvs. large.
C. Lvs. connate-perfoliate.

SINFINGIA (after Wilhelm Sinning, gardener at the University of Bonn). Including Rosamovia. General does. A genus of about 16 species of Brazilian tuberous herbs. The generic characters of Sinningia are: pubescent or villous herbs from which a tuberous root arises, opposite, usually large, petioled, the floral ones reduced to bracts, fls. usually large, solitary or fascicled, in the axil, pedicelled, calyx-tube shortly and broadly turbinate, 5-angled or winged, the limb finely or broadly 5-cleft or parted; corolla-tube nearly equal at the base or the posterior gibbous, long or broadly cylindrical, the upper part swollen or bell-shaped; lobes 5, spreading, or the 2 posterior smaller; stamens included, attached to the tube of the corolla; anthers broad, the cells confluent at the apex: glands of the disk 5, distinct, or the 2 posterior more crowded together or connate; ovary half inferior; style dilated at the tip; stigma concaoe, entire or slightly 2-lobed. The genus includes the florists' Gloxinia, which is properly Sinningia spectabilis, Hiern., 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. (Rosamovia conspicua, Regel). Root tuberous: stem 1 ft. high, lvs. ovate-oblong, short-acuminate, somewhat heart-shaped at the base and dentate: fls. yellow, paler on the outside, marked on the lower part of the tube with purple dots and lines; calyx-tube entirely united with the ovary, equally 5-parted, the segments lanceolate, spreading, corolla-tube obliquely and narrowly campanulate, swollen and recurved at the base; glands of the disk 2: capsule 1-seeded: seeds many.

ornata, Benth. & Hook. (Rosamovia ornata, Van Houtte). A hybrid of the above species with a gar- den variety of Gloxinia with flowers of a bright red; the result is a plant resembling R. 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. 23:2035.

Rosamovia Haustei, Hort. John Saul, is apparently not known to botanists.

SIPHONANTHUS. See Clerodendrum Siphonanthus.

SISYRINCHIUM (an old Greek name first applied to some other plant). Iridaceae. Satin Flower. Rush Lily. About 60 species of American perennials, usually with fibrous roots, grass-like, narrow or terete lvs. and simple or branched stems often flattened and winged, bearing clusters of usually blue or yellow fls. subtended by two spathes: perianth nearly flat or bell-shaped; segments 6, nearly equal, obovate or oblong; stamens inserted on the base of the perianth; filaments more or less connate; ovary subglobose to turbinate, 3-loculed, 3-valved. The species are of easy culture in any good garden soil. Useful in the wild border, where hardy.

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SISYRINCHIUM

SIPHONANTHUS. See Clerodendrum Siphonanthus.

SISOO TREE. Dalbergia Sissoo.
SISYRINCHIUM

A. Fls. yellow.
B. Stem leafless.

Califorunicum, Dryand. (Maris Californica, Ker- Gawl). A half-hardy perennial: stem 1½ ft. high, 2 lines through, broadly winged: lvs. many, shorter than the stem, about ½ in. broad: spathes 3-4-fl.; segments of perianth oval pale yellow, ½ in. long. Mts. of Mexico. B.M. 2117, 2135.

B. Stem leaf-bearing.
C. The stem slightly 2-edged.

tenuifolium, Humb. & Bonpl. A half-hardy perennial: root fibers slender, long: stem simple, about 1 ft. high: lvs. short, sheathing the lower part of the stem, about 1 in. broad: spathe 4-fl.: segments of perianth yellow, lined with brown, ⅞ in. long. Calif. to Ore. -Swampy grounds.

A hardy perennial: stem winged, about 1 ft. high, usually terminating in 2 unequal branches, subtended by a spathe a-6-fl.: segments of perianth yellow, lined with brown, ⅞ in. long: capsule lines through, broadly winged: lvs. many, shorter than the spathes: fls. blue, ⅜-⅞ in. across. April-June. Eastern U. S. B.B. 1:141.

BB. Stem flat.
C. Spathea very unequal in length.

graminoides, Bicknell (S. dnceps, S.Wats., not Cav.). A hardy perennial: root fibers slender, long: stem simple, about 1½ ft. high, usually branched low down: lvs. suberete or narrowly linear: spathes 3-4-fl.; segments of perianth yellow, veined with brown, ⅝ in. long. Tropical America.

AA. Fls. purple, blue or white.
B. Stem terete.

grandiflorum, Doug. (S. Douglasti, A. Dietr.). A hardy perennial: root fibers slender, long: stem about 1 ft. high, usually forked: lvs. linear: spathes 3-4-fl.; segments of perianth yellow, ⅞ in. long. May, June. Northwestern U. S. B.M. 3599. B.R. 16:1364.—This is possibly the handsomest species in the tribe. Var. album is also offered and is equally desirable.

BB. Stem flat.
C. Spathea equal in length.


c. Spathea very unequal in length.

SITOLOBium is referred to Dicksonia cicutaria. Swz., a handsome, strong-growing tropical American fern with lvs. 4-8 ft. long, bipinnate, papery, light green; petioles hairy; lower lfts. 1-½ ft. x ¾ ft.

SILOM (from Sion, old Greek name used by Dioscorides). Umbellifera. Four widely scattered herbs with pinnate foliage and small white fls. borne in compound umbels. Glabrous plants: leaf-segments dentate: petals inflexed at the tip. For S. Sisarum, see Skirret.

S. latifolium, Linn., the Water Parsnip, is a British species sometimes naturalized in English wild gardens, especially in damp woods. Like Ferula and certain other umbelliferous plants, it is valued more for its stately habit and handsome foliage than for its flowers.

W. M. SKIMMIA (Japanese Skimmia, meaning a hurtful fruit). Rutaceae. Ornamental evergreen shrubs with alternate entire leaves, small white flowers in terminal panicles and showy bright red berry-like fruit. They are tender, not being reliably hardy as far north as Washington, D. C. Handsome shrubs for borders of evergreen shrubbery and especially valuable for planting in cities, as they belong to the best smoke-enduring evergreen shrubs; they are particularly beautiful when covered with their bright red fruits, which are retained through the whole winter if not eaten by birds. In the greenhouse two crops of berries on a plant may be seen occasionally. The Skimmias are of rather slow growth and thrive best in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome fruits they are sometimes cultivated in pots in a sandy compost of peat and loam. As the Skimmias are not self-fertilizing, it will be necessary to plant stamine plants among the pistillate ones to secure well-fruited specimens. Prop. by seeds sown in full or stratified and by cutting p budding with gentle bottom heat. Scott writes: "Seeds sown in the fall and grown along in a greenhouse in winter may be planted out in a good loam the following spring, when they will make a vigorous growth and bloom the following October. Their red berries make them very desirable as a Christmas berry plant."


Fortunei, Mast. (S. japonicum, Lindl.), similar to the preceding but of dwarfer habit: lvs. lanceolate or oblong, acuminate, dark green above, light green beneath, ¾-5 in. long: fls. white, in oblong-ovate panicles, usually perfect: fr. obvate, dull crimson. Spring. China. G.C. II. 25, p. 245 (as S. obtata): III. 5, p. 525. The following as S. japonica: B.M. 4:719; F.S. 7, p. 39; Gn. 7, p. 183 and 35, p. 319; R.H. 1865, p. 219, 220. S. fragrans and S. fragrantissima are names of the staminate plant; S. obtata of the pistillate. Var. argentea, Nichols., has the lvs. bordered with white. A hybrid between this and the preceding species is probably S. intermedium, Carr., with narrow oblong-elliptic lvs. dark green above. To this hybrid belong also S. Förensii, Hort., with lanceolate or oblanceolate yellowish green lvs. and subglobose and obovate fr. on the same panicle (G.C. III. 5:553) and S. Rögeri, Hort., with similar but deep green lvs. and globose squarish fruit.

S. Laureota, Sieb. & Zucc. Shrub, 5 ft. high, of a strong aromatic odor when bruised: lvs. narrow-oblong to obovate, acute or acuminate, bright green: fls. 5-merous. Himalayas.

S. Laureolae, Sieb. & Zucc. Shrub, 5 ft. high, of a strong aromatic odor: lvs. narrow-oblong to obovate, acute or acuminate, bright green: fls. 5-merous. Himalayas.

ALFRED MARSH WODEHOUSE

SKIRRET (Sium Sisarum, Linn.) is a vegetable of minor importance the roots of which are used like salsify or oyster plant. It is a hardy, perennial, umbelliferous herb, native to eastern Asia. It grows 3-4 ft. high, has pinnate foliage and small white fls. in compound umbels. The roots grow in large clusters, sometimes like one of a sweet potato or dahlia, but they are much longer, more cylindrical and somewhat jointed. The roots have a sweet and slightly floury taste and if well grown are tender. The chief objection to this vegetable is the woodiness of the core, which must be removed before cooking, as it is not easily separated from the fleshy part at the table, and detests its place among the vegetables. The thickness of the core varies greatly, no matter whether the plants are propagated by seed, offsets or division of roots.
Skirret belongs to a moisture-loving genus, and needs a rich soil. The seeds may be sown in autumn or spring and the plants yield well the first season. For European practice Vilmorin recommends that the seedlings be grown in a seed-bed until they have made 4 or 5 leaves and then transplanted into permanent quarters. Now the seed in drills half an inch deep, and thin out the seedlings to 8 inches in the row. The roots may be left outdoors in the ground all winter, but others advise storing them in sand or earth. W. M.

**SKIRRET.** Smilax serpyllifolia, Nutt. Rootstock slender: stem 1-2 ft. high, slender: lvs. 2-6 in. long, lanceolate, acute, flat and spreading; raceme open, sessile or short-peduncled; berry ½ in. through. Early summer. Pacific states.

**SMILAX.** (ancient Greek name). Liliaceae. A genus of about 180 species very widely distributed over the world, usually woody climbers, which ascend by means of the coiling appendages of the petiole; sometimes shrubs or rarely herbaceous perennials, with slender twigs: rootstocks usually large and often tuberous: lower lvs. reduced to scales; the upper simple, or rarely several-nerved, often evergreen: lvs. usually numerous, rather small, divided in axillary, sessile or peduncled umbels; pedicels nearly equal in length: berries usually globose, 1-4-seeded.

There are 17 species native of the U. S., nearly all of which are useful wild garden plants, having glossy attractive foliage. The last three noted below have been offered by collectors. For Smilax of florists, see Asparagus americanus.

- **a.** Lvs. usually variegated. Exotic species.
- **b.** Plant climbing.

**argyea, Lind. & Rod.** Tender foliage plant: stem wiry, slender, armed with short, stout thorns: lvs. lanceolate, becoming 8-10 in. long, dark green, blotched with gray, 3-nerved, short-petioled. Bolivia. I.H. 39:152. — According to G.F. 8:305 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 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 semideciduous, unarmed or with spines: lvs. ovate-elliptoid or lanceolate, 1½-6 in. long, usually blotched with white, 5-9-nerved: lvs. white, sweet-scented, in many-flowered umbels: berries ½ in. thick, usually 3-seeded and, according to J. D. Hooker, bluish, while Franceschi mentions them in his catalogue as shining red. S. Eu. to India. G. 28, p. 615.

- **a.** Lvs. green. Native species.
- **b.** Stem herbaceous.

**herbacea, Linn.** A hardy perennial with a somewhat procumbent or climbing branched annual stem 4-6 ft. high, unarmed: lvs. ovate to lanceolate acute to cuspidate, obtuse or cordate at the base, long-petioled, 7-9-nerved: umbels 15-80-fl., long-peduncled: fls. carriente: when open: berry bluish black, ½ in. thick. Apr.-June. In woods or fields throughout the greater part of the U. S. B.B. 1:439.
SMILAX

BB. Stem woody.
c. Foliage evergreen.

laurifolia, Linn. Stem stout, high-climbing, armed with straight prickles; branches angled, mostly unarméd; Ivs. leathery elliptic or oblong-lanceolate, 3-nerved: umbels 6-30-fld., on short, stout peduncles; berries black, ovoid. N. J., south and west to Ark.

2331. Smilacina racemosa (X 5).
c. Foliage deciduous.

Walteri, Pursh. Stem climbing, angled, prickly below; branches unarmed; Ivs. ovate to ovate-lanceolate obtuse or abruptly acute, 5-7-nerved: umbels 6-15-fld., on short peduncles; berries coral-red or rarely white. Wet soil, N. J. to Fla. west to Mississippi river. B.B. 1:442.

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 ustilaginea, 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 arena), maize and teosinte smut (Ustilago zeam), stinking smut of wheat (Tilletia tritici), rye smut (Urocystis occulta), 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. Hermodactylium. Snake’s Head Lily. Fritillaria Meleagris.

SNAKE'S BEARD. Ophiopogon. Snake’s Head Iris. Hermodactylium. Snake’s Head Lily. Fritillaria Meleagris.

SNAKE'S MOUTH. Pogoniris.

SNAKE'S TONGUE. Ophioglossum.

SNAPDRAGON is Antirrhinum.

SNEEZE WEED. Helenium.

SNEEZEWOOD. See Pachyptilium.

SNEEZEWORT is Anthriscus.

SNOWBALL TREE. Ribes Opulent.

SNOWBERRY. Consult Chiococca and Chiogenes; also Symphoricarpos.

SNOWDROP. See Galanthus.

SNOWDROP TREE. Halesia.

SNOWFLAKE. Leucojum.

SNOW FLOWER. Chionanthus.

SNOW GLORY. Chionodonsa.

SNOW-ON-THE-MOUNTAIN. Euphorbia marginata.

SNOW PEAR. Pyrus nivalis.

SNOW TREE. Pyrus nivalis.

SNOW WREATH. Nemizia Alabamensis.

SOAP BARK TREE. Quillaja Saponaria.

SOAP BERRY. Sapindus.

SOAP BULB. Chlorogalum.

SOAP-PLANT. See Chlorogalum.

SOAPWORT. Saponaria officinalis.

SLOBOLÉWSKIA (after G. Sobolewski, Russian botanist). Crucifera. About 2 species of Asiatic annual or biennial, erect, branching herbs, with long-petioled oval or lance-shaped leaves and white flowers borne in numerous corymb-like racemes: silique clavate, compressed or nearly terete, curved, coriaceous, inflated at the apex, 1-celled, 1-seeded.

clavata, Fenzl. Basal Ivs. reniform-cordate, th( per nearly sessile: silique 5 lines long by 1H lines wide. May.—Offered by John Saul in 1893.

F. W. Barclay.

SOBRALIA (after Fr. Mart. Sobral, a Spanish botanist). Orchidaceae. This is a genus of extremely handsome orchids with a very distinct habit. The plants have slender, reed-like stems clothed with leaves throughout their entire length. The stems are tufted, forming bushy plants varying in height according to the species. The flowers are among the largest of the orchids, those of S. macrantha attaining a diameter of 9 in. across the sepals. They are, however, very fugacious, fading a few days after opening. Ivs. with sheathing bases, plicate-venose: fls. membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading; labelium convolute around the column, terminal portion large, undulate, often fimbriate, smooth
but nearly all of them make up a succession of flowers which is more or less rapid. The individual blossoms are of a size to equal almost any orchid flower, and quite as graceful in their general appearance—far more graceful than most Cattleyas even. Where space for large and bushy plants can be afforded, some of the Sobralias will prove most charming plants, having the double advantage of presenting in a well-grown plant not only beautiful blossoms but a subject which is thoroughly good-looking as a foliage plant. They also have the added advantage of being, in most instances, of rather easy culture. Given a suitable soil and a liberal supply of water they are almost sure to grow and bloom, although they will do better if they are given their time for rest, when less water is allowed without permitting the matter about the roots ever to become 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 as blue as to the rich claret color of S. Lowii, and from yellow to the purest white.

F. J. LE MOYNE.

1. leucanthera, Reichb. f. Stems tufted, 3 ft high, spotted: Ivs. 4-6 in. long, lanceolate, acuminate: fls. 6-7 in. across; sepalis 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, veined golden yellow, with a few brownish stripes. Aug. Costa Rica. B.M. 7058. R.B. 23:265. J.H. 3:37.

2. xantholeuca, Reichb. f. Stems about 2 ft high, tufted: Ivs. spreading and drooping, lanceolate, 6-7 in. long, with speckled sheaths; fls. solitary, lemon-yellow, with a deeper shade on the lip: sepalis linear-lanceolate, spreading and recurved; petals similar but shorter; blade of the labellum orbicular, crisp and undulate, margin crenate. Guatemala. B.M. 7232. R.H. III. 5:9. G.C. III. 5:9. Gn. 22:366. — A species with flowers about as large as S. macrantha, but plants of more compact habit.

3. fragrans, Lindl. A small species with stems about 1 ft high: Ivs. 1 or 2, oblong-lanceolate, 4-5 in. long; fls. 2-3 on a long peduncle, about 2 in. long, pale sulfur-yellow; sepalis oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and having many fimbriated crests. Columbia. B.M. 4962. — One of the smallest of the genus.

4. macrantha, Lindl. Fig. 2332. Stems tufted, reed-like, 4-7 ft. high, leafy all the way up: Ivs. 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; sepalis linear-oblong, 4½ in. long, reflexed and twisted; petals broader, oblong, wavy above; labellum 5 in. long, with the expanded portion almost circular, 5 in. across and 2 lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several thin yellow ridges. May—July. Mexico and Guatemala. B.M. 4446. F.S. 7:669. P.M. 14:244 (var.). G.M. 31:559. Var. Kienastiana, (see also Nos. 4 and 6). Fls. white (see also Nos. 4 and 6). 1. leucanthera

5. Branda, Krzl. Stems 3 ft high: Ivs. lanceolate, acuminate, 8 in. long; fls. purple-rose, paler outside, with the labellum darker and having a yellow disk; sepalis 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. Habitat not stated by Sander.

6. Fenzliana, Reichb. f. Stems slender: sheaths blackish, asperulate; Ivs. oblong, acutish: fls. rose-colored; sepalis oblong, acute; petals obovate-cuneate, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the anther. Nicaragua. — Var. alba, Hort., has white fls.


8. Cattleya, Reichb. f. Stem stout: Ivs. 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.
SOBRAlia

9. Löwii, Rolfe. An imperfectly known species introduced about 1892 from Colombia. It grows about 1½ ft. high and has fls. of a bright uniform purple.

The following trade names are not accounted for: S. magnifica.—S. Pafii.—S. virgulata.

HENRICH HASSELBRING.

SOIL. The soil is a superficial covering of the earth's crust, more or less well adapted to the growth of plants. It is usually only a few inches thick. Below this is a rotten subsoil, and behind is a subsoil rutting rock. The term soil is occasion comprehensively to include both the soil and subsoil.

The soil adapted to the growth of the higher plants consists of fragments of rocks or minerals, organic matter, soil solution, and a soil atmosphere. The mineral fragments vary in size from the finest clay particles to gravel and even boulders. The organic matter is derived from low organisms, from previous vegetation, or from growing plants; as also from stable manure, and occasionally fish or animal matter added to the soil by man. The soil solution consists of water carrying dissolved substances derived from the soil grains 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 coil. The soil atmosphere differs from the ordinary atmosphere above the soil in being richer in carbon dioxide and nitrogen, and containing more water vapor and less oxygen.

In origin there are two main classes of soils: sedentary soils, formed by the disintegration and decomposition of rocks in place; and transplanted soils, including those of alluvial, glacial and solon origin. The word alluvial is here used to include all water-transferred material; the term is, however, frequently used in a more specific sense to indicate the recent flood deposit of rivers.

Soils are classified according to their origin and their mechanical and chemical composition and properties. Genetically, they are classified according to the rock from which they are derived, as granite soil, lime-stone; or according to the manner of their origin, as alluvial, lacustrian or drift. Mechanically, they are classified broadly into stony, gravelly, sandy, sandy loam, loam, clay loam, clay, adobe, black-waxy, or a grade or some other physical property; chemically, into calcareous, humus, alkali, and according to other striking chemical features. In the soil survey of the U.S. Department of Agriculture a local name is adopted for each soil component which the specific characteristics will be given; examples of this are Hartford sandy loam, Norfolk sand, San Joaquin adobe, Glendale loess.

The physical properties of soils concern the size and arrangement of the particles, and the relation of these to each other and to the organic matter; also the soil atmosphere, the soil moisture, and the physical forces of heat and gravitation. In these there is an intimate relation with physiography or the form and exposure of the surface of the land, as well as to climatology.

There are undoubtedly constant physical changes going on in the soil, as well as chemical changes, which are much to do with the development of vegetation. The soil moisture may be looked upon as a nutrient solution dissolving its material from the difficulty soluble soil compounds in water, 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, 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 this proper weathering, 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 weathering is a normal weathering which is often not sufficient 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 exhauston to the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils, as they are liable to be leached away and also to recombine, forming differently 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 sors.

The influence of fertilizers is therefore twofold: the direct addition of plant-food for the immediate use of plants, and the action of the fertilizing components upon the solubility of 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 much 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 matters even in amounts which would be detrimental if the lime salt were not present in excess.

The principal objects of the cultivation of the soil are to secure proper aération, to conserve the moisture supply, and to improve the drainage. The irrigation and artificial drainage of soils are treated elsewhere.

3333. How the gardener makes his soil, by letting it decay in piles.

The larger pile is composed of soils.

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 and 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 the early-quick crops, with corn, wheat and
gazes, and with some special products such as ever-
cranberries and other horticultural crops. With inten-
sive cultivation, however, the flavor, appearance, tex-
ture and general quality of the crop assume greater
commercial importance, and even with intensive meth-
ods these are largely influenced by the character of the
soil. This is shown in a striking manner in the localiza-
tion of certain interests, even under the most inten-
sive systems of agriculture, such as the production of
the fine lettuce around Boston, of the carnations, vio-
lets, tomatoes and roses in other districts. With the
present specialization in these lines, it is not only neces-
sary that one should have a knowledge of the methods
of cultivation, but should have the proper soil condi-
tions 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 differ-
ent. These matters must be realized by the horticultur-
ist in order to attain the highest degree of success in
any particular undertaking.

MILTON WHITNEY.

SOILS FOR POTTING. — Strictly speaking, there are but
two distinct kinds of soils, though there are various
modifications or physical differences in both. These
are mineral soils and organic soils or peat. Peat is formed
in temperate climates by the accumulation of vegetable
matter in swamps and bogs in parts of the world with
peculiar atmospheric conditions (see Peat). Mineral
soils, which cover the greater portion of the earth's surface, are formed by the disintegration of rocks and
stones through the agency of water, frost or the atmos-
phere. Peaty soils are composed almost entirely of
vegetable matter, with but little mineral matter. Min-
eral soils are just the reverse. The physical differences
in peat and in soils are due almost entirely to the ab-

cence or presence of fiber. The physical differences in
mineral soils vary considerably from almost pure clay
to almost pure sand; indeed, the mechanical (or physi-

cal) analysis of mineral soils is based largely upon the
proportions of clay and sand. The following table,
taken from Tanner's "First Principles of Agriculture," is
self-explanatory:

<table>
<thead>
<tr>
<th>Name of soil</th>
<th>Percentage of sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy loam</td>
<td>80 to 100</td>
</tr>
<tr>
<td>Loam</td>
<td>60 to 80</td>
</tr>
<tr>
<td>Clay</td>
<td>30 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 line 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 vary-
ing 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 90 per cent of the material of 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, phos-
phoric acid and potash. Of the three, nitrogen is the
most important, but all are present in varying degrees
in most natural manures. Moreover, nitrogen composes
four-fifths of the atmosphere and the soil absorbs it
chemically important, and even with intensive methods
the 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
states, "Soil is not a physical condition is one on the
understanding that 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 locality, but when the
topography of any particular locality is of a hilly or
mountainous character, the different variations or phys-
ical differences may often be found within the radius
of a mile. The capacity of soils to retain moisture va-
ries considerably. A clay loam is far more retentive
of moisture than a sandy loam. The experienced gardener
therefore selects a clay loam for his strong-rooting,
large-leaved tropical plants, because transpiration is so
much greater in these plants. For a general collection
of greenhouse and small-growing tropical plants he
selects a good loam. For cacti, agaves and other succen-
ent plants which will not take as much water as at all
seasons as other plants, he selects a sandy loam. For
ferns, most of the Ericaceae and Gesneraceae he selects
peat; while for nepenthes, orchids, bromelids and the
epiphytic palms he selects fern or kalmia root. Other
materials which a gardener should always have on hand
when he has a large and varied collection of plants are:
leaf-mold, which is made by collecting leaves and stor-
aging for at least two years, turning them over occasion-
ally to facilitate decay; living or fresh sphagnum moss;
sand; charcoal, and some convenient manures, such as
pulverized sheep manure and bone meal.

Growing plants in pots is very different from grow-
ing them in borders or the open ground. In pots, espe-
cially the larger sizes, the capacity of the soil for ab-
sorbing 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.

Excep 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 ma-
terially in aerating the soil. If the soil is sifted too
much it becomes very fine, packs close and allows too
little airation. Leaf-mold is decayed vegetable

mater,
or humus. It may have little manural value, but is used
by gardeners to make soils "light" or spongy. For most
young plants a good proportion added to the soil is ex-
cellent, as it encourages root growth.

Sand is the best medium for rooting cuttings of the
majority of plants. It is also added to soils to increase
their porosity, especially when potting very young
plants. Silver sand is best for all purposes because it
contains less oxides than red or yellow sands.
In potting plants, experienced gardeners make potting mixtures or add a variety of materials to the soil to suit the requirements of different plants. For young seedlings or for freshly rooted cuttings, the compost should be a light and porous nature, but as plants increase in size and vigor a heavier and richer mixture is usually given, that is, if plants are to be grown on as amateur plant-growers in their own anxiety to grow the finest 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. Consult Soy Bean and Glycine.

SOLANDRA (after Daniel C. Solander, a Swedish naturalist and traveler, 1736-1786). Solandreae. 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, 2-3-cleft; corolla funnel-shaped; tube cylindrical; throat obliquely and widely bell-shaped; lobes broad, imbricated; stamens 5, inserted on the corolla-tube: berry globose, pulpy.

a. Plant becoming 12-20 ft. high.

grandiflora, Sw. Fig. 2335. Lvs. obovate-oblong, acute, glabrous, thick: fs. 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. Ill. 34:123.

2335. Solandra grandiflora (X 1.5).

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.

MICHAEL BARKER.

SOLANUM (Latin, solamen, solace or quieting). Nightshade. Solanum, giving name to the family Solandreae, is a vast genus of temperate and tropical herbs, shrubs and even trees, but is comparatively poorly represented in temperate North America. Dunal, the latest monographer (DC. Prodr. 13, pt. 1), in 1852, recognized 901 species, and many species have been described since that time. The genus finds its greatest extension in tropical America. Of the vast number of species, barely 25 are of much account horticulturally, and half that number will comprise all the species that are popularly well known. One of these is the Potato, Solanum tuberosum, one of the leading food plants of the human race. The genus seems to abound in plants with toxic properties, although its bad reputation in this respect is probably exaggerated.

As a genus, Solanum is not easily separated from other genera, but some of its most characteristic characters are as follows: Lvs. alternate: inflorescence mostly sympodial and therefore superaxillary or oppo-

2336. Tuber of Potato—Solanum tuberosum (X 4).

site the lvs.: corolla gamopetalous and rotate or shallow-campanulate, plaited in the bud, the limb angulated or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated, 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 fs.
The species are herbs in temperate climates but in warm countries many of them are shrubby and some are small trees. Many of them are climbers. It is impractical to 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.

**SOLANUM**

1. tuberosum, Linn. Potato. Fig. 2833. 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-biramate, lvs. unequally pinnate, the 5-9 oblong-ovate lfts. interposed with much smaller ones; fls. lilac or white, in long-stemmed dichotomous clusters, the corolla prominently lobed: fr. a small globular yellow berry, usually not produced in the highly developed modern varieties. Temperate Andes of Chile and adjacent regions. — See *Potato*. There is a form with yellow-blotched lfts. (known as *S. variegatum*) sometimes cult. for ornament.

Var. boreale, Gray (*S. Fernaldi*, Gray). Plant usually smaller, as also the tubers, which are about 5 in. in diam., and send off long, creeping subterranean stolons; interposed lfts. one or two or even none; corolla angled. *Ms.* S. Colo. to Mex. — Apparently only a northward extension of the species.

2. *Maglia*, 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: fls. smaller than those of *S. tuberosum*, white, slender-peduncled, in loose, long-forked cymes: tubers small (2 in. or less long), globous or oblong, soft and watery. Coast region of Chile: Rain. M. 150. — 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. *Jasminei*, 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 narrow winged, the lfts. 5-9, with no interposed small ones, small and lanceolate-oblong in shape: fls. small, white, the corolla deeply cleft and the anthers large and prominent: tubers few, globular, hard, 1 in. or less in diameter, withstanding frost. *Ms.* of Colo., N. Mex. and Ariz. B. M. 6766. — Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

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States from Guatemala in 1882 by Gustav Eisen. A full review of the history and botany was made in Cornell Expt. 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. *Melongêna*, Linn. (*S. insulicûrum*, Linn.). Erect and much-branched herb or subshrub, 2-3 ft. tall, woolly or scurfy, spiny: lvs. large and juicy, ovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose below, shallowly 5- or 8-nerved 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. esculêntum**, Nees (*S. esculêntum* and *S. oigêrum*, Dunal. Common Eggplant. Guine Squash. Aubergine. Figs. 750-753, 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. *serpentineum*, Bailey (*S. serpentineum*, Desf.). Snake Eggplant. Fr. greenly elongated and curled at the end.

**Var. depreàsium**, 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.


**BP. 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. Lvs. entire or very nearly so.**

8. *Pseudo-Capsiciûm*, Linn. Jerusalem Cherry. Figs. 2339, 2340. Small shrub, reaching 3-4 ft., but usually grown as smaller specimens in pots, glabrous, erect: lvs. lance-oblong to oblong-oblate, mostly obscure, entire or somewhat wavy, shining green, strongly penninerved: fls. few or solitary in lateral clusters, small, white, the corolla 5-lobed; fr. globular, ¼-½ 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. *procerum*, Hort., is a dwarf compact form. Var *Weatheríllî*, Hort, *Weatheríllî's Hybrid*, is a form with strongly veined undulate lvs. and pointed orange-colored fruits.

9. *Capsiciûstra*, 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: fls. white, in short racemes: fr. ½ in. or less in diam., orange-red or scarlet. Brazil. F.S. 12:432.—Frequent greenhouse and window plant. Var. *variegátum*, Hort., has variegated lvs.

10. *Héndersoni*, Hort. Very like *S. Pseudo-Capsiciûm*, but the white fls. very numerous, and the fr. ovoid or olive-form, orange-red. A horticultural form, perhaps a hybrid. Also known as *S. hybriðum* *Héndersoni*.


A species grown for its ornamental fruit.


12. *umbelliferum*, Eschsch. Perennial, shrubby at the base, hoary-pubescent or sometimes almost glabrous; lvs. obovate-oblong, varying from oblong to acute; fls. violet-blue (or sometimes white); in umbel-like clusters, ½ in. across, showy and fragrant. Calif. Variable. — *S. umbelliferum*, recently offered, is very likely this species.

**KE. Lvs. prominently lobed.**

13. *aviculàre*, Forst. (*S. lacintiûm*, Alt.). 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 globose, varying from green to orange-red, about ¼-1 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. *Indiæcum*, Linn. Strong shrub, sometimes taller than a man, with many stout, often recurved prickles,
1680

SOLANUM

15. **Toreyi**, Gray. Strong perennial herb, with close greyish pubescence and scattering weak prickles: Ivs. ovate, sinuate or lobed, woolly beneath, usually prickly; fls. blue, 1 in. or less across, triangular-lobed; berry globular, about ½ 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.


17. **marginatum**, Linn. f. Shrubby, 3-5 ft. tall, white-tomentose, bearing many straight but not very large prickles: Ivs. mostly ovate in outline, subcordate, shallow-lobed or angled, at some stages with an irregular white band along the margin due to the shedding of the tomentum on the body of the leaf (whence the name marginatum). Fls. large, I 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. 11.M. 1928.

18. **robustum**, H. Wendl. Vigorous herb or subshrub, 3-5 ft., densely tomentose, prickly on stems and Ivs., the stems winged: Ivs. very large, sometimes 1 ft. long, broad-ovate or ovate elliptic in outline, with many pointed angular lobes extending one-third or less the depth of the blade, woolly beneath: fls. white, about 1 in. across, lobed, racemose: fr. globular, small, hairy, orangecolored. Brazil. R.H. 1881, p. 256; 1886, p. 256. —Hold species, useful for subtropical gardening.

19. **Waraschewiczii**, Weiek (S. waraschewiczoides, Hort.). Strong, erect plant, 3-4 ft., usually with a strong central stem, densely rusty-tomentose and armed with many short stout hooked or straight spines: Ivs. large, the blade often more than 1 ft. long, rather soft, tomen
tose or densely pubescent beneath, deeply several-lobed: fls. large, about 1½ in. across, white, numerous: fr. glabrous and shining, pale yellow. Probably South American. R.H. 1885, p. 430; 1886, p. 257. —A very striking plant for subtropical gardening and easily raised from seed in a single season; half-hardy perennial.

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**Solanum Pseudo-Capsicum**

20. **jasminoides**, L. POTATO VINE (from the fls.). Fine greenhouse twining shrub, reaching several ft. in height, glabrous: Ivs. rather small, the upper ones lanceolate to lance-ovate and entire, the lower ones of about 3 narrow, ovate entire fls.: racemes long and united into a cluster 2 in. or less long and about 8-12-fl.: fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. America. P.M. 8:55. B.R. 35:253. On. 45, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 52, p. 28. —A most useful deciduous climber for the coolhouse, and much grown. Half-hardy, and useful for the open in the South. Will grow 10-20 ft. if given a chance. Var. **grandiflorum**, Hort., has very large trusses of fls. and is a robust grower; excellent. Gng. 1:259. Var. **variegatum**, Hort., has variegated foliage.

21. **Sealothamnium**, Andr. (S. aureum, Hort. & S. venustum, Kunth). Beautiful slender climber or trailer. 4-10 ft., minutely pubescent: Ivs. with 3 lfts. (terminal one largest) or the upper ones simple, the margin entire, the fls. ovate-lanceolate; fls. many in long drooping pinnacles, on pedicels swollen at the apex, the corolla mauve or azure-blue, star-shaped, usually 1 in. or less across: fr. ovoid, glabrous, scarlet. Brazil. B.M. 1882, 5828. R.H. 1983, 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: Ivs. various, sometimes 10 in. long, the uppermost simple and obovate-elliptic, the others lobed or trifoliolate and with the terminal leaflet much the largest, all with entire margins: fls. in large cymes, pale blue-blue, the corolla 2½ in. across and shallow-lobed: fr. globose. Costa Rica. B.M. 69714. G.C. III. 14:339. G.M. 36:639. A.F. 12:3147. F.E. 8:328. —A splendid greenhouse climber, perhaps the most showy of the cultivated Solanums. Blooms in summer and fall. Ernest Brauntou writes: "S. Wendlandii is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbels 12 inches across. It is perhaps the showiest vine in California when in bloom. It is generally hardy here, although some winters nip and even kill the vine in the colder and lower parts of this city. Cut up an old vine, any kind of wood, stick the pieces in sand or light soil,
SOLANUM

inil wait. Every cutting will grow. When in a robust condition it is a good feeder. It should be in the full sun, though it does well anywhere.

S. betaceum, Cav., is Cyphomandra, for which see Vol. 1.—S. cromicaum, Voeltz., is a shrub or small tree, with cyphomandra-like lvs. and the young parts clothed with fluffy hairs: fls: white: fr: globose, hairy, inclosed in the calyx. S. Brazil. B.M. 749. — S. rubiunum, Lam. Stout herb or subshrub, 1-2 ft. tall, with prickly stems and ovate-acute lobed lvs.: fls: white, 1 in.

2343. Solanum Wendlandii. Much reduced.


L. H. B.

SOLDANELLA (Latin, a small coin: referring to the shape of the lvs.). Primulaceae. About 4 species of alpine plants 2-3 in. high, with nodding, funnel-shaped, fringed flowers of violet or purplish blue, and about 1-1/2 in. across. Soldanelles are amongst 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. Soldanelles are cultivated in this country only in a few large rock gardens. Those who have limited resources and dwell in the region of changeable winters might attempt to grow these plants in pots under a frame in lieu of nature’s winter covering. According to J. B. Keller, they prefer a half-shady or shady position and are proper, by seed or division.

Soldanelles are native only to the Alps of middle Europe. They are slender, glabrous, perennial herbs, with short rhizomes: lvs: long-stalked, thick, roundish, with a heart-shaped or kidney-shaped base, entire: scapes slender, solitary or few, about 6 in. high or less: calyx 5-parted; corolla 5-cleft. The descriptions of the species are here adopted from Koch’s Synopsis Florae Germaniae. Some white-flowered forms have been recorded.

2343. Soldanella alpina (X 1/2).

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, branched racemes or in shorter, branchless, spirally panicked racemes: only 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.
Apenninus, Hohen. (Cyperococcus Apenninus, Linn.). Plant hardy, 2-3 ft. high: Ivs. rather coarse, the radical ovate-oblong, those of the stem long-lanceolate: fls. blue, forget-me-not-like, in dense, axillary, panicle racemes, May, June. S. Europe.—A useful plant amongst shrubbery or in the back part of borders. Prop. by division or seed.  

F. W. BARCLAY.

SOLIDAGO (according to Gray, from "solidus and ago, to make solid or draw together, in allusion to reputed vulnerary properties"). Composite. GOLDENROD. Amongst the gloires of the American autumn are the aster-like and goldenrods. They comprise several species; the latter are known by the common name of tickseed. The flowers run in various colors. Goldenrods in xanthie, —the blue and bluish 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 stalks may be lifted and divided as soon as they become root-bound and show signs of failing. The Solidagos are variable, even within the same species. Therefore it is well to mark fine individual clumps when in bloom, for removal in late fall or early spring. The observation of a single season should result in a fine collection of individual plants; and the natural excellence of these specimens should be maintained and augmented by supplying good soil and giving good care. Too often it is thought that because the plants thrive under poor conditions in the wild, they do not require superior conditions in the garden; but this is an error.

Solidagos are erect perennial herbs with simple alternate leaves, and many small yellow (rarely white) heads in spikes, threes, compound, panicles, or racemes. The heads are oblong or narrow-campanulate, with small, mostly appressed scales, containing few florets, the disk-florets all perfect and the ray-florets in the same sort and pistillate. The pappus is composed of 1 or 2 rows of roughish capillary bristles. The genus is characteristic of eastern North America, where about 60 species occur. There are several species on the Pacific coast, a few in Mexico and South America, and two or three in Europe and northern Asia, making, altogether, nearly 100 species. None of the species are well known in the trade, although any of them may be expected to appear in the catalogues of dealers in 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 Britton & Brown's Flora. The following have been offered by American dealers:

bicolor, Linn. cassia, Linn. Fig. 2344. Cauviniana, Torr. & Gray. Drummondii, Torr. & Gray. elongata, Nutt. confertiflora, DC. juncas, Ait. lanceolata, Linn. latifolia, Linn. Missourinniensis, Nutt. neglecta, Torr. & Gray. nemoralis, Ait. Fig. 2346. occidentalis, Nutt. odorata, Ait. Ochrocephala, Ridd. patula, Muhl.  

SOLLYA (in honor of Richard Horman Solly, 1778-1858, an English botanist). Pittosporaceae. Two species of Australian evergreen twining plants: Ivs. narrow; fls. nodding, on slender pedicels, solitary or in loose, few-flowered cymes; sepals distinct; petals oblong, small; petals obvate, spreading from the base; anthers conuplicate in a cone around the pistil: capsule many-seeded. Propagated by cuttings in sand under glass, or by seeds, which germinate readily.  

heterophylla, Lodd. AUSTRALIAN BLUEBELL-CREEPER. Small shrub, 2-6 ft. high, with slender, twining stems: Ivs. 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 pedicels: cymes 4-8-flowered, terminal or leaf opposed: fls. bright blue, 3/4-3/4 in. long, July. B.M. 3523, R.B. 21:253, R.B. 17:466. 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 border plant, being kept within bounds by the shears. The roots are very attractive to the California pocket-gopher, who plays sad havoc with it if not watched.  

J. BERT DAVY.

SOLOMON'S SEAL. Polygonatum.

SOLOMON'S SEAL, FALSE. Smilacina.  

SONERILA (adapted from a native name). Melastomaceae. This includes a number of dwarf, tender foliage plants which must be grown in the greenhouse all the year round. The plants belong to the same cultural group with Bertolonia, Graveol, and Monologue and are distinguished by having their floral parts in pairs. There are about 70 species, all native of India and the Malay archipelago. The fls. are usually rose-colored, 3/4 in. across or less, and generally disposed in scapoid racemes or spikes. The genus is monographed in Latin by Cogniaux in DC. Mon. Pl. Ther. vol. 7 (1891). The species described below are all evergreen plants with Ivs. distinctly petioled, those of each pair being of equal size (except in S. maculata): fls. 3-merous; stamens 3, long-acuminate.

Sonericas are highly esteemed in Belgium, where they have been developed by Van Houette, Linden, Van Gaert and others. At present only 8 names are found in the American trade, as follows: S. eragota, Hennessoni, manuacta, maritimenfe, urbii, orientalis, pictura, petala and purpurea. A satisfactory explanation of these names involves a number of others mentioned below. In addition there are about 15 kinds with personal names that vary from the types mentioned below in their variegation. There are also some hybrids between Sonerila and Bertolina which are known to the trade as Bertolina. The most important of the species mentioned below is S. margaritacea.

It was long thought impossible to grow Sonerila and its allies outside of a bell-jar or Wardian case. The Bertolinias now dispense with the "double glass" and grow these plants in tropical or even temperate greenhouses. For potting material they use a compost of...
SONERILA

fibrous peat and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaying. A temperature of not less than 75° suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70-80°. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use finely screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time 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. SEIBRECHT

INDEX.

guttulata, 4. margaritacea, 5. punctata, 4.
Hendersonii, 6. orientalis, 4. speciosa, 1.
maculata, 2.

A. Foliage not variegated
AA. Foliage variegated

B. Candy has not long and sparse
BB. Candy has short or sparse

C. No. of nerves 7; margin of lvs. minutely serrate
CC. No. of nerves 9 or 7; margin of lvs. sharply and prominently serrate

1. speciosa, Zunker. This is practically the only species cult. for its flowers: height 1 ft.; lvs. opposite, cordate-ovate, green above, sometimes crimson beneath, mostly 7-9-nerved: fls. purple or rose, 4-14 in a cluster, 1 in. across. India. B.M. 5026; 4978 (S. elegans). F.S. 23:2442.

2. maculata, Roxb. This differs from the other species here described in having lvs. of unequal sizes. The larger one of each pair may be 3-5 in. long: the smaller a half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticulate, 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 scurfy or puberulous branches: lvs. short-petioled, broadly lanceolate, wedge-shaped at the base, minutely serrate, 7-nerved, lined with white along the primary nerves: fls. rosy. Sumatra. — S. picta of the trade is probably S. orientalis, var. picta.

4. orientalis, Linden. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1891, and remarkable for two novel features: some of the varieties have dark purple or bronzy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. In I.H. 37:113 the lvs. are shown as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color of fls. not recorded. Habitat not stated. The typical form is said to have brony lvs. with an amaranth reverse. Var. guttulata has green lvs. peppered
with small white dots and is pale green below. Var. punctata is much like the preceding variety but with peach or pale leaves. Var. pica has the purplish lvs. of the type, with an irregular lanceolate strip of silvery gray down the middle. Var. Robert Sallier, R. B. 20:61, has dark green lvs., peppered white and with a lanceolate figure of silver down the middle. Said to be a hybrid of vars. pica and punctata. It has the stripe of one and the dots of the other.

3. 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, dark green above, pubescent below, new: lvs. rosy, 3 M. 5104. F. S. 11:1126 (nerves too parallel). L. H. 2:249. - Supposed to be native of Java. In Vol. 11 of this work, page 684, Grevillea virginiana, var. m. margaritacea, is erroneously referred to Soneria instead of Salpinga. Salpinga margaritacea is readily told from Soneria margaritacea by its 5-nerved lvs. and floral parts in 5's.

6. Hendersoni, Hort. This is referred by Cogniaux to S. margaritacea, of which it appears merely a horticultural variety. For trade purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotted 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. S. 1875:159. L. H. 23:239. -- The blotches are all about the same size. S. M. M. in which it is perhaps merely a horticultural variety. It is convenient to treat it as a distinct species. It has the stripe of purplish gray beneath, much more broken up by the green.

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 S. margaritacea, but with no darker ground 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 blotched forms. S. 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, called Nine Pounds Toile. It has the silver leaf and some of the silveriness of S. argentea, with the numerous minute dots of the S. orientalis group. It is much liked. Robert Sallier says that the central color is bronzy green and silver, and more broken up by the green.

S. marmoreata and picturata of Siebold cannot be accounted for by the undersigned.

W. M. SOPHORA (Sophora, Arabian name of a tree with peashaped flowers), including Styphnolobium and Edgewardia. Laguncularia. Ornamental deciduous or evergreen trees or shrubs, sometimes perennials with alternate, odd pinnate leaves, papilionaceous, yellow, whitish or violet flowers and long and narrow moniliform pods. The best known species, S. japonica, is hardly as far north as Mass., but S. platycarpa seems to be somewhat hardier. The evergreen species with large yellow lvs. are tender and can be grown only in the southern states and California. They are very showy in spring when they are in bloom; in England they are often planted against a wall, where they can be easily protected in the winter. S. japonica is especially valuable for its late-appearing flowers, which are white and disposed in ample panicles; the foliage is dark green and graceful and the tree is conspicuous in winter on account of its dark green branches. The Sophoras thrive best in well-drained sandy loam but grow fairly well in rather dry soil. Prop. by seeds and the varieties by grafting on the typical form; some species are also increased from seed and softwood cuttings and by layers.

More than 25 species in the temperate regions of both hemispheres. Trees, shrubs, or hedges: lvs. odd-pinnate, with usually opposite small lfts.: lfts. papilionaceous, in racemes on terminal leafy panicles; calyx with 5 short teeth; standard orbicular or broadly obovate; stamens 10, free or comate 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 medical properties, and the seeds of S. secundiflora contain sophorine, a poisonous alkaloid. S. tetrapera is a valuable timber tree in its native country.

2. platycarpa, Maxim. Tree, similar in habit to the preceding but with very distinct fls.: lfts. 11-15, alternate, ovate to elliptic-lanceolate, acuminate, glabrous or nearly so, 2½-3½ in. long: fls. white, over ½ in. long; calyx gradually narrowed into the short pedicel: pod oblong to oblong-lanceolate, compressed and 2-winged, 1-seeded. Japan. Has proved hardier than S. japonica and is therefore to be recommended for northern regions.

8. lvs. persistent: fls. violet, in terminal racemes.
2349. 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, 5-3 in. thick; seed bright scarlet. Spring. Texas to New Mexico. S. S. 3:121. R. H. 1884:201. On account of its handsome fragrant fls. to be recommended for planting south.

AA. Fls. yellow, in axillary racemes; lvs. evergreen.

(E. Dewis.)

b. Pod 4-winged; fls. about 1 in. long.

5. tetrapera. Ait. Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches; lfs. very numerous, almost sessile, obturate to linear-oblong, silky-pubescent beneath, 1-3 in. long; fls. 4-6 in. long, in short racemes; standard as long as wings; pod terete, not winged. Chile. L.B.C. 12:115.

B. Pod not winged; fls. 3-4 in. long.

5. macrocarpa, Smith (E. Deiuoluisii Chilensis, Miers). Shrub or small tree, with the young branches densely tomentose; lfs. in 10-20 pairs, elliptive or oblong-oblanceolate, silky-pubescent beneath, 1-3 in. long, in short racemes; standard as long as wings; pod terete, not winged. Chile. L.B.C. 12:115.


B. R. 9:738. -S. Karakorum, Hort. Similar to S. Japonica; lfs. usually 11, lanceolate, dark-green, acuminate at the apex, ciliate at the base, silky-pubescent when young, dark yellowish green above, 1-2½ in. long; fls. violet-blue, the standard marked near the base with a few

280. Sophora Japonica var. pendula, in summer.
1686 SORBARIA

soil and thrive also in partly shaded situations. Prop, by hardwood cuttings; also by root-cuttings, suckers and seeds. Four species in Asia and one in N. America, formerly usually united with Spiraea but easily distinguished by their stipulate, pinnate lvs. and the 5 carpels being opposite to the sepals.

A. Less, pinnate.
B. Panicles with upright ramifications, dense.


AA. Lvs. bipinnate.

Mileleolium, Ecke (Spiraea Multiflora, Torrey. Chamaecytis Multiflora, Maxim. Rositima Multiflora, Kunz.). Aromatic, glandular-pubescent spreading shrub, 2-6 ft. high: lvs. lanceolate or linear, 1-3 in. long, with minutely, densely set, oblong and obtuse lfts. 3-5 in. across, or acuminate, in 2-3 in. high: fls. % in. across, July, Aug. Calif. to Wyoming and Arizona. G. F. 2:569. G. C. III. 22:257. 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 REIDER.

SORBUS (ancient Latin name of S. domestica. Including Aria, Aucuparia, Cornus, Meziaytica and Tanumaria. Rositina. Ornamental deciduous trees or shrubs, with alternate simple or odd-pinnate leaves, white or rarely pinkish flowers in terminal corymbs and berry-like, usually red fruit. Most of them are hardy north except some Asiatic species and S. domestica, which seem tender north of Mass. They are chiefly inhabitants of mountainous regions, and the northern species, as S. americana and S. umbellulata, do not thrive well in warmer and drier climates, while S. Aria, A. terminalis and allied kinds endure drought and heat well. They all have hard, one-seeded fruit, which usually turns orange-red in fall. The fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillocks. Those of the Aucuparia group are more adapted for cool and moist mountain regions; those of the Aria and Torminaria group, which grow specially well on limestone soil, are suited to warmer and drier climates. S. hybrid is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit. S. arboifolia and S. melanocarpa are handsome shrubs for borders of shrubberies; they prefer moist soil, but S. melanocarpa also grows in drier rocky situations. Prop. by seeds sown in fall or stratified; also by layers, and S. arboifolia 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. Aucuparia or Americana and on Hawthorn. The trees are very useful to hortors.

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 compound corymbs; sepals and petals 5; stamens 10, with red or yellow anthers; styles 5-5, free or connate at the base: fr. a 2-5-logoed pome, usually rather small, with 1 or 2 seeds in each cell. Closely allied and often referred to Pyrus, from which it is chiefly distinguished by its compound leaves and essence and by the fls. being more or less perigynous except in the Micronesia group, which has a decidedly inferior ovary every like Pyrus; the fruits, too, are usually smaller and berry-like.

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C. Young branches pubescent, green.


DA. Young branches glabrous, usually red.

Argescosia, Hemsl. (Spiraia A. Tschonoski, Hemsl. N. sorbaria, var. angustifolia, Wenzig.). Shrub, 6-8 ft. high with upright or ascending, little-branched stems, usually bright red when young: lfts. 15-21, lanceolate to linear-lanceolate, acuminate, narrowed at the base, simply or obscurely doubly serrate, glabrous, 2-4 in.

2350. Sorbaria sorbinia (X 1/3).

Usualy known as Spiraea sorbinia.

when young or glabrous, 3-4 in. long; panicles 5-12 in. long: fls. % in. across, June, July, N. Asia, from Ural to Japan. A.G. 11:125. Gu. 16, p. 217. — Escaped from cultivation in some localities in the Middle States.

BB. Panicles with spreading ramifications.

A. Folius, filiformis. 7.
B. Auriculata, 1.
C. Angustifolia, 3.
D. Nobilis, 1.
E. Cornuta, 1.
F. Multiflora, 1.
G. Areculata, 1.
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J. Atrata, 1.
K. Equida, 1.
L. Scandica, 1.

Sorbus (ancient Latin name of S. domestica. Including Aria, Aucuparia, Cornus, Meziaytica and Torminaria. Rositina. Ornamental deciduous trees or shrubs, with alternate simple or odd-pinnate leaves, white or rarely pinkish flowers in terminal corymbs and berry-like, usually red fruit. Most of them are hardy north except some Asiatic species and S. domestica, which seem tender north of Mass. They are chiefly inhabitants of mountainous regions, and the northern species, as S. americana and S. umbellulata, do not thrive well in warmer and drier climates, while S. Aria, A. terminalis and allied kinds endure drought and heat well. They all have hard, one-seeded fruit, which usually turns orange-red in fall. The fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillocks. Those of the Aucuparia group are more adapted for cool and moist mountain regions; those of the Aria and Torminaria group, which grow specially well on limestone soil, are suited to warmer and drier climates. S. hybrid is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit. S. arboifolia and S. melanocarpa are handsome shrubs for borders of shrubberies; they prefer moist soil, but S. melanocarpa also grows in drier rocky situations. Prop. by seeds sown in fall or stratified; also by layers, and S. arboifolia 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. Aucuparia or Americana and on Hawthorn. The trees are very useful to hortors.

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A. Foliage simple.
   a. Stems erect-petuniate, with the lfts. of almost equal size.
   b. Fruits small, ¼-½ in. across, or slightly larger, berry-like.
      (Aucuparia group, species 1-4.)
   c. Fruits ½ in. or more across, apple- or pear-shaped, with
      glabrous styles. (Cornsucia group, species 5-7.)
   d. Winter-branched glabrous or sparsely pubescent,
      or sparsely appressed, rusty-pubescent.
   e. Lfts. long-acuminate: lts. ½-1½ in. across.
   f. Lfts. acute or obtuse: lts. ½-2½ in. across.
   g. Fruits less than ½ in. across.
   h. Fruits ½ in. to more than ½ in. across, or more
      across, bright red.
   i. Siberiaca, Var. dilatata, Pier., has yellow fruits.
   j. There are var. with variegate foliage of the typical and of the weeping
      form. The fruits of S. Aucuparia, S. domestica, torminalis and var. alpina
      are ovate, and the strong and close-grained wood of S. domestica and S. torminalis,
      and in a lesser degree that of S. Aucuparia, is valued for handles of tools and similar small
      articles. See Pyrus.

2. Tianschanica, Rupr. (Pyrus Thunb., Regel). Small tree or shrub, similar to the preceding;
   young branchlets glabrous, red-brown and glossy when older; petioles and lfts. glabrous; lts. 11-15, lanceolate, acuminate, serrate, entire toward the base, dark green
   and glossy above, light green beneath, about 2 in. long; corollas glabrous; stamens half as long as petals: styles 2-5. fr. globose, bright red. May, June. 1. Asia.
      4. sambucifolia
      5. domestica

A. Foliage simple.
   a. Styles 2; trees or rarely shrubs.
   b. Under side of lfts. glabrous at length, green: lts. lobed; fr. brown, with glabrous (Avenaria group, species
      No. 8.)
   c. Under side of lfts. greyish or whitish tomentose. (Avenaria group, species 9-12.)
   d. Lfts. lobed. (See also No. 6.)
   e. Fruits of veins 5-9.
   f. Base of the usually broadly ovate lts.
   g. Mostly rounded...
   h. latifolia
   i. Borne of the ovate to oblong-aruncate lts.
   j. Borne of the ovate to oblong-aruncate lts.

B. Lvs. not or but obscurely lobed; pairs of veins 6-12. 12. Aria
   a. Styles 5; shaggy with spreading serrate lts. 14. Aria (Avenaria group, species 13-14.)
   b. Fruits red; lts. tomentose beneath.
   c. Fruits black; lts. glabrous or nearly so
      13. arbutifolia

1. Aucuparia, Linn. (Pyrus Aucuparia, Gaertn.),
   European Mountain Ash. Rowan Tree. Fig. 2351.
   Round-headed tree, 20 to 40, occasionally 60 ft. high;
   young branchlets pubescent, grayish brown when older;
   petioles more or less tomentose: lts. 9-15, oblong to
   oblong-lanceolate, serrate, entire toward the base, dull
   green above, pubescent beneath or rarely glabrous, 2½-
   2 in. long; fls. white, ⅓-⅔ in. across, petal-like, 4-6 in. broad, tomentose or sometimes almost glabrous corollas; sta-
   mens about as long as petals: fr. globose, about ⅛ in.
   across, bright red. May, June. Europe to W. Asia and
   Siberia. Var. delici, Kotsch. (var. delici var. delici),
   Almost glabrous, petioles pubescent; lts. oblong-lanceolate,
   2-3 in. long, glabrous beneath. The fruits are of an agreeable acid flavor and recommended for pre-
   serve. The tree grows well in northern climates where
   hardly any other fruit tree will grow. Var. delici
   laciniata, Beissn., is a handsome and graceful form

2351. Sorbus Aucuparia. (× 1/4)
confounded with the preceding species; both are very handsome in autumn with their large clusters of bright red fruits. Sometimes a form of S. hybridus is found in American nurseries under the name of S. umbelliferum.

5. domestica, Linn. [Pyrus, Sorbus, Geän., P. doméstica, Smith. Cornus domesticus, Spachy. Service Tree. Fig. 235b. Round-headed tree, 30-60 ft. high: winter-buds glabrous; petals tomentose; fruits 1 1/2-1 1/2 in. obovate-oblong to oblong, sharply and rather coarsely serrate, with acuminate teeth, usually entire near the base, green and glabrous above, thence-tomentose beneath, at least when young, 1-2 1/2 in. long; flesh white, 1/2 in. in diameter, in broadly pyramidal rather loose, tomentose corymbs: fr. 1 1/2-1 1/2 in. across, usually yellowish with red or orange cheek, apple-shaped in var. maliformis, Lodd., pear-shaped in var. pyriformis, Lodd. May, S. Eu. N. Afr. and W. Asia. G.C. II. 1:283; 1:449, M.D.G. 1897:356-358. This species is often confounded with the European ash, from which it is almost indistinguishable without fruits or flowers, except by the glabrous winter-buds.

6. hybridus, Linn. [Pyrus pinnatifida, Æhr. P. F. nivosa, Hort. S. intermedia, Ait. S. intermedia, Ait.] Tree, attaining 40 ft., of regular, pyramidal habit with upright branches: young branches and petals whitish tomentose; lvs. ovate to oblong-obovate, with 1-4 pairs of decurrent lfts. at the base, or but pinately lobed, upper part lobed with the lobes becoming gradually shorter and more indistinct toward the apex, dark green above, whitish or grayish tomentose beneath, 3 1/2-4 in. long; petals about 1 in. long; fr. 1-1 1/2 in. across, in tomentose corymbs about 3 in. broad; fr. globose or globose-cordate, 1 in. high. May, June. Natural hybrid, occasionally found with the parents in Europe. Two different hybrids are usually included under S. hybridus: the typical one is S. Amerinaca x intermedia, which has the lvs. oblong-obovate to oblong, 3 1/2-5 in. long, with 10-12 pairs of veins, the lfts. and lobe margins not pointed and the veins often slightly recurved. It is mostly cult., under the name of S. sinicola or yorcools, Hort. The second hybrid is var. Thomsoniana, Reid, [Pyrus Thomsoniana, Linn.], and is a hybrid of S. Amerinaca x Aria; it has ovate-oblong lvs., somewhat more deeply lobed, 2-2 1/2 in. long, with 8-10 pairs of veins, lfts. and lobes broader and shorter. With the veins usually curving upwards. This is known in gardens as S. yorcools hybridum aina. Var. decurrens, Kochne (S. yorcools, Hort., not Kit.) is a transition to S. Amerinaca, only the 2-3 of 5 upper lfts. are connate near the middle, which, like the upper separate lfts., is decurrent at the base, under side less densely tomentose. In some nurseries under the name of S. umbelliferum.

7. spuria, Pers. [Pyrus heterophylla, Desr. S. Amerinaca vulgaris, Ait. S. umbelliferum, Ait.] Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches; lvs. ovate to oblong-obovate, obtuse, with 2-6 lobes or lfts. near the base, simply erose-crenate-serrate toward the apex, 1 1/2-2 in. long, pubescent or glabrous beneath; lfs. white or pinkish white, in pubescent or glabrous corymbs 1-1 1/2 in. broad; fr. subglobose or pear-shaped, dark purple or almost black, May, June. Of garden origin. B.R. 11:1196.—Sometimes cultivated under the name S. sinicola floribunda aina. Hybrids of different origin are usually united under S. spuria, the more pubescent forms with dark purple fr. are probably the offspring of S. Amerinaca and S. achillea, while the more glabrous forms with usually blackish fruit have S. Amerinaca and S. umbelliferum as their parents. A similar form with quite glabrous and more pointed lobes originating at the garden is a hybrid of S. Americana and S. umbelliferum, was named S. Silicoides, Dipp.

(Tormicoria group, species No. 8.)

8. torminalis, Crantz (Pyrus torminalis, Æhr. Torminaria torminalis, Dipp. T. Chusi, Roul.) Wild Service Tree. Round-headed tree, with spreading branches, 40-60 ft. high; lvs. broadly ovate, slightly cordate to broadly emuncte at the base, with several triangular ovate, serrate lobs on each side, the lower sinuses reaching about half way to the middle, thence-tomentose when young, 2 1/2-4 in. long; petals 1-1 1/2 in. long; lfs. white, 1 1/2 in. across, in broad, rather loose tomentose corymbs: fr. oval, 1 1/2-3 in. in diameter, brown, dotted. May, June. Southern and middle Europe.—The foliage turns bright red in fall.

(Aria group, species 9-13)

9. latifolia, Pers. [Pyrus rotundifolia, Bechst. P. intermedia, var. latifolia, Ser. P. Aria, var. latifolia. Hort. Torminaria latifolia, Dipp. S. Aria formidabilis.] Tree, attaining 50 ft., similar to the preceding; lvs. broadly ovate to ovate, usually rounded at the base, pinately lobed with short, broadly triangular, sharply serrate lobs and with 6-9 pairs of veins, grayish or whitish tomentose beneath, 2 1/2-4 in. long; petals 1 1/2-3 in. long; fr., about 1 in. across, in broad, tomentose corymbs: fr. globose or globose-cordate, about 1 in. in diameter, high orange to brownish red. May, June. Occasionally occurring in middle Europe.

10. intermedia, Pers. [Pyrus intermedia, Æhr. Sorbus Sebacea, Fries. Aria Succursa, Kochne. Helenium Succursa, Dipp.] Tree, 20-40 ft. high, with oval head; lvs. ovate to oblong-obovate, broadly cuneate at the base,
pinnately lobed with broad and short, irregularly serrate lobes and 5-8 pairs of veins, white tomentose beneath, 2½-4 in. long; petals ½-¾ in. long in broad, toothed oroblasts; fr. orange-red, globose or subglobose, about ½ in. high. May. Northern and southern Europe. This is sometimes confused with *S. hybrida* and considered to be a hybrid of similar origin, but it is certainly a good species. It never bears distinct leaflets at the base and the sinuses do not reach farther than one-third toward the middle.

11. *flabellifolia*, S. Neun. (Pyros Arborea, var. flabellifolia, Decne. *S. slabeilata*, Hort.). Small tree, attaining 20 ft.; lvs. orbicular to broadly oval, obtuse, usually broadly cuneate at the base, incisedly lobed with 5-7 lobes truncate or rounded, slightly toothed, snowy white beneath, 1½-3 in. long; fr. scarcely ½ in. across, in dense, white-tomentose corymbs, fr. deeply pressed globose, orange-red. Southeastern Eu. W. Asia. — Cult. in some nurseries as *Pyrus aurea striata*.

12. *Aria*, Crantz (Pyros Arborea, Ehrh. *Aria s угa*, Hort. *Aria eugenia*, 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 dark green and glabrous above, white-tomentose beneath, 2-5 in. long; petals ½-¾ in. long in dense, tomentose corymbs, fr. subglobose, orange-red, about ½ in. high. May. Middle and southern Europe to Himalaya and Siberia. A fine tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and under sides of the leaves. Several vars. are known. Var. *Gratissima*, Lindl. *Area Gratissima*, Nichols. Lvs. elliptic to oblong-obovate, ovate, irregularly doubly serrate, 3-6 in. long; stamens longer than petals; fr. ovate. Probably from the Himalayas and sometimes cult. as *S. nepalensis*. *Var. edulis*, Wenzig (Pyros eodalis, Willd.). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2½-5 in. long; fr. oval, ¼-¾ in. high. There are some garden forms, as *var. aurea*, *chrysophylla* and *lutecens*, with more or less yellow foliage.

* (Aronia group, species Nos. 18 and 14.)


11. *melanocarpa*, C. Koch (Pyros nigra, Sarg. *Aronia nigra*, Koehne. Pyros arbutifolia, var. nigra, Willd.). Beach Cranberry. Closely allied to the preceding, usually lower; lvs. oval to ovate, abruptly acuminate or obtuse, pale green and glabrous or nearly so beneath; calyx and pedicels glabrous or nearly so; fr. globose, about ½ across, glabrous, whitish or grayish green and glabrous, ½-1½ in. across, tomentose or pubescent beneath, 1½-3 in. long; corymbs tomentose, few to many-flowered, 1½-2 in. broad; white, or tinged red, ½-¾ in. across; fr. subglobous or pear-shaped, bright or dull red, about ¼ across. April, May. Nova Scotia to Minn., south to Fla. and La. B.M. 3668. G.F. 3:417.

11. *melanocarpa*, C. Koch (Pyros nigra, Sarg. *Aronia nigra*, Koehne. Pyros arbutifolia, var. nigra, Willd.). Beach Cranberry. Closely allied to the preceding, usually lower; lvs. oval to ovate, abruptly acuminate or obtuse, pale green and glabrous or nearly so beneath; calyx and pedicels glabrous or nearly so; fr. globose, about ½ across, glabrous, whitish or grayish green and glabrous, ½-1½ in. across, tomentose or pubescent beneath, 1½-3 in. long; corymbs tomentose, few to many-flowered, 1½-2 in. broad; white, or tinged red, ½-¾ in. across; fr. subglobous or pear-shaped, bright or dull red, about ¼ across. April, May. Nova Scotia to Minn., south to Fla. and La. B.M. 3668. G.F. 3:417.

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11. *melanocarpa*, C. Koch (Pyros nigra, Sarg. *Aronia nigra*, Koehne. Pyros arbutifolia, var. nigra, Willd.). Beach Cranberry. Closely allied to the preceding, usually lower; lvs. oval to ovate, abruptly acuminate or obtuse, pale green and glabrous or nearly so beneath; calyx and pedicels glabrous or nearly so; fr. globose, about ½ across, glabrous, whitish or grayish green and glabrous, ½-1½ in. across, tomentose or pubescent beneath, 1½-3 in. long; corymbs tomentose, few to many-flowered, 1½-2 in. broad; white, or tinged red, ½-¾ in. across; fr. subglobous or pear-shaped, bright or dull red, about ¼ across. April, May. Nova Scotia to Minn., south to Fla. and La. B.M. 3668. G.F. 3:417.

S. melanocarpa, Wenzig (Pyros Miyagawa, Sarg. *Micromelum alii- folium*, Koehne). Tree, 60 ft. high; lvs. ovalate and abruptly acuminate or ovate, serrate, glabrous at length, but on vigorous shoots, especially near the reseeding tips, more or less serrate beneath, 2½-4 in. long, ½-3 in. wide, in 6-12-ft. almost glabrous corymbs; fr. subglobose, ½ in. across. Japan. G.M. 41, p. 234, 284. G.F. 7:81-8. *Chamaecereus* Turczan. *S. chloranthus*, Lindl. *Aria Chamaecereus*, Hort. Upright shrub, 6 ft. high, allied to *S. Aria*. Lvs. elliptic to oblong serrate, almost glabrous,
Sorghum

SOUTH CAROLINA, HORTICULTURE IN. Fig. 2355.

Owing to the combined influence of varieties of soil, latitude and elevation, the climatic conditions of South Carolina and the range of horticultural productions are remarkably varied. With reference to its adaptation to amateur and commercial horticulture, this state may be divided into four belts by lines drawn roughly from southwest to northeast.

The coast region, embracing a tier of counties bordering the Atlantic ocean and a number of terri- colombias, is especially adapted to commercial horticulture. A considerable area is devoted to growing early vegetables to supply the large cities of the northeastern states. The introduced species grown on shipmenions, are Irish potatoes, cabbage, asparagus, and beans. The Hoffman and Neuman varieties of strawberries, which are especially adapted to this region, are also grown for shipment. The fig grows to perfection here, but has not yet been produced on a commercial scale. The capabilities of this region have been only partially developed on account of the habitat and profit of sea island cotton and rice culture. The famous disease known as asparagus rust has seriously menaced the asparagus plantations.

The Piedmont, or second zone, embraces two formations, popularly known as the Upper and Lower Pine Belts. The latter covers an area of about 9,000 square miles; the former 5,000. The Upper Belt embraces the best farm and horticultural lands of the state where the surface is generally level, with an elevation of 250 feet. Both of these belts contain large areas especially adapted to vegetable and fruit growing, especially melons. The industries are receiving more and more attention every year as the landowners become more familiar with the intensive methods necessary for success- ful truck farming and the commercial requirements for successfully handling large crops of perishable products. Asparagus, early potatoes, watermelons and cantaloupes are at present the principal crops grown for the northern markets. The sweet potato grows to perfection in this region, 400 to 500 bushels being easily produced. Recent experiments by the Agricultural Department of the Experiment Station in preparing the sweet potato for compact shipment seem to have opened the way for carrying this vegetable to all parts of the world. This section is especially adapted to the fig, the oriental types of pears and plums and to the early varieties of peaches and apples. While affording every facility for commercial horticulture, there is, perhaps, no part of the globe where an abundant supply of fruits and vegetables may be more easily and continuously provided for domestic use. Fresh vegetables in season may be gathered from the garden every day in the year.

The Hill Belt, fifty miles in width, stretching across the state from Georgia to North Carolina, is more diversified in soil and elevation, affording a wide range of soil products. In some sections of the Hill Belt rapid strides have been made in peach and melon growing for market. From a limited area around Ridge Springs 150 car-loads of peaches were shipped in 1890; from this section also large shipments of melons and asparagus are made. The rapid development of manufactures has created a home market for large quantities of fruit and vegetables, there being every facility here. Standard Labrusca grapes, such as Delaware, Concord and Niagara, are remark- ably exempt from disease which are more destruc- tive in other sections. The Rosaceidae family, the southern fox grape type, most commonly known from the amber-colored variety, Scuppernong, succeeds well from the mountains to the coast. Other varieties of the same family are more productive than the Seabreeze; such as the Miah Memory, Tender Pulp, Thomas, James and Flowers. The berries of some of these var- ieties adhere to the stems and grow in bunches of fifteen to twenty, hence may be as readily packed as the Delaware. When trained upon vertical trellises and pruned in early fall, the yield far exceeds that of any other type.

In the Piedmont and Alpine regions, ranging in elevation from 400 to over 3,000 feet, varies even more than the hill country in variety of products to which it is

SORREL, TREE. Oxalis cernua.

SOLRREL, WOOD. Aralia petracta.

SOUR GUM. See Nyssa sylvatica.

SOUR SOP. Acanthus morioicit.

SOUR WOOD. Oxalis aegrophylla.

2355. South Carolina.

To show horticultural zones.

SORREL. Various species of Rumex (which see) produce large, thick, acid leaves which are prized for salad or for "greens." 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 sparse. 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 be kept 18 inches apart. Do not let the plants exhaust themselves by seed-bearing. The Spinach Dock (Rumex Rotundifolius) is one of the best and earliest. The Belleville (Rumex Acetosella) is also an excellent plant for salads, as it is by the amateur and commercial horticulturist, the other as a succession. Various other species may be had of European seed dealers. See Dock.

L. H. B.

SOUTH CAROLINA
adapted. The cherry, peach, pear, grape, small fruits and apple afford a tempting variety. The succession of fruits spans the seasons, the winter apples lasting until strawberies are ripe. While little has been done in this great region towards growing fruit and vegetables for shipment, the beauty of its scenery, so numerous in this section, has converted the farms in their vicinity into market-gardens. The typical mountain wagons, loaded with white canvas, laden with luscious apples, succulent cabbages, mealy potatoes and fragrant onions, products of the rude methods of the inhabitants of the highland region, are only suggestions of the possibilities of the fertile valleys and mountain coves under the manipulation of skilful hands guided by the trained head.

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. 45° 57' N and 42° 28' S and long. 96° 26' and 104° 3'. 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 190,000. The Missouri river divides the state into nearly equal portions. With the exception of a small area in the northeast corner, the southeast part is lowest and all the streams flow in that direction. The state may be divided into three sections: (1) the Black Hills; (2) the Table-lands; (3) the Eastern Section.

The Black Hills in the southwestern part are outliers of the Rocky Mountains, and the extensive and very rich deposits of gold, silver and other minerals are important sources of wealth. The Indians early knew of these gold deposits, but they were not known to white men until 1874. The Black Hills, so named by the Indians because of the heavy forests of pine and spruce covering the mountains, 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 hardly upon the open prairies of the state.

The Table-lands comprise the entire section of the state west of the Missouri river, with the exception of the Black Hills. Five branches of the Missouri flow from the western part of the state across these lands from west to east. These are White, Bad, Cheyenne, Moreau or Owl, and Grand rivers. The rainfall in this part is too light to make general farming feasible, but native pasture and hay, from the grasses and stock-raising is profitable. Cattle, horses and sheep are raised in immense numbers and feed the year round upon these ranges, the dry climate curing the grass into the best of hay as it stands.

The eastern section contains three river valleys that cross it from north to south, viz., the eastern half of the Missouri, the James river valley and the Big Sioux river on the eastern border. In the southern part the valley of the Vermillion traverses the region between the Sioux and the James. These river valleys are all very fertile and blend together as they reach the Missouri at the south. Diversified agriculture flourishes in these rich valleys, especially in the southern and 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 definition 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 1,300 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 325,805,600,000 cubic feet annually, an amount of water sufficient to fill a river-bed a mile wide, 20 feet deep and nearly 600 feet long. When this water is more generally utilized, it is confidently believed that the horticultural area shown on the map will be extended to include the entire state east of the Missouri river.

Horticulture in South Dakota is to a considerable extent still in the experimental stage. Most of the plant-
river valleys considerable fruit is grown as far north as
the Minnesota line. North of this the orchards are
few and far between, the country being newly settled,
and grain-raising, stock-raising and 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 varieties
less hardy than Oldenburg and Wilmly, if the planter
desires a long-lived, fruitful orchard and cannot afford to expe-

rience. The following list of hardy varieties should be
considered:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Recommendation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oldenburg</td>
<td>Recommended</td>
<td>High productivity, good flavor, and hardy.</td>
</tr>
<tr>
<td>Hibernal</td>
<td>Recommended</td>
<td>Similar to Oldenburg, good for northern climates.</td>
</tr>
<tr>
<td>Charlanoff</td>
<td>Recommended</td>
<td>Resistant to scab and mildew, good keeper.</td>
</tr>
<tr>
<td>Wealthy</td>
<td>Recommended</td>
<td>Early season, good quality, hardy.</td>
</tr>
</tbody>
</table>

The largest orchard in the state is in Turner county,
consisting of 7,000 trees on about 132 acres. This or-
card was planted in the early seventies and still yields
withstanding the severely cold winters of 1898-1899.

SOUTHERNWOOD (Artemisia Arborescens), which see
or Common Wormwood, is a European herb.

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, ex-
cept near the larger towns. Agriculture has been exten-
sive, rather than intensive. In a state yielding heavy
crops of wheat and other cereals, with a soil so rich
that commercial fertilizers are not thought of and barn-
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 raising cultivators are the more favored
implements. In the course of time, with the increase in
population, will come a change in methods. Eastern
collectors and gardeners find that the soil and climate
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
often comes when the ground is bare.

The State Agricultural Experiment Station at Brookings
is a flourishing institution, the annual attendance being
about five hundred. The United States Experiment
Station is in co-operation with the college and is busy
with the problems presented in a new state. These insti-
tutes and home reading courses are provided to help in
the dissemination of agricultural knowledge.

The South Dakota State Horticultural Society is com-
promised of the amateur and professional fruitmen of
the state and is an earnest body of workers striving to
solve the problems presented to Prairie horticulturists.
No state appropriation has been granted hitherto, so that
the proceedings at present are published from time to
time in the agricultural press of the state. The twelfth
annual meeting was held at Sioux Falls, January 22-24,
1901.

The dry climate is very salubrious, and many people
suffering from poor health in warmer and moister
sections find relief here.

SOUTHERNWOOD (Artemisia Abrotanum, which see
for botanical account) is a European herb, aromatic,
much branched, woolly-stemmed, rather tender, per-
ennial, 3 to 6 ft. tall, bearing flat, linear leaves,
variegated with yellow. The flowers are small, white.

The following native species have been taken in
hand in this plant-breeding work: sand cherry, choke
cherry, pin cherry, black currant, gooseberry, buffalo
berry, grape, hazel, choke-berry, Juneberry, plum,
red raspberry, black raspberry, strawberry. The work with
cultivated fruits is mainly in the apple and pear, which
combine the hardiness of the Russian sorts with the bearing
capacity of the best American winter varieties. Several
Siberian fruits have also been taken in hand. These
were planted in 1899, and the writer went on a ten
months' tour of exploration in eastern Europe and
western and central Asia by U.S. Secretary of Agri-
culture Hon. James Wilson. The state Legislature in
March, 1901, granted an appropriation of $20,000 for a
"plant-breeding building," for improved facilities in
the breeding of horticultural and agricultural plants.

Of conifers, the hemlock, white pine, balsam fir,
Arborvitae and Norway spruce fail on the open prairie;
while jack pine, bull pine, Scotch pine, northern red
cedar, western white spruce, and Colorado silver or blue
spruce all do well in open exposure. Of deciduous trees,
the native species will do, as any introduced species
will not combine the hardiness of the Russian sorts with
the bearing capacity of the best American winter varieties. Several
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SOUTHERNWOOD
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, 193. It grows to perfection only in a tropical or semitropical 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 3-5 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 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 harvested 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 then serve as a cover-crop during the winter. When the soil is kept hard and unfurrowed the 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 juneeum.

SPANISH LIME. Melicocca bijuga.

SPANISH OYSTER PLANT. Scyllymus.

SPARAXIS (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Tritonia). Iridaceae. WAND FLOWER.

Sparaxis is a group of spring-blooming "Cape bulbs" of the Ixia tribe, with spikes of 6-petaled, or more or less funnel-shaped flowers one inch or two across and exhibiting an extraordinary range of color and throat markings. These plants are less popular than Ixias, which they much resemble. The plants are dwarfer and more compact than Ixias, the spikes are shorter and fewer flowered, and the blossoms are sometimes larger. Sparaxis is essentially distinguished from Ixia and other allied genera by the sub-regular perianth, unilateral and arcuate stamens, and scarios, lacerated spathes. Other general features are: the rosettock a corn; lvs. linear or lanceolate and arranged in a basal rosette; inflorescence a simple or panicked spike; rhizome 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. tricolor.

Sparaxis pulcherremsis of the Dutch trade is properly Dianema pulcherrimum. Baker. Bulbs 6-10 in. high. The flowers are more and has pendulous fls. bright blood purple but apparently with pale rose and perhaps other varieties (also a white var.). It is distinguished by its pendulous fls., with regular perianth, simple or branched, equillateral stamens, and large bractlets which are not laciniate.

B.M. 5555. F.S. 17:1810. Gn. 20:315; 44, p. 281. This plant is said by F. W. Burbridge to be "perhaps the most graceful of all the Cape Irises."

A. Throat of flower same color as seg- ments.

B. Fls. small: segments %-% in. long

C. Fls. larger: segments 1 in. or more

D. Throat of flower height yellow, often with a dark blotch on the lower part of each segment

E. Tricolor

bulbifera, Ker. Corn globose, ½-¾ in. thick: basal lvs. about 4, linear or lanceolate, ½-1 ft. long: stamens ½-1 ft. long, simple or branched, bearing low down 2-3 small lvs., often with bulbs in the axil: fls. solitary or few in a spike, yellow; perianth ½ in. long, B.M. 545 (Ixia bulbifera). To this species Baker refers S. albiflora, Eckl., with fls. whitish inside, and S. viola- tos, Eckl., with dark purple fls.

grandiflora, Ker. Habit, corn, 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 yellow outside, purple inside, B. R. 3:258; ffs. white inside, midvein on the back purple). B. M. 511 (Ixia bakeriana. Fls. rich purple, margined lighter).—According to Baker, the principal named types are: *strigopurpurea*, dark purple; *anemoniiflora*, pale yellow; *Liliago*, white, flushed with claret-purple outside; and *stelartsis*, dark purple, the segments narrower than the type, oblong-lanceolate and acute rather than oblong.

*tricolor*, Ker. Fig. 238. Differs from *Ixia grandiflora* only in the color of the flowers, which are very variable but always having bright yellow throat and often a dark blotch at the base of each segment. B. M. 1482; 341 (*Ixia tricolor*). F. S. 2:124. F. 1843:272 (S. piets personata, patchellii).—According to Baker, this is the favorite type among cultivators. It certainly has the greatest variety of colors and markings. In the works cited the floral segments range from nearly white through rose, brick-red, carmine, crimson and light purple to dark purple, excluding blue and yellow, which latter color usually appears in the throat.

W. M.

**SPARGANUM** (Greek, filli; referring to the ribbon-like lvs.) *Typhodium.* Bur-reed. Bur-reeds are marsh herbs closely allied to cattails but with fls. in globular 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.

*Sparganium* has 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.*

b. *Height 3-8 ft.*


AA. *Inflorescence branched.*

BB. *Height 2-3 ft.*

c. *ramosum*, Curt. Lvs. flat; heads 5-9, disposed in axillary and terminal, interrupted spikes, the lowest one large and pedilulate; the others wholly stamine; pedilulate heads 8-10 lines in diam. July. Southern U. S., particularly in mountain bogs.

W. M.

**SPARRANNIA** (after Andreae Sparrmann, 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 remaining ones, exterior. *S. urucata* is of easy treatment under glass in a temperature never lower than 55°F., 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°F. of heat.

AA. Lvs. deeply 5-7-lobed.

AA. Lvs. not lobed.

*Afriacanuss.* Linn. A large shrub or tree, 10-20 ft. high: lvs. cordate-acuminate, 5-7-angled, unequally toothed, 5-6 in. long, 7-9-ribbed below: fls. white, or long, many-fld., peduncles: capsule 5-celled. B. M. 510. G. M. 37:253.


F. W. BACkAY.

*Sparrmannia* Africanus is not common in S. California, but is highly esteemed. One in Singleton Court, 25 years old, is 12 ft. high and 2 ft. in diameter, one of about fifty trunks 5-4 inches in diameter. It was in full bloom in January and February and one of the finest sights imaginable. It was literally covered with snowballs of 4 inches diameter, and admired by hundreds 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, hydrangeas 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 bass-wood suckers, the leaves being nearly identical in appearance with those of the bass-wood. It is the only shrub with broad leaves and looks well anywhere and at any time. This is one of the finest flowered shrubs or trees in cultivation. The double variety is not as desirable as the single.

ERNEST BRAYTON.

**SPARROW-GRASS.** Provincialism for *Asparagus.*

**SPARTINA** (Greek, spartine, a cord; on account of the tough leaves). *Gramineae.* Species 7. Perennial marsh plants of various parts of the world, most or all of which are found in the United States. Culms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inwards: scapelets 1-fl., on two sides of the triangular rachis; spikes 2-2 several in a raceme.

**cynosurolides,** Wille. *Fresh-water Cord-grass.* In the West known as "Slough-grass." A common coarse fresh-water marsh grass, occurring across the continent in the northern states. Recommended for cultivation along the margins of ponds and aquatic areas. *Ilia* procurable from collectors.

A. S. Hitchcock.

**SPARTIUM** (Greek *spartos*, the ancient name of the plant). *Gramineae.* *Eremogone.* Ornamental shrub, with long and slender green branches, small and sparsely foliaged, and showy papilionaceous yellow fls. in terminal racemes. It is a handsome shrub especially adapted for warmer and drier regions; in the East it is probably hardly as far north as Philadelphia. It becomes naturalized easily, as happened in several localities in S. America, where it was afterwards described as *S. americana*, Muench. It grows in almost any kind of welldrained soil and is well suited for planting on exposed sandy and rocky situations. Prop. by seeds and by greenwood cuttings under glass. One species in the Mediterranean region and the Canary Islands. Allied to *Cytisus* and *Cytisus.* But chiefly cultivated are the 1-lipped calyx: lvs. simple: fls. in terminal, loose racemes; calyx split above, hence 1-lipped, tip with 5 minute teeth: keel incurved, acuminate: pod linear, compressed, many-seeded; seeds with callose appendage at the base like in *Genista.* The slender branches yield several, free, the anther-bearing ones, interior, the remaining ones, exterior.
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 Spariurn Elenense, Biv., S. tereo, Poir., S. monospernum, Linn., S. radiatum, Linn. and S. cruciatum, Ait., see Genista; for S. punctulatum, Linn., see Cytisus; Spathoglottis multiflorum, Ait. = Cytisusalusbus.

jaunacem. Linn. (Genista jaunacem. Linn. Spartiathus jaunaceus, Link.). Spanish Broom. Upright shrub, 10 ft. high, with slender, terete, green, rush-like branches sparingly hairy or almost leafless; lvs. obovate to linear, entire, bluish green and sparingly appressed pubescent; spadix 1-1½ in. long; fls. fragrant, yellow, about 1 in. long, with ample 2½ in. long, whole year. B.M. 85.

G.-22, p. 404: 34, p. 254. — There is a double-fl, form.

F. 1880, p. 76.

AV. Lvs. less than 2 in. wide.

b. Lvs. 2-3 in. wide.

floribundum, N. E. Br. Petioles 4-6 in. long; leaf-blade obovate to oblong-lanceolate, very sharply acuminate, abruptly obtuse and contracted into a node at the base, dark green above, lighter beneath: spathe obovate-lanceolate, very long-acuminate, about 2½ in. long by 1 in. wide, white; spadix white, a little shorter than the spathe. Colombia. J.H. 21:159.

BB. Lvs. 6-8 in. long.

c. Scapae thickened and curved below the spathe.

candidum, N. E. Br. Petioles 5-6 in. long, minutely speckled with white; leaf-blade narrowly oblong-lanceolate, very sharply acuminate, abruptly obtuse, and contracted into a node at the base, dark green above, paler beneath: spathe obovate-lanceolate, long-cuspidate-acuminate, about 2½ in. long by 1 in. wide, white; spadix white, a little shorter than the spathe. Colombia. J.H. 21:159.

cc. Scapa straight.

Patinii, 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-acuminate, white except for the green costa, spreading or recurved; spadix long stipitate (5 lines), a little shorter than the spathe. Colombia. F. 1879, p. 19.

cc. Scapae short.

P. candidum, Poepp. (S. cannifolium, Schott). A large plant: lvs. broadly oblong, 20-30 in. long, shortly acute, the base rounded or cordate: scape ovate or oblong-ovate, narrowly cuspidate, somewhat decurrent on the peduncle, 8-12 in. long; spadix 3-4 in. long. Mexico. J.H. 21:159.

nn. Petioles 5-10 in. long.

cc. Scapae straight.

candidans, Poepp. (S. cannifolium, Schott). Leaf-blades broadly lanceolate to oblong-lanceolate, 10-16 in. long, acute or acuminate, base broadly ovate, somewhat cuneate-acuminate, deep green above, paler beneath: spathe 4½-7 in. long, oblong-lanceolate, acuminate, white on the face, green, possibly rarely white on the back: fls. obovate. West Indies, Colombia. B.M. 605 (as Pathos cannifolium).

cc. Scapae 2 in. long.


F. W. BARCLAY.

SPATHOGLOTTIS (Greek, spatha and tongue: said to refer to the shape of the lip). Orchidaceae. Plants growing with Bletia in habit and form of inflorescence; pseudobulbs broadly conic, 1-3 in. long: lvs. elongate, long-petioled, narrow, plicate, articulate: scape lateral, bearing large fls. in a terminal raceme: sepals free, subequal; petals similar or broader and longer; label- lum not spurred, lateral lobes somewhat concolate, middie lobe clasped: column slender: pollinia 8. About 10 species in Asia, Australia and the Malay Islands.

Spathoglottis grow best at the warm end of the Catleya or Brazilian house in a moist, shady location. Pot culture suits them best, and the compost should consist principally of equal parts peat fiber and sphagnum moss with a little chopped sod added; about one-half of the pot should be devoted to drainage. They all require a liberal amount of water when growing, but only enough to keep them in sound condition when at rest. They are rather hard to increase by division and the supply needs to be ordered in advance.

Spathoglottis Vieillardi. (X ½)

2359.

spatha, Blume. Lvs. 2-3 ft. long, finely acuminate, scape 2-3 ft. high, with a raceme 6-12 in. long: fls. 1 in. across, lilac; sepals and petals broad, acute; middle lobe of the labelum long and narrow, cuneately dilated at the tip; calli yellow, villous. Malay Peninsula.

treubii, Lindl. (P. treubii, Schott). Lvs. 12-18 in. high, narrowly lanceolate: scape tall and stout, 2 ft. high; raceme 6-8 in. long: fls. 1½ in. across, golden yellow; sepals broad, obtuse; middle lobe of the labelum equaling the lateral lobes; narrowly lanceolate. Malay Peninsula. G.C. III. 4:93. — The lip varies, being sometimes broad and retuse at the apex.
Vieillardi, Reichh. f. (8. Augustorum, Reichh. f., Fig. 2359. Lvs. long-lanceolate, acuminate, 1-2 ft. long: scape 12-18 in. high, robust: raceme 6 in. across. very pale lilac, nearly globular, scented, papery calyx-tube, 6 in., has linear lvs. which appear to be whorled, and the petals profusely dotted with crimson, the tips of the sepals and the lip rich crimson. G.C.H. 2:3299. G.M. 41:308.

S. Knaphtallone, Hook. is often regarded as a variety of S. aurea, from which it differs in having the backs of the sepals scented with red brown, the rest glabrous, and narrower lvs. B.M. 7433.—S. Pontica, var. Melanota, is advertised by Sander. Fls. pale chocolate color with the segments broader than in the type. Holot more dwarf.

Heinrich Hasselbring and R. M. Gray.

SPATHHYMEA (Greek; referring to the spathe).—Spergula. 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 those who have never seen it. It is a hardy, compact little herb which is usually found in the woods, commonly in clumps, and the variation in their coloring is never less. These are motiled with pumplish 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 include old flowers which are described below in detail. Just when the Skunk Cabbage blossoms is a matter of much debate; the stems are generally out in February or March. The buds retain their beauty for months. In April or May they decay and the strong growing leaves soon replace them. This is a hardy plant, and a hearty one in all situations. The presence of the rank foliage of Skunk Cabbage is much discussed. It was long supposed to be pollinated by the action of the carrion flies which are attracted by its odor. However, Trelease has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later. Skunk Cabbage has long been known as Symplocarpus, but this name must give way to the older one given by Kalmusque. Generic-characters: spath-like calyx-tube or calloban, entirely covered by fls., the ovaries of which are embedded in the spathe; perianth of 4 hooded sepals; anthers 2-celled; style perpendicular, 4-lobed; ovary 4-lobed, with a solitary, suspended, anatropous ovule; berries in large heads. 1-seeded. Only one species.

Jutida, Raf. (Symphoricarpos volubilis, Nutt.). Skunk Cabbage. Fig. 2359. Lvs. numerous, 1-3 ft. long, 1 ft. wide, ovate, strongly scented, with the segments broadly ovate and greenish yellow, colored as described above; fr. ripe Aug.-Sept. Nova Scotia to Minn., south to Fla. and Iowa. B.M. 826.—Pothos floribundus. Linn. is often regarded as a variety of S. Aurea, a weed than a flower by the action of the carrion flies which are attracted by its odor. However, Trelease has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later. Skunk Cabbage has long been known as Symplocarpus, but this name must give way to the older one given by Kalmusque. Generic-characters: spath-like calyx-tube or calloban, entirely covered by fls., the ovaries of which are embedded in the spathe; perianth of 4 hooded sepals; anthers 2-celled; style perpendicular, 4-lobed; ovary 4-lobed, with a solitary, suspended, anatropous ovule; berries in large heads. 1-seeded. Only one species.

SPATTER-DOCK. Naphys adenium.

SPERMINT. See Mentho.

SPEAR-WOOD. Eucahryps dactylogynus.

SPEARWORT. Certain species of Rumexus.

SPECULARIA (from Spectakulum, to view; meaning Venus' Looking-glass. Compaeaterous. Venus' Look ing-glass (Specularia Spectacula) is a pretty little hairy annual herb with 3-angled, bright yellow, 1 in. 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 Rumexus. Specularia is a genus of about 5 species closely allied to Companula 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 nearly to 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. obovate and entire; the upper ones obovate-oblong or lanceolate and nearly entire. Calyx-tube linear, 1 in. or so long; limb 5-parted, the segments linear and as long as the corolla-lobes; corolla nearly wheel-shaped or broadly bell-shaped; stamens free from corolla; ovary 3-lobed: stigma shortly 3-lobed.

A. Peduncles about 1 ft. long.

Pananica, D.C. (Companula Speculum, Linnae). Venus' Looking-glass. Fig. 2359. Erect, 3 in. high; calyx pubescent or pale-pubescent; the tube constricted at the apex; lobes finally reflexed, according to De Candolle, Europe. B.M. 162.—Var. procumbens is offered abroad in addition to white, lilac and double forms. R.H. 1897, p. 224.

AA. Peduncles 1-3 ft. long.

pentagonia, D.C. Calyx pilose, lvs. spreading. Asia Minor. B.R. 1:596.—This species is not now advertised in America. Some species have narrow lvs. and longer calyx-tube than S. Spectacula. An interesting feature of this species (and perhaps others) is the 5-angled flower-buds.

W. M.

SPEEDWELL. Veronica.

SPÈRGOULA. See Triticum.

SPÈRGULA (Latin spargere, to scatter; the seeds are said to be expelled). Caryophyllaceae. A genus of 3-8 species of annual herbs including Spurry, which see, a forage plant adapted to poor, dry, sandy soils. It is a common weed in cultivated lands. It grows about 6 in., has linear lvs. which appear to be whorled, and bears numerous, small, white, 3-petaled fls. in summer. The fls. are about 5 in. across and borne in terminal panicles. Important generic characters of Spergula are the small, scarious stipules, 5 styles, alternating with the sepals, and capsule-valves opposite the sepals.
**Spergula**

Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

**Arvenia**, Linn. Sperry, which see. Annual, 6-18 in. high, branched at or near the base: lvs. linear, clustered at the nodes in 2 opposite sets of 6-8 together, appearing as if verticillate: stipules small, connate. En. B.B. 2:36. W. M.

Some of the species are dichotomously branched, but native to the warmer parts of America: lvs. usually 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.

There seems to be no reason why *Spharalcea arvensis*, Linn. Sperry, which see. Annual, 6-18 in. long, cordate, palmately 5-lobed (sometimes broad at base, obscurely 3-lobed, crenate, sometimes in-plant was offered in some catalogues as *Malva miniata*. (both as *Malva umbellata*). — Advertised in 1890 as the Sunset Plant. E. S. Carman said the same

**Sphæralcea** (Greek words, *globe mallow*; referring to the fruit). *Malvaceae*. 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.**

**Acœrifolia**, 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 spikes, terminating the branches. Rocky Mt's. B.M. 549.

**B. Fls. in umbels.**

**Umbellata**, Don. Mexican shrub, 3 or 4 ft. high, with scarlet, pendulous fls., about 1½ in. across, and usually 3 in an umbel: lvs. cordate, 7-lobed, crenate. L.B.C. 3:292 and B.R. 19:1698 (as *Malva umbellata*). — Var. tricolor, Hort., was said by John Saul to have reddish 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. 357 and B.R. 16:1306 (both as *Malva Munroana*). A.G. 11:339. — Advertised in 1890 as the Sunset Plant. E. S. Carman said the same plant was offered in some catalogues as *Malva miniata*.

**Sphæragyne** (Greek words referring to the globe stigma). *Melastomaceae*. This genus has been referred to *Tococa*, which see for *S. latifolia*. The handsome foliage plant known to the trade as *Sphæragyne 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 undefined. It is a broad-leaved hothouse plant with strong parallel ribs, metallic green above and purplish brown beneath. For cultural suggestions, see *Miconia*.

**Imperialis**, Linden. Stem simple or little branched, erect, robust: lvs. opposite, decussate, oval, with 5 longitudinal ribs running from base to apex and many parallel transverse veins connecting them. Peru. I.H. 24:284. — Native of Peru, and introduced to Europe by Linden in 1871. It is said to be easily grown in a warm house.

**Sphænum**. Sphagnum moss, bog moss or peat moss is found in swamps or bogs and is one of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite’s “Sphagaceae 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. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite’s “Sphagaceae 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. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite’s “Sphagaceae 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. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite’s “Sphagaceae 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. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the north temperate zone. According to Braithwaite’s “Sphagaceae 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. Besides some slight differences in the reproductive organs, the chief differences lie in the larger growth of

**Phthiria**, Thunb. (Scrophulariaceae). This genus has been referred to *Astragalus*, which see for *A. latifolia*. The handsome foliage plant known to the trade as *Phthiria 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 undefined. It is a broad-leaved hothouse plant with strong parallel ribs, metallic green above and purplish brown beneath. For cultural suggestions, see *Miconia*.

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or unless one has conditions very similar to its native habitat, it is difficult to keep it living for any length of time. This does not greatly matter, except that Sphagnum used for surfacing pots should always be living for the sake of appearance. That which is used in potting and propagating need not necessarily be living as long as it is fresh and not decayed, while partially decayed moss may be used for mulching and packing.

SPHENOGYNE. See Urolinia.

SPICE BUSH. Consult Rouzine.

SPIDER FLOWER. Cleome.

SPIDER LILIES. Hymanocallis and Faneurium.

SPIDER PLANT. See Cleome.

SPIDERWORT. Tradescantia.

SPIGELIA (after Adrian von der Spigel, physician, 1598–1625). Loganiaea. About 35 species of American annual or perennial herbs, rarely somewhat woody, with opposite, membranous, feather-veined, rarely 2-3-nerved leaves, and small red, yellow or purplish flowers, usually borne in terminal, one-sided, somewhat curved spikes: calyx 5-lobed; segments narrow; corolla tubular; lobes 5, valvate; stamens 3, attached to the corolla-tube: ovary 2-loculed: style articulated, simple, obtuse or somewhat capitate and stigmatic at the summit: capsule flat-topped, circumsessile above the persistent base.

Marilândica, 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 fl-rows in terminal, 1-sided spikes. June, July. W.N. 260, B.M. 80. –An elegant plant for the hardy border. Shade is not necessary for its welfare if planted in good, loose, deep loam.

F. W. Barclay.

265. Phanthus, 184. 262. Spinach (L.)

SPINACH (Spinacia oleracea, which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 2632. It is a cool-season plant, and therefore it is grown in fall and spring. It is a plant of easy culture, thriving in almost any good, well-dug, well-drained, fertile soil 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 farther in somewhat protected places.

Spinach may be raised both as a fall and spring crop. The fall crop is raised from seed that is sown in August; in eight weeks the leaves may be large enough for eating. The spring crop is grown from seeds sown in the fall, or from those sown during winter in hotbeds or cold frames, 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 grow this fall-sown Spinach on wide ridges or hills that are made by throwing 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, the seeds are sown in rows 8–10 in. apart, the distance between the rows being from 10 to 20 inches, depending upon the methods that are employed for tilage. If hand tillage alone is to be given, the plants may be placed closer. In the spring turnover is removed from the plants. If the land is not protected, for Spinach is most desired very early in the season. Unless the land is in extra good "heart," it is well to make a surface application of a soluble fertilizer early in the spring in order to start the plants into growth. A fertilizer that is very rich in nitrogen gives best results; in fact, it is customary in some places to use a solution of nitrate of soda or sulfate of ammonia, applying the material with a sprinkling cart. From 50 to 75 pounds of the fertilizer may be used to the acre with very good results, at each of two or more applications.

For home use, Spinach is sometimes carried over the winter in frames, the plants having been transplanted to the frames or raised in them during the late fall. These frames are protected from frost by mantles or shutters. Whenever it is desired to bring the plants into growth, sash is placed over the frame, and extra protection is given in very cold weather. The plants will soon become root-leaves with few bole-leaves. Different frames may be covered at different times as the season advances, thereby providing a supply for home use. Sometimes the seed is sown in hotbeds that are made late in winter or 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 harrowed, and if 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. During the summer, it is better to use the New Zealand Spinach, which is a warm weather plant. This plant has no relationship with the ordinary Spinach (see Tropaeolum). It is usually used to start the plants to grow into frames for home use. Care must be taken that the plants do not become checked or stunted, else the young leaves 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 very few insects or diseases troublesome to it.

Spinach is usually transported to market in barrels or crates. Plants are usually cut so that an inch or so of the root is left with them. All dirt is removed, as well as any leaves that are about. 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 pricky Spinach is considered to be the most hardy and is chiefly recommended for fall sowing.

SPINACH ORACH, OR SEA PURSLANE (Atriplex hortensis) is also sometimes called Mountain Spinach.

SPINACIA (from spina; alluding to the spiny fruit). 

ORNAMENTAL deciduous shrubs, with alternate, estipulate, simple or palmate leaves. Many are hardy north; some of the best of them are Spirea arguta, Van Houttei, pubescens, triloba, bracteata, media, ulmifolia, alba, Douglasii, Menziesii, Johnsonii. Spirea bradford, Japanica and albiflora, Ja-

The Spireas grow in almost any moderately moist soil, the Spiraea species being generally more moisture-loving; and S. tomentosum, S. salicifolia, S. racemosa should be planted in shrubberies only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockeries S. decumbens, corymbosa, densifolia, battalo, and some dwarf hybrids of S. Japonica are to be recommended.

The species of the section Chamädryon, and also S. canescens and bella, should be pruned as little as possible, only thinned out and the weak wood removed, while those of the section Spiraea can 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, pubescens, Van Houttei and S. pubescens, are sometimes forced.

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**SPEREA**

**SECTION 1. PETROPHYTUM (Species not in cult.).**

This section contains a few rather rare American species of which none is in cultivation. The best known is **S. cuspidata**, Nutt. (**Petrophytum cuspidatum**, Rydb.), a dwarf cuspidate shrub, only a few inches high, with crowded, small, entire leaves, and small, whitish flowers, in dense, usually simple racemes on slender stalks arising from the tufts of the greyish green foliage. It is very unlike any other Spearea and more resembles the habit of *Saxifraga*. It is perhaps better regarded as a distinct genus like the allied *Klebsia waalya*, Rydb. (*Eriogynia waalya*, Wats.), and *Eriogynapectina*, Hook.**

**SECTION 2. SIMIREA (Species No. 1).**

1. **lavigata**, Linn. (S. *Altaiica*, Pall. *Sibíria lavi-gata*, Maxim.). Shrub, 5 ft. high, with slender arching or upright branches; lvs. emerald-green, bluish green, glabrous, 3/4-2½ in. long; flowers showy in terminal panicles, 3-5 in long, those of the staminate white to greenish white, in terminal panicles, 3-5 in long, those of the staminate white to greenish white, in leafy stalks.

2. **hypericifolia**, Linn. Vigorous shrub, 5 ft. high, with slender arching or upright branches; lvs. almost semi-evergreen, ovate-oblong, 3/4-2½ in. long; flowers showy in terminal panicles, 3-5 in long, those of the staminate white to greenish white, in leafy stalks. **FOLIAGE**

**SECTION 3. CHAMELEON ( Species No. 36-40).**

**FOLIAGE**

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2. **hypericifolia**, Linn. Vigorous shrub, 5 ft. high, with slender arching or upright branches; lvs. almost semi-evergreen, ovate-oblong, 3/4-2½ in. long; flowers showy in terminal panicles, 3-5 in long, those of the staminate white to greenish white, in leafy stalks.
rower, oblong-obovate; fls. smaller, yellowish white; pedi- cels glabrous; petals obovate, shorter than stamens; flowers somewhat earlier, but less showy. Var. flavel- lata, Zabel (S. flavellata, Brotel. S. hypericifolia, var. crenata, Bois. & Buls. Lvs. obovate to oblong-lan- ceolate, acute, incisely serrate at the apex or entire on the flowering branches. Var. obovata, Maxim. (S. ob- ovata, Waldst. & Kit.). Lvs. obovate, rounded at the apex, entire above the middle. E.S. E. En. Var. trun- cata, Zabel (S. thalictroides, Hort., not Pall.). Lvs. broadly obovate to oblong-obovate, truncate and cre- nately dentate at the apex. Siberia.

3. Thünbergii, Sieb. Fig. 2363. Shrub, 5 ft. high, with spreading or arching branches; lvs. sharply serrulate, 1-1 1/2 in. long; fls. pure white, about 3/4 in. across, in 3-6-fld. naked umbels; petals obovate, much longer than stamens; follicles with the spreading styles below the apex. April, May. China, Japan. S.Z. 1:69. G.F. 8:84. 83. — 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. crenata x hypericifolia). Shrub, 5 ft. high, with slender, arching branches; lvs. obovate, cuneate, serrate above the middle, usually 3-nerved, glabrous at length, about 1 in. long; fls. pure white, about 3/4 in. across, on slender pedicels, in 3-6-fld. umbels; petals obovate, longer than stamens. May. Of garden origin. Handsome shrub similar to the former, but blooming a little later.


7. cina, Waldst. & Kit. Dense, bushy shrub, 3 ft. high; lvs. elliptic to oblanceolate, acute at both ends, usually entire, grayish pubescent on both sides, more densely beneath, 3/4-1 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-ovate to oblong-obovate, acute, usually entire, glabrous, peninnerved, 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, Lin. (S. crenifolia, C. A. Mey.). Shrub, 3 ft. high, with slender, striped branches; lvs. oblong-ovate to oblan- ceolate, acute at both ends, crenately 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; pet- als roundish obovate, shorter than stamens; sepals upright in fr.: follicles with erect styles. May. S. E. Eu. to Caucasus and Altai. L. B. C. 13:1252.—Hardy.

10. Pikowünsia, Bess. (S. crenata x media. S. Nicow- iderti, Hort.). Shrub, 4 ft. high, with terete upright branches; lvs. obovate, cuneate at base, with few sharp teeth at the apex or sometimes entire, peninnerved 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. Nippowisæa, 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, 4-1 1/2 in. long; fls. over 1 in. across, in umbel-like racemes, sometimes compound at the base; petals orbicular, longer than stamens; sepals spreading in fr. June. Japan. G. H. 2:223:3. — Desirable hardy shrub of vigo- rous growth with showy umbels of pure white fls. and dark green handsome foliage remaining fresh until late in fall.

12. Blumei, G. Don (S. rapéstris, Sieb.). Shrub, 4 ft. high, with spreading and arching branches; lvs. ovate to rhombic-ovate, incisely crenate-serrate, pale bluish green beneath and rather prominently veined, 3/4-1 1/2 in. long; fls. polygamous, white, in many-fld. umbels; petals orbicular, shorter than stamens; folli- cles with spreading or reflexed styles. June. Japan. B. H. 8:36.—Not hardy north, rare in cultivation; often the following or other species are under its names.

13. trilobslta, 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. 13:1251. G. F. 1:423.—
Handsome bushy shrub, quite hardy; cult. under many different names as S. aquilegifolia, adiantifolia, crataegifolia, Bionui.

14. Van Houttei, Zabel (S. Cantonensis x triloba, S. aquilegifolia, var. Van Houttei, Briot.) Fig. 2366. Shrub, 6 ft. high, with arching branches; lvs. rhombico-ovale or rhombico-ovate, rounded or somewhat narrowed at the base, acute, incised serrate, dark green above to pale bluish green beneath, 1½-3 in. long: fls. white, ½ in. across, in many-fl. umbels; petals twice as long as stamens; sepals upright or spreading in fruit. May, June. Of garden origin. G. 55, p. 231. G. 2:317. G. 4:210. P. 2:317. M. D. G. 1900:17. —This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming Spires and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

15. Cantonensis, Lour. (S. Recesvena, Lindl. S. lanceolata, Poir. S. corymbosa, Roxb.). Shrub, 4 ft. high, with slender, arching branches; lvs. oblong-obovate, incised doubly serrate, dark green above, pale bluish green beneath, 1½-2½ in. long: fls. over ½ in. across, in rather dense umbels; sepals upright in fruit: follicles with spreading styles. May, June. China, Japan. B. R. 32:10. A. G. 15:356.—Very handsome shrub, with large pure white fls., but only half hardy north. Var. filo plano, with double fls. and narrower lvs., is still more tender. This species and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.

16. biandra, Zabel (S. Chinensis x Cantonensis. S. Recesvena rubusta, or nova, Hort.). Upright shrub, 6 ft. high, with arching branches; lvs. oblong-ovate, acute at both ends, incised, dark green and almost glabrous above, grayish tomentose beneath, 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.

17. Chinensis, Maxim. (S. pubescens, Lindl.). Upright shrub, 5 ft. high, with arching branches, tomentose when young: lvs. long-petioled, ovate, incised serrate and sometimes lobed, finely pubescent above, yellowish tomentose beneath, 1½ in. long: fls. pure white, about ¾ in. across, in pubescent umbels; sepals upright or spreading in fruit; follicles glabrous, with spreading styles below the apex. May, June. China. B. R. 33:38.—Handsome, but not 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 in size: lvs. petioled, ½ in. across, in glabrous umbels; sepals triangular-ovate, somewhat smaller, petioles shorter: fls. rather large, pure white, in pubescent unilabell; sepals ovate-lanceolate, upright in fruit: styles terminal, spreading. May. China. B. R. 33:38.—Handsome, but not hardy north.

19. média, Schmidt (S. confusa, Regel & Korn.). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young: lvs. ovate to oblong, cuneate at the base, incised serrate above the middle, almost glabrous or pubescent, 1½-2½ in. long: fls. in many-fl. rather long-stalked, umbel-like racemes; follicles with the spreading or reflexed styles, somewhat below the apex. Max. S. F. E. to Japan.—Var. glabrescens, Zabel. Almost glabrous. Var. oblongifolia, Rehd. (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. chamedryfolia, Linn. Shrub, 6 ft. high, with angular, glabrous branches: lvs. distinctly petioled, ovate to lanceolate, sharply serrate and often doubly serrate, almost glabrous, bluish green beneath, 2½-3 in. long: fls. in many-fl. umbels, the lower ones long-stalked, the upper ones often almost sessile; follicles with the styles upright and terminal; 5 ft. high, terminal, spreading. —Var. flexuosa, Maxim. (S. flexuosa, Frisch.). Less high, with spreading more or less zigzag branches: lvs. narrower, sharply serrate above the middle. Siberia to Dahuria.

Var. ulmifolia, Maxim. (S. ulmifolia, Scop.). Upright: lvs. ovate, incised or doubly serrate from below to the middle: fls. larger, about ½ in. across, appearing later. B. R. 3:1042. B. R. 15:222. Both vars. are often cult.: they spread by preclusing species, by suckers. Sometimes as S. atrifolia or aubifolia in gardens.

SECTION 4. CALOSPIRA (Species Nos. 21-36).

A. Stamos as long as petals: lvs. small, ½-1 in. long: fls. white.

B. Height 3-6, occasionally 12 ft. —21. canescens

B. Height above 12 ft. —22. decumbens

AA. Stamos longer than petals.

B. Coryms on lateral branches along the branches of the previous year.

B. Height less than 12 ft. —23. longissimissima

B. Words and phrases shorter than petals

B. Shows angular: lvs. usually broadly ovate —24. bellis

DD. Shows terete: lvs. usually ovate-lanceolate —25. expansa

BB. Coryms terminal on upright shoots of the year.

C. Inflorrencence pubescens, rarely glabrous, very compact, besides the terminal corybm lateral ones blooming somewhat later; sepals beneath it, only weak branches with a single corybm.

D. Shrubs 1 ft. or less high, with bulblet lvs. less than 1 in. long —26. buliata

DD. Shrubs 1½ ft. high, with larger lvs. —27. incana

E. Branches terete.

F. Ripi follicles diverging —28. margaritacea

G. Fls. pink —29. Foxii

EE. Branches more or less angular, rather stiff, almost glabrous.

F. Color of fls. pink, rarely white —30. Bumalda

FF. Color of fls. white —31. albiflora

FF. Inflorrence usually glabrous, consisting of an terminal corybn; follicles not diverging.

D. Sepals reflexed in fruit: petals oblong, petiole ascending —32. superba

DD. Petals spreading or half upright: petals oval to oblong.

G. Fls. white

F. Corymb usually pubescent —33. corymbosa

FF. Corymb usually glabrous.

G. Less commonly in -34. lucida

GG. Less commonly very nearly sericea —35. betulifolia

EE. Fls. pink —36. densiflora

21. canescens, D. Don. Shrub, or sometimes 12 ft. high, with spreading and arching branches; lvs. broadly oval to oblongate, very short-petioled, cuneately dentate above the middle, grayish green, pubescent beneath or sometimes almost glabrous at length, ½-2½ in. long: fls. in dense, terminal, spreading corymbs to 2 in. across, appearing very profusely along the branches; sepals upright or spreading in fls.: follicles villous, with the ascending styles a little below the
apex. July. Himal. Gt. 45, p. 49; 49, p. 421; 52, p. 28; 54, p. 48.—Very graceful and handsome shrub, but not hardy north. It occurs under very many different names in the garden.—as S. argyrophylla, var. alta, coccifolia, flagelata, flageliformis, floribunda, vaccinifolia, and others.

22. decumbens, W. Koch (S. procumbens, Hort.). Dwarf, procumbent shrub, about ¾ ft. high, with ascending branches, glabrous. lvs. elliptic to oblong, acute at both ends, crenately serrate above the middle, glabrous, ½-1 in. long: fls. white, in small corymbs, about 2 in. across; follicles glabrous, with upright terminal styles. June. Tyroel. G. C. H. 11:732.—Pretty shrub for rockeries.


25. expansa, Wall. (S. bëlla, var. expansã, Regel. S. Kumaonensis, Hort.). Closely allied to the foregoing, more vigorous and upright, 6 ft. high, with terete branches tormentose 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 corymbs: follicles pubescent, diverging. July. Himal.—S. pulchella, Kunze (S. Kumaonensis, Hort.). Is supposed to be a hybrid of this and the foregoing species; it combines the broader corymbs of the latter with the brighter color of the first species, therefore handsomer than either parent; sometimes cult.: as S. expansa rubra, but there is also another hybrid of the same name. See S. rubra in suppl. list.


Var. Fortunei, Rehd. (S. Fortunei, Planch. S. callosa, Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2-4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurved, cuspidate teeth, rose 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 petioles and the inflorescence is less compound. Var. atrosanguinea, Hort. Fls. deep pink, in tomentose corymbs. Var. ruberrima, Hort. Fls. deep pink, in puberulous corymbs. Var. macrophylla, Simon-Louis. Lvs. becoming 6 in. long, bullate: corymbs small. Var. glabrata, Nichols. (S. glabrata, Lange). Of more rigid habit: lvs. ovate, glabrous: fls. bright pink, in glabrous corymbs. Var. pubescens, Regel. Lvs. pubescent on the veins beneath: corymbs tormentose. Most of the other forms often enumerated as varieties are hybrids of this species.

27. Margarita, Zabel (S. Japonica x superba). Shrub, 5 ft. high, puberulous: lvs. ovate-elliptic to elliptic, coarsely and often doubly serrate, white beneath and pale green, 2½-3 in. long: fls. rather large, bright pink, in broad corymbs; sepals spreading in fruit: lvs. upright, glabrous, with upright styles: July. Aug. Of garden origin.—Handsome, very free-flowering form.


31. albiiflora, Miq. (S. Japonica alba, Regel. S. ven- canta, Lange). Fig. 2357. Low shrub, 1½ ft. high, with stiff, upright branches; lvs. lanceolate, usually or sometimes doubly serrate, glabrous, 1-2 in. long; fls. white, in dense corymbs, one large terminal and many smaller ones below, forming a kind of raceme; disk prominent; sepals reflexed in fr.; folicles upright, not or little diverging. July, Aug., Japan.

32. supérra, Zabel (S. albiiflora × s. cratmgifdlia). 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 whitish; disk prominent; petals obovate or broadly obovate. June, July. Of garden origin.

33. corymbosa, Raf. (S. cratmgifdlia, 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, 1½-2 in. long; fls. white, rather small, in somewhat convex usually pubescent corymbs, 1½-3 in. across; petals oval; folicles and styles upright. May, June, N. J. to Ga. L.B.C. 7:671.

34. biliscéul, Donui. Closely allied to the former: branches yellowish-brown or brown; lvs. more or less serrate, ovate or oval; corymbose glabrous, usually looser and more flat, broader. June, July, Dakota to Brit. Col. and Oregon. The allied S. Virginiana, Britta, is more branched and higher; lvs. oblong to oblong-lanceolate, dentate above the middle or almost entire: inflorescence glabrous. Va. to N. C. B.B. 2:197.

35. betulifdlia, Pall. Low, much-branched shrub; lvs. oval to obvate or obvate-oblung; usually cuneate at base and very short-petioled; serrate or crenately serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ½-1½ in. long; corymbs usually glabrous, 1-2 in. across. June, July. Siberia to Manchuria, Kamschatka and Japan. — The two preceding and the following species are all closely allied and considered by some botanists as varieties of S. betulifdlia.


Section 5. Spiræa (Species Nos. 37-49).

A. Inflorescence a broad panicle, about as broad as high. (Hybrids of species of this and the preceding section.)

B. Panicles rather small, on lateral branchlets at the end of last year's branches. 37. Fontenaysii

C. Lvs. glabrous or nearly so. 38. conspicus

D. Aype of lvs. acute or obtuse, or nearly so. 39. noth.

E. Shape of lvs. broadly ovate or ovate-obovate. 40. pyramidata

CC. Lvs. pubescent or tomentose beneath. 41. Sassaunciana

DD. Rose of lvs. rounded or reniform. 42. Nobilianna

AA. Panicles elongated, longer than broad. (Spiræa præp). 46. Menziesii

BB. Foliage pubescent or tomentose beneath. 47. Billardi
d

CC. Follicles pubescent or tomentose beneath. 46. Menziesii

48. Douglasl

37. Fontenaysii, Billard (S. Fontenaysii, Dipp. S. cratmgifdlia × s. betulifdlia). Shrub 3 ft. high, with slender, upright branches; lvs. oval or oblong oval, rounded at both ends, crenately 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 obovate or oblong, as long as or longer than stamens; sepals spreading in fruit. June, July. Of garden origin.—Not quite hardy north. Var. alba, Zabel, is the white-fl. var. rosé, Zabel, the pink-fl. form. S. semperflorens, Hort. (S. branchifolii, Lange). S. insigniss, Hort. S. conspicua — Doub. is a similar form, but the lvs. are tomentose beneath and the fls. pink.

38. conspicus, Zabel (S. albiiflora × alba). Upright shrub, 3 ft. high, with pink flowers and puberulous branches; lvs. elliptic-orbicular, 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-Aug. S. semperflorens, Hort. (S. branchifolii, Lange). S. insigniss, Hort. S. conspicua — Doub. is a similar form, but the lvs. are tomentose beneath and the fls. pink. R.H. 1860, p. 496, 497. Gn. 45. p. 48.
39. *notha*, Zabel (*S. corymbosa × latifolia*). Shrub, 3 ft. high, with brown glabrous branches; lvs. broadly ovate to obtuse, short-petioled, coarsely and doubly serrate, almost glabrous. 1-2 in. long; lvs. white to pinkish white, in broad, glabrous panicles; petals, almost twice as long as the orbicular petals. July, Aug. - Of garden origin.

40. *pyramidata*, Greene (*S. lutea × Münchii*). Upright shrub, 3 ft. high; lvs. oval-oblong to oblong, usually sharply serrate above the middle, glabrous or nearly so, 1\2-3 in. long; panicles 1\2-3 in. long, rather dense, puberulous: lvs. pinkish or almost white. July, Found wild in Ore. and Wash. - Worthy of cultivation, but not yet introduced.


42. *Nobleiana*, Hook. (*S. Douglaia, var. Nobleiana, Wats. S. Douglaia × densiflora*). Shrub, 4 ft. high, similar to the former: lvs. oblong or narrowly oblong, usually rounded at the base, acute, sharply serrate above the middle, grayish-tomentose beneath, 1-3 in. long; lvs. light pink, in dense broadly pyramidal tomentose panicles, 2-3 in. high; petals half as long as stamens; sepals reflexed in fr.; styles erect. June, July. Natural hybrid, found in Calif. B.M. 5169. 1.H. 8:356. - A similar form is *S. pacifica*, Zabel (*S. corymbosa × Douglaia*), with broader lvs. and lvs. of paler pink.

43. *salicifolia*, Lind. (*S. Sibiriaca, Raf. S. salicifolia*, var. *carnea*, Alt.). Upright shrub, 5 ft. high, with toothed yellowish brown branches puberulous when young; lvs. oblong-lanceolate to lanceolate, sharply and sometimes doubly serrate with often incurred teeth, 1\2-3 in. long; lvs. light pink or whitish, in oblong, dense, tomentose panicles leafy below, the lvs. exceeding the ascending panicles often twice as long as petals; sepals reflexed in fr.; follicles eiliate at the inner surface. June, July. S. E. Eu. To Japan and probably Alaska. - Var. *grandiflora*, Dipp. (*S. grandiflora*, Leode.). Lower, with larger, lighter pink lvs. B.M. 20:1888.

44. *albà*, Dur. (*S. salicifolia, var. paniculata*, Alt. *S. lanceolata*, Borkh.). QUEEN OF THE MEADOW. MEADOW SWEET. Fig. 2368. Upright shrub, retaining 6 ft., with reddish brown branches puberulous when young; lvs. narrow, oblong to oblong-lanceolate, acute, usually regularly simply serrate, 1\2-2\2 in. long; lvs. white, in leafy pyramidal tomentose panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens white, usually as long as petals; follicles glabrous. June-Aug. From N.Y. west to the Rocky Mts., south to Ga. and Miss. Also known as *S. salicifolia*.

45. *latifolia*, Borkh. (*S. salicifolia*, var. *latifolia*, Alt. *S. carpinifolia*, Willd. *S. Canadensis*, Hort. *S. Bethlememensis*, Hort.). QUEEN OF THE MEADOW. MEADOW SWEET. Upright branching shrub, from 2-5 ft. high, with bright or dark red-brown glabrous twigs; lvs. broadly oval to ovate or oblong, usually coarsely and often doubly serrate, 1\2-3 in. long; lvs. white, larger than those of *S. alba*, sometimes lightly bluish 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 introduced into this country by American botanists to *S. salicifolia*. *S. alba* is chiefly found west, *S. latifolia* east of and in the Alleghanies.

46. *Münchii*, Hook. (*S. Douglaia, var. *Münchii*, Presl.). Upright shrub, 4 ft. high, with brown, at first puberulous branches; lvs. oblong-ovate to oblong-lanceolate; petals, coarsely and evenly serrate above the middle, pale-green beneath, 1\2-3 in. long; lvs. small, pink, in rather narrow, 3-8 in. long panicles; stamens more than twice as long as the roundish petals; sepals reflexed in fruit. June-Aug. Alaska to Oregon.

47. *Billardii*, Hort. (*S. Douglaia × salicifolia*). 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; lvs. bright pink, in 5-8 in. long, tomentose or tomentulose panicles, usually rather narrow and dense. July, Aug. Of garden origin. - *S. Leuconaea, Bethlememensis rubra, leimphanus, eximia, Constans, Californica*, Hort., are very similar and probably of the same parentage.
SPIRANI.
the base: TLS. suallia: -.nai, and petals white, lateral united at the top, or united with the petals into a helix; labellum sessile or clawed, concave, embracing 2 ft. high: spike 3 in. long: HS. and longer bracts scarlet. April. Mexico. B.M. 1374 (as Neotinea speciosa).

A. Color of fls. scarlet.
B. Fls. in 3 rows: lvs. persistent at the flowering time.

SINGH. Consult Lamia.

SISENIS. Aspleniun.

SINDAS. See page 1864.

SPOOR TREE. Acacia Farnesiiana. S. Vegetable. Luffa.

SPRINGUEA (after Isaac Sprague, of Cambridge, Mass., botanical artist, collaborator of Asa Gray). Portuladceae. Probably only a single species, a biennial herb 2-12 in. high, with mostly radical, spatulate, fleshy leaves and ephemeral flowers in dense, scorpioid spikes, umbellately clustered on scape-like peduncles; sepals 2: petals 4: stamens 3: capsule 2-valved; seeds 8-10, black, shiny.

umbellata, Torr. May be treated as an annual. Fls. white, tinged with rose, in late summer. Sierra Nevada, at 3,000-10,000 ft. altitude, from the Yosemite valley to the British boundary, usually in sandy dry soils. B.M. 5143. — Var. caudicifera, Gray, is a subalpine form in which the caudex-like branches extend for a year or more (the leaves below dying away) and are at length terminated by scapes an inch or so in length. Desirable for rockwork and edgings. F. W. Barclay.

SPRAYING (see Pomology), the art of protecting cultivated plants from insect enemies and vegetable parasites by covering them with a spray which shall have a toxic or physically injurious effect upon the animal or vegetable organism.

Historical Sketch. — The history of spraying is interesting. The story of its progress in America differs in details from the history of its development in Europe. The main features in each country are quite similar. In both places insect enemies made the first draft on the ingenuity of man in devising methods by which to hold them in check. Vegetable parasites were studied afterwards. It is a curious fact that, in the case of both insects and fungi, in America, some of the most injurious forms came from Europe and were the means of directing attention to wholesale methods of destroying them. Some of these enemies, comparatively harmless in their native home, like the currant worm and codling-moth, have done more to forward spraying methods in the United States than anything else.

The first insecticides used in America, as well as in Europe, were not of a poisonous nature. They were substances which had an injurious effect on the body of the insect. These were of two kinds mainly: infusions which were astringent, and caustic substances which burned the tissues. Tobacco water and alkali-

HINHELASSRIM.

SPIRANARACUS. Consult Lamia.

SPIRENGWORT. Aspleniun.

SPRINGERS. See page 1864.

SPONG TREE. Acacia Farnesiiana. S. Vegetable. Luffa.

Following Paris green came London purple, and then white arsenic. Since that time many different forms of arsenical poisons have been compounded, differing in the quantity of mercury used. London purple has now been largely dropped by fruit growers, owing to its variable quality. White arsenic, used in combination with soda ash and lime, is the most reliable and widely used of the group.

While sinking insects were instrumental in bringing about the invention of many arsenical sprays, it has only been within the last twenty-five years that an effective method has been adopted 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 it to the potato bug and water emulsion that a desirable, easily prepared oil insecticide was found. About the same time, Dr. Ridley, with Mr. Holmes of the Department of Agriculture at Washington, recommended the use of what is now known as the Ridley-Hubbard formula.

The potato bug invasion and the discovery of the efficacy of Paris green in destroying leaf-eating insects did a great deal to stimulate spraying, but the credit for being given occasionally to those factors for tracing the life-histories of many fungi destructive to cultivated plants.

Spray pumps. — Early in the eighties, coconut-oil sprayers threatened the extinction of French vineyards. The situation engaged the attention of French investigators. Notable among them were Professor A. Millardet and his co-workers of the Academy of Science, Bordeaux, France. He, with others, discovered partly by accident and partly by experiment that solutions of copper prevented the development of downy mildew. After much experimentation, "bonbonille Bordelaise" was found to be effective in preventing the growth of downy mildew and other plant parasites, thus increasing the grape in that region. The announcement was definitely made in 1883. The following year the European formula for Bordeaux mixture was published in several places in the United States, and immediately there commenced an unparalleled period of activity in economic vegetable pathology. As a result of the establishment of the United States Department of Agriculture and the beginning of stations gave added impetus to the movement. The rapidity of the spread of spraying knowledge among fruit-growers is remarkable. Ten years ago it was an unknown art to the majority of fruit growers and horticulturists, but today every fruit-grower and garden club and grange purchase their spraying materials by the carload 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. — Any spray may be effective if (1) by hitting the enemy, (2) by placing poison before the enemy, and (3) by protecting the plant with a covering unfavorable to the growth of the pest. The cautious 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 blooming." 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 poisonous principle; their action is usually quickly recorded on the time and thoroughness of the application. If applied too soon they may be dissipated before the insects appear; if applied late the injury is only partly prevented, because insects, food less abundant and less active in extent, a 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 the spores of fungi resting there and prevents other spores from germinating. Fig. 2356 shows the stage of development of fruit-bugs 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 the leaves, twigs and branch have been covered. Time is the most important factor bearing on success. The early spray is most effective. This applies particularly to the treatment of fungus diseases. Spray before the buds open. Get ahead of the enemy.

Spraying Machines. — Bordeaux mixture was first applied with a broom (Fig. 2351); 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 pole or other small reservoir, suitable for limited garden areas. (2) The knapsack pump, carried on a man's back and operated by the operator. (3) A barrel pump, a force pump fitted to a hose or barrel or larger tank, suitable for spraying orchard areas up to beaches in size. (4) A grain sprayer, a large tank provided with a pump and mounted on wheels. The pump is operated by power borrowed from the wheels as they revolve, and the current is caused by means of chain and sprockets. (5) The power sprayer, power being furnished by steam, gasoline, or compressed air. The essence of a good pump is: (1) Durability; secured by having brass working parts (copper compounds corrode iron); (2) strength; obtained by a good-sized cylinder, substantial
valves, wall and piston: (1) easily operated: found in a pump with long handle, large air-chamber and smoothly finished working parts: (2) compactness: secured by placing the cylinder so that it is inclosed by the tank, preventing top-heaviness and facilitating the movement of the pump in the orchard. A barrel or tank pump should be strong enough to throw out liquid from the nozzle under the combined pressure of hand and thrust generated by four nozzles. Nearly all spray mixtures require occasional stirrings to prevent settling and insure uniformity. An agitator is a necessary part of the pump 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 enables the operator to set it for 5, 10, 15 or 20 per cent of kerosene, as the case may be. As the kerosene and water are forced through the pump and nozzles they are thoroughly emulsified. This type of pump is not yet perfected, but marks a distinct step in advance and fills an important place in the treatment of scale and other sucking insects. For special devices, consult experiment station bulletins.

Nozzles.—The nozzles of twelve or fifteen years ago were crude affairs when compared with those now in use. They usually discharged the liquid in a solid stream, or a coarse spray formed by passing through a series-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 directed spray sprays the tree and naturally uses a large quantity of liquid. For small trees and bush fruits the Vernocel (Fig. 2380), or fine spray type, is best, while for old orchards and park work, nozzles of the Metrovan 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

<table>
<thead>
<tr>
<th>Paris green</th>
<th>1 pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>20 to 30 pounds</td>
</tr>
<tr>
<td>Lime</td>
<td>2 to 6 pounds</td>
</tr>
</tbody>
</table>

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 should be applied together with perfect safety. Use at the rate of 4 to 8 ounces of the arsenic to 30 gallons of the mixture. The action of arsenic is weakened, and the Paris green loses its caustic properties. For insects that chew.

ARSENETTES OF LIME AND SODA.—These are cheap, the amount of arsenic is under perfect control and it does not harm the foliage. For chewing insects.

Arsenie of lime is made by boiling 1 pound white arsenic in 2 to 4 quarts water until it is dissolved; then use this arsenie solution to make 2 pounds good lime adding water if necessary to make it, when slaked, white and grainy enough to make a good mixture of this stock mixture. Also prepared by boiling together, for 2 to 4 minutes, 1 pound white arsenic and 2 pounds lime putty by weight in 2 gallons of water; when dissolved it must be measured so that the arsenie may be applied with accuracy. Keep in a tight vessel and use as desired. Thoroughly stir before using. For most insects one quart to 30 gallons will be sufficient. Arsenite of lime is insoluble in water and will not injure the foliage of any cultivated fruit at this strength. This insecticide is growing in popularity. Some green dye stuff may be mixed with it to prevent the ever-present danger of mistaking it for some other material.

Aresenite of soda: The arsenic (10, 15) may also be boiled with 4 pounds of sal soda crystals in 2 gallons water until dissolved, and this solution used in the same manner with lime. The arsenite of lime is cheaper, and either can be used with Bordeaux mixture the same as Paris green. When used with water, however, it will be water to put in some freshly slaked lime. More expensive than arsenite of lime, but thought by some orchardists to be more effective.

OTHER ARSENITES.—Green arsenious and Parisgreen are more bulky and flaky than Paris green, and when of good quality they are just as effective and require less agitation. Arsenic of lead can be applied in large quantities without injury to the foliage, hence it is very useful against hoppers and similar insects that are hard to poison. It also adheres to the foliage a long time.

NORMAL OR 1.6 PER CENT BORDEAUX MIXTURE

Copper sulfate (blue vitriol) .......... 6 pounds
Quicklime (good stone lime) .......... 4 pounds
Water ................................ 40 to 60 gallons

For peaches and Japanese plums, an extra amount of lime should be added, and more water: if 10 to 50 gallons should be used.

Six pounds of sulfate of copper dissolved in 50 gallons of water, when applied at the proper time, will prevent the growth of fungi. However, if applied in this form, the solution will burn the foliage. Four pounds of quicklime in 6 pounds of copper will neutralize the caustic action. When sulfate of copper and lime are added in this proportion, the compound is Bordeaux mixture. Potatoes demand full strength. Diluted Bordeaux mixture is effective against certain mildews and fruit diseases.

Weighing of copper and lime at time of mixing is very inconvenient. Bordeaux mixture is best when used within a few hours after being mixed. Therefore a stock mixture of Bordeaux is impracticable. It is, however, practicable to have stock preparations of sulfate of copper and of lime ready for mixing when required.

The lime should be "slaked" in a barrel or box with sufficient water to prevent burning or breaking and to spread the lime. It is important that 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, 3 pounds of copper sulfate. To accomplish this the sulfate should be suspended at the surface of the water in a long tank. The water must be loaded with copper will sink to the bottom, and the water least loaded will rise to the surface. If 50 pounds of sulfate are suspended in 25 gallons of water on an evening each
gallon of water will, when stirred the next morning, hold two pounds of sulfate.

Three gallons of this solution put in the spray barrel equal six pounds of copper. Now fill the spray barrel half full of water before adding any lime. This is important, for if the lime is added to so strong a solution of sulfate of copper, a curdling process will follow. Stir the water in the lime barrel so as to make a dilute milk of lime, but never allow it to be dense enough to be of a creamy thickness. If in the latter condition, 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 brown color. When no change of color is shown, add another pull of milk of lime to make the necessary amount of lime a safe 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 cubic inches 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 spouul. The bottle should be marked "Poison." Drop out a little of the Bordeaux mixture in a copper pan, and drop the ferrocyanide on it. So long as the drops turn yellow or brown on stirring the mixture, the mixture has not received enough lime.

Ammoniacal Copper Carbonate.

Copper carbonate .......................... 5 ounces
Ammonia (35° Beechnut) ................. 3 pints
Water ..................................... 45 gallons

Make a paste of the copper carbonate with a little water. Dilute the ammonia with 7 or 8 volumes of water. Add the paste to the diluted ammonia and stir until dissolved. Add enough water to make 45 gallons. Allow it to settle and use only the clear blue liquid. This mixture loses strength on standing. For fungous diseases.

Potassium Sulfate Solution.

Water (hot) .................................. 20 parts
Iron sulfate, as much as the water will dissolve.
Sulfuric acid (commercial) .................. 1 part

The solution should be prepared before using. Add the acid to the crystals, and then pour on the water. Sometimes recommended for grape anthracnose. The dormant vines being treated by means of sponges or brushes, but it should be applied with caution.

Iron Sulfate and Sulfuric Acid Solution.

Water (hot) .................................. 100 parts
Iron sulfate, as much as the water will dissolve.
Sulfuric acid (commercial) .................. 1 part

The solution should be prepared before using. Add the acid to the crystals, and then pour on the water. Sometimes recommended for grape anthracnose. The dormant vines being treated by means of sponges or brushes, but it should be applied with caution.

Ammoniacal Copper Carbonate.

Copper carbonate .......................... 5 ounces
Ammonia (26° Beechnut) .................. 3 pints
Water ..................................... 45 gallons

Make a paste of the copper carbonate with a little water. Dilute the ammonia with 7 or 8 volumes of water. Add the paste to the diluted ammonia and stir until dissolved. Add enough water to make 45 gallons. Allow it to settle and use only the clear blue liquid. This mixture loses strength on standing. For fungous diseases.
SPRAYING

Literature.—To say that the literature of spraying is voluminous would but faintly describe the situation. Hardly an experiment station in the United States has failed to publish two or three times on this subject. Many of them issue annual "spray 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 Scribner, 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 Linneaus). Amaryllidaceae. Jacobean Lily. A single species from Mexico, a half-hardy bulbous plant with linear, strap-shaped leaves and a hollow cylindrical scape bearing one large showy flower. Perianth strongly declined, tube none; segments nearly equal, the posterior ascending, the inferior concave and enclosing the stamens and ovary: bracts only one, spathe-like: stamens attached at the base of the perianth-segments, and somewhat shorter than the segment by which they are enclosed, having a few small scales at the base of the filaments: ovary 3-loculed: style long, slender: seeds compressed ovate or orbicular, black.

formosissima, Herb. (Amaryllis formosissima, Linn.). Fis. 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. excelsa. Sitka S. is P. aspera. Tideland S. is P. nitens. A. Clinton.

SPURGE. Consult Euphorbia.

SPURGE, MOUNTAIN. Packysandra procumbens.

SPURGE NETTLE. Jatropha.

SPURRY (Spergula arvensis, which see) has long been grown in Germany, France, Holland and Belgium, where its value as a soil renovator and as a forage crop

was early recognized. It is an annual, and when sown in the spring matures seed in from ten to twelve weeks from time of sowing. This plant possesses special value as a renovator for sandy soils. It has long been used by the farmers of Holland to hold in place the shifting sands along the seashore. So well adapted is it to sand that it has been termed "the clover of sandy lands." It is not recommended for the American farmer except where the soil is so poor that other plants fail. In such circumstances it may be used as a cover-crop to plow under. The seed may be sown any time from April to August, but in orchards it had better be sown in July. Sow at the rate of six quarts per acre. The seed being small, it should be lightly harrowed in upon a well-fitted soil. It is very persistent in the production of seed, and upon fertile soils it will maintain itself for several years unless thorough cultivation is given. Where soils are in fair condition and other crops will grow, it is doubtful if Spurry has any place. Sometimes written Spurrey.

A. CLINTON.

SQUASH (Plate XXXVII) is a name adapted from an American Indian word, and is applied in an indefinite way to various plants of the genus Cucurbita. The application of the name does not conform to the specific lines of the plants. What are called summer Squashes are mostly varieties of Cucurbita Pepo. The winter Squashes are either C. maxima or C. moschata, chiefly the former. If the name Squash belongs to one species more than to another, this species is probably C. maxima. See Cucurbita, particularly the note on p. 410. The pictures show some of the forms of these species. Plate XXXVII is the Hubbard Squash, Cucurbita maxima. Fig. 2382 is the Winter or Canada Crookneck, one of the forms of C. moschata. Figs. 2383-88 are forms of the multiformar 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.

2381. A V-spout with Bordeaux brand of nozzle.

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 tilth. It is customary, with many large growers, to apply a little commercial fertilizer to the hills in order to give the plants a start. A fertilizer somewhat strong in nitrogen may answer this purpose very well; but care must be taken not to use nitrogen too late in the season, else the plants will continue to grow over-vigorously rather than to set fruit.

Cultural groups of Squashes are of two general kinds, the bush varieties and the long-running varieties. The bush varieties are usually early. The vines run very little, or not at all. The various summer Squashes belong to this category, and most of them are varieties of Cucurbita Pepo. The hills of bush varieties are usually planted as close together as 4 x 4 feet. 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 should fill the pot or box so that the earth is held in a compact ball, and the plant should be fresh, green and stocky. Plants that become stunted and develop one or two flowers when they are in the box are usually of little use. Sometimes seeds are planted directly in the field in forcing hills, and when the plants are established and the season is settled the protecting box is removed and the plants stand in their permanent positions.

A good Squash vine should produce two or three first-class fruits; if, however, one flower sets very early in the season, the vine may devote most of its energies to the perfection of that single fruit and not set many others, or may set them too late in the season to allow them to mature. If it is desired, therefore, that the plants shall produce more than one fruit, it is advisable to pick off the first fruit, providing it sets long in advance of the appearance of other pistillate flowers. These remarks apply particularly to winter squashes in northern regions. With small varieties and under best conditions, as many as a half-dozen fruits may be get 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-
SQUASH

b- killed with very heavy applications of arsenites,—applications so strong that they may even injure the plants. Sometimes the hills of Squashes are covered with wire gauze or mosquito netting that is held above the earth by means of hoops stuck into the ground. This affords a good protection from insects that arrive from the outside; but if the insects 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 on the hill, 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 ammoniacal 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 Marrow types. The summer or bush Squashes are of three general classes: the Crooknecks, the Scallop or Pattypan varieties, and the Pineapple or oblong-conical varieties. All these are forms of C. Pepo. The fall and winter varieties may be thrown into several groups: the true field pumpkin, of which the Connecticut Field is the leading representative, being the one that is commonly used for stock and for pies; the Canada Crookneck or Cushaw types, which are varieties of C. moschata; the Marrow and Marblehead types, which are the leading winter Squashes and are varieties of the C. maxima; the Turban Squashes, which have a “Squash within a Squash” and are also varieties of C. maxima. The mammoth pumpkins or Squashes which are sometimes grown for exhibition and which may weigh two or three hundred pounds, are forms 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. 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.

The Squashes need to 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) to 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. This should be done on a cool, dry day. If the weather continues cool and dry, keep them well aired by day; but if damp weather comes build a small fire in the stove in order to dry out the green stems. Keep the temperature about 50°, and air well in dry weather. The Squashes may need picking over about Christmas if put in the building about October 1; handle very carefully when picking over. Fifty tons can be kept in a single building with a small fire. Do not let them freeze, but if temperature goes down to 40° at times it will do no harm: nor should it be allowed to go as high as 70°. The Hubbard Squash keeps best and longest and does not shrink in weight as much as other kinds; but any of them will shrink 20 per cent if kept until January 1.

L. H. B.

SQUASH, GUINEA, or EGGPLANT. See Solanum Melongena and Eggplant.

SQUAW BERRY. Mitchella repens.

SQUIRREL CORN. Dicentra Canadensis.

SQUIRTING CUCUMBER. Echallium Elaterium.

STACHYS (from an old Greek name applied by Dioscorides to another group of plants, coming from the word for spike). Lobatia. 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-pediceled, in axillary whorls or terminal dense spikes: calyx 5-dentate, teeth equal or the posterior larger; corolla-tube cylindrical, 2-lipped, the posterior usually villose, concave or fornicate, 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.

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**STACHYS**

grandiflora, Benth. (Betonica rosea, Hort.). 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 but entire; fls. red, terminal spike, July. En. 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.

**STADMANNIA**

longiflora, Benth. (Betonica 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 but entire; fls. red, terminal spike, July. Caucasus.

Stachys, Siebold (Salvia Sieboldii, Nutt.). 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 but entire; fls. red, terminal spike, July. Caucasus.

2369. Tuber of Stachys Sieboldii (L.)

without protection, so that a well-established plant takes care of itself and spreads. For history, chemical analysis, etc., see Bull. Bull. 37.

**Florida**, Shuttlew. slender, erect, 1-2 ft., branch- ing, glabrous: lvs. coriaceous, oblong-lanceolate, blun- toothed, stalked; fls. small, light red, in an open interrupted spike; tubers cylindric, about 1 in. in. long. Fls. has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. 61), but practically unknown horticulturally. The tubers are fully as good for eating, as those of S. Sinaiella.
therefore very uncertain names, and the following
diagnosis of the genus (taken from Baker's "Flora of
Mauritius and the Seychelles," 1877) is probably suffi-
ciently accurate:

Stangmannia—Stem-grown small, polygamous, 1 ft.
deep cup, with 2 obscure, deltoid teeth; petals none;
disk thick, curved, lobed; stamens 8; regular, ex-
serted; style short; stigma capitate; ovary deeply 3-
lobed, with a false column in each cell; fr. rarely 1-
celled by abortion, large, dry, round, indiscernent.

The generic name is sometimes written Stadmannia,
a spelling which is said to be an error dating back to
Wettstein's "Annotations" (1720-51). Stangmannia is an
American trade name which seems to be practically unknown
to science. H. A. Siebrecht says it is "an imposing
decorative plant for store culture." He adds that it
reminds him of the famous St John's Wort.

Lvs. alternate, petiolar, abruptly pinnate; 10 in. 12-opis,
obovate, short-dentate, glossy, coriaceous, entire, oblique at
base; panicles dense, cylindrical, 3-4 in. long; fr. hard globu-
lar, nearly 1 in. thick.

W. M.

STAGHORN FERN. Platycerium.

STAGHORN SUMACH. See Rhododendron.

STANDING CYPRESS. Gilia rhomboidea.

STANGERIA (named for the Earl of Stanhope, presi-

A genus of about 20 species inhabiting tropical
America from Mexico to Brazil. These plants are easily
grown and very interesting, but the fragrant character
of their flowers has been found to be more obvious to their extensive
when planted than is that of the leaves. The flowers are produced on thick stems,
which have their way through the material in which they are planted and emerge from the bottom of the
basket, and their color is enhanced by a perceptible warmth or light in early in the morning.
They are large, fragrant, and curiously formed. The sepals and petals are usually
reflexed; the petals are subequal or the petals are nar-
rower. The labellum is remarkably transformed. The
basal part of epichil is boat-shaped or saccate, often
with two horns on the upper margin. This passes
gradually into the mesochil, which consists of a fleshy
central part and two lateral horns. The terminal lobe
or epichil is firmly or movable joined to the mesochili.
It is usually fleshy and keeled but not saccate. The
base of the labellum is continuous with the long-winged
column. Pseudobulbs clustered on the short rhizome,
sheathed with scales and each bearing a single large
plaited leaf contracted to a petiole at the base.

Henrich Hasselbring.

Stanhopeas enjoy a shady, moist location. A tempera-
ture of 60-65°F. at night and 70-75°F during the day
should be maintained in winter, with a gradual advance of
10°F toward midsummer. They should be grown sus-
pended from the roof in orchid cabinets or terra cotta
baskets with large openings at the bottom, and if drain-
age is used it should be placed in such a manner that it
will not interfere with the exit of the pendulous
flower sepal. Equal parts chopped sphagnum and peat
forms a good compost for reverting 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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AA. Labellum with an excavated or
saccate base and a plane termi-
nal lobe.
BB. Mesochil and pleuridion want-
ful.........................................................
1. eburnea
BB. Mesochil and pleuridion presen-
t...........................
CC. Hypochil boat-shaped, short
and sessile........................................... 2. Wardii
CC. Hypochil entire or obso-
late 3-toothed at the apex............ 3. saccata
DD. Epichil evidently 3-toothed
at the apex..................................... 4. Shuttleworthii

1. eburnea, Lindl. (S. grandiflora, Lindl.). Pseudo-
bulbs conical, 1% in. long; lvs. leathery, 8-12 in. long;
scapes pendulous, with small bracts, 2-3-in:; fls. 5 in.
across, ivory white; petals narrow; sepals yellow, thickly
spotted with purple; petals one-half as large; hypochil
narrow, at the base, with a thickened acetabulum; sepals
yellow, with 2 dark spots on the hypochil.

W. M.

STANHOPEA (named for the Earl of Stanhope, presi-

A genus of about 20 species inhabiting tropical
America from Mexico to Brazil. These plants are easily
grown and very interesting, but the fragrant character
of their flowers has been found to be more obvious to their extensive
cultivation. The flowers are produced on thick sepa-
ces, which have their way through the material in which they are planted and emerge from the bottom of the
large basket, and their color is enhanced by a perceptible warmth or light in early in the morning. They are large, fragrant, and curiously formed. The sepals and petals are usually
reflexed; the petals are subequal or the petals are nar-
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It is usually fleshy and keeled but not saccate. The
base of the labellum is continuous with the long-winged
column. Pseudobulbs clustered on the short rhizome,
4. **Bucephalus**, Lindl. (*B. grandiflorus*, Reichb. f.).

Pseudobulbs crowded, rugose; lvs. petioled, 9 in. long, pointed; the pendulous raceme bearing 4-6 large, tawny orange fls., marked with large crimson spots; sepals and petals reflexed, the former broad; lower part of the labellum curved, boat-shaped, bearing 2 curved horns and a broad fleshy middle lobe; column green and white, spotted with purple. Ang. Mexico. Perm. B. M. 5278. B. R. 21:21. — Flor. very fragrant. Distinguished by its very short ovaries.

5. **platyceras**, Reichb. f.

Pseudobulbs and lvs. as in *S. Bucephalus* but stouter; scape 2-4 ft., with ovate acute bracts one-half as long as the ovary; fls. 7 in. across, pale yellow, with numerous ring-shaped spots and blotches of purplish; sepals oblong, pointed, petals broadly linear, acute; hyochil boat-shaped, 2½ in. long; horns 1 in. long, broad, pointing forward, parallel with the tongue-shaped middle lobe; the hyochil is deep purplish crimson inside and spotted outside, the upper part of the labellum colored like the sepals. Colombia. Gn. 33:62.

6. **insignis**, Frost. Figs. 2390, 2391. Pseudobulbs clustered; lvs. broadly lanceolate; scape 6 in. long, covered with dark brown scales. 2-4 ft.; fls. 5 in. across, dull yellow, spotted with purple; sepals broad, concave; petals narrow, wavy; hyochil globose, almost wholly purple inside, heavily spotted outside, horns 1 in. long, falcate, middle lobe cordate, keeled. July- Oct. Brazil. B. M. 5498, 5499. B. R. 23:1837. L. B. C. 20:1985. R. N. 2:117 (from which Fig. 2390 is adapted). — Distinguished by the broad wings of the column.


Lvs. about 9 in. long; scape pendulous, 2-3 ft.; fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepals oblong to ovate-oblong, obtuse; petals narrow; hyochil rounded, ovate, purple, horns in-curved, middle lobe obtuse, channelled, obscurely 3-toothed. Peru, B. M. 10:974. F. S. 3:121.

8. **Shuttleworthii**, Reichb. f.

Pseudobulbs large, conical, subulate; lvs. broadly oblong, acute; raceme pendulous, loose; sepals and base of the labellum apiculate or only colored in purplish brown blotches, front part of the labellum yellowish white; hyochil semi-globose; horns flattened, subacute, terminal lobe triangular; column white, green along the middle and spotted with purple on the outside. Colombia.


3291. **Stanhopea insignis** (C. & L.)

11. **saccata**, 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; hyochil deep-crimson; horns flat, a little twisted, ovate-elliptic. Guatemala. I. H. 8:270 (as *S. colensoi*).

12. **ecornuta**, Lem. Pseudobulbs and lvs. large; scape short, clothed with green bracts, 2-ft.; sepals erect, 2 in. long, ovate, concave, white; petals smaller; labellum reduced to a fleshy sac-like hypochil, 1½ in. long, yellow deepening to orange at the base; column as long as the labellum and of the same color. Cent. Amer. B. M. 1883. F. S. 2:181. G. C. 1850:295. S. *Amesiana*, Hort. Hugh Low. belongs to the hornless class of which *S. ecorum* is the type and is perhaps a variety of *S. leucotis*. It has large, waxy, clear white, fragrant 3-fls. over 1 ft. across, and a very thick, fleshy, saccate labellum. G. M. 36:82. — Habitat?

**HEINRICH HASSELBRING**

**STANLEYA**

(Edward Stanley, Earl of Derby, 1779-1849, ornithologist, once president Linnean Society). *Crucifer*. *Stanleya pinnatifida* is a hardy perennial herb about 3 ft. high with the principal stem bearing the blossoms. They are a clear and bright yellow flowers an inch across borne in terminal spikes a foot or more long. The genus contains 3 species of stout herbs native to the western U.S. It belongs to the Stylisma tribe of the mustard family, which tribe is characterized by long, narrow pods, seeds in a single series and incumbent calyx lobes. Stanleya is distinguished from neighboring genera by the long, club-shaped buds, cream-colored or yellow 3-fls., and long stalked ovaries and pods. Other generic characters: sepals linear; petals narrow, long-clawed; stamina 6, nearly equal; seeds numerous, pendulous.


W. M.

**STAPELIA**

(J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). *Aesculineae*. *Carnation Flower*. Odd fleshy cactus-like plants from South Africa. Schumann, in Engler and Prantl's "Naturpflanzenfamilien," considers that the genus contains 70-80 species. Decaisne, in De Candolle's Pro-
STAPHYLIA

1717

S. Astraea, Mass. STAPHYLA PLOW, Dwarf: branches 4-angled, mostly curved, sharply toothed: 6.4 or 5 in. across, with spreading star like disc-like segments, violet-purple with transverse yellowish bases. B. M. No. 1, R.H. 1859. Offered by Blanc 1859.—S. Batavia, Simia. N. Normale, &c. nov. mutata, Jacq. About 6-8 in.: branches 4-angled, with large spreading teeth, glistening: fl. 2 in. across, with ovate-acuminate segments, yellow with transverse marking of red-purple. B. M. 4716. (175. p. 158. One of the commonest of the old kinds, but the name does not appear in the American trade.—S. Plantii, Hort. Stems stout and erect strongly 4-angled, serrate-toothed and with inflexed points: fl. about 5 in. across, hairy, brown barred with yellow, the margins of the segments brown-purple. B. M. 5502. F. 39:1921.

In 1859, Blanc catalogued the following names, in addition to some of those above:—S. normale, Jacq. (properly S. peta, Donn.)—Fls. glabrous, corolla yellow, marked with numerous rufous spots, the cor or circle is marked with large spots of two tones, dark brown, yellow.—S. deliciosa L. deflexa, Jacq.: Only about 2 in. across, the color greenish or pale red, deeply wrinkled.—S. plantii, Jacq. Flower flat, corolla spreading, sulfur-yellow, lined and spotted with dark purple.—S. revoluta, Mass.: Distinct flowers, red with white blotches, smooth, very fuzzy, and with fringed margins.—S. mutata, 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. formosa, E. Br.: A very rare species from the Omo river. Corolla 3 in. in diameter, the face entirely dull, smoky purple, darker at the tips of the lobes. L. H. B.

STAPHYLIA

2392. Staphylea gigantea (4: 4-5).

STAPHYLIA (Greek, staphyle, cluster; referring to the inflorescence). Calyx brown, Bladder Nut. Ovarian mental deciduous shrubs, with opposite, stipulate odd-pinnate or 3-foliolate leaves and white flowers in terminal, usually nodding panicles followed by capsular blander-like fruits. The species are all inhabitants of temperate regions, and S. trifolia, S. Bumalda and S. pinanata are hardy north, while S. Colchica is hardly at least as far north as Mass.; S. Bolanderi and S. Eunoti are more tender and seem not to be in cultivation in this country. They are all desirable shrubs with handsome bright or light green foliage and pretty white flowers in spring. They are well adapted for shrubberies, but all except S. Bumalda are liable to become bare and unsightly at the base and are therefore not to be recommended for single specimens, S. Colchica and its hybrid S. echium are perhaps the most beautiful species while in flower. The former blooms at an early age and is sometimes forced. Staphyleas grow well in almost any kind of soil and position, but do best in a somewhat moist rich soil and partly shaded situation. Prune and deadhead the blossoms to prevent Greenwood cuttings from forced plants root readily.

Eight species in the temperate regions of the north are shrubs, with smooth striped bark; leaves, and 3-lobed stipules. S. eunoti and S. formosa in terminal panicles; sepal and petals 5 of about the same length, upright; stamens 5; pistils 2-3, usually connate below: fr. a 2-3-holobed, inflated, membranous capsule,
with 1 or few subglobose, rather large, hony seeds in each cell.

A. Leaves. Stellate.

b. Middle leaflet short-stalked: panicle sessile.

_Eumáida_, DC. Shrub, 6 ft. high, with upright and spreading slender branches; leafs. broadly oval to ovate, shortly acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1 1/2-2 1/2 in. long; leaflets about 1/2 in. long in spreading panicles or umbel-like racemes; sepals yellowish white, petals white: capsule usually 2-lobed, somewhat compressed, 1/4-1 in. long. June. Japan. S.Z. 1:93.

2393. **Staphylea trifolia** L.

b. Middle leaflet short-stalked: panicles stalked.

_trifolia_, Linn. American Bladder Nut. Fig. 2393. Upright shrub, with rather stout branches, 6-15 ft. high; leafs. oval to ovate, acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1 1/2-3 in. long; leaflets about 1/2 in. long in nodding panicles or umbel-like racemes; sepals yellowish green, petals white: capsule much inflated, usually 3-lobed, 1 1/2-2 in. long. April, May. Quebec to Ontario and Minn., south to S. C. and Mo. Gt. 37, p. 129. — **Var. paniculata**, Zabel. Long and suckering leafs. smaller, broader, glabrous at length: leaflets. long and succedent, about 3-8 ft. in length: fr. often 2-lobed, 1 1/2-1 3/4 in. long. 

AA. Leaf, 3-7-foliolate, only occasionally 5-foliolate: panicles stalked.


_pinnata_, Linn. Upright shrub, attaining 15 ft., sometimes tree-like: leafs. 5-7, ovate-oblong, long-acuminate, sharply and finely serrate, glabrous and glaucenose beneath, 2-3 in. long; panicles 2-5 in. long, on peduncles about 2 in. long; leaflets. oval, white, slightly pubescent at the base, reddish at the apex on leaflets of a size as long as the oblong peduncles: capsule 2-3-lobed, much inflated, subglobose, about 1 1/2 in. long. May, June. Europe to W. Asia. Gt. 34, p. 269.

bb. Pinnate broad, ovate, upright or nodding: fl.-buds obovate-oblong.


S. Bolanderi, A. Gray. Allied to _S. trifolia_; leafs. broadly oval or almost orbicular, glabrous; stamens and styles exserted: fr. 2 1/2 in. long. Gt. 2:345. N. Amer. 11:117. Intermediate between and supposed to be a hybrid of _S. pinnata_ and _Célichia_; leafs. usually 5: panicles very large and nodding. A very free flowering variety with pinkish tinged fls. is


ALFRED REDHED

**STAR APPLE.** See Cephalocereus.

**STARFISH FLOWER.** _Spathularia Aquatica._

**STARFLOWER.** _Aster, Tricentaria, Tribolium_ and other plants.

**STAR GRASS is Chloris lanceata._

**STAR OF BETHLEHEM.** _Orchidopsis androphiunum._

**STAR THISTLE.** _Centaurea._

**STAR TULIP.** _Calthorho._

**STARWORT.** _Aster._

**STÁTICE (from a Greek name meaning astringent, given by Pliny to some herb).** _Punica granatum._ Seal Lavender. About 120 species well scattered about the world, but mainly seacoast plants of the northern hemispheres and especially in Asia. Mostly perennials or annuals, rarely annual or shrubby, with usually tufted rather long leaves (radial in the herbaceous species), and small blue, white, red, or yellow flowers. Perianth little or much branched, spreading and leafless; bracts subtending the fl.-clusters; scale-like, somewhat clasping, usually ciliate on the back, and with membranous margins; frs. in dense, few to several fl.-clusters on or 2 in the axil of a bract; fl.-buds usually erect and unilaterally arranged on the branches or more nearly sessile in dense, cylindrical fl.-clusters: calyx funnel-shaped, often colored and serrated or pinnatifid. _Státie_ is most usually distinguished from _Arnberia by the indorsum. Arnberia bearing its flowers in a single glabrous head. Státies are of easy cultivation but prefer a rather deep, loose soil. From the delicate nature of the fl.-clusters the species are better suited to rockwork and isolated positions than for mixing in a crowded border. Many of the species are useful for cut bloom, especially for mixing with other flowers._

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1. **Suvorovi, Rezzel.** A tall annual: fvs. radical, oblong-obovate, obtuse, mucronate, 2-3 in. long; margins entire or serrate: scapes several, stout, obliquely angled, immediately extending from the base, very silky, 1 in. long. — **Var. Hesselii**, Zabel. S. E. China. Wall. Shrub or small tree: fr. oval to oblong, 2-4 in. long; leaflets in peduncled, pedunculate, racemose-like panicles: fr. 3-4 in. long. Himalayas.
bearing 1 long terminal spike and several distant, sessile lateral ones 4-6 in. long, nearly ½ in. through; fls. rose, small, nearly sessile, crowded; June, July, July, August. B.M. 6099. — A handsome annual, suitable for growing in masses and useful for cut blooms.


3. *siniata*, Linn. A biennial plant which may be treated as an annual, about 1 ft. high, of a spreading growth; fls. drooping, the lobes pointed, the terminal bearing a bristle; scapes several, 3-5-winged, the wings produced in linear leaf-like appendages; branches several, 3-winged; floral bracts or peduncles broadly 3-winged, the wings dilated below the spikelet and prolonged into 3 unequal triangular, acute appendages; spikelets 4-5-fld.; corolla white; calyx large, blue. Late summer. Mediterranean region of Europe. B.M. 71.

4. *macrophylla*, Brousse. (S. Hölloffii, Hort., is a garden form of this species). A Tender, somewhat shrubby species 3-4 ft. high; stem branched and bearing clusters of sessile, ovate-shaped, scarious bracts; stems several, much branched into a large, paniculate corymb: branches winged; spikelets 2-fl.; calyx blue; corolla white. B.M. 4125. B.K. 317. — Cult. in S. Calif. Makes a good potted plant for winter flowering in a cool greenhouse. T. D. Hatfield, in Fl. 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 easily 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; fls. obovate, attenuate on the petiole, stiffly and shortly mucronate tipped, often purplish underneath; scape somewhat angulated: branches angled and winged, recurved, not crowded, bearing unilateral, scorpioidly capitate, densely imbricate short spikes; calyx persistent, crowned with a silvery white funnel-shaped border; corolla purple, very deciduous. Midsummer. Siberia. B.M. 656.

6. *Tatariaca*, Linn. (S. inscirta, var. hybrida, Hort. & S. Sceurliana, Schult.). A Hardy perennial, 1-2 ft. high; fls. tufted, obovate to oblong-spatulate, 4-6 in. long, narrowed into the petiole; scape widely branched: branches triangular, slender, narrowly 3-winged, somewhat recurved; spikelets 1-2-fl., in usually lax, simple or branched spikes; fls. 2 lines long, typically red, with several garden varieties. Caucasian. B.M. 6537. — Var. nana, Hort. (S. inscirta, var. nana). is a dwarf form. 2394.

7. *Bonduelli*, Leistib. Fig. 2394. A Tender annual or biennial plant, about 18 in. high; fls. 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 oblanceolated, 3-winged, forked at the apex: fls. yellow, individually large for the genus, clustered in the fork of the branchlets or peduncles: bracts scarious, the inner furnished with sharp spines. Summer. Algeria. R.H. 1883:276. B.M. 5158. F.S. 20:2129.


10. *Gmelini, Willd.* A Hardy perennial 1-2 ft. high; fls. glabrous, broadly ovate or oblong, very shortly petiolate or sessile; scape terete below, angled above, densely corymbose-paniculate; spikelets usually 2-fl., in dense, imbricated, scorpioid spikes; fls. blue. Late summer. E. Eu. and Asiatic Russia.


floriculture, seed raising, the nursery business, and viticulture were subjects of special reports in the Eleventh Census, 1890. In this Cyclopaedia statistics appear under such large topics as Horticulture, Cut-flowers, Floriculture, and the various articles on states.

ST. BERNARD’S LILY. *Amaryllis belladonna.*

ST. BRUNO’S LILY. *Paeonia officinalis.*

STELLARIA

2395. Staurtonia hexaphylla (L.

STAUWTONIA (G. L. Sturm, physician, 1740-1801). *Berberidaceae.* A genus of 2 species of tender evergreen woody vines, one from China and one from Japan. The lvs. have 3-7 digitate leaflets. Fls. monocious, in axillary, few-fl, racemes; sepals 6, petaloid; petals wanting; sterile stamens many; monadelphous stamens, anthers bincorne, ovary rudimentary; fertile fl. with 6 sterile stamens and 3 carpels.

hexaphylla. Deese. Fig. 2385. A handsome vine becoming 40 ft. high; lvs. oval, about 2 in. long; stalked; fls. in axillary clusters, white, fragrant in spring; berry about 4 in. long, splashed with scarlet. Japan. Act. 12:139.

F. W. BARCLAY.

The Staurtonias are beautiful evergreen climbers and well adapted to the soil and climate of the South Atlantic and Gulf region. Both *S. hexaphylla* and the related *Bolbodendron affinis* (known also as *Stauwtonia affinis*), grow well in the writer’s Florida garden, although they are not such very luxuriant climbers as are the Alpinias, Thunbergias and Bignonias. It requires a few years before they are fully established. They are excellent subjects to be planted on old stumps and on small trees, such as cedars and maple trees, which they perfectly cover in the course of time with their pretty evergreen leaves and their rather insignificant but powerfully fragrant flowers. They will not flourish in dry, hot, sandy soil, demanding for their welfare rather moist, shady spots containing a profusion of humus. A little commercial fertilizer containing a fair amount of nitrogen and potash will also prove very beneficial. The need of some kind of a staminal column is shown by the plant itself, which assumes a rather yellowish cast in the green color of the foliage. A few days after it has received some plant-food the foliage shows a very beautiful dark green color. These two species and the beautiful *Aristolochia japonica* are valuable additions to the garden flora of our southern states.

ST. BERNARD’S LILY. *Amaryllis belladonna.*

ST. BRUNO’S LILY. *Paeonia officinalis.*

STELLARIA

2395. Staurtonia hexaphylla (L.

STELLARIA (Latin, stér: referring to the form of the flower). *Caryophyllaceae.* A genus of about 70 species of annual or perennial herbs, mostly diffuse, tufted or weakly ascending. They are scattered about the whole world, but are mainly found in the temperate regions. Lvs. opposite, simple; fls. usually white and disposed in terminal or rarely axillary leafy or naked panicle-like cymes; sepals usually 5; petals, usually 5, rarely more, bifid, often deeply; stamens 3-10; styles 3-4, rarely 5; capsule ovoid to oblong, relatively short, dehiscing by as many as twice or many teeth as there are carpels. See Gray, *Syn. Flora of N. Amer.*

A. Fls. 7-10 lines across.

Holosteum, Linn. *Easter Bell.* A hardy perennial, erect, 6-18 in. high, simple, straight and branched, from a creeping rootstock; lvs. sessile, lanceolate, 1-3 in. long; fls. white, abundant, in terminal leafy panicles; sepals usually 5; petals, usually 5, rarely more, bifid, often deeply; stamens 3-10; styles 3-4, rarely 5; capsule ovoid to oblong, relatively short, dehiscing by as many as twice or many teeth as there are carpels. See Gray, *Syn. Flora of N. Amer.*

As. Fls. 2-5 lines across.

graminearum, Linn. A slender-stemmed, hardy perennial plant not usually over 6 in. high, from a creeping rootstock; lvs. sessile, linear lanceolate, usually about 1 in. long; fls. white, in terminal or lateral racemes, fragrant, open panicles; sepals and petals nearly equal in length. May, June. Europe; naturalized in America. B. B. 2:22. — Var. aerea, Hort. *Golden Stork’s-wort,* has pale yellowish leaves and is lower and more matted in growth. Well adapted for sandy banks where grass will not grow well.

media, Linn. *Chickweed.* Fig. 2396. A low, downy annual weed common in all rich, moist, cultivated soils, especially troublesome during the cooler months.

2396. Stellaria media (L. = S.
of the growing season and in frames, etc., during winter.

Lvs. 2 lines to 1½ in. long, the lower petioled, the upper sessile: fs, axillary or in terminal leafy cymes; sepals longer than the petals. Eu., Asia. B.B. 2:21. — It is considered to be a good fall and winter cover-plant or orchard and vineyards, but is never cultivated. It is an indication of good soil. F. W. Barclay.

STEPHANANDRA (Greek, stenos, narrow, and taphros, a trench; the spikelels 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-fld., the lower sterile or neutral 2-4 in a short spike, which is embedded in the notches of the broad rachis, thus forming a spike-like panicula. Creeping grasses with compressed culms and flat, divergent leaves.

STEPHANOTPHYLLUM (Greek, stenos, narrow, and taphros, a trench; the spikelels 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-fld., the lower sterile or neutral 2-4 in a short spike, which is embedded in the notches of the broad rachis, thus forming a spike-like panicula. Creeping grasses with compressed culms and flat, divergent leaves.

Americanum, Schrank. (N. neomancotta, Kunze. N. glabraea, Trin.). St. Augustin Grass. Flowering branches erect, 6-12 in. high. Var. variegatum has leaves striped with white, and is used as a basket plant.

The introduced form of St. Augustin Grass is one of the most valuable lawn grasses. It will grow on almost any soil and thrives even in shade. The leaves are rather broad, never over 6 in. high and require little mowing. This grass does not become coarse, and is not held down or smothered by the weight of snow. It is particularly good for house lots and lawns. It 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 acetos, male stamen; alluding to the persistent crown of stamens). Rosaceae. Ornamental small deciduous shrubs with alternate, stipulate, lobed lvs., and with small white fls. in terminal paniciles. Graceful plants, with handsome foliage, hardy north or almost so. Well adapted for borders of shrubberies or rocky banks on account of their graceful habit and handsome foliage. Prop. easily by hardwood cuttings or by basal division. It is mostly propagated by cuttings.

Four species in China and Japan, all undershrubs with slender more or less zigzag branches: fs, slender-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-seeded pod.

flexuos, Sieb. & Zucc. (N. incisa, Zabel). Shrub, 5 ft. high, almost glabrous, with angular spreading distantly zigzag branches: fs, triangular-ovate, coriaceous, with long acuminate to acute and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish
Stephanandra is closely allied to Spiraea and has the Spiraea-style of beauty. It grows 2-3 ft. high and has long, slender branches which are densely and regularly interwoven in a fan-like manner. Its habit of growth is fountain-like, the branches being gracefully pendent. Its flowers are white or pink and, although minute, are so numerous that the plant becomes very showy. It is especially suited for the back of herbaceous borders or for the front of larger shrubs. Its foliage, which is deeply toothed, is glossy green in early spring and deep glossy green during spring and summer. In the autumn it puts on unusual tints of red and yellow. 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.

**Stephanaphyllum.** See Relaxia.

**Stephanotis** (from Greek words for crown and ear; alluding to the ear-like appendages on the staminal crown), *Stephanophyllum*, Turninng graceful 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 umbell-like clusters from the axils of three-petalled, corolla funnel-form or salver-form, the tube cylindrical and usually enlarged at the base and sometimes at the throat, the lobes 5; crown mostly of several stamens, usually free at the base and adnate to the anthers on the back, the anthers with an indented tip or membrane; fr. a more or less fleshy follicle.

**Stephanotis floribunda**, Brongn. Fig. 2398. Glabrous, 8-15 ft.; fls. elliptic, with a short point, thick and shining green, entire; fls. 2-3 in. long, of waxy consistency, white or cream color, very fragrant, in many umbels, the calyx one-fourth or less the length of the corolla-tube; fr. 3-4 in. long, ellipsoid, glabrous, fleshy, containing melon-like seeds which are provided with a tuft of hair. Madagascar. B.M. 4488. G. 21, p. 141 (showing a pyramidal plant blooming in a small pot and not climbing); 46, p. 208; 55, p. 150. G. C. H. 14:169 (a dwarf variety, the Elverson); 24:87; 25:137; 31:17:56. R.R. 1974, p. 368; 1982, p. 428, 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 55° F.). 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. Thouarsii**, Brongn., from Madagascar, appears to be the only other species in cult., but it is not in the American trade. It has obvate lvs., fls. in 3’s, and sepals about one-third the length of the corolla-tube.

L. H. B.

**Sterculia** (Sterculius of Roman mythology, from sterco, manure; applied to these plants because of 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 southern states and California. Fls. mostly polygamous, apetalous, the calyx tubular, 4-5- cleft, often colored; stamens united in a column which bears a head of 10-15 sessile anthers; pistil of as many carpels as calyx-lobes and opposite them, each carpel 2- to many-ovuled, the stigmas free and radiating: fr.
sterculia, each carpel distinct and either woody or membranaceous and sometimes opening and spreading into a leaf-like body long before maturity (Fig. 2399); seeds 1-many, sometimes arillate or winged, sometimes hairy. Sterculias have very various foliage, the leaves of different species being simple, palmately lobed or digitate. The flowers are mostly in panicles or large clusters, sometimes large and showy, varying from greenish to dull red and scarlet. The species are grown mostly for street and lawn trees. The only kinds that clusters, sometimes large and showy, varying from

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Sternbergia (after Count Caspar Sternberg, a botanist and writer, 1761-1838). *Amurphyllium*. A genus of 4 species of low-growing, nearly bulbous herbs from eastern Europe to Asia Minor, with strap-shaped or linear leaves and bright yellow crocus-like flowers. Perianth regular, erect, funnelform; stamens inserted on the perianth-tube; filaments long, filiform; anthers dorsifix, versatile; fr. fleshly, scarcely dehiscent; seeds subglobose. The bulbs should be planted rather deeply, about 6 inches. J. N. Gerard says of their culture in *G.F.* 19:158 that they require a rather heavy soil, in a somewhat sunny position where they will be well ripened in summer.

**STEVIA.** For the Stevia of florists, see *Piqueria*. True Stevias are described in horticultural literature, but it is not known that any of them are now in the American trade.

**STEWARTIA.** See *Stewartia*.

**STICK-TIGHT.** Vernacular for burs of *Cynoglossum*.

**STIGMAPHYLLON** (Greek, stigma and leaf; referring to the leaf-like appendages of the stigmas). About 50 species of tropical American woody vines with usually opposite, entire to lobed, petioled leaves and yellow flowers in axillary, peduncled umbel-like cymes: 5-parted, 8-glandular; stamens 10, of which 6 are perfect and 4 antherless or deformed; styles 3; stigmas produced into leaf-like or hooked appendages: ovary loculicid, 3-loculed.

**ciliatum**, A. Juss. A tender woody twining vine: lvs. evergreen, smooth, opposite, corulate, ciliate; fr. bright yellow, large, in peduncled axillary clusters of 3-6. *P.M.* 15:777. *Gn.* 33:631. Apparently the only species in the trade and possibly the most handsome of the genus. G. W. Oliver says that *S. ciliatum* is one of the best medium-sized vines for outdoor trellis work. For pot culture it is of little service and thrives in the greenhouse only when planted in the September or October for propagation. On outdoor plants much of the wood is useless for this purpose, being thin and soft. Choose the wood made early in the season; a heel or joint is not necessary; root in bottom heat and carry through the winter in the greenhouse as small plants. Ernest Brunton says of its culture in *S. Calif.* that it must have shade, protection from dry or hot winds, and an open soil. Under the right conditions it flowers admirably.

**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 1815, where his father, Edward 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 affairs. From taking up the profession of law by constitutional weakness and defective eyesight, his many-sided nature found expression in diversified activities. He was in turn a teacher, assistant in the preparatory 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 stoker in the New York custom house. As a public servant, he made his profession the springboard for more important ones; his love of literature and his zeal for systematic knowledge of plant-life from readings by his sisters, and this gave impetus toward subsequent study on broader lines. He brought together many rare and choice species of plants, and made interesting experiments on the farm. Love of nature was henceforth a dominant force with him. His articles in the daily press of New York on the various interests of country life attracted wide attention, and led to his appointment as 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*. Widely 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 masterly conduct of the page during the next five years set a high standard for journalism in this field, and established his reputation as a specialist in agriculture, culture and cognate subjects. On the founding of "Garden and Forest" in 1888, William A. Stiles was invited to be the managing editor. For nearly ten
STYLES

years, to the close of his life, he devoted himself to this, his editorial work, and writing and management, and steadily maintained the high character of the most able and influential periodical in American horticultural journalism. His ripe scholar- ship, sound judgment, and steady use of English, and persistency, all contributed to the success of this part of his life-work, and his profound, sympathetic understanding of nature, as a human and spiritual being, characterized all his activities. For many years he rendered conspicuous service in working for the establishment of small parks easily accessible to the poor, and for the wise conduct of the larger parks and their preservation from invasion and despoilment. 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 signal service, until the time of his death. William A. Styles was unmarried. He had a fund of infinite wit and humor, and was the warm and honored friend of the best men and women in the communities in which he lived. M. B. COULSTON.

STILLINGIA (after Dr. Benj. Stillingfleet, an Eng- lish botanist). Euphorbiaeae. About 15 species of herbs found in South and North America. An alternate, stipulate leaves and small, monocyclic, apetalous flowers in terminal spikes. The genus is closely allied to Stillingia is of 2-3 dry 1-seeded carpels with no central axis remaining after dehiscence but with a large, linear-lanceolate to obovate, obtusely serrate: f. yelowish, in terminal spikes. Spring to fall. Southern Texas. Stubbs, Trin. Poecilium Grass. Culms 2-3 ft., in bunches: panicles contract€d; empty glumes broad, nerved, about 1½ in., tapering to a slender point: fl. glume nearly 1 in.; awn usually about 6 in. long, the lower half erect, pubescent and strongly twisted, the upper half bent to one side, rough. Illinois to California.

capillata, Linn. Similar to S. spartea: flowers more numerous but smaller in every way: fl. glume about ½ in. long; lower part ofawn only minutely pubescent, and the upper or bent portion sinuous. Plains, Europe.

A. S. HITCHCOCK.

ST. JOHN'S WORT. Hypericum.

STOBBEA (after D. Stobus, a Swedish patron of Linnean). Compositae. This genus is included by Bentham and Hooker under Berkheya. About 70 species of South African herbs or somewhat shrubby plants, commonly with aspect of thistles as to the foliage. Lvs. usually decurrent, dentate, pinnatifid or pin- natisect, the lobes dentate and spiny: heads small to large, solitary or somewhat corymbose; rays usually yellow.

purpurea, DC. (Berkheya purpurea, Benth. & Hook.). A half-hardy, probably biennial plant 2-3 ft. high, lower lvs. about 1 ft. long, irregularly lobed, sessile, linear-lanceolate to obovate, obtusely serrate: f. yellowish, in terminal spikes. Spring to fall. Southern states. According to Mueller's "Select Extra Tropical Plants," it is one of the best for its purgative properties. C. D. Beadle reports that the plant has stood a temperature of —9° at Biltmore, N. C. The plant grows readily from seed, but does not bear transplanting well.

For S. odoratum, see Sapium odoratum

Sylvatica, Linn. Queen's Delight. A half-hardy perennial herb with a woody root: stems clustered, 2-3 ft. high: lvs. numerous, very short-petioled or sessile, linear-lanceolate to obovate, obtusely serrate: f. yellowish, in terminal spikes. Spring to fall. Southern states. To be recommended for growing with half-hardy alpines. It can be wintered in a coldframe. Prop. by seed and division. F. W. BARCLAY.

STIPA (Greek, stipe, tow; in allusion to the plumeous awns of one of the original species). Gramineae. A large genus of about 100 species, throughout the world except the colder parts. They are particularly charac- teristic of the prairies and steppes. The sharp-pointed awns of some species are troublesome or even dangerous to stock, especially sheep, on account of the tendency to work through the skin and into the vital organs. Perennial grasses with narrow, awl- shaped leaves and loose panicles; spikelets 1-1½ in.; empty glumes membranaceous, longer than the indurated fl. glume; fl. glume with a sharp hairy calyx below and a stout persistent twisted awn above. At maturity the fl. glume falls away from the empty glumes. The species here mentioned are cultivated for ornament, including the making of dry bosom.

Pennisetum, Linn. Feather Grass. Culms 2-3 ft., in bunches; empty glumes narrowed into awns an inch or more long; fl. glume 1½ in. or more long; awn a foot or more long, lower portion smooth and twisted, the upper very pubescent, giving the plant a very graceful appearance. Steppes of Europe and Siberia. On, p. 199. V. 3:247. R.I. 1896, p. 489.

elegantissima, Labill. Stems 2-3 feet, erect from a horizontal rhizome: lvs. narrow and erect: panicle very long; lower plumeous: spikelets 4-5 lines long; awn ½ in. long. Thrives in sandy soil.

tenacissima, Linn. Esparto Grass. Culms 2-3 ft., in bunches: lvs. narrow, smooth, cylindrical, elongated; pale, delicate, not aromatic, yellow; fl. glume ½ in. long, between teeth; awn 1-2 in. Spain and North Africa. The lvs. furinal fiber from which are made ropes, mats, paper, etc. In Africa it is called Halfa or Halfa.

STOCKS (for botany, see Matthiola. Fig. 2401; also compare Figs. 424, 1377 and 2402) are divided into two groups, Summer and Winter Stocks. The former are annuals and therefore bloom in the first summer; the latter are biennials and bloom in the second year, or, if sown very early, late in the fall or the winter of the first year. Fall or intermediate Stocks are between these two groups; they bloom profusely in the autumn. The seed of the Summer Stocks, or, as they are commonly called, Ten Weeks' Stocks, is sown from the end of February until April, mostly in a luke-warm hotbed, which must be sunny and well aired. Good clean garden soil, well mixed with sand and free of humus, is the proper soil for sowing the seed. The seed will germinate in 6-10 days, the light-seeded sorts germinating quicker than the dark-seeded kinds. Air must be admitted as soon as the seedlings have drawn in the air, or the young plants will die. After the plants have been well hardened for a few weeks in the open without danger, watering can be given in the morning, so that the roots are well chilled, as it is the heat the seedlings must be shielded. If the seed is to be raised from pot-grown plants a good, well-matured, sandy garden soil should be used which contains an admixture of well-rotted sod or the soil taken from river bottoms. The pots are about 6 inches high, with a diameter of 7 inches. When they show their fourth leaf the seedlings are planted firmly into these pots with well filled, perfectly dry, with the above soil; care should be taken that the roots are inserted vertically. From 6 to 8 plants are put into each pot. These pots are then placed on sunny sashes, usually protected by 6 ft-roofs. The development of the plants depends now principally on careful watering, which is done mostly with watering pots and at the beginning with a fine spray attached to the spout of the watering pot. After a crust has formed on the surface of the pot, the spray is discontinued and the pots are watered with the pipe of the can. This watering is done at night during warm weather and in the morning when the weather is cool. Very little watering on cloudy or rainy weather. The watering of the Stocks is the most particular and important part in the cultivation in pots, for if due care is not exercised a white maggot will make its way in and destroy the roots. The common flea-beetle
Double Stock, Matthiola incana, var. annua (X 1.5).

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 of 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 seed contained therein will produce a high percentage of double flowers the following year, and the selection is done with care. The seed that will go on the market can be vastly improved by the removal of "wild" pods, which contain seeds that produce nothing but single flowers. The seeds are removed by hand from the pods, mostly by women and children.

The double-flowered varieties of Matthiola incana, var. annua, commonly known as "Ten Weeks" or "Summer Flowering Stocks," are among the most fragrant and pleasing of common garden annuals. They are readily raised from seed sown in a gentle heat about the first week in April, keeping them close for a few days until germinated, gradually turning them to an abundance of air as they increase in size, and finally, towards the end of May, transferring them to the flower garden or border where they are intended to flower, choosing a dull or showery day for the purpose.

The varieties of M. incana, though perennial in their native habitat, are best treated here as annuals, and are well worth growing as pot-plants, either for cutting or the decoration of the conservatory during the winter and early spring months. They are known in the trade in this country as "Boston Florists' Stock," "Princess Alice," "Cut-and-come-again," "East Lothian" and "Brompton Stocks." Though they are as readily propagated from seed as the "Ten Weeks' Stocks," they require a much longer period of time to grow; therefore, those intended for early winter flowering should be sown in June, while those intended for spring flowering should be sown about the middle of August. Fill a number of 3-inch pots with sifted loam and plant about three seeds in each pot; place them in a close shaded frame till germinated; as soon as they commence to grow reduce the seedlings to one in each pot. They must not be allowed to suffer for water at any time or they will lose their leaves. As soon as the pots are fairly well filled with roots (though they must not become potbound), they should be shifted on into larger sizes until they reach a 6- or 7-inch pot. The soil best suited to them is a rich, heavy loam. As soon as the plants show signs of flowering they are greatly benefited by an occasional watering of weak liquid cow or sheep manure water. Those sown in June should be grown outside until the approach of cold weather, when they should be transferred to the house where they are intended to flower, while those sown in August should be grown 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. incana and M. isoneura is imported from Germany, principally Erfurt and Queltingen, 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, TEN WEEKS'. See Stocks and Matthiola incana var. annua.

STOCK, VIRGINIAN. Malcolmia maritima.

STOKES' ASTER. See Stokesia.

STOKESIA (Jonathan Stokes, M.D., 1735-1831, 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 chrysanthemum. 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 long, narrow strips.

Stokes' Aster is hardy 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 is woolly and indolent and Meek for its drought-resisting qualities. Stokes' Aster should be planted in a well drained, sandy loam, not in cold and heavy clay. It blooms from August until hard frost. According to Chapman, the heads of wild specimens are only an inch across, but the size of heads in cultivated plants is stated by many horticultural experts to be 3-4 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 8 heads. No double form seems to have appeared.

Generic characters: heads many-flowered; marginal flowers much larger, deeply 5-cleft; involucre subglobose; outer bracts prolonged into a large, leafy, bristly-fringed appendage; achenes 3-4-angled, smooth; pappus of 4-5 thread-like, deciduous scales.

cyanus, L'Hérit. Stokes' Aster, Fig. 2403. Much-branched, hardy perennial herb, 1-2 ft. high; branches often purplish; lvs. lanceolate; radical ones entire, tapering at the base into long, flattened stalks; cauleine lvs. gradually becoming sessile, the uppermost with a few teeth near the base and half-clasping; fls. blue or purplish blue, 3-4 in. across. Aug.-Oct. Ga., S. C. B.M. 4926. Mn. 5, p. 214. R.H. 1863:211. W. M.

STONECROP. See Sedum.

STORAGE. Various ideals are confused under the denomination of storage. There are two kinds of storage: (1) Common or non-refrigerator storage, employed mostly for holding perishable commodities temporarily; (2) cold storage, in which low and even temperatures are maintained by some refrigerating process. The common storage, without refrigeration, may be again divided into two species: (a) the storage may be only a temporary halt, or a half-way station, on the way to the shipping point, and where products are kept be again divided into two species: (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 nurseriesmen. Sometimes these buildings are employed for the storing of apples and other products. Usually the floor is two or three feet below the level of the ground.

2403. Stokesia cyanus (a). 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 23 feet square, and the back room a storage and shipping department 23 x 25 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 1¼-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 ceiling with pine, but the top floor not ceiling.

2404. A half-cellar storage.

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, 12 inches high, 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 make it as near a non-conductor of heat as possible. Dead-air spaces are the cheapest and most easily constructed means of non-conducting air. Solid brick walls, 6 to 8 inches thick, 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 room must be provided with ventilator shafts carrying good dampers so that perfect ventilation can be secured during cold weather. Precision 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 reservoir 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 comes from the orchard. Consequently they 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 storehouses, apples are usually stored in barrels that are piled on their sides. Fig. 2411. It is a common practice to resort 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, at a temperature so low as to arrest the action of ferments 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 ancient times. The early Egyptians, for instance, stored their provisions in ice pits dug in the ground 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 storerooms should have a dead-air space between the stone or brick wall 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 eight feet will increase their capacity and cooling power. The floors in these rooms should be made of metal overlaid with 2x4's and covered with a 1-inch soil 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 slab floor in the second-story ware-room will give direct circulation into the lower ware-room, and both be cooled in consequence. The floor structure must be strong and well braced so as to carry the heavy load placed upon it. Heavy stacking carrying 2x4's 18 inches apart, and framed with 2x4's one inch apart, will give ample support for the ice chambers and second-story ware-room. The roof to the second-story room should be built so as to make it as near a non-conductor of heat as possible. Dead-air spaces are the cheapest and most easily constructed means of non-conducting air. 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 room must be provided with ventilator shafts carrying good dampers so that perfect ventilation can be secured during cold weather. Precision 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 reservoir 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 comes from the orchard. Consequently they can be made much smaller than would be necessary were they to serve the double purpose of cold chamber and ice house.
means or by ice, cold storage can only be accomplished by maintaining a desired temperature over a long period. In order to secure this, the compartments in which the products for storage are to be held must be as perfectly insulated from outside heat as possible.

Successful experimental refrigeration by mechanical means was accomplished as early as the middle of the eighteenth century, but no successful commercial application of cold storage was made until after the invention of Lowe’s “carbolic 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, and now there are about 1,200 refrigerating plants in the United States, of which about 600 are used mostly for horticultural products. Foreign countries are now following the example of the United States, and London, Liverpool, Glasgow, Paris and other European cities offer facilities for storing such products. In the United States, Chicago is the great center for fruit storage, single firms holding as many as 100,000 barrels a year. Apples are the principal storage fruit, good winter sorts holding their form, color and flavor better than any other commercial fruit when held for long periods in cold storage. Another reason why the apple is a favorite in cold storage is that people use it continuously over a long period. A good apple is always a relish. The apple, too, is the fruit which best pays the producer to hold in cold storage.

From the nature of the case, mechanical refrigeration will usually be confined to transoceanic trade, and to cities and towns where the principal business of the refrigerating machinery will be the production of ice for commercial and domestic use, the cold storage warehouse being a side issue to ice-making. The fruit-grower who wishes to avail himself of the advantages of cold storage must either ship his product to the city or depend upon natural ice to reduce the temperature of his warehouse. If he is in a climate where a supply of natural ice is available, his most economical plan is to make provision to use it. If in the far south he must own an ice plant or purchase artificial ice.

To successfully handle peaches and plums in cold storage, one must nowadays have a supply of ice in order to avail oneself of the best service of the Fruit-Growers’ Express or other lines. The cars come iced, it is true, but before starting them on their journey it is safest for the grower to have a sufficient supply of ice to fill the pockets of the car.

To hold apples from harvest time until the 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 32°, 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
Ice is used. To accomplish this, non-conductors of heat 4.7 grams in favor of the sealed cans. This at least suggests the possibility of checking loss in weight by the use of non-porous storage receptacles. Barrels do not have any marked effect in checking this loss, as fruits stored in headed and open barrels differed only one-half pound in amount of loss during a period of 147 days, the total loss being 4½ pounds on a barrel of 139 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 the practical orchardist, however, efficiency in this respect must be sacrificed. But as air in this respect 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 may 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, 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 the end of the storage season, for the years 1890 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the American Agriculturist.

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:

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 1890 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the American Agriculturist.

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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. But as air in this respect 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 may 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 the end of the storage season, for the years 1890 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the American Agriculturist.

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:

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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 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 may 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 the end of the storage season, for the years 1890 to 1900, inclusive, is compiled from the weekly market reports on the Baldwin apple for New York city as published in the American Agriculturist.

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since passed the stage of an experiment, and the annual tonnage of such products is rapidly increasing. It is no
longer than 1880 that the Oceana carried the first
cargo of apples in cold storage from Melbourne to Eng-
land, and the first cargo of West India fruits was car-
brried in 1886 by the ship Nonpareil. Now California is
able to send her splendid products on the refrigerator cars
to New York, and thence to Liverpool by cold storage on
shipboard, and put the products in good order on the
English markets. With refrigeration, time is of less
importance than handling, shaking and a constant
temperature.

Storage machinery has been greatly modified during
the past two years. Small condensers, propelled by gas
engines, have become common, and, even withials, are now
available for use in hotels, men's 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 dis-
tribute 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 busi-
ness 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 sys-
tem," and operates by pumping chilled brine
of one of the salts, sodium, calcium or potas-
sium chloride, through coils of pipe in the
room to be cooled. Both these systems pre-
sent objections, which are of greater moment
to the horticulturist than to any other class
using cold storage. The temperature in the
immediate neighborhood of the cooled coils
is 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 de-
vised. A coil of pipe is arranged for direct expansion
and the air of the room to be cooled is drawn out by a
fan, passed over the chilled pipes, the temperature
lowered, and again carried back to the cold room into
which it is distributed from the ceiling by large wooden
conduits with numerous dampers and openings, so that
the cold can be distributed evenly through the room by
the constantly moving air. With this arrangement the
temperature can be kept constant and uniform through-
out 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>Cantaloupes</td>
<td>Carry only about three weeks</td>
<td>33-34</td>
</tr>
<tr>
<td>Cranberries</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>Dates, figs, etc</td>
<td></td>
<td>34</td>
</tr>
<tr>
<td>Figs</td>
<td>Direct</td>
<td>36-40</td>
</tr>
<tr>
<td>Grapes</td>
<td></td>
<td>36-38</td>
</tr>
<tr>
<td>Lemons</td>
<td></td>
<td>34-40</td>
</tr>
<tr>
<td>Oranges</td>
<td></td>
<td>34-45</td>
</tr>
<tr>
<td>Peaches</td>
<td></td>
<td>36-40</td>
</tr>
<tr>
<td>Pears</td>
<td></td>
<td>36-40</td>
</tr>
<tr>
<td>Watermelons</td>
<td>Carry only about three weeks</td>
<td>36-38</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>33-36</td>
</tr>
<tr>
<td>Celery</td>
<td></td>
<td>33-35</td>
</tr>
<tr>
<td>Dry beans</td>
<td></td>
<td>34-40</td>
</tr>
<tr>
<td>Dried corn</td>
<td></td>
<td>32-40</td>
</tr>
<tr>
<td>Dried peas</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>Dry tomato</td>
<td></td>
<td>34-45</td>
</tr>
<tr>
<td>Dried apricots</td>
<td></td>
<td>34-36</td>
</tr>
<tr>
<td>Parsnips</td>
<td></td>
<td>34-38</td>
</tr>
<tr>
<td>Potatoes</td>
<td></td>
<td>34-36</td>
</tr>
<tr>
<td>Sauerkrut</td>
<td></td>
<td>35-38</td>
</tr>
</tbody>
</table>

"Asparagus, cabbage, carrots, and celery are carried
with little humidity; parsnips and salsify same as
peaches and plums, except that they may be frozen
without detriment.

Apples when stored in barrels should not be stored
on ends, but preferably on their sides. Fig. 2411. A
temperature of 32° is considered most favorable.

In general, green fruits and vegetables should not
be allowed to wither. 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 perishable fruits, should be placed in
cold storage just when they are ripe. They will keep
better than if put in when not fully ripe. Pears will
stand as low a temperature as 33°. Sour fruit will not
bear as much cold as sweet fruit. Catawba grapes will
suffer no harm at 26°, while 32° will be as cold as is
safe for a lemon.

The spoiling of fruit at a temperature below 40° F.

is due to moisture. In storing apples, eight to ten cubic
feet storage room space is allowed per barrel, and twenty
to twenty-five tons daily refrigerating capacity per 10,000
barrels."

L. C. CORBETT.

Treatment of Fruits Intended for Cold Storage.—Cold
storage has come to be a factor of prime importance in
the marketing of many fruits, especially in apples,
pears and grapes. With the more perishable fruits, like
berries, peaches and plums, it is but little used, largely
for the following reason: The action of cold in preserv-
ing 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 de-
gree 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 con-
cerned in the normal process of ripening take place
much more rapidly than in winter apples or other fruits
that are naturally good keepers. By the time the more
perishable fruits reach market, in the ordinary course
of events, these changes have already progressed so far
that it is necessary to dispose of the fruit at once in
order to avoid loss. If, now, market conditions are un-
favorable 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
some reason it is desirable to hold perishable fruits in
cold storage, it is essential that great care be used in
selecting only perfectly sound, full-grown but unripe
specimens, and that these be placed as soon as possible
after picking in a refrigerator car or an ice-box for
transportation to the storage rooms. No perishable fruit that has been exposed to ordinary temperatures for twenty-four hours after picking is in fit condition for the above temperature maintained until they are taken out to be placed on the market. They will come out with a minimum amount of decay, crisp, full-flavored, and in condition to "stand up" much longer than if carried at a higher temperature. Bartlett pears put in the twig, at a temperature of 32°-35°, carry for two months to ten weeks. Ventilated barrels are sometimes used, but slatted bushel crates are preferable. Winter or late varieties of pears will carry much longer.

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-

F. S. EARLE.

Management, Temperatures and Prices.—The rapid advancement of the cold storage industry should be of great interest to the horticulturist. It is now possible to secure all the benefits, with a comparatively small investment. Mechanical refrigeration is best accomplished by employing what is known as the compression-ammonia process. Anhydrous ammonia, i.e., ammonia free from water and held in liquid form only under great pressure, is allowed to expand and vaporize in pipes submerged in brine. The ammonia, in changing from a liquid to a gaseous condition, absorbs the heat from the liquid in which the pipes are submerged. In this manner it can be brought to a temperature of zero or lower. 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.

Tomatoes, if sound, not broken or bruised, picked before they are thoroughly ripe, will, at a temperature of 40°, carry three to five weeks. Celery, if dry and sound, should, at a temperature of 34°, carry from three to four months. Vegetables, such as carrots, parsnips and turnips, at a temperature of 34°, carry successfully until June or July; if decay has set in before the products are placed in cold storage, it will not be entirely stopped but only arrested in a moderate degree, and to obtain any measure of success nothing but sound, perfect goods should be placed in the refrigerating rooms.

The following are the charges usually applied by those conducting public cold storages: Apples, 15 cents per bbl. first month, 10 cents each additional month; celery, 10 cents per bunch first month, 6 cents each additional month; cherries, 1 cent per lb.; grapes, 1 cent per lb. first month, 15 cents each additional month; maple sugar, 3 cents per lb. first month, 1 cent each additional month; peaches, per bbl., same as apples; per 1/2 bbl., 10 cents first month, 7 cents each additional month; melons, same as peaches; quinces, same as apples; vegetables, 25 cents per bbl. first month, 15 cents each additional month; cucumbers, per case, 15 cents first month, 10 cents each additional month. In very large quantities, season rates are sometimes made at comparatively lower rates.

Mechanical refrigeration is surely of paramount importance to the producers of vegetables, fruits, eggs, butter, etc. It provides a means by which they are not compelled to accept ruinous prices of 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 30 per cent, or until such time as the demand equals the supply.

S. R. MOTT, JR.
Now, with refrigerator cars of strawberries coming in from Florida in February and along up the coast till well into July, when the last strawberries come in from Maine and northern New York, berries just about as fresh and bright as "home-grown" are to be had in our eastern markets for five months. 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, and the "seasons" of other fruits are likewise extended in a lesser degree, and the failure of the local crop in any one section now has little effect on the local market. Michigan or Missouri may be sending peaches to New York, Boston and Philadelphia the same 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 constructed with ice-bunkers at each end of the car, with a capacity of 4 to 6 tons of ice for each car. Fig. 243.

One style has some two feet of the whole top of car awash ice-bunker, and is one of the best of cars if kept fullyiced all the while in transit. Railroads can attach this object to it slightly cheaper, and it can be kept icy, and when hot full the ice slides from one side to another going around curves, etc. Most of the leading railroads of the country own a number of refrigerator cars, and these are furnished free-to shippers who do their own icing.

There are several refrigerator car companies which own and operate cars, and for a specified sum they attend to loading the car and all the icing at initial points and return. They guarantee refrigeration until car is unloaded. This is the most expensive service, but is safest and best for long distances. But for one and two days' shipments, where the cars do 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-own their own cars, charging the expense along on the freight bill.

In loading a refrigerated 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 proper spacing of the rows. Two strips about 11/4 in. square, tacking a small nail down through them, one into each package. The packages are held in place, and the strips serve for the next tier of packages to rest on and have an air space of an inch between the two layers. In this way cars are loaded full up to eighteen inches from the top of the car, care being taken to have the richest or poorest carrying fruit in the bottom of the car, and the finest, long-keeping at the top; for if the ice-bunkers are not put "check-and-block" full all the time, the top tiers do not get as good refrigeration. It is also the custom of many marketmen to emblazon the 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 middle tiers are not so good as they would have been if better cared for. The best results in refrigerator car service are attained when the car has been loaded at least twelve hours before running, and the loading is quickly done by opening the car doors only a few times.

The writer's own plan, when fruit is abundant, is not to start loading a car till he has fruit piled in it; then with a jumper 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
Another very important point is the first re-icing. When 400 to 700 warm packages of fruit are put into a car that will hold, then close the doors, and, by lantern-light, work joes on inside till all these packages are best service from start to finish the ice-boxes should be may go a long time without re-icing and yet carry fruit quickly as possible. Once get all the heat out of the fruit packages and the ice-boxes then full, and a car may go a long time without re-icing and yet carry fruit in good order. But neglect the first re-icing twelve to fifteen hours, and there is always danger, while for best service from start to finish the ice-boxes should be kept full all the time. The most ice will be consumed in fruit-loading and in the first twelve hours thereafter.

When well re-iced en route refrigerator cars arrive at destination with bunkers nearly full of ice, and in many of the larger towns where a car-load of high-priced 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 southern cities of New York and New England after perfectly sound condition ten days to two weeks after being picked ripe from the trees.

J. H. HALE.

STORAX. See Nigella.

STORK'S BILL. Erodium and other members of the Geraniaceae family.

STOVE PLANTS. The term "stove" applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of bricks. Such structures came to be called stove-houses or stoves, and the plants grown in them "stove plants." (A "greenhouse" was in those days an unheated glass-house in which plants were merely kept alive over winter.) These terms still exist in England, but are supplied in the United States by terms of wider application. In the eastern United States, it is now common to use the term "greenhouse" for all warm temperatures for their successful culture in glass-houses. In this country such plants are spoken of as greenhouse 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 glass-houses. The names applied to plant houses in England are therefore: Stove, for tropical plants; intermediate house, for plants basking from warm-temperate climates; greenhouse, for those plants requiring the least degree of heat. A conservatory or show house is one in which plants are placed while in flower and usually kept at a 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 glass-houses are named cool-temperate house, warm-temperate house, tropical house, palm house, acacia and succulent house, experiment house and propagating house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stove plants is too heterogeneous to be treated exhaustively in a single book, because the stove contains thousands of dissimilar plant treasures from the tropics, especially those found at low altitudes. In general, the stove is the house which requires the most expense and care, the greatest heat and the highest atmospheric moisture. For the general principles of its management, consult Greenhouse Management. E. J. CANNING.

ST. PETER'S-WORT. Ascyron stoloniferum.

ST. PETER'S WREATH. Spiraea hypericifolia.

STRATIOSTÈRES (Greek, soldier; referring to the word-shaped leaves). Hydrastichéritea. The Water Soldier, or Water Aloe, is a hardy aquatic plant of small ornamental value but considerable botanical importance, and was introduced into the United States from the eastern parts of Europe, and has a rootstock creeping in the mud which produces at the bottom of the water tufts of long, narrow, sword-shaped leaves bordered by small spiny teeth somewhat after the fashion of Pandaniaceae. The ffs. 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 ffs. are several in a spathe, stalked, and have usually 12 or more stamens. The female ffs. are solitary and sessile in the spathe. The plant is a distinct calyx, which is not the rule among monocotyledons. Stratiotes 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 best encouraged from the fact that it spreads too rapidly. Technical characters: peduncles rising from among the ffs. to a few inches above the water, much thickened at the top, bearing a spathe of 2 bracts; ovary and stigma nearly as thickened as the hypanthium but with its fruit is acaule but somewhat succulent. It is offered by one American specialist in aquatics.

W. M. TINKER.

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 runner plants, either transplanted or allowed to remain where they form, will bear the following year. Usually the plants will continue to bear for four or five years, but the first and second crops are generally the best. It is therefore customary to drop the older beds, either the strawberry plant beds. The better the location of the strawberry plant beds, the shorter the rotation. In market-garden 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 North and is therefore 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. 2414 shows such a plant, and the roots trimmed for planting. Fig. 2415 shows the plant that has 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 the old crowns and the roots at the bottom are hard and black. These plants sometimes make good plantations under extra good care, but generally
Plate XXXIX. Strawberry test ground, with a truss of the Greenville variety.
they should be avoided. Pots are sometimes plunged under the new runners in June and July, and they become filled with roots by August or September. These pot-grown plants are excellent for fall setting in the home garden, but they are seldom employed in extensive commercial practice. Fig. 2416.

In Florida, according to Reifs, beds need to be reset annually, in September or October; plants set at this time produce a good crop in the following February, March and April. The plants may be produced at home, or they may be secured from the North. Excellent plants for Florida conditions are procured from North Carolina.

For the very finest berries, each plant is allowed a space or hill by itself, and cultivation is given both ways. For general commercial results, however, plants are generally set in narrow rows. The old method was to plant in rows 3-3½ feet apart and the plants from 12-15 inches apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a matted row. In this system some plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits, and is now passing away. The up-to-date grower starts with the assumption that the largest and highest colored fruits are found on plants along the outside of the rows, and therefore he plans to have as many outside rows as possible. 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 prolificacy of the variety as a plant-maker. If the plants used for a new bed are strong and start into growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually "bedded in," i.e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing. This system is shown, in a full-bearing bed, in Fig. 1486, Vol. III.

Strawberries are usually mulched in the fall in order to retard the season of bloom. Sometimes the crop may be retarded a week or ten days by this means, and cases are reported in which it has been delayed with commercial results somewhat longer than this. The mulch is usually more necessary in regions of light and precarious snowfall than in those in which the snow blanket is deep and lies all winter. In regions of deep and continuous snowfall, a heavy mulch is likely to prove injurious. Experience has shown that the best mulch is usually some strawy material. Along the seacoast, salt hay from the tide marshes is much used. In interior places clean straw, in which there is no grain to sprout and to make weeds, is very largely employed. Fig. 2417. In the South, pine needles are used. Sometimes loose strawy manure is used, and the mulch adds fertilizer to the soil as well as affords protection. Under ordinary conditions the mulch is three or four inches deep over the plants after it is fairly well packed down. It is not always possible, however, to mulch as heavily as this, since the material is likely to be expensive when one has a large area. The mulch is usually applied late in the fall after the ground has frozen, and if the material is abundant both the plants and the intervening spaces are covered. In the spring the mulch is raked from the plants as soon as they begin to start. Some persons allow it to lie between the rows as a cover to retain moisture and to keep the berries clean. The most expert growers, however, prefer to take the mulch from the field and to till the plantation once or twice before the plants are in bloom. The material is sometimes returned and spread on the loose soil between the rows. In the northern prairie states, heavy mulching is essential. Professor S. B. Green advises for western Minnesota and Dakota a covering of at least six inches of straw. This mulch is easily provided, since straw is so abundant in that country that it is often burned as the readiest means of getting rid of it. When not mulched in that region, the plants are likely to be killed outright or to start with a very weak growth.

Strawberry flowers may be either perfect or imperfect, and the nature of the flower is characteristic of the variety. In some kinds, the flower is perfect or hermaphrodite (having both stamens and pistils) and is consequently self-fertile. In others it is pistillate, producing no pollen, and requiring a pollen-bearing variety to pol-
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

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 Hawes (Fig. 108, Vol. II). 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 American book writings on the Strawberry are:

R. G. Farlee, "A Complete Manual of the Cultivation of

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 safer for one about to engage in Strawberry-growing to figure close to this total, aside from the cost of fertilizer.
to the New York market, yet he never saw cultivated Strawberries in that market before 1840, though there were probably a few before that time. It is probable that there are now more Strawberries carried to New York every fair day during their season of ripening than had ever been seen in that city during its entire history previous to 1840.

The introduction of Hovey Seedling about 1834 or 1835, and of the Jersey, or, as it was sometimes called, the Early Scarlet, a few years later, marked a new era in Strawberry culture. These were great improvements over the common wild fruit previously seen in the market; but it was not until the introduction of the Wilson, about 1854, that it became possible for almost every one who owned a small plot of land to have a supply of berries for himself and friends during the berry season. This modest little plant completely revolutionized Strawberry growing. Its fruit was much larger than any other then in cultivation, being also very firm and able to bear transportation much better than any other, and it seemed to be perfectly at home in nearly every soil and climate from the Atlantic to the Pacific ocean, and from Lake Superior to the Gulf of Mexico. In addition to all these qualities, it was marvelously productive. Soon after this, new varieties began to appear in numbers greatly exceeding anything ever before known. This progress has been kept up until the present time, and each succeeding year many new varieties are brought to notice. The increase in the cultivation of this fruit was not rapid until 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 ungraded 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 with August or early in September, but has never failed in spring setting. As early as the land is fit to be worked, put on about twenty fair-sized two-horse loads of manure per acre and plow it in; then top-dress with as much more fine, well-rotted manure, and harrow it in thoroughly. If fine manure cannot be obtained, it would be better to plow all the manure under, as coarse manure on top of the beds would be an annoyance, and cause more or less trouble the entire season. Whether the manure is wholly or partially plowed under, the land must be made fine and mellow before putting in the plants.

**Setting the Plants.** — The plants should be taken from beds that were set the previous season, if possible. Use a common six-tined manure fork and take up a lot of the young plants, being sure to get only the runners of the previous fall. Pick them out of the loose earth, taking off all the old dry leaves, and if they have long, nice, light-colored roots throw away all others, clip off about one-third of their length. Fig. 2411. Be careful not to let the sun shine on the roots for any length of time. During some of the hot sunny days of early 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 mellow. A boy follows with the prepared plants, and drops one at each crossing of the marks. He is followed by the setters, of whom there should be two to work to best advantage. They go on their knees between two rows, pick up the plants with the left hand and at the same time, with the fingers of the same hand, spread the 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 the bent end of 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
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 there are open spaces of any size, mince, hares, and is likely to get into the dirt, it is well to put back a little of the mulch after the thorough cultivation of the spring is done. For the spring dressing, wood ashes are to be preferred. If unleached, they should be applied at the rate of not less than 50 bushels to the acre. Twice that amount should be used if the ashes have been leached. If ashes are not to be had, put on well-rotted stable manure at the rate of about 20 wagon-loads per acre. The spring cultivation consists of pulling out by hand all the weeds that can be found among the plants and then hoeing over all the open spaces large enough to accommodate a common braid hoe. Do not work the ground more than half an inch deep, for the roots have much work to do within the next few weeks. Now it is time to begin to count the cost. We will consider the land worth $200 per acre:

**Expense of an acre of Strawberries up to picking time.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest and taxes</td>
<td>$15.00</td>
</tr>
<tr>
<td>Plowing, harrowing and surface-draining</td>
<td>$5.00</td>
</tr>
<tr>
<td>Value of 11,000 plants at $5 per 1,000</td>
<td>$55.00</td>
</tr>
<tr>
<td>Manure, 60 loads, at $1 per load</td>
<td>$60.00</td>
</tr>
<tr>
<td>Marking ground and setting plants</td>
<td>$1.00</td>
</tr>
<tr>
<td>Summer cultivation</td>
<td>$5.00</td>
</tr>
<tr>
<td>Training runners around the plants</td>
<td>$2.00</td>
</tr>
<tr>
<td>Winter covering and rooting of putting it on</td>
<td>$6.00</td>
</tr>
<tr>
<td>Taking off winter cover and spring cultivation</td>
<td>$5.00</td>
</tr>
</tbody>
</table>

**Total** $101.00

In a very dry and unpropitious year, the yield on the writer’s place was 7,136 quarts, or 223 bushels per acre; the gross receipts in cash were a few cents over $500 per acre. In the year 1886 the yield was over 8,000 quarts, or something over 250 bushels per acre; and the gross receipts $653 per acre. These were both hard years for Strawberries. In 1875 exactly one-quarter of an acre yielded 3,571 quarts, or 111½ bushels, of marketable fruit. The average price was 12 cents per quart. In 1876 one-fourth of an acre yielded a fraction less than 100 bushels. These were both favorable seasons for berries. But we will take the first mentioned crop for our estimate, as it was the poorest of the four. The boxes, and crates cost a fraction less than $7 per 1,000 quarts; picking, packing and carrying to the depot not to exceed $15 per 1,000:

**The story of an acre of Strawberries in an unfavorable season.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross receipts</td>
<td>$500.00</td>
</tr>
<tr>
<td>Cost of growing the crop</td>
<td>$301.00</td>
</tr>
<tr>
<td>Picking, packing and marketing (7,136 qts.)</td>
<td>$157.00</td>
</tr>
<tr>
<td></td>
<td>$318.00</td>
</tr>
</tbody>
</table>

**Net profits above expenses** $182.00
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 our 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 is a little sloping to one corner, where a pipe catches the water as the ice melts, and carries it from the building. It has an open space of nearly 12 inches all around the building, which lets the cold air pass below, where the fruit is. There are six tiers of shelves, one above the other all around the room below. Upon the floor above the ice is placed, and on the shelves below are the cases of fruit. About 50° is the best temperature to keep the fruit; if much lower than this, it is found that the fruit will not keep so long after being removed from the cooler. It is best not to throw fruit on the market, but to try to have it so good that it recommends itself. Endeavor to have it engaged to the retail grocers in advance. Then there is but one profit between the consumer and the grower.

**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 commend the Strawberry favorably to southern land-owners who would grow fruit for home use or for market are the following: its comparative freedom from disease and insect enemies; the ease with which it adapts itself to different soils and varied conditions of climate; the small cost at 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-buds, the grower may reasonably expect the following spring one-half to two-thirds of a crop. Being a water-loving plant and a liberal feeder, especially during fruiting season, the Strawberry accomplishes its best work in a soil capable of taking in the largest quantity of water and of holding during protracted drought the greatest amount of moisture within easy reach of the plant. This ideal Strawberry soil is found in the rather compact deep clay loams over the well-drained clay subsoils so abundant in most of the South Atlantic and the Gulf states. As to fertilizers, much depends on the kind of soil and treatment. Where the cereals are benefited by the
The first instance, an over-vigorous vine growth at the blooming period nor during the hot summer months. In strongly nitrogenous fertilizers be made just before the plant. In no case should heavy applications of than to apply in large quantities to land occupied by the plant is rendered too tender and too sappy to resist the expense of fruit will be the result; in the second, 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 and adequately used for Strawberries. It is better to fertilize heavily the crop that precedes Strawberries.
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 ear-heads 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 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.

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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, more or less—at least by hand weeding—to prevent it from becoming too foul during the second summer; but the process of thinning out and the careful cultivation necessary for a crop expected to make a paying return in fruit, are eliminated.

The triennial rotation is followed when two "main" or "money" crops are secured from a plat before its abandonment, and the permanent 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.
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 Longworth Prolific, have succeeded under such conditions, and it is to be among the most profitable. Whatever may be said of other parts of the continent of North America, it is an indisputable fact that the Plains region is very well suited for Strawberries. Good judgment in the selection of proper locations and the right varieties, thorough preparation of the soil and good culture will be abundantly rewarded.

H. E. VAN DEMAN.

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, the hot summer, which enforces dormancy as early as June on light loams in the more arid localities of the interior. Such soils become dry and hot to a depth of several inches in spite of surface cultivation and cause the dwindling and death of a shallow-rooting plant like the Strawberry, unless frequent irrigation is begun in time. This trouble is less acute on more retentive soils in regions of lower summer temperature and greater rainfall, and plants in such situations may survive the summer dormancy, but it is true that everywhere in California and even in the more humid states on the north that Strawberry-growing without irrigation results either in failure or only partial satisfaction and the venture is seldom to be recommended. It is, however, 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 litteral and alpine types. Some interest has been shown in development of cultural varieties from these sources, but no commercial significance has as yet attached to them. The varieties chiefly grown are different from those popular at the East. New varieties from the eastern states and 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 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 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. 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New varieties from the eastern states and of cultural varieties from these sources, but no commercial significance has as yet attached to them. The varieties chief
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 pot method as practiced at Cornell University is about as follows: As early in the spring as possible large plants are set in well-enriched soil. The 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 placed on each runner to keep it from growing beyond the pot. When the pot is filled with roots the young plant is cut from the parent stock, the pots lifted and taken to the potting shed or other convenient place, where they are at once shifted into the fruiting pots usually a 6-inch pot. The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting soil should have mixed with it bone-fouir 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 be filled with roots and the plants will have attained their full growth. At this time larger and firmer crowns will be had by careful attention to watering and subsequent drying off to almost the wilting stage than by watering the plants up to the time of freezing weather. The drying process seems to represent the late fall season and causes the plant to store up material in the crowns at an earlier period. At the coming of cold weather the soil in the pots may be allowed to freeze. It is very desirable that the soil be cold and dry before freezing; for if the ball of earth is wet there is danger of breaking the pots when the cold becomes intense. The period of forcing from the time the frozen plants are brought in until the ripening of the fruits will be about eight weeks. The time will vary slightly under different conditions of heat and sunlight. When first brought in, the plants should be cleaned of all dead or diseased leaves. The pots should be plunged to near the rim in some material that will retain moisture, e. g., tan bark or coal ashes. The benches or shelves should be as near the glass as convenient. A thorough spraying with Bordeaux mixture or some other fungicide should be made at once. For the first few days the house should be held at about 35°, 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° through the day, will be about right.
STRAWBERRY

Strict attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel hair brush is useful for distributing the pollen. A ladle or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. During the first week give one dilute application. After this give two applications a week, increasing the strength of the manure liquid each time. Well-rotted cow manure or sheep droppings furnish good material for this purpose. When the fruits are coloring the liquid manure should be withheld and only clear water given. This give two applications a week, increasing the strength of the manure liquid each time. As they swell, the fruits will need support, and the liquid manure should be given only clear water given. The clusters of fruits. They hold the fruits away from the sides of the pots, protect them from any water or liquid manure that is given the plants, and enhance the beauty of the potted plant. After one fruiting, the plants are worthless.

C. E. HUNN

STRAWBERRY BUSH. See Eonymus.

STRAWBERRY GERANIUM. Saxifraga serrenensis.

STRAWBERRY-RASPBERRY. Rubus rosifolius.

STRAWBERRY TOMATO. Physalis Alkekengi and other species of Physalis.

STRAWBERRY TREE. Arbutus Unedo.

STREPTILZIA (after the wife of King George III, Charlotte Sophia, of the family Mecklenburgh-Strelitz, a patron of botany). Scitamumales. Bird of Paradise Flower. A South African genus of 4 or 5 species of perennial herbs, with generally large, long-petioled leaves and showy flowers of peculiar form: rhizome subterranean or produced into a large woody stem: pedicels short: spathe long or short, peduncled. Strelitzia Reginae requires a good strong soil, a copious supply of water and considerable sunlight. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A 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-fld., the fls. orange and blue-purple. Winter. B.M. 119, 125.

AA. Plant with woody stems.

b. Fls. pure white.


BB. Fls. pale blue and white.

Nicola, Regel & C. Koch. Resembling S. Augusta in habit and foliage, but the fls. and spathe are much larger and the petals are hastily combined and blue in color. B.M. 7036.

F. W. BARCLAY

STREPTOCALYX (twisted calyx). Bromeliaceae. There are 7 species of Streptocalyx according to Mez (DC. Monogr. Phaner. Vol. 9) of Brazil. The genus differs from Bromelia in having strongly imbricated broad sepals and long corolla-tube. No species are in the American trade, but S. Fis. Major, Moritz, is described in horticultural literature (sometimes as Echmea Fis. Major, Morr. & Wittm.). It is a stemless pineapple-like plant, with 20–40 rigid lance-like 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.

STREPTOCARPUS (Greek compound meaning twisted fruit). Gesneriaceae. Cape Primrose. In October, 1826, there bloomed at Kew a most interesting gloxinia-like little plant, seeds and specimens of which had been collected in South Africa by Bowie, on the estate of George Rex, at Knysna. The plant was described as Didymocarpus 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 reddish leaves. It proved to be a poor grower and easy to grow. "So abundantly does it produce seed," wrote W. J. Hooker, in 1839, "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-
The introduction of this curious plant seems to have revived the interest in Streptocarpuses, an interest that has been kept alive by the frequent introduction of other species. The chief stimulus to the systematic breeding of these plants seems to have been the introduction of S. Dunnii, said by J. D. Hooker to be "quite the monarch of its beautiful genus" (but now excelled by S. Wendlandii). Seeds of this species were sent to Kew in 1884 by E. G. Dunn, of Cape Town. It is one of the monophyllous section to which S. polyantha belongs. In the meantime, S. parrisitissa, a species allied to S. Rezii, had been introduced from the Cape region. With the three species, S. Rezii, S. parrisitissa 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 Tydias." 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: Gesnerae, with ovary more or less inferior and fruit a capsule; Cyrtandrea, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. B. Clarke in vol. 5 of De Candolle's "Monographie Phanerogamarum," contains the genera Streptocarpus, Episcea, Cyrtandra, Aeschynanthus, Ramonda, and others. The Streptocarpuses are stemless or nearly stemless herbs, bearing 1 or more tubular nodding fls. on short scapes that arise either from the crown of the plant or from the midrib of a flat prostrate leaf: corolla-tube cylindrical, the limb 5-lobed and somewhat 2-lipped; perfect stamens 2, included; pistils with ovary linear, usually hairy, with style as long as or shorter than the ovary, and stigma capitate or indistinctly 2-lobed: fr. a linear 2-valved capsule, the valves twisting. The flowers are usually showy, blue or lilac, rarely yellow. The species are of three groups: the stemless monophyllous species, with one prostrate leaf from the midrib of which the scapes arise (this leaf is really an enlarged cotyledon, the other cotyledon not enlarging); the stemless species, with several or many radical more or less primula-like leaves (whence the English name "Cape Primrose"); the stem-bearing species, with opposite cauline leaves. The cultivated species chiefly represent the first two sections. In the American trade, only four specific names occur, S. Rezii, S. Galpinii, S. Dunnii, and S. Wendlandii; but since the hybrids represent several other species, these additional species are inserted in the following account. Streptocarpus is an African genus. The stem-bearing section is confined to central Africa and Madagascar, and the others to South Africa. Clarke's Monograph, 1883, describes 19 species, but S. Dunnii, S. Wendlandii, S. Galpinii and others have since been discovered. There are 25-30 known species.

Streptocarpuses are not difficult plants to grow. They are usually raised from seeds, the seedlings blooming in 8 to 15 months from starting. The seeds are very small, and care must be taken not to cover them too deep. Give an open sunny place in an intermediate temperature. They are not stove 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 these forms introduced from the wild.
b. Leaf one, prostrate on the ground, usually very large.
c. Fls. red.

Dunnii, Hook. f. Soft-hairy: leaf becoming 3 ft. or even more in length and 16 in. wide, thick-nerved, reddish tomentose 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-fl.: corolla long-tubular, curved, ¼ in. long, the limb narrow, bright rose-red. Transvaal. B.M. 6903. G.F. 3:699.—A very floriferous species, one plant sometimes bearing more than 100 flowers.

c. Fls. blue, mauve or lilac.

Saundersii, Hook. Hairy: leaf 1 ft. by 9 in., cordate, obtuse, coarsely serrate, yellowish green above and purple beneath: scapes 10-16 in. tall, bearing a com-
STREPTOCARPUS

polyantha, Hook. Hair: as compared with S. Nourdensi, 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. 4590.

Galpin, Hook. f. Hair: leaf ovate-oblong, obtuse, entire; scapes several to many, glandular-pubescent; fls. short and broad, being nearly or quite bell-shaped, the limb broad and subequal, rich mauve, with a white eye. Transvaal. B.M. 72:10. G.C. III. 11:139. —Named for Ernest E. Galpin, who discovered the plant.

Wendlandii, Damman. Fig. 2433. Hair: usually bearing a rosette of very small lvs. at the base of the midrib: leaf broad, usually 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. 74:7 (part of which is copied in Fig. 2433). G.C. III. 22:275. Gn. 45, p. 394. J.H. III. 24:223. —Probably the finest species yet introduced.

BB. Leaves several, rising from the crown.

Rezii, Lindl. Fig. 2434. Hair: 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 limb large and oblong, with reddish, short and broad, being nearly or quite bell-shaped, the limb broad and subequal, rich mauve, with a white eye. Transvaal. B.M. 72:10. G.C. III. 11:139. —Named for Ernest E. Galpin, who discovered the plant.

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BB. Leaves several, rising from the crown.

2435. Streptocarpus Kewiensis (x 1/2).

2436. Streptosolen Jamesonii (× 1/4).

STREPTOSOLEN

STROBILANTHES (Greek, cone and flower, referring to the inflorescence). Acanthaceae. A large genus containing about 130 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 greenhouse they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much syringing. Under unfavorable conditions they lose their leaves and become unsightly.

Lvs. opposite or rarely scattered, entire or toothed: fls. blue, violet, white or yellow, in terminal or axillary spikes or heads, or in loose cymes, mostly large; calyx deeply 3-parted, with linear lobes; corolla-tube narrow at base, straight or curved, enlarged above, limb of 3 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; seeds small, achenes.


STRYPHNOENDRON

STROPHELLIS (Greek, cone and flower, referring to the inflorescence). Acanthaceae. A large genus of about 7 species native to Mexico and the West Indies. They are mostly erect, branching, soft-wooded shrubs, 2-4 ft. high: lvs. opposite or sparingly scattered, entire or toothed: fls. blue, violet, white or yellow, in terminal or axillary spikes, large, pale violet-blue; corolla-tube very short, dilated into a subcampanulate throat and expanding into a limb 2 in. across; lobes orbicular, undulate. B.M. 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. (Goldthwaiss isophylla, Nees). An erect, much-branched, bushy shrub, 3-5 ft. high, slightly contracted at the base, 2-loculed; ovules 2 (rarely 3 or 4) in each locule.

11:355. — Used either for bedding or for pots. Blooms profusely in winter or summer, according to treatment.

Stropholirion (Greek for twisted rope and lily, referring to the inflorescence). Staphyleaceae. Five tropical American plants (according to Petersen in Engler & Prantl's Naturpflanzenfamilien), closely allied to Calathea, Maranta, Phrynium and Thalia. It agrees with Maranta and Thalia in having a 1-loculed capsule, and thereby differs from Calathea and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segments not standing opposite each other. From Thalia it differs, as does Maranta, in having 2 side staminodia rather than one. For culture, see remarks under Calathea.

Portean, Griseb. (Mardanta Portean, Horn.). Two to 4 ft. high, with maranta-like lvs., the blades long-elliptic or ovate-lanceolate, varying from emarginate to almost obtuse, purple beneath, bright green above with transverse stripes or bars of silver where: lvs. solitary or twin on the rachis, blood-red, the inflorescence simple or compound. Brazil. Lowe 26.

sanguinea, Sonder. (Mardanta sanguinea, Hort.). Plants about 1 ft. long, oblong-acuminate, purple beneath and green above: scape 12-20 in. tall, red towards the top, bearing a panicle of bright red and red-bracted lvs. Probably Brazilian. B.M. 4646. F.S. 8:783. —An old garden plant. Thrives in an intermediate house and frequently attains a height of 5 ft. when planted in a border. L. H. B.

STROPHOLIRION (Greek for twisted rope and lily, referring to the twining stem). Staphyleaceae. Very like Brodiea, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and expands into a subcampanulate throat and expanding into a limb 2 in. across: fls. solitary or twin on the rachis, blood-red, the inflorescence simple or compound. Brazil. L. H. B.

STROPHELLIS (Greek for twisted rope and lily, referring to the twining stem). Staphyleaceae. Very like Brodiea, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and expands into a subcampanulate throat and expanding into a limb 2 in. across: fls. solitary or twin on the rachis, blood-red, the inflorescence simple or compound. Brazil. L. H. B.

STRYPHNOENDRON (Greek for twisted rope and lily, referring to the inflorescence). Straphylostemonceae. 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, fleshy, cylindrical spikes. Fls. sessile, 5-merous; petals often connate to the middle, valvate; stamens none, free; pod linear, compressed, thick. Here belong *N. glaucescens* and *N. horridum*, both of which are known as Acacia, the latter as *A. juniperina*. Neither species is known to be cult. in America.

**STUARTIA** (in honor of John Stuart, Earl of Bute, a patron of botany; 1717-1702). Sometimes spelled Star- 

A. Styles united: petals always 5.
B. Stamens purple, spreading: capsule subglobose.
**Malachodendron**, Linn. (*S. Virginaea*, Cav.). Shrub, 6-12 ft. high: lvs. oval to oval-oblong, acute at both ends, serrulate, light green, pubescent beneath, 2½-4 in. long: fls. white, ½ in. across, with obovate spreading petals: seeds wingless, shining. May, June (July and August in the North). Va. and Ark. to Fla. and La. Gn. 14:336; 18, p. 628; 34, p. 280. G.C. II. 8:433. This species has the largest and showiest flowers.

**STURTEVANT, EDWARD LEWIS**, agricultural experimenter and writer, was born in Boston, Mass., January 23, 1842, and died at South Framingham, Mass., July 24.

**STURTEVANT, ALFRED**.

STURTEVANT

30, 1898. Though holding the degree of M.D. from the University of Maryland, Dr. Sturtevant never practiced the profession of medicine, but devoted his life to agricultural work; first specializing on Ayrshire cattle, then on pedigree corn (Wau-bakum) and muskmelons (Muscadine), and afterword 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 Linnaeus (say 1753), which, with his index cards and herbarium, is now preserved at the Missouri Botanical Garden in St. Louis.

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; he has 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.

Wm. Trelease.

STYLÓPHÖRUM (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. The British Red Book gives 3-4 species of perennial herbs, one native to southern Europe, the other 2 native to southeastern Asia. The flowers are numerous, white and usually united at the middle and sometimes tricuspidate at the apex, glabrous above, pubescent beneath, 6-10 in long; fls. fragrant, in loose racemes 3-6 in long or sometimes in clusters; corolla fully 2/3 in long, with spreading, oblong petals: fr. subglobose, about 2/3 in. across. May. S. Va. to Fla. L.B.C. 11:1016 (poor). B.B. 2:339.

b. Young branches, petals and racemes covered with a

grandiflora. Alf. Shrub, 4-12 ft. high; lvs. oval to obovate, shortly acuminate, usually narrowed toward the base, denticulate or almost entire, glabrous above, grayish tomentose or pubescent beneath, 2-3 in long; fls. fragrant, in loose racemes 3-6 in long or sometimes in clusters; corolla fully 2/3 in long, with spreading, oblong petals: fr. subglobose, about 2/3 in. across. May. S. Va. to Fla. L.B.C. 11:1016 (poor). B.B. 2:339.

b. Young branches, petals and racemes soon

Obassia, Sieb. & Zucc. Shrub or small tree, 30 ft. high; young branches and petals covered with a

quickly disappearing floccose rusty tomentum; lvs. orbicular to broadly obovate 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; rachis glabrous; pedicels and calyx finely tomentose; corolla 3/4 in long, with slightly spreading obovate-oblong petals: fr. 2/3 in long, ovoid, pointed. May. Japan. S.Z. 1:46. B.M. 7039. G.C. III. 4:331 (not correct in regard to habit). A.F. 12:30. M.D.G. 1898:16.

a. Fls. in few-fl. clusters or short racemes: lvs. 1-3 in. long.

b. Petals 5-8; branches and lvs. beneath pubescent.

California, Torr. Shrub, 5-8 ft. high: lvs. broadly oval or ovate, obtuse, entire, stellate pubescent, at least when young, 1-2 1/2 in long; fls. in few-fl. tomentose clusters; pedicels about as long as calyx; corolla 3/4 in long, with 5-8 obovate petals; stamens 10-16, with the filaments pubescent and connate about one-third. April. California.

b. Petals 5; lvs. almost glabrous, acute.

c. Pedicels about as long as calyx, puberulous.

Americana, Lam. (S. glabraeum, Cav. S. lavigatum, Alf.). Shrub, 4-8 ft high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1-3 in long; fls. nodding, in few-fl. 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. 10:900. B.K. 11:352 (as Halcyia parcellophora).
SUCCEULENTS are desert plants that live on a minimum of moisture. Vegetable gardens are said to be "succeulent" when they are tender, sappy, full of juice, "as lettuce or cucumbers. In ornamental gardening "succulency" is cultivated in 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 aloes as, from 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 leaves as succulent as the aloes are usually kept in pots for the decoration of verandas, etc., but could probably be grown in the open air in many places. They seem to be worthy of trial by northern florists. Flora Capensis contains many succulents which are 5 to 11 in a raceme. An interesting feature of the plant is its large bladdery-like pod, which sometimes measures 2 to 4 inches. Botanically Sutherlandia is very imperfectly understood. There are at most 5 species, or one very species may prove to be the only one. Generic characters: fls. as described above; calyx campanulate, 5-toothed; stamens 9 and 1; ovary stalked, many-ovuled; seeds reniform. At the Cape S. frutescens runs into two forms. The common or typical one has the leaflets glabrous above, with the veins and veins of the leaflets as described above, while the sea-side form var. spectabilis has white hairs on both sides. In cultivation there seem to be three forms: (1) the typical species, which is generally treated as an annual in Europe. If Sutherlandias are kept in a greenhouse, they become woody and unsightly and lose some of their foliage. Young, compact and bushy specimens are preferred. (2) A form with larger red fls. (var. grandiflora), which in France at least does not flower until the second year. (3) A white-flowered form, which is probably one of two different things cultivated under the name of S. floribunda, but which is here called S. frutescens, var. albula. Sutherlandias 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 summer for several months. They seem to be usually kept in pots for the decoration of verandas, terraces, etc., but could probably be grown in the open. Sutherlandias are grown in many parts of the world, and the seeds of var. grandiflora are generally sown in June or July, and the plants wintered in a greenhouse. They bloom toward the end of May, which is earlier than the typical forms. For winter treatment the French advise more prun- ing and as much air and light as possible. In America the Sutherlandias seem to be known only in California, though an eastern dealer has recently offered one under the name of "Scarlet Bush." The typical form, S. grandiflora, is worthy of trial by northern florists. Flora Capensis: 2212. The species is hardy at San Francisco. 

**SUKSDORFIA** violacea, Gray, and Sullivânia Oregána, S. Watson, are two small perennial herbs of the saxifrage family native to the Columbia river region. They were once offered by western collectors but are not known to be in cultivation. They are fully described in Proc. Am. Acad. Arts. Sci., the former in 15:41, the latter in 14:292.

**SUMACH.** See Rhizoma.

**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. of Agric., by Harvey W. Wiley, on "The Sunflower Plant, its Cultivation, Composition and Uses," 1901.
Australian undershrubs and herbs, differing from Colutea chiefly in smaller stature and the large lateral stigmas. Flowers pea-like, in axillary racemes, purple, blue, red, yellow or white, often showy; standard or vexillum large and showy, orbicular; wings oblong, twisted or falcate; stamens 9 and 1; fr. a purplish inflated pod, which is sometimes divided by a partition and sometimes with the upper suture depressed; seeds small and kidney-shaped: lvs. unequally pinnate, usually with several or many small leaflets. 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. galegifolia*, var. *albiflora*.

*S. galegifolia*, R. Br. (*Virga galegifolia*, Andr. *Colutea galegifolia*, Sims. *S. Osbornii*, Moore). Small, glabrous, attractive shrub, with long, flexuose or half-climbing branches: lfts. 5-10 pairs and an odd terminal one, small, oblong and obtuse or somewhat emarginate; racemes axillary and mostly exceeding the foliage, bearing rather large deep red fls.: pod 1-2 in. long, much inflated, stipitate, Australia. B.M. 792. — *Swainsona 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 continuous bloomer. Cuttings taken in late winter bloom in summer; these plants may then be transferred to the house for winter bloom, although maiden plants are to be preferred. By cutting back old plants, new bloom may be secured. Cuttings grow readily. The plant is easy to manage. The original form of *Swainsona* is little 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. L.R.B. 17:1642. A.F. 8:1173; 10:611; 11:1180. Gng. 5:185. — In North America this is now one of the most popular of white florists’ flowers for use in winter decorations. It has been called the "Winter Sweet Pea" because of the shape of the flowers, but it has no fragrance. 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 preferable to the border.

Var. *rosea*, Hort., has rose-purple fls., and is somewhat dwarf. *S. coronillaflora*, Salisb., probably represents this form or something very like it. B.M. 1755. *S. coronillaflora* 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. *violacea*, Hort., has rose-violet fls., and is somewhat dwarf. *S. coronillaflora*, Salisb., probably represents this form or something very like it. B.M. 1755. *S. coronillaflora* 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. ferrandi*, Hort., is called a "garden variety" by Kew authorities. Var. *alba* is described in R.H. 1856, p. 592, and var. *brachycome* is in the American trade.

L. H. B.

**SWALLOW THORN.** *Hippophae rhamnoides.*

**SWAN RIVER DAISY** is *Brachycome iberidifolia.*

**SWEET ALYSSUM.** See *Alyssum maritimum.*

**SWEET BASIL.** See *Basil.*

**SWEET BAY** of general literature is *Laurus nobilis.* In America, *Magnolia floribunda.*

**SWEET BRIER.** *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 perennial 3 ft. tall, with very large, downy, grayish green, much-divided leaves, hairy stems and leaf-stalks, small or falcate; the stems 9 and 1; long white flowers, and large brown seeds of transient vitality. The leaves, which have an aromatic, anise-like, sweetish flavor and odor, characteristic of the whole plant, are still occasionally employed in flavoring soups and salads, though their use as a culinary adjunct, even in Europe, is steadily declining. In American cookery, the plant is almost confined to 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-
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, tarragon, balm and basil, arranged approximately in their order of importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs combined. Hence some seed-men do not rank parsley with Sweet Herbs. Sage is the universal flavoring for sausage and the seasoning for excellence for rich meats such as pork, goose and duck. It is more widely cultivated than thyme, savory and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken and veal. With the exception of spearmint, without which spring lamb is deemed impotent, 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 then they have only a very limited sale, being restricted mainly to the foreign population and to such restaurants and hotels as have an eucalyptus patronage.

In many market-gardens both near to and remote from the large cities, sweet herbs form no small portion of the crop, since most of them, when properly packed, can be shipped in the green state even at a considerable distance, and when the market is ever 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 in early spring, though cutture, 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 garden soil of fine texture, kept clean by frequent cultivation, gathered on a dry day after the dew is off, dried in a current of warm, not hot air, rubbed fine and stored in air-tight vessels.

For specific information see articles on the following:

- Anise, Anisum, Pimpinella, Carum, Carvi, Carvi, Coriander, Dill, Fennel, Horseradish, Hyssop, Marigold, Marjoram, Mint, Parsley, Peppermint, Sage, Samphire, Savory, Tarragon, Thyme.

**SWEET LIME.** See Lime.

**SWEET MARJORAM.** See Origanum.

**SWEET PEA (Lathyrus odoratus. See Lathyrus for botanical account.)** For structure of the flower, see **Legume.** Figs. 2441-44. For its beauty and fragrance, the Sweet Pea is the queen of the large genus to which it belongs. Long a common garden annual, within recent years it has been brought to a high degree of development, until it ranks with the most popular garden favorites. It is also grown for high-class exhibitions and floricultural competition.

Its early botanical history has been traced back to 1560. The whole history of the Sweet Pea is characterized by S. P. Dicks, of London, in American Gardening, for July 24, 1897. The origin of the Sweet Pea is divided principally between Sicily and Ceylon, the origin of the flower being indistinguishable from the former island and Sardinia. Sicily was the native habitat of the white variety, but all obtainable testimony credits Ceylon with the original pink and white variety known as the pink and the white. Thomas Lear, and frame the original red out of which the crimson-scarlet sorts have come. Father Francesco Cipani, a devout Italian monk and enthusiastic botanist, is credited with being the first cultivator of the flower, at Pompeii, Sicily, in 1609, and the seed of the purple variety was sent by him to England and elsewhere. The seed of this flower became an article of commerce as early as 1760. In 1792 a London seed catalogue listed 5 varieties, the black, purple, scarlet, white and Painted Lady. About 40 years later the striped and yellow are found named on the list. Not until 1860 do we find any further advance, when a blue-edged variety was offered, since known as Butterfly. In 1865 Invincible Scarlet won a certificate. In 1868 Crown Princess of Prussia appeared in Germany, and gave us the first light flesh-pink. Adonis in 1890 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 somewhat improved size and form. Orange Prince, the dark maroon Boreatton, and the deep bronze-blue of Indigo King, were among the cheering signs of his success in originating colors. But his novelties did not meet with popular appreciation till about 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, Easton, 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 arose in America the increased demand for the seed led to the successful experiment of growing it in California. The demand soon increased till 125 tons of this seed were produced by the California seed-growers, and now practically the world's supply comes from that source. This also led to the production of American novelties in this flower, the extensive seed-growers having unequalled opportunity for finding new sorts and also of making them by cross-fertilization. The American novelties have the advantage of being introduced with stronger seed than the Eckfords. The complete list of varieties in 1898 numbered about 150 named sorts. The colors now represented are white, light primrose,
Plate XL. Sweet Pea. Lathyrus odoratus.
primrose-cream, buff-cream, buff-pink, various shades of light pink, flesh-pink, rose-pink, several shades of bright rose, scarlet, crimson-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 sets and also in contrasted and blended colors, and all these colors are now found in stripes and flakes. In 1877 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 spotting the plant totally abandons its long habit, making a mass of dwarf foliage, the blossoms being of the usual size, but with very short stems.

The best canon of judgment gives no encouragement to the so-called "double" Sweet Pea, the grandiflora single form being the approved type, as it certainly is the most graceful and best adapted to the flavor. 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 inches long are occasionally exhibited, and the flower cannot be said to have high culture unless the stems are well on towards 10 inches in length. The finest grandiflora type of blossom has a standard which when pressed out will be nearly circular and will cover a silver dollar. The finest exhibition stock will now show some blossoms that measure 1½ 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 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 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 vines with 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

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 popularization. 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 climate and 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 land of flowers—California. In California, finely ripened seed can be produced in such large quantities that in two years...
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. Our experience 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 Potatoes under the crown and unlike the common potato they

2444. Three varieties of Sweet Pea, about half natural size, indicating the progress in size of flower.

The figure on the left shows a variety of the last generation; that on the right an average flower of today; the grandiflora type, reduced from a flower 1½ in. across. Larger flowers can be secured, but it is a question whether they are desirable.

Two other distinct types have been originated in this country, the Bush Sweet Pea, which stands half-way between the Cupid and tall Sweet Peas in growth, needing no trellis or support but with the foliage held well above the soil and the flower-stems of greater length than in the compact Cupids. This type is also especially adapted to hot weather and dry soils, having a splendidly developed system of fine fibrous roots. The second type is the result of breeding and selection, as exemplified in Burpee Earliest of All, which has the true vine-like 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 sacrifice of size in the flower or of length in the stems. With this variety and early planting a great show of flowers may be had even in the southern states. Its early flowering habit makes it the most desirable of all varieties to grow under glass for winter flowering. Herebefore, the enthusiasm for Sweet Peas 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 better locations, there is no reason why they cannot be grown under more widely varying conditions than any other popular flower.

E. D. DARLINGTON.

SWEET POTATO. Ipomoea Batatas, which see for botanical account.

Commercial cultivation of the Sweet Potato.--The cultivation of the Sweet Potato as a staple crop is confined almost exclusively to the southern states. While it is true that this plant is grown in various 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 39th parallel of latitude. Hence the cultural details here given, as well as the memoranda on diseases, are compiled from a strictly southern standpoint.

Methods vary but little. Local environment enters less as a factor into Sweet Potato culture than into any other horticultural industry of the country. For this very reason it is remarkable that there should occur such extraordinary variations in type as are everywhere noted, and for which local environment, if anything, should be held responsible. So marked are these variations that without apparent cause any given "variety" so-called—more correctly, perhaps, "selection"—will develop, when transferred a few hundred miles from its place of origin, after a few years of cultivation in the hands of half a dozen different growers, just that many distinct types, each differing materially from the other in size, color, number of eyes, sweetness, maturity, and habit of growth. This difference extends, sometimes, even to a change in the form of the leaf itself from possibly an ovate shape without any margin to a very narrow, lanceolate leaf. Slighter than an apple leaf has, to a sagittate or halberd form or even to one deeply eleft or indented. See Fig. 2446.
Propagation is effected altogether by means of shoots, mostly those from the root. While blooms are often followed by tiny tubers, particularly in the extremities, they are nearly always imperfect and invariably drop from the pedicel. No ovaries ever develop. Therefore the remarkable series of rapid transformations observed in the Sweet Potato could be credited entirely to an active and persistent tendency in the plant to bud variation—in which it must be admitted to be a veritable kaleidoscope.

Propagation. — "Draws," or developed sprouts from root-buds, supply the readiest and, indeed, the only practicable means of propagation. Tubers of the last season's crop are "bedded" for this purpose; that is, an outdoor hotbed is constructed in which the tubers, placed in a single layer, close together, and covered with several inches of soil early in spring. In a few weeks the latent buds of the tubers, under the stimulus of the heat from the fermenting manure, will have sprouted, and by the time all danger from frost has passed a dense growth of "draws," or "slips," will cover the bed. These are removed from the tubers, set by hand in the field in rows four feet apart—the plants eighteen inches, generally, in the row. The size of the bedded tubers does not affect the crop. As good results are obtained from small as from large potatoes. Even the smallest tubers or "strings" consistently planted from year to year, produce as heavily as the choicest selections. This is but logical if we remember that the Sweet Potato is an enlarged, 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 sightly tubers—due, doubtless, to the fact that by this method the mycelium of the black root rot is excluded from the hybrid bed to the field.

Soil and Fertilization. — Although a gross consumer of nitrogen, the Sweet Potato cannot advantageously occupy "bottomland." With this reservation it may be said that almost any land will produce potatoes. Yet a 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 most approved fertilizer formula has been found to be, per acre, about as follows:

| Nitrogen (ammonia equiv. 50 lbs.) | Lbs. 40 |
| Phosphoric acid | 90 |
| Potash | 50 |

This requirement would be met by a compound of:

| Nitrate of soda | 360 |
| Sulphate of potash | 160 |

Total | 1,000 |

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 tendency of the leaves which in manures 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 or compost is an excellent substitute for the Sweet Potato; but is, of course, too variable in character and too uncertain in quantity to be generally available.

A complete summary of methods employed in Sweet Potato culture would occupy too much space. They are, moreover, too familiar to require repetition. Yet it is desirable to call especial attention to certain points which have been insufficiently discussed in previous publications. First among these is the practice of premature planting. Against this tendency earnest protest must be entertained, and in the name of wise loss. When an early market crop is not the object there is no need for haste in putting out the draws, since the season is abundantly long for leisurely planting, even in June, after the scarcity of early frost. If planted in May, or earlier, with the long southern season, the crop is likely to mature before the approach of cold weather permits the proper housing. The consequent and usual result is a "second growth," which produces tubers to the inroads of the "soft rot," which causes great loss.

A deep, mellow soil-bed, with an extended season, unquestionably will produce more and larger, but later, tubers. Shallow preparation will yield an earlier crop. It follows that the deeper the soil the earlier the planting may be effected.

Preservation. — Were it possible to successfully and inexpensively preserve through the winter the Sweet Potato crop, southern agriculture would be practically revolutionized. Land capable of producing a bale of cotton, worth, say $40, will readily yield 500 bushels of potatoes, of half the cost for cultivation worth, at 20 cts. per bush, $60. This the planter would gladly take, at harvest time, but there is then no market at any price. Yet six months later he cannot supply the demand at 60 cts., or $300 per acre. These figures are conservative. Even on poor soil, producing 500 pounds seed cotton (one-third of a bale) per acre, the yield in Sweet Potatoes—100 bushels, a very small output—could be sold in the spring for $60 or possible to successfully keep the tubers through the winter. Many succeed in so doing, and reap the reward, but it is still an unsolved general problem. Methods, too, are variable in the extreme—and this is one notable exception to the rule of uniformity prevailing in Sweet Potato culture. Climate and local environment seem here to play an important part, and means of preservation found successful in one place prove quite unserviceable in another—personal variation, even, entering as a factor in the problem, one man failing where another, by the same methods, succeeds. Many ways have been devised and practiced, some simple, some complex; but none has been found so effective by its enthusiastic originator or advocate to be absolutely infallible.

Nothing has yet been found that will effectively supersede the well-known popular method of "banking" or "hilling" in quantities of from 30 to 50 bushels, according to the different local customs which prevail in each community. The ordinary practice is to heap the tubers in a conical pile around a perforated wooden container, blue, covering them with a few inches of dry pine straw, then a layer of corn stalks, and finishing with three inches of dry sand and afterward two or three inches of clay or other stiff soil. The hill may be constructed either under shelter or out-of-doors. If the latter it is well to protect with a covering of boards to keep off the rain, though not absolutely necessary.

Diseases and Maladies. — A few of the most important maladies of the Sweet Potato—the cause, indeed, of nine-tenths of the loss experienced in attempts to winter the crop—will be noted in the probable order of their importance:

(a) Soft Rot (Rhiizopus 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 abandoned places, chiefly of the tuber, especially when the potatoes
are stored in large bulk, without sufficient opportunity to dry out, and is therefore the main cause of loss with stored potatoes, developing rapidly and immediately, under favoring conditions, and reducing, sometimes in a few weeks, the so-called "drams," or representatives of a bin or hill to a pulpy mass of corruption, emitting a most disgusting odor. A few simple remedial measures will greatly reduce loss from this cause: 1. Dig only when the soil is dry. (2) Dig before tubers become sappy from a "second growth." (3) Remove all affected tubers before storing. (4) Use padded baskets in handling to avoid abrasion. (5) Store in small bulk and keep dry and well ventilated.

3. Black Rot (Ceratotheca fimbriata): 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 deplored because it is not so immediately noticeable, and tubers containing its germs are more likely to be housed. The black rot does not produce a pulpy mass, though effectively destroying the entire tuber. It frequently makes its appearance on the young draws at "setting-out time." Remedies: careful selection—1st, of sound tubers for bedding; 2d, of perfectly healthy draws for setting; 3d, where these conditions cannot be fully complied with, by planting the bulk of the crop with cuttings from the vines, thus minimizing the damage. The use of copper sulfate, or any of the standard fungicides, either as a spray or for soaking the tubers, is not advisable; for, since the mycelium of most of the fungi causing decay in the Sweet Potato is lodged in and protected by the interior cells of the tuber, surface treatment would prove more or less futile.

6. Soil Rot (Acreosytes 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 evaporation of the vegetable tissue due to a resumption of rapid growth when wet weather follows a period of drought, particularly when the soil is a stiff clay, produces the primary "crack-ing" and the spores of the fungus, finding a ready bedlam, 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 safest preventive—and this is true for any and all rots—is 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.

4. Other Fungi: Several other fungi are serious enemies of the Sweet Potato, as the stem rot, white rot, dry rot, potato scurf, leaf blight, etc.; but these do not compare with the damage produced by the first three—soft rot, black rot and soil rot.

A matter of the first three, it matters little to the practical grower whether or not he

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is able to distinguish one from another. After the disease has spread across the acres of one of them have been permitted to develop and the resulting decay once appears, it is usually too late to put remedial measures into effect. Remedies, in this case, must precede manifestation of disease. Every possible precaution should be observed at one and the same time against them all. Proper preventive effort during harvesting will be found a sure guarantee against loss from decay than the most elaborate structure or the most carefully detailed method of housing yet devised, and when thoroughly enforced, little apprehension need be felt as to results, no matter what plan of preservation is adopted.

To end this following summary of procedure will be found serviceable:


b. Rotate the bed. Never use old soil or old manure a second season.

c. Dig only when the soil is dry.

d. Dig before tubers are rendered moist and sappy by a "second growth," and to this end never plant too early in spring.

e. Use padded baskets in handling to prevent bruising and abrasion.

f. Handle with scrupulous care.

g. Reject all affected tubers before storing.

h. Store dry. In small bulk; if in bins erect bulkheads and use flues for ventilation.

i. Use only perfect tubers for bedding, rejecting any showing symptoms of decay.

j. Use only healthy and unaffected draws for setting out.

k. Where draws in bed are affected with diseased roots (black rot) and cannot be thrown away, plant in a separate pit and take cuttings from their vines later for the main crop.

Varieties. — Since new varieties of the Sweet Potato can originate only by bud variation, it is a marvel where and how all of the different types arise. The writer has personally cultivated and tested some fifty odd kinds, and there doubtless exist, in all, 75 or 80—the number still increasing. But one uniform method of classification exists—that by the "leaf" 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 yielder of first quality, a safe keeper and free from disease. No potato embodies, superlatively, all of these characteristics. All of the heaviest yields belong, unfortunately, to the "milky" or "turpentine" group—as Norton, Hayman, Southern Queen, White St. Domingo, Early Golden, etc.—and their sappy consistency prevents them from keeping well, while their quality is uniformly poor. Regarding quality, however, tastes differ. The northern market prefers a dry, mealy potato, represented by the Jersey or Nansemond strain. The southern market, on the other hand, demands a rich, sugary potato, like the Georgia or Yellow Yam, which is generally considered

546. Leaves of Sweet Potato

Adapted from Bulletin of the Georgia Experiment Station.
SWET POTATO

to be the standard of excellence, and is a good keeper through the winter. 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 tube and glandu.

SWERTIA (after Emanuel Sweert, a bulb cultivator of Holland and author of Florilegium, 1622). Gentianaceae. About 40 species, widely scattered about the world but mainly from S. Asia, of annual or perennial herbs with simple leaves, mainly radical in the perennial species and yellow, blue or white flowers in loose or rather dense corymbs.

SWET VERNAL GRASS. See Anthoxanthum.

SWET SULTAN. See Centaurea moschata.

SYMBIOSIS is the intimate association of two or more distinct organisms, with benefit to one or 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 syntropism 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 root 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 (chlorophyllless). (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) mutual benefit results from the union of two organisms capable of living separately, as the bacteroid and the roots of the Leguminosae; (c) the symbionts are so intimately connected in their growth as to suggest as single individual, as the union of algae and fungus to form a lichen. (4) Prototrophy, the wet nurse relationship, as in the lichen Lecidea intumescentia, which eventually gets its nourishment by means of a lodger, a different lichen. (5) Contingent symbiosis, when one symbiont lives in the interior of another for shelter, as Nostoc in the thallus of Hebeloma, Lema, Cyes, Gunnera; and Anabaena in Azolla.

SYMMORCOPAS (in Europe is Acer Pseudo-platanus: in America Platanus occidentalis). The Symmoric of the ancients was a kind of fig known as Pharamas' Fig, Ny- momara antiquorum, or better Ficus Symmoricus.

SYMPHORICARPOS (Greek, fruit borne in clusters). Caprifoliaceae. Shrubs with simple, opposite, oval, entire and ciliate leaves: fls. small; calyx 4-5-toothed; corolla campanulate or bell-shaped, 4-lobed on short pedicels; stamens 5, exerted; stigma capitate: fr. a 4-valved, but 2 seeded berry. About 10 species. These little American shrubs are all excellent plants for covering the ground under trees, for mounding 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 cuttings.

A. Fruit white.
B. Stems and style included.

SYMPHORICARPOS (x 1).

BO. Stems and style exserted.

occidentalis, R. Br. Wolfferry. This may be considered as the western form of our eastern species, but it is less attractive than the preceding, as it is less fruitful and the individual berries are not as clear and waxy. Lvs. ovate: fls. in spikes, both terminal and axillary; stamens and style exserted: frs. the same dimensions as white. July. Mich., north and west. G. F. 1:297. B. B. 3:236. A shrub of about the last and closely resembling it, the exserted stamens and style-being the most obvious distinction.

AA. Fruit red.

vulgaria, Michx. INDIAN 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 Dakota, south to Ga. and Tex. Mn. 1, p. 84. Gn. 34, p. 280.—A rather more compact bush than the two previously described species. Valuable because of its abundant persistent fruit and foliage. Var. variegatum, 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.

SYMPOHYANDRA (Greek: authors grown together). Campanulaceae. Symphyandra Holmiana is a hardy perennial herb, 1-2 ft. high, with pendulous bell-shaped flowers ½ 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 manifested 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, fleshly roots, needs a dry position and soaks itself".

Symphyandra is a genus of about 5 species of perennial herbs found in the region of Asia Minor. Its special botanical interest lies in the fact that the authors 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: candex thick: lvs. broad, usually cordate, dentate: radical lvs. long-stalked: stem-lvs. few or small: fls. white or yellowish, usually nodding, racemose or panicled: indorsement cuticular: calyx tube nodate, hemispherical or top-shaped, with or without reflexed appendages between the lobes: corolla bell-shaped, 5 lobed: ovary 3-lobed.


This desirable bellflower has been cult. by amateurs in the East. It sometimes spreads rapidly in half-shaded rockeries and sows itself.

W. M.

SYMPOHYTHYUM (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 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 globose. Of easy culture in any good soil. The shade of evergreen trees is not objectionable. When grown for the beauty of the variegated foliage the flowering stems may be removed with advantage.

AA. Lvs. deciduous 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 deciduous on the stem.

asperinum, Dorn. PRICKLY COMFREY. Fig. 2449. A hardy 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. Canavese. B. M. 285.—Var. variegatum, Hort, has leaves distinctly margined with yellow.

J. B. Keller and F. W. Barclay.

SYMPLOCAROPSIS. See Spathyema.

SYMPLOCOS (Greek, symplocos, entwined or connected, the stems being connate at the base). Including Hopaea and Loddia. Styracaceae. Ornamental deciduous or evergreen trees or shrubs, with alternate, entire or serrate lvs. and usually white fls. in racemes or panicles, rarely solitary, followed by berry-like, red or blue fruits. Only the deciduous S. crataegoides is hardy north; it is a shrub with abundant white fls. in spring and bright blue fruits in autumn. It thrives in well-drained soil and sunny position. The half-evergreen S. tinctoria, which seems not hardy north of its natural habitat, prefers moist soil and shady situation. The evergreen species are all tender and little known in cultivation. Prop. by seeds, which usually do not germinate until the second year, and by greenwood cuttings under glass; also by layers.

About 160 species widely distributed through the tropical regions except Africa; only a few outside the tropics. Mostly trees, in terminal or axillary racemes or panicles, rarely solitary: calyx lobed; corolla 5-parted, often almost to the base; stamens numerous, usually connate at the base; style filiform: ovary 2-5-lobed; inferior: fr. a drupe, with 1-5-seeded stones. Several species have medicinal properties; S. tinctoria yields a yellow dye.

crataegoides, Buch.-Ham. (S. pauciflora, Wall. Loddia crataegoides, Decne.). Deciduous shrub or sometimes a tree, attaining 40 ft., with slender, spreading branches, forming an irregular open head; young
brachyphallos: lvs. short-petioled, oval or oblong to ovate or obovate to orbicular, usually acute or acuminate, distinctly veined beneath and more or less pubescent at the veins, rarely glabrous, 1/2-3 in. long; fls. white, fragrant, 1/2-1 in. across, with spreading oblong-oblong petals in long-flowering racemes: fr. usually 1-seeded, oval, blue, about 1/2 in. high in June. May, June. Himalayas to China and Japan. G.F. 5:389. M.D.G. 1901:100, 101.

Syngonium (Greek name, said to refer to the cohesion of the ovaries). Araceae. About 10 species of tropical American woody climbing or creeping plants, with milky juice and stems rooting and leaf-bearing at the nodes: lvs. sagittate, with age pedate 5-9-parted, on long petioles, with a persistent accrescent sheath: peduncles short: spathe yellowish or whitish green; tube small, ovolid, persistent; spadix shorter than the spathe: spadix with 3-4 stamens, pistillate fl. with oblong-ovoid 2- or abortively 1-loculed ovary; seeds solitary in the locules, obovate or globose, black. All the aroids are monographed in Latin in DC. Men. Phan. vol. 2, 1879.

Podophyllum, Schott. A tender creeping plant: lvs. becoming 3-7-pinnaeate, 4-6 in. long; petals becoming 15-20 in. long; tube of the spathe 1-1½ in. long; blade of the spathe 2½ in. long, greenish outside, white within. The typical form is probably not in cult.

Var. albolineatum, Engl. (S. albolineatum, Bull.), has whistling costa and lateral nerves. Offered by John Saul, 1863, presumably as a tender foliage plant.

F. W. Barclay.

SYRINGA (Greek, together and little door or valve, the valves of the capsule long adhering below to the short placenta). Scrophulariaceae. Six species of hardy herbaceous perennials, native to western North America. S. reinwardii is a tufted plant bearing 6 or more 1-loculed racemes about 5 in. long with about 40 purple-blue fls. each ½ of an inch across. In England this plant is considered a winter bloomer: it flowers there in February or March, occasionally November.

Syringa is nearly related to Wulfenia of southeastern Europe and the Himalayas, but the anther-cells are not confluent and the seeds are discoidal. In their native region they are summer-blooming plants with small purplish or flesh-colored spikes or racemes. Generic characters: Plants glabrous or pilose: rhizome thick: radical lvs. petiolate, ovate or oblong and crenate or incised-pinnaeate: 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 next, with more acutely cut, leathery lvs., longer and stouter scapes and racemes: seeds narrowly oval and corolla-lobes, a globose corolla-tube and more seeds in the cells. Ore. to Wash. Introduced by Woolson, Passaic, N. J.

Syringa (of doubtful meaning; probably from spring, pipe, because pipes are easily made from the popular and 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 vulgaris, as strong, and of S. Chinensis is not of equal excellence. S. vulgaris and Jasidea are almost scentless, S. Amoenus and its allies have only a slight odor similar to that of the Privet. Almost all species are hardy north. S. vulgaris, var. Esculentus, is somewhat tender north.
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 blooming season only spoils the effect, and so does too great a variety of colors. Some species, as the treelike S. japonica, S. pekinensis and S. villosa, are very handsome as single specimens on the lawn. S. japonica is the only tree of the genus; it attains a height of 20 ft., S. vulgaris, and S. pekinensis, sometimes grow into small trees or at least large shrubs 10-20 ft. high. S. Pericica is the smallest species and seldom exceeds a few feet. The first to bloom is S. oblata, followed closely by S. vulgaris, Chinensis, pubescens, Persica, villosa and Jordana, after the middle of June. S. Amurensis and Pekmen's come into bloom, followed at the last by S. japonica, which blooms in the North in the beginning of July. S. Amurensis and Pekmen's sometimes bloom sparingly a second time in fall. The foliage is bright green and handsome, but drops comparatively early in fall, especially of S. japonica, without assuming any fall coloring as a rule.

In S. oblata the foliage turns to a deep vinous red and remains until November. In S. Pekmen's it is retained until late in fall and finally assumes a purplish hue or turns pale yellow. The foliage is not much attacked by insects, but as a fungus, Microspora atra, 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 borer, Tracheum dawudallum, 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 be done as far as necessary. Pruning in winter or spring would destroy a large part of the flower-buds for the coming season. Lilacs grow in almost any kind of soil, but a rich and moderately moist one is the most suitable. They are easily transplanted at any time from fall to spring. S. vulgaris and its numerous varieties are the most popular of the Lilacs on account of their early and profuse blooming, their sweet fragrance and the variety of colors ranging from dark purple to lilac, pink and white. The double-flowered varieties keep the blooms longer, but the panicles are less graceful and they usually do not bloom as profusely as the single ones; they also remain mostly smaller and have a more compact habit. The faded fls. do not fall off, but remain on the inflorescence; this gives the plant a very insidious appearance if the faded panicles are not removed. W. J. Stewart suggests a word of warning against Lilacs not on their own roots, because of the attacks of borers and the bad habit of suckering in some cases.

Some of the best single-flowered vars. are the following:

**SINGLE-FLOWERED LILACS.**

**White:**
- *Alba*—commonly.*Alba pyramidalis:* Frau Bertha Dammann, A.F. 12:1678; Madame Moser; Marie Legraye, one of the very best, B.H. 29:135; Princess Marie.
- *Alba virginalis:* Aline Mosqueris dark red; Charles X (Carolit), dark lilac-red, A.F. 12:1066. F. 1875, p. 76; Marly-en-vis, sometimes called Rubra de Marley, lilac-red; Rubra insignis, purplish red.

**Dark purple:**
- Hélium; Ludwig Späth (Andenken an Ludwig Späth, Louis Späth), very large panicles, the best of the dark vars.

**DOUBLE-FLOWERED LILACS.**

**White:**
- Madame Abel Chatenay, compact panicles; Madame Casimir-Perier, large, graceful panicles, one of the best; Madame Lemoine, large fls. in dense panicles; Obliquis, Virginité, white and pink.

**Blue, blue or pink:**
- Alphonse Lavallée, bluish lilac, A.F. 12:1677; Belleville, fls. pink with white center; Charles Baltet, lilac-pink; Condorcet, blue, A.F. 12:1674; Boven Ketelde, lilac-blue; Jean Bart, pinkish violet, Lamare, pale lilac, large, rather loose panicles; Lemoine, lake-pink; B.H. 28:174; Lénon Simon, changing from pinkish to bluish lilac, Gt. 3:1867; Maxime Cornu, pinkish blue; Michel Buehner, pale lilac, large and very double; President Carnot, pale blue.

**Purple:**
- Charles July, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; Le Tour d'Anverge, 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. Marly-en-vis, Marie Legraye, Alba virginalis, Ludwig Späth and other varieties are also good for forcing. Of the double-fl. vars. the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Lénon 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. Marly-en-vis 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 Vol. II, p. 896). The Lilac has nothing like the commercial importance for forcing in America that it has in Europe, but the appreciation of it for winter bloom is on the increase in this country.

Lilacs are generally forced in pots, being potted usually in July or in the forepart of August, that they may fill the pots with new roots before winter. Some growers pot the plants in spring or in the preceding fall. This practice is of especial advantage if the plants are intended for very early forcing. These early potted plants are then plunged into the ground outdoors, mulched, well watered and regularly manured; after June, when the young growth is almost finished, only enough water is given to prevent wilting. When the flower-buds have been formed, more water is given until they have reached their full size. It is essential to keep the plants
Syringa

of the albuminoids in the plant has been stated recently by other botanists also. Lilacs may be prop. 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 prop. 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, Pericraria and vulgaris.

As a stock S. vulgaris is mostly used and sometimes Ligustrum. S. japonica will probably prove to be a good stock. S. wilsonii, 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. Budding is done even 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 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 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 Asparagus," a book devoted almost exclusively to Lilac forcing.

Interesting experiments recently conducted have shown that the Lilac is more readily forced when the plants are subjected to the influence of ether during forty-eight hours shortly before forcing. An account of these experiments by W. Johannsen is entitled "Das Etherverfahren beim Frühreiben mit besonderer Berücksichtigung des Flieder." That the ether has a particular effect on the metamorphosis and regeneration
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. he-

After the neopoliticism the new

1. Josikaea. Saac. Shrub, attaining 12 ft., with upright, stout, terete branches; lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent on the midrib beneath, 2½-5 in. long; fls. pinkish lilac or white, short-pedicelled, in broad or somewhat narrow panicles, 3-7 in. long; stamens inserted near the mouth; sepals half-upright. May, June. China to Himalayas.

2. villosa, Vahl, not Deene., nor Hooker, nor Koch. Figs. 2450, 2451. Bushy shrub, 8 ft. high, with rather stout, upright, terete and warty branches; lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent on the midrib or glabrous beneath, 3-7 in. long; fls. pinkish lilac or whitish, short-pedicelled, 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. Bétrischneideri, Lemoine), has broadly elliptic or elliptic lvs. and pink fls. in rather large panicles with leafy bracts at the base. B. R. 1888-1892. G. F. I. 324. G. 39, p. 91. G. 44, p. 360. Var. Emoti, Rech. (S. Emoti, Wall. I.), has narrow elliptic to oblong lvs., more whitish beneath; fls. whitish or pale lilac, in rather narrow panicles, usually with large lvs. at the base. Himalayas. B. R. 31-36. B. H. 1896, p. 368. G. 39, p. 106. Not quite hardy. There are also vars. with yellow lvs. (var. aurea, Sum.) and with yellow variegated lvs. (var. aureovariegata, Hort.). Hybrids with S. vulgaris and S. Josikaea have been raised at the Botanic Garden at Paris.

3. pubescens, Turcz. (S. villosa, Decne., not Vahl. S. villosa, var. cretica, DC.), Shrub, 6 ft. high, with slender, somewhat quadrangular branches; lvs. roundish ovate to rhombic-ovate or ovate, shortly acuminate, dark green above, 1-3 in. long; fls. pale lilac, fragrant, short-pedicelled, in ovate, not very large, but numerous panicles; tube very slender; apex of anthers not reaching the mouth. Max. N. China. G. F. I. 445; 6:366. B. M. 7964 (as S. villosa). Fine-flowering shrub of graceful habit, with handsome dark foliage.

4. obliata, Lindl. Shrub or small tree, 12 ft. high: lvs. roundish ovate or reniform, often broader than long, cordate, short-acuminate, bright green, 2½-4½ in. across; fls. purple-lilac or purple-violet, in rather loose, pyramidal panicles, 3-6 in. long; pedicels about as long as long
SYRINGA


5. hyacinthiflora, Hort. (S. oblata × vulgaris). Intermediate between the parents, with broadly ovate lvs., turning purplish in fall. Only known in the form. Var. plena, Lemoine. Many or perhaps the most of the newer double-flowered sorts have originated by crossing this form with S. vulgaris.

6. vulgaris, Linn. Figs. 2453, 2454. Shrub or small tree, 20 ft. high; lvs. ovate, truncate or slightly cordate, acuminate, bright green, 2-4 in. long; bluish purple or white, in large panicles. May. Southeastern Europe to Caucasus and Afghanistan: sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. M.D.G. 1899:205. The most important of the older original sorts are the following: Var. alba, Dietr., branches yellowish gray; fls. white; buds yellowish green; blooms a week earlier than the other sorts. A.F. 12:1081. Var. carulescens, Dietr. Fls. blue, in rather loose panicles. Var. purpurea, DC. (var. rubra, Lound.). Fls. purplish red, in large and rather dense panicles. Here belong also var. Marlyiensis, Hort., and Charles X. Var. violacea, Dietr. Fls. violet-lilac, in rather loose panicles. Var. plena, Hort. With double fls. There are several sorts with variegated lvs., but these are hardly worth cultivating.


8. Persica, Linn. Fig. 2455. Shrub, attaining 6-10 ft., with slender, arching branches; lvs. lanceolate, acuminate, 1½-3 in. long; fls. pale lilac or white, in rather loose, broad panicles, about 3-4 in. long; pedicels as long or longer than calyx. May, June. Caucasus to Afghanistan. B.M. 486.-Var. alba, Loud. (S. Steinweissii, Hort.). Fls. white. Var. lacinata, Vahl (S. pteridiflora, filiciflora and plinata, Hort.). With pinately lobed or pinnatifid lvs., of dwarfer habit and with smaller panicles. R.H. 1858, p. 492, 493; 1885, p. 80; 1901, pp. 40, 41.


TABEBUIA (Brazilian name). *Bignoniaceae*. Ornamental evergreen trees with opposite, long-petioled, simple leaves and showy flowers in terminal, few-flowered racemes. Only *T. leucoxyila* seems to be introduced. It requires the same cultivation as the tropical species of *Tea*, which see. The genus contains 5-8 species, inhabitants of tropical America, closely allied to *Tea*, but more or less distinct. The leaves, chiefly distinguished by the simple leaves and the irregularly splitting tubular calyx, formerly also species with digitate foliage were included, for which see *Tea*.

leucoxyila, DC. (*Bignonia leucoxyila*, Vell.), *B. peti- lata*, Lindl.). Evergreen tree or shrub: fls.: white, oblong-oblong to obovate-oblong, obtuse or sometimes acuminate at the apex, glabrous, dark green with distinct pale midrib, 1-4 in. long: fls. in few-fl. terminal racemes; corolla funnel-shaped, about 2 in. long, with yellow tube and pale lilac limb. Brazil. B.R. 12:905.

Alfred Rehder.

TABERNÆMONTANA (J. T. Tabernæmontanus of Heidelberg, physician and botanist, author of krauter-buch mit künstlichen figuren, died 1599). *Apocynaceae*. A genus of more than 100 species of trees or shrubs widely scattered in tropical regions. Lvs. opposite, pinni-nerved: fls. white or yellow, in terminal or sometimes apparently but not truly axillary cymes; calyx usually short-5 lobed or parted; corolla salverform; stamens inserted on the corolla-tube, included: berries large and yellow, sometimes blue or purple, and inedible. See *Goniothalamus* for distinctions from that genus.

a. Fls. white.

   coronaria, Willd. *Crape Jasmine*, Nero's Crown. A tender shrub, 6-8 ft. high: lvs. glossy green, oblong to oblanceolate: fls. white, fragrant, 1-2 in. across, in 1-8-fl. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. hort. — Cult. in the more southern states and also in greenhouses. Also known as Adam’s Apple and East Indian Rosebay.

   a. Fls. yellow.


   F. W. Barclay.

   T. Cannasii, Regel. — See *Goniothalamus*.

   F. W. Barclay.

The East Indian Rosebay, *Tabernæmontana coronaria*, is one of the best ornamental shrubs for subtropical gardens. This species and *T. Cannasii*, referred to this work to *Goniothalamus*, 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 beautifully 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. Cannasii*. *T. Pompilius* and *T. advena* are much smaller than those of the double white oleander, while *T. Cannasii* has solider and smaller blossoms. Both do well under the same treatment. In order to enjoy the beauty of the East Indian Rosebay to its fullest extent, it must be planted in rich, sandy soil, not too wet and not too dry, and in places fully exposed to the sun. Only very strong pot-grown plants should be set out in the garden. This should be done during the rainy season. Avoid breaking the ball in transplanting. It is 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 frosts come, and a weakened *Tabernæmontana* is usually killed outright by even an slight frost. Just before Christmas all the plants are pruned to the nature (bushy, suckers, branches, *P. rosea recta*, *Triostia canescens*, *lappulata*, etc., are barked about 18 inches to 2 feet high with dry sand, and they always come through without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The *Tabernæmontana* look best in groups by themselves or in front of other glossy-leaved evergreens.

N. Nehrling.

TACAMAHAC. *Populaceae*. 

TÁCCA (Malayan name). *Taccaceae*. A genus of 9 species from tropical regions. Perennial herbs from a tuberous or creeping rhizome large, radical, petiolar and umbilicate or umbriform tubers and large, usually 3-branched, the divisions pinnately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate: fls. greenish, 8 lines across, many, with the sterile pedicels purplish; berry nearly globular, 1 in. in. through. Afr., India and Australia. L.B.C. 7:692. B.M. 7299:7300. — According to Von Mueller's Select Extra-tropical Plants, the Fiji Arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

AA. Lvs. much lobed.

   pinnatidita, Jack. Tender perennial herb, about 2 ft. high: rootstock globose, becoming 1 ft. through: lvs. large, usually 3-branched, the divisions pinnately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate: fls. greenish, 8 lines across, many, with the sterile pedicels purplish; berry nearly globular, 1 in. through. Afr., India and Australia. L.B.C. 7:692. B.M. 7299:7300. — According to Von Mueller's Select Extra-tropical Plants, the Fiji Arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

AA. Lvs. not lobed.

   cristata, Jack. (*Atteca cristata*, Kunth). Rootstock a short conic caudex, marked with leaf-scarcs: lvs. 1-2 ft. long, oblong, acuminate, dark purplish green, much longer than the lvs.: fls. dark purple, 1½ in. across, in a somewhat one-sided umbel, with numerous pale sterile pedicels 8-10 in. long; involucral bracts 4, conspicuous, the 2 inner elliptical, narrowed to a pedicel, the 2 outer revolute. Malayia. B.M. 4525. F.S. 9:866. 867. Gn. 45, 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.

F. W. Barclay.

TACSONIA (from the Peruvian name of one of the species). *Passifloraceae*. From *Passiflora, Tacsonia* differs in having a long-tubular calyx, style 3, stamens and petals 3 or 5, the latter never wanting, corona of tube-veils 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 et Prantl*) unites Tacsonia with *Passiflora*. Masters accepts (*Trans. Linn. Soc. 27) 25 species of true *Tac- sonia*, relegating the intermediate forms largely to *Pass-* flora. Other species have been discovered subsequently, making the total number in the genus above 30. The species are all South American, inhabiting the Andes. They are tendril-climbing shrubs or herbs, re-quiring the treatment given *Passiflora* or cultivated freely in the open in middle and northern California.

(1764)
TACSONIA

Jamesoni, Mast. Lvs. sub-orbicular, 3-lobed, glabrous; fl. large, bright rose or cherry red, with a cylindrical tube 4 in. long. Peru.

Exoniensis, Hort. (hybrid of T. Van Volxemii and T. mollissima). Fig. 2158. Lvs. downy, corolla, ovate-oblong, divided nearly to base into 3 lanceolate, saccate segments: fls. 3½-4 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 corolla color of throat. - Resembles T. mollissima in having downy lvs., long lower tube, color of fl. and aristate sepals.

B. Bracts beneath the flower more or less united.

A. Fls. orange or rosy orange.

Parritu, Mast. Lvs. deeply 3-lobed, glabrous above and pilose beneath, the lobes narrow and entire; stipules entire, subulate-acuminate: fl. with a long and slender tube, glabrous, with pointed, rosy-orange petals oblong and flat, shorter than the sepals, orange; corona double, the outer row of tooth-like projections. Colombia. G.C. II. 17:225. I.H. 35:41. - Named for Senor Parra, through whom it was introduced.

AA. Fls. scarlet or rose-colored.

B. Bracts beneath the flower not united.

Insignis, Mast. Pilose: lvs. ovate-lanceolate, subcordate, dentate, rugose or blistered above and red downy 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, oblong; corona of one series of short threads, blue and white. Probably Peruvian. G.C. 1873:1113. F.S. 29:2685-4. B.M. 6068.

CC. Lvs. stiped or divided.

Van Volxemii, Hook. Fig. 2457. Stem slender and slightly pubescent; lvs. cordate-ovate in outline, deeply 3-lobed, the lobes long-lanceolate-acuminate, saccate: fls. 5-7 in. across, bright red with short green calyx-tube that has a swollen base, the green calyx-lobes green externally; corona an inconspicuous toothed rim. Colombia. B.M. 5571. G.C. 1869:171. - Probably the best known species and handsome, but less showy than some others.
TAGETES (Tagus, an Etruscan god). Compositae. Marigold. A genus of some 20 species of tropical American herbs. Lvs. opposite, pinnately cut or rarely simply serrate; fls. of various sizes, yellow or orange, marked in some species with red. The popular annual species known as "African" and "French" Marigolds have been derived respectively from T. erecta and T. patula, both of which are native to Mexico. These two species were introduced into cultivation in 1596 and 1574. For garden purposes, Tagetes may be divided into two groups, based upon habit of growth. T. erecta and T. patula are of upright and somewhat open growth, while T. patula and T. signata are spreading and bushy, the lower branches lying close to the ground and often rooting. The French Marigolds, T. patula, are valuable bedding plants. Good garden forms are of even height and bushy, compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 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.

For Pot Marigolds, see Calendula.

A. Fls. generally marked with red.

T. patula, 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; R.H. 1895, p. 365. Sometimes used as a substitute for Tarragon, which see. This species is suited for massing or for borders. R.H. 1895, p. 365.

T. signata, Bartl. An annual branching species: lvs. pinnately divided into usually 12 oblong, linear, sharply serrate segments, the lower teeth awned: rays 5, yellow, 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. B.H. 1895, p. 365.

B. Lvs. lanceolate, simply serrate.

T. 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 corymb. The flowers have a much more agreeable odor than the other species cultivated. Chile. B.M. 740; R.H. 1895, p. 366. Sometimes used as a substitute for Tarragon, which see. This is a species discovered about 1550 by T. S. Brandleigh in Lower California. It makes a compact bush 4-5 ft. high, bearing a profusion of yellow flowers borne in winter. Small plants flower well in pots. See T. patula.

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TALARMA (South American name). Magnolidae. Talaruma Hodgsoni is an excellent, magnolia-like, tender evergreen tree with cup-shaped flowers fully 6 inches across and 4 inches deep. It blooms in April. The flowers have a spicy odor, hard, thick, fleshy texture, and the glucous purplish blue of the sepals contrasts...
TALAUMA (possibly a native name in Senegal). Portalaeae. 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 3; petals 0-5; ovary sessile, 3-valved, style 1-celled; fruits a capsule. T. patens 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 3-6 in. long, contain a pleasant acid pulp much used throughout the tropics as the basis of a cooling drink. The pulp is also used in medicine, being rich in formic and butyric acids. It is laxative and refrigerant, and is also used to prepare a gargle for sore throat. The pulp of the Tamarind is generally called the "fruit" or "Tamarind" and the pod is spoken of as the "shell." In the East Indies the shell is removed and the pulp simply pressed together into a mass. The Tamarinds of the Malayan Archipelago are considered better than those of India. They are preserved without in formic and butyric acids. It is laxative and refrigerant, and are exported from one island to another and when sent to Europe are cured in salt. In the West Indies the fruit is prepared by removing the shell and placing alternate layers of fruit and sugar in a jar and then pouring boiling syrup over the mass. McFadyen says that in
order to prevent fermentation, the first syrup, which is very acrid, is poured off and a second is added. Also that an excellent preserve is imported from Corea, which is made from the unripe pods preserved in sugar with the addition of an extract of the Indian Tamarind has long pods; the West Indian short ones.

The Tamarind tree yields a handsome furniture wood. It is yellowish white, sometimes with red streaks, hard and close-grained; heart-wood dark purplish brown.

Botanically, the flower of the Tamarind is rather difficult to understand. It is far removed from the sweet pea type, which is the one a northerner commonly thinks of as typical of the legume family. At first glance it is a pale yellow flower about an inch across with 5 or 7 petals, of which 3 are united with red. On closer study it seems that 1 of the showy parts are sepals, which are all pale yellow. The three red-veined parts are petals, while the other two petals that the student expects to find, are reduced to mere bristles hidden in the flower at the base of the staminal tube.

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 are of slow growth.

**Indica, Linn. (T. officinalis, Hook.). TAMARIND.**
Fig. 2462. Tender evergreen tree, attaining a height of 80 ft., with a circumference of 25 ft.; lvs. abruptly pinnate; lfts. 20-49, opposite, oblong, obtuse; lfts. pale yellow, the petals united with red. B.M. 5463. The lfts. are said to vary from white to pinkish.
W. HARRIS, E. N. REASONER and W. M.

**TAMARISK.** See Tamarix.

**TAMARIX (ancient Latin name), Tamarissacea, Tamarisk.** Ornamental shrubs or trees, with minute, alternate, sessile leaves and small, usually light pink flowers in racemes or terminal panicles, followed by small, capsular fruits. None of the species are quite hardy north, but T. Obaiana, Gallica and parviflora are fairly hardy as far north as Maine. The Tamarisks are of graceful and distinct appearance, with light and feathery foliage and large, loose, pinnate, pinkish flowers. Several of the species bloom late in summer and are a welcome addition to our autumn-flowering shrubs. As they are hardy in no parts of warmer arid regions, they are well adapted for countries 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 fine and should be only slightly covered, or usually by cuttings of ripened wood or Greenwood cuttings under glass.

About 60 species from the Mediterranean region, distributed to E. India and Japan. Shrubs or trees; lvs. alternate, scale-like, often unipetalous or shooting; lfts. small, short pedicelled or sessile, in racemes of 3-5 flowers; petals 4-5; stamens usually 45-55, 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, dehiscent into 5 valves; seeds many, minute, with a tuft of hairs at the apex. Several species have medicinal properties and yield dye-stuffs. The punctures of an insect, nannodes, cause T. nannotica to produce "nannochromes."

**T. Germánica, Linn., is now referred to the genus Myricaria, which is chiefly distinguished by the 10-stamened, connate, one-throated male and by the 3-beaked stigmas. Ten species are known, all shrubby or subshrubby, with the lfts. in terminal, often panicked racemes. M. Germánica, Desv., is a graceful under-shrub, 4-6 ft. high, with purple-clawed, brownish green, lanceolate, glandular-clotted; lfts. 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. En., W. A. in. M. Dahunica, Ehrenb. (Tamarix Dahunica, 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.

**INDEX.**

A. Lvs. 4-merous; racemes lateral on last year's branches.
B. Petals spreading, persistent.

**A.**

**B.**

C. Petals deciduous.
D. Racemes lateral.

**C.**

**D.**

E. A lvs. ovate, acute.
F. A lvs. lanceolate.

**E.**

**F.**

**1. parviflora, DC. (T. tetranda, var. parviflora, Boiss. and Kotschy), Fig. 2462. Shrub or small tree, 15 ft. high, with reddish brown bark and slender spreading branches; lvs. ovate-acuminate, semi-amplexicaul, scarious at the apex when old; lfts. pink, very short pedicelled, slender in racemes about 1 in. long, along last year's branches; petals spreading, persistent; funicles very small, sometimes only 3 per flower; young usually 3, much shorter than ovary. April, May, S. En. F.S. 9:399. R.H. 1855:401. Commonly confused with the following species, also with T. Africana and Gallica and cult, under these names, T. tetranda, var. parviflora, 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; lfts. light pink or almost white in racemes 1-2 in. long along last year's branches; disk purple, deeply 4 lobed; styles usually 4, about as long as ovary. April, May, S. En.azine, W. Asia. Doubtful whether in cultivation in this country; all plants seen under this name by the writer belong to the preceding species.

3. Gallica, Linn. (T. petaliolia, Pall. T. arborea, Sieb. T. Campani, Willd. T. Angelica, Webb. Shrub or small tree, with slender spreading branches; lvs. dull to bluish green, closely incised, rhomboid; ovate, acute or acuminate, keeled, semi-amplexicaul, with scarious margin; lfts. white or pinkish, almost sessile, in slender racemes, petals-delicate, filaments dilated at the base; disk usually deeply 5 lobed; styles 3. May-July. W. En. Mediterranean region to Himalayas; naturalized in S. Texas, Gu. 34. Al.-Va. Lvs. 2-3 pairs. Lvs. above dark green, half the lower ones, with slender, upright branches; lvs. dull green; racemes longer and slenderer; lfts. pink; disk obscured and
TAMARIX

4. juniperina, Bunge (T. japonica and T. phlebina, 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 in. long on last year's branches:

2463. Tansy—Tanacetum vulgare (X 1-3).

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. Chinensis.)

5. Chinensis, Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches: lvs. 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. Odessàna, Stev. Shrub, 4-6 ft. high, with upright, slender branches: lvs. lanceolate, subulate, decurrent: fls. pink; racemes slender, about 1 in. long on last year's branches; pedicels about as long as calyx; petals slightly spreading; disk 5-lobed, with rounded lobes. July-Sept. Caspian region.


T. articulata, Vahl. Tree, attaining 20 ft., with slender, jointed branches: lvs. glaucous, minute, sheathing: fls. 5-merous, pink, sessile in terminal panicles. W. Asia. Not hardy north.—T. Pallasii, DC. Shrubby and very similar to T. Odessaiana, but panicles less spreading with more upright racemes; petals upright; disk 5-lobed; with emarginate lobes. Aug. Sept. S. Russia and W. to C. Asia. T. Amurensis, Hort., is a form of this very variable species. T. Caespita, not seen in bloom by writer, may also belong here. ALFRED RENNER.

TANACETUM (name of doubtful derivation). 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 corymb, or rarely solitary. Fl. heads heterogamous, disk-shaped: female fls. with 3-5-toothed, tubular corolla; akenes 5 ribbed or 3-5-angular, with a broad truncate summit, bearing a corniform pappus or none. For culture, see Tansy.

vulgare, Linn. TANSY. Fig. 2463. Stem robust, erect, 2-3 ft, leafy to the summit: lvs. pinnately divided into linear-lanceolate segments which are serrate or pinnately cut: fls. heads 1-2 in. across, numerous, in a dense, flat-topped cyme. July-Sept. Europe. Adveotive in the eastern U. S.—Var. crispus, 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 Citron.

TANGIER PEA. Scarlet. Lathyrus Tangitanus.

TANSY (Tanacetum vulgare, Linn.). Fig. 2464. A coarse-growing, herbaceous perennial naturalized from middle Europe, and a familiar occupant of our old gardens, waste places and roadsides. Its common name is said to be derived from athanasia, 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 3 ft. from the perennial root, bear greatly divided, deeply cut, compound, bitter, aromatic leaves and rather dense corymb of numerous small yellow flower-heads which appear in midsummer. The seed, which is small, is marked by 5 rather prominent grayish 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, but now almost obsolete. By the medical profession, its tonic and stimulant properties and its efficacy in hysterical and dropsical disorders are still recognized, though other medicines are more popular. In domestic practice it played an early role as an anthelmintic and stomachic and is still somewhat popular as a local agent to relieve the pain of muscular rheumatism, bruises and chronic ulcers.

The wild plants usually satisfy all demands, but when no wild supply is at hand seed may be used to start the half-dozen specimens that a family should need. Easily started, readily transplanted or divided. Tansy requires no special care in cultivation except to keep it clear of weeds and to prevent its spreading and thus becoming troublesome as a weed. It will thrive in almost all soils and situations that are not too wet. For botanical account, see Tanacetum.

M. G. KAINS.

TAPE GRASS. Vallisneria.

TAPIOCA. See Manihot.

TARAXACUM (ancient name of doubtful origin, probably associated with supposed medicinal properties). Comp. 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 &
TARAXACUM

1770

Hooke would reduce them to about 6, and others would retain 23 or more. Taraxacums are distinguished by having large many-flowered ligulate yellow heads solitary on naked and hollow scapes; involucres 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 achenes; flowers opening in sunshine.

The common Dandelion is Taraxacum officinale, known also as T. dens leonis. See Dandelion. It varies immensely in stature and form of leaves, as shown in Figs. 2453-56. For history, see Sturtevant, Proc. 6th Meeting Soc. Prom. Agr. Sci., Jan., 1886. For an account of the red-seeded Dandelion, T. erythrosporum, see Fernald, Bot. Gaz. July, 1896:323. From the common Dandelion we may deduce that it differs in having smaller sulfur-yellow heads, smaller and very deeply cut leaves, outer involucral scales not reflexed and somewhat glaucous; achenes red or red brown and shorter beaked; pappus dirty white. It is known to occur in New England, New York, and Pa.; perhaps naturalized from Europe.

L. H. B.

TARE, TARES. To the modern English farmer the word "Tare" means the common vetches, Vicia sativa, although Tare is also applied loosely to other species of Vicia and Lathyrus, particularly Vicia hispanica. The celebrated passage in Matthew xiii. 25, "His enemy came and sowed tares among the wheat," refers probably to the darnel, Lolium temulentum. The original Greek word in Matthew is Zizania, a name which in botany refers to the wild rice. Darnel belongs to the grass family and its seeds were long thought to stuperize those who ate them unintentionally. Recent investigations have proved that darnel seeds have no narcotic properties.

TARRAGON (Artemisia Dracunculus, which see) is a close relative of wormwood (A. Absinthium). It is a perennial composite herb native of the Caspian Sea region and Siberia, and is cultivated as a culinary herb in western Europe. Its lanceolate, entire leaves and small, inconspicuous and generally sterile blossoms are borne upon numerous branching stems, 2-3 feet tall. Its green parts, which possess a delicate, aromatic flavor resembling anise, are widely

used for seasoning salads and for flavoring vinegar, pickles and mustard. The essential oil of Tarragon and Tarragon vinegar are articles of commerce, the crop being grown extensively in southern France for this purpose. The former is obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather the crop for distillation or infusion is when the first flowers begin to open, since the plants have then a larger percentage of oil than before or after. From 500 to 1000 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated Tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for division is when the plants have just commenced to grow in the spring. Tenacious and wet soils should be avoided and only loams of medium texture and of poor quality in sunny situations chosen. The plants may be set, either in the spring or in the autumn, 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.

Tasmania (after Abel Jansen Tasman, Dutch captain who discovered Van Dieman's Land or Tasmania). Magnolidea. This genus is included under Drimys by Bentham and Hooker. A small genus of tender evergreen aromatic, glabrous trees or shrubs with simple, short-petioled leaves with transparent dots and terminal clusters of greenish yellow, rose or white flowers. Drimys aromatica, F. Muell. (T. aromatica, R. Br.), is a shrub or small tree cult. in a few north-

TASMANNIA

2465. Small-leaved form of Dandelion.

F. W. BARCLAY

TASSEL FLOWER. See Euphorbia flammea and Brokenellia.

TAU-KOK BEAN. See Dolichos.

TAXODIUM (alluding to the similarity of the foliage to that of Taxus). Gymnospermae, Schizobryae. Conifer. 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 is feathery 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 terminal horizontal roots. From these roots spring the peculiar cypress knees, pyramidal protruberances 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. From the under side of the horizontal roots large anchor-roots are sent perpendicularly into the earth and help to anchor the tree firmly in the swampy yielding soil. The knees are 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 purpose is probably to bring air to the roots during the several weeks or months when the swamps are covered with water. The knees always grow high enough to rise above the surface of the water (see, also, G.F. 3, p. 2, 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. Propagated by seeds sown in spring and the varieties by grafting on seedling stock early in spring in the greenhouse; also by cuttings in sand constantly 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. monoeccious, small, staminate fls. catkin-like, consisting of spirally arranged anthers, with 4-9 anther-cells and forming terminal panicles; pistillate fls. solitary or in pairs at the ends of branchlets of the previous year, composed of imbricated scales bearing two ovules inside the base; cone globose or nearly so, maturing the first year, consisting of spirally arranged woody scales enlarged at the apex into an irregularly 4-sided disk with a nucellus in the middle and toward the base narrowed into a slender stalk; 3 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.

**TAXODIUM**

**distichum**, Rich. (Cupressus distichus, Linn. Schizobrya disticha, Mirbel). BALD CYPRESS. DEODOROUS CYPRESS. Fig. 2469. Tall, deciduous tree, becoming 150 feet high, with a buttressed trunk usually 4-5, but sometimes attaining 12 ft. or more in diameter, usually hollow in old age; bark light cinnamon-brown, flaky; branches erect or spreading, distinctly ramified, forming a narrow pyramidal head, becoming at maturity broad and rounded, with slightly pendulous branches; lvs. narrowly linear, acute, thin, light green, 1½-2 in. long; panicles of the purplish staminate fls. 4½-5 in. long; cone almost globose, rugose, about 1 in. across and fertile of nucellus at maturity: seed 1½ in. long, March-May. Del. to Fla. west to Mo. and Tex. S.S. 10:537; H.F. 3-7; 10:535; C.J. II. 11:272; 14:361; III. 7:325, 328; 14:659; 24:529. Gng. 2:228, 541. G.M. 39:575. M. D.G. 1866:363. S.H. 2:541.-An interesting natural variety is:

Var. imbricarium. Nutt. (C.distichum Sinuose pendentu. Loud. T.distichum, var. pendulinum. Carr. Gymnospermae penduli, Endi. t. Nichol. Flor. Del. 1842:216).-A great number of garden forms have been described,

2468. Variation in foliage of the common Dandelion. All leaves drawn to the same scale
of which the following are the most important: Var. fastigiataum, Knight. With slender, upright, very slender short spreading branches sparingly ramified. Var. microphyllum, (Carr. Dwarf shrub, with short spreading branches; the lateral branches with typical foliage, those of the longer ones gradually passing toward the end into small, scale-like, imbricate lvs. Var. nanum, Carr. Dwarf shrub, with numerous short branches. Var. nudans, Alt. Branches spreading, long and slender, nodding at the tips. Var. pendulum novum, P. Smith. A graceful form with slender, pendulous branches. Var. pyramidatum, Carr. Narrow pyramidial form with short ascending branches. T. mucronatum, A. Ten. (T. Mexicanum, Carr.) Tall tree, occasionally 120 ft. high, with a trunk 20 ft. or more in diameter; lvs. evergreen. Var. F. 31 5. 6. C. III. 12 617 - T. heterophylhum, Bronn. (Wigsten. heterophylhum, Endl.) Shrub, 10 ft. high; lower branches pendulous; lvs. linear scale-like on the same plant; cones ovate, ½ in. long. China. Tender and rarely cult. often confounded with var. of T. distichum.

ALFRED RENIER.

TAXUS (ancient Latin name of the Yew). Coniferous Yew. Ornamental evergreen trees or shrubs, with 2-ranked linear leaves, insignificant berry-like red fruits. The best known species is T. baccata, which is as far north as Rhode Island and northwestern New York, while T. canadensis 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 pellucid 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. IV, 2:264, 265).

That the typical tree-like form of the Yew is nowadays not much planted is chiefly due to its slow growth, but the numerous mostly shrubby garden forms are popular plants for small gardens. The Yews thrive best in a moderately moist sandy loam and endure shade well. Large plants may be successfully transplanted if it is possible to send 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 grafted ones and cuttings of the type rarely grow into trees but usually into low-sprarching 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: lvs. linear, without resin-dots, pale or yellowish green beneath, commonly 2-ranked; lvs. central secondary leaves, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globes, composed of 4-8 stamens each, with 3-8 anther-cells attached to the pollinarium; pistillate consist of a pistil consisting of typical terminal ovary with several bracts at the base; seed a bony nut surrounded or almost inclosed by a fleshy cup-shaped scarlet disk; cotyledons two. The wood is heavy, hard, close-grained, strong, elastic and of reddish brown. 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 bolts. The foliage is poisonous to horses and cattle but the berries are not.

in diameter; bark bright red; branches ascending; lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous-green or pale grey beneath. 1⁄2-1 in. long; fr. like that of T. brevifolia, Japan. Very similar to T. brevifolia, but branches more upright, stouter and lvs. somewhat broader, more abruptly mucronate and thicker in texture. Var. nana, Hort. (T. brevifolia, Hort., not Nutt.), is a dwarf compact form with shorter leaves.

**Camellia Canadensis**, Marsh. (T. brevifolia, var. minor, Michx. T. brevifolia, var. Canadensis, Gray. T. minor, Britt.). Fig. 2471. Preserves shrub, with wide-spreading slender branches, rarely more than 3 ft. high; lvs. shorter and broader, theirselves with tub and gradually, made yelowish green than those of T. brevifolia, assuming in winter usually a reddish tint: fr. ripens about 2 months earlier than that of T. brevifolia; fls. monoeious (at least usually), New-foundland to Manitoba, south to Va. and Iowa. B.B. 1:61. V. 14:272. --In cultivation it becomes usually more a upright and less straggling shrub.

*T. brevifolia*, Nutt. Tree, 10-30 or occasionally 80 ft. high, with slender horizontal or somewhat pendulous branches forming a large bushy crown. Lvs. usually falcate; lvs. slender, dark yellowish green, 1.5-2 in. long. Brit. Col. to Calif. S.S. 16:341. Probably as hardy as T. brevifolia. -- T. Frasierana, Chapm. Bushy tree, 25 ft. high or sometimes shrubby; lvs. slender, 1-1.5 in. long, dark green. Fla. S.S. 16:351.

**Alfred Rehder.**

**TEA.** The Tea plant is described in this work under Camellia Thea, together with its varieties Bohea and vibriss, of which the former was supposed to yield black Tea and the latter green Tea. Both kinds can be brought about in many neglected parts of the healthy, civilized region, affording lucrative employment 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 new idle land into blooming and remunerative tea-gardens. Where in Assam was once a dismal jungle, the home of the tiger and cobra, and full of deadlier fevers, almost uninhabited by man and practically worthless, is now—thanks to the tea-industry—a fertile, comparatively

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 consumers with the prejudices 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 diver-sification 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 cultivation of Tea; and converting countless acres of new idle land into blooming and remunerative tea-gardens. Where in Assam was once a dismal jungle, the home of the tiger and cobra, and full of deadlier fevers, almost uninhabited by man and practically worthless, is now—thanks to the tea-industry—a fertile, comparatively

**L. H. B.**

**AMERICAN TEA.**—Previous to the inauguration of the Pinehurst experimentation in South Carolina, it had been abundantly demonstrated that parts of the southern states were well adapted for the growth of those varieties of the Tea plant which do not require a tropical climate; and before the Civil War many families supplied themselves with Tea grown and made at home, the result of the distribution of oriental Tea seed throughout the southern states by the national government. But it remained to be solved whether Tea might be produced on a large scale at a profit; and the experiments have shown that no general article on Tea is here included. The following article gives an idea of the present condition of the tea-growing industry in America. The Tea plant is shown in Fig. 2472.

The Pinehurst experiments have shown, other things being equal, the dependence of the productivity of the Tea plant upon an abundant supply of moisture, whether of precipitation or percolation, or by artificial irrigation. The yearly rainfall in the oriental Tea countries varies from 60 to 150 inches, and even more. Almost all of it occurs in the leaf-producing months; whereas here the 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 as much as possible; by the distribution of the trenches and the terracing of the land with a view to preventing the denudation of the surface and the loss of water during the heavier rains. These objects are largely attained by providing the tea-gardens on well-drained, flat lowlands or former pond-beds. Very recently special attention has been paid to the

2471. Spray of Taxus Canadensis (X 3/4).
artificial irrigation of tea fields, whereby it is designed to better approximate to the oriental supply of water during the cropping season, although, of course, it will be needless to attempt to imitate the tropical deluges which not only run off from, but with the soil.

The selection of the most suitable location for the establishment of a tea estate, becomes, then, of the greatest importance. The choice of fertile, that lands, underlain by a porous subsoil, susceptible of irrigation by gravity, as a safe-guard against droughts, will obviate the necessity of applying artificial enrichment, of under-drainage, and of clearing 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 sprang. And as the successful commercial tea estate must be on a large scale, like similar undertakings in sugar, whether beet or cane, it will be necessary to consider the means of transportation and accessibility to markets, abundant supply of labor and healthfulness of situation.

The part played by purely manual labor in the cultivation and manufacture of black Tea upon the best equipped British tea estates in India, is being steadily encroached upon by mechanical appliances until now it has been almost relegated to its last functions of planting, 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 hill-sides and by planting sufficiently far apart it is possible to use plows and cultivators, and thus reduce the cost of cultivation. As yet no mechanical contrivance has been found for dispensing with human labor in the pruning of the tea bushes and the gathering of the leaf. But a ten cent duty on foreign Tea should in many sections of the southern states somewhat compensate for the difference in the cost of these operations here and in the Orient. The testimony before the U. S. Labor Commission has shown that where the negro population is congested, their wages, beyond a scanty supply of food and clothing, are strictly nominal.

very recently the manufacture of green Tea has required a large amount of handwork for the roasting and rolling of the leaf. It not infrequently occurred at Pinehurst that green tea of a high quality may be made solely by machinery, by means of the "Rotary Witherer," invented by the writer, in conjunction with the previously mentioned green tea machines. And thus, by the substitution of mechanical operations, not only should the production of Tea on a scale commensurate with the cost of such an establishment, be made cheaper, but the production should be more uniform and free from the possible contamination of frequently unclean hands (and feet!).

It was to be expected that the different climatic conditions should exert some effect on the character of the tea plants and somewhat alter the taste of their product. This experience has been the rule with Tea, and it has cost a considerable, oftentimes disheartening, effort to successfully launch upon the market the output of each new locality. The very limited production at Pinehurst has probably prevented any obstacle to the sale of its crops; the novelty of its product may have largely compensated for the different climatic conditions here and in the Orient. The natural remedy lies in the greatest possible adaptation to already formed habits of taste and a lowering of price. Time, study, perseverance and money are necessarily demanded, but success seems to be reasonably assured.

It should not surprise any one familiar with the Teas consumed in the United States and Great Britain that the sorts most highly valued in the Orient, the product of methods of discrimination and so highly prized as often to be commercially unattainable, rarely commend themselves to the tea-drinkers in the former countries.

For nearly ten years the experimentation at Pinehurst was mainly carried on without outside assistance. The National Department of Agriculture, however, contributed very welcome assistance by the gift of tea-seed, publication of reports and other important ways; and for the past two seasons has rendered most effectual preliminary aid, under the direction of the Secretary of Agriculture, the Hon. James Wilson, who has enlisted the interest and support of Congress in the work. The proprietor of Pinehurst appreciates most deeply this assistance, both in money and sympathy, which he recognizes as being indispensable for the ultimate inauguration of the hope for industry. Under the instruction of the National Department of Agriculture he will diligently continue the experiments which seem most calculated to produce at low cost medium grades of both black and green Teas, not being sight, however, of the possible growth and manufacture of the finer varieties.

The first tea plant in this country was set out by the French botanist, Michaux, about 1800, at Middleton Barony, on the Ashley river, distant some 15 miles from Charleston and 10 from Pinehurst plantation. As seen a few years since it had grown into a small tree about 15 feet high. The reports of the U. S. Patent Office and the Department of Agriculture record the results of many subsequent attempts to introduce and cultivate the tea plant in the southern states. In 1848, Mr. James Smith, of Greenville, S. C., being convinced from the letters of his daughter, then in British India, of the feasibility of raising Tea in this region, began his well-known experiments. In the experiments in this district the 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 ardent interest of many experimenters living in a climate particularly favorable for the outdoor cultivation of the Camellia Sinensis. The Scotch botanist, Mr. Robert Fortune, was employed by the Government to gather Chinese tea-seed, which was distributed in 1853 and 1858 throughout the southern states. The Southfork of the Oconee, having been taken in 1859, seriously interfered with the prosecution of these

2472. Tea plant. (If.)
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 the Indo-Ceylon Teas, appears to constitute a most desirable quality for many consumers. It may be presumed, however, that this failure in particular 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 attempts at commercial Tea culture. Unhappily, the retirement from office of Commissioner Wm. G. Le Duc, to whose great interest in this subject the inception of the experiment was due; the serious prostration by illness of Mr. John Jackson, who had cultivated Tea in India, and under whose management the seed was obtained and the gardens established; the great distance of the station from its source of control (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 "Newington" plantation that embraced the adjoining site of the later formed Pinchurst estate.

The Pinchurst investigation owed its origin to the belief that the previous attempts to demonstrate the feasibility of American Tea culture had been arrested before reaching definite conclusions. More careful cultivation and manipulation, the result of experiment and observation, with the consequent production of a higher class of Teas, might reverse the generally entertained opinion that the cultivation of Tea in this country must always prove a failure. It was hoped that success in this field of agricultural enterprise would furnish employment for thousands who are now idle and give a value to vast acres at present worthless.

The local experiments, begun about ten years ago, were wisely on a small scale; but they have been gradually increased until they now embrace about sixty acres, planned in Teas, a commodious factory equipped with the requisite mechanical appliances, facilities for the application of irrigation to some of the tea-gardens, and a well-trained corps of youthful tea pickers. When with the requisite mechanical appliances, facilities for effectively few exceptions the successful, but with very few exceptions the attempts would prove either partially or wholly unsuccessful, but with very few exceptions the gardens are far more successful: 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.

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The following are well suited for cultivation in the southern states and California or in the North in the cool greenhouse and will stand a little frost: T. aromatica, Cupressis, juniperoides, mollis, Riesoliana, Smithii and steans. T. Amboeinseis, rhodolia and leonolynllla can be grown only in tropical regions or in the warm greenhouse. The Tecomas, with the exception of the first 5 species described below, are very ornamental climbing plants. T. radicans is particularly adapted for covering walls and rocks, as it climbs with pods and clings firmly to its support. The Tecomas require rich, rather moist soil and sunny position. Propagated by seeds, by greenwood cuttings under glass, or by hardwood and also by root-cuttings and layers. Sec, 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: i.e., old pinnate or digitate, opposite, stipulate: 1s in racemes or panicles; calyx campanulate, 5-toothed or irregularly 2-3 lobed; corolla funeiform, with 5 or rarely 4 lobed limb; stamens 2 longer and 2 shorter; style slender: ovary 2-lobed,

years in some instances. A Rose (Assam Hybrid) tea garden at Pinchurst is shown in Fig. 2473.

TEAS. Monarda didyma.

TEA, PARAGUAY. Iber Paraguayensis.

TEASEL. The species of Dipsacus. See p. 491 and Fig. 719.

2473. Assam-Hybrid Tea garden at Pinchurst, South Carolina.
surrounded at the base by a disk; fr. an elongated capsule, basally dilated, dehiscing 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 (N.S.W.).

TRUMPET VINES IN THE SOUTH. — All the Tecomas, the climbing species as well as those growing in bush form, are very successfully cultivated in Florida, being well adapted to the soil and climate, but most of them, to do their best, need to be planted from the start in rich soil, and in addition they should be well fertilized at least once a year. They prefer a tiller rich in nitrogen, and a heavy mulch will also prove very beneficial. The bushy kinds can be grown in groups or as single specimens on the lawn, while the rampant climbing species, such as T. radicans and T. grandiflora, should be grown on posts and tall stumps, or they may be trained over small oaks, persimmon trees or catalpas. T. Capensis, a half climbing species, is effectively used for decoration of the veranda, its glowing scarlet flowers contrasting well with the exquisite blossoms and the tropical foliage of the alphonas, chumbericas and Clerodendrum Thomsonii, which all flower at the same time. Tecoma stans and T. grandiflora are the two showiest species of the genus, the latter being a glider, flowering abundantly in May and June, while the first one is a large-growing bushy species opening its immense corollas of vivid yellow flowers the latter part of November and early in December. The Yellow Elder, T. stans, grows exceedingly well on high pine land and is perfectly at home in Florida, attaining an immense size if well fertilized and mulched, dense masses 18-25 ft. high and as much through being not at all rare. This Tecoma is the glory of the south Florida gardens in autumn, as is the beautiful Bauhinia purpurea in April, never failing to call forth enthusiastic admiration from all beholders. No shrub is better adapted for the new settlers in the sandy pine lands gardens. When covered with its large, fragrant flowers it is visited by numerous humming-birds and insects. Owing to its rapid growth and dense foliage from the ground, the Yellow Elder is highly valued as a screen for unsightly fences and buildings. This Tecoma ripens its seeds so abundantly that hundreds of seedlings come up around the old plant. The value of this shrub, blooming so late in autumn, cannot be overestimated.

T. mollis, incorrectly known to the trade as T. stans var. candida, also does well, but being a native of Guatemala it is much less hardy than the former. The growth is more upright and stiff, the lfts. are much larger, less serrate and more acute. It was formerly grown to find the flowers, which are borne in terminal panicles, are smaller and without fragrance and the color is a much lighter yellow. It also flowers several weeks later than T. stans. The foliage looks crinkled and often blackish, being attacked by a kind of aphids and by several fungi.

T. Smithii is said to be a hybrid between T. mollis and T. Capensis, raised near Melbourne, Australia, by Mr. Edwin Smith. The plant comes true from seed, and seedlings flower when about a year old, beginning to open their large clusters of yellow and reddish trumpets in April and continuing with short intervals until cut down by frost in December.

The Cape Honey-suckle, T. Capensis, is another species which grows most luxuriantly in Florida gardens and in those all along the Gulf Coast. It is grown on trellises on verandas and porches with a southern exposure. Of all the species this is the best and most suitable for verandas, being a dense and bushy grower, evergreen, almost constantly in flower, easily kept in health and readily trained into shapely specimens. If the long shoots are cut back severely, the plant can be easily trained into shrub form. These long shoots, usually lying flat on the ground, readily strike root and form an excellent material for propagation. T. Capensis and T. Smithii are the only Tecomas which grow and flower fairly well as pot-plants in northern greenhouses. They need good soil and rather large pots to do well. If not well cared for they lose most of their foliage and look poor and unshapely.

The Chinese Trumpet Creeper, T. grandiflora, is the most floriferous and gorgeous of all the climbing species. In the writer's garden a large pine stump, about sixteen feet high, in May and June is completely covered with masses of brilliant fiery orange-scarlet flowers which can be seen at a distance of half a mile. The flowers are much larger, more brilliant and much more abundantly produced than those of our native T. radicans. While all the other Tecomas are subject to the attacks of insects, this one is infested by a voracious caterpillar, which devours the leaves greedily. The lubber grasshoppers also attack the lower foliage. T. Capensis grows well on the ground, forming luxuriant shoots 25-30 ft. long in one season if well fertilized. Like our native species, this one is deciduous.

Our native Trumpet Creeper, T. radicans, is very common in the southern woodlands and fields. There is a great variety in the brilliancy of the blossoms. This is an excellent plant for covering the bare trunks of palm trees.

The Wonga Wonga Vine, T. australis, is rather difficult to grow on high pine land, as it needs a soil rich in humus. In rich soil, however, and liberally fertilized it is a rampant grower with beautiful dark green glossy foliage. The flowers are interesting but comparatively small and not showy. However, the species is worth cultivating for foliage alone. It must be well taken care of and well watered during the dry spring months or it will dwindle away in a very short time.

The Bower Plant of Australia, T. poinsettiae, is a tall, rampant climber, reveling in the Florida sunshine, but it needs a very rich soil and a dry weather an abundance of water. A heavy mulching also proves very beneficial. Plants only two feet high have flowered profusely. In good soil it grows in one season 20-30 ft. high, climbing tree trunks.

T. Mackennii, from Natal and Caffraria, demands a very rich soil and a heavy mulch of stable manure. Its leaves easily drop from the woody branches after a
cold night, and 6 or 7 degrees of frost kill the plant down to the ground. For this reason the vine should be banked with dry sand every fall and if killed down to the snow it must be cut off immediately or the entire plant will be lost. Plants raised from seed received under the name of *T. Riveolatum*, from India, are much heavier 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 or before it has attained considerable size. In Florida, *T. Mackeii* should be planted on tall stumps, or on arches and sheds by itself, never mingled with other species. This species is properly *T. Riveolatum*.

*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. l. = supplemental list.)

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<td>1. leucocxyon, Mart. (<em>Bignonia leucocxyon</em>, Linn.; Evergreen tree: Lvs. long-petioled, digitate; Lfts. 5, usually 3, stalked, ovate to oblong, acuminate, 2-8 in. long; calyx 2-3 lipped: capsule linear, 6-8 in long. W. Indies, Guiana)</td>
<td>2. rosa*, Bertol (<em>Tabebuia rosa</em>, DC.); Evergreen tree: Lvs. digitate; Lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, in many-fl. terminal panicles; corolla funnel-form-campanulate, with short tube and large, spreading lobes, rosy pink; calyx campanulate, obscurely 2 lobed, almost truncate. Guatemala.</td>
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<tr>
<td>4. mollis*, Humb. &amp; Bonpl. (<em>T. velutina</em>, Lindl. <em>T. stan</em>, var. velutina, Hort.); Similar to the preceding, but pubescent, fls. long-ovate, acuminate, less deeply serrate or almost entire, villos pubescent on both sides or only beneath: 2-4 in. long: fls. like those of the preceding, but little or not at all fragrant. Mex. to Chile and Peru.</td>
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<tr>
<td>7. radicans, Juss. (<em>Bignonia radicans</em>, Lindl. <em>Capparis radicans</em>, Bur.). Trumpet Creeper. Trumpet Vine. Trumpet-Honeysuckle. Figs. 2475, 2476. High climbing shrub, climbing with rootlets: Lvs. odd-pinnaite; Lfts. 9-11, oval to ovate-oblong, acuminate, serate, dark green above, pale and pubescent beneath, at least along the midrib, 2-8 in. long: fls. in terminal racemes; corolla tubular-funnelform, with 5 broad spreading lobes, usually orange with scarlet limb, 2-3 in. long, tubo almost thrice as long as the 5-toothed calyx; cylinder-oblong, keeled along the sutures, stalked</td>
<td>2475. The Trumpet Creeper climbs by means of aerial roots. — <em>Tecoma radicans</em>.</td>
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9. grandiflora, Del. (T. Chionéa, C. Koch. Biguanio Chionéa, Lam. Conspicua algirica, Lour.). CHINESE TRUMPET CREEPER. Fig. 2177 (adapted from Gardening). Climbing shrub, with few or no aerial roots; fls. odd-pinnate; fls. usu. 7-9, ovate to ovate-lanceolate, serrate, glabrous beneath, 1 1/2-2 1/2 in. long; fls. in terminal racemes; corolla funnelform-campanulate, shorter and broader than that of the preceding species, scarlet, about 2 in. long, to the middle, about as long as the tube of the corolla: fr. obtuse at the apex. Aug.-Sept. China. Japan. H.M. 1335. 3011. F.S. 14: 1124. 1225. Ginn. 27, p. 34; 35, p. 348; 47, p. 735. G.F. 3: 460. F.E. 2: 27. H.H. 4: 150.—Less high-growing and sometimes shrubby; flowers when quite small and can be grown as a potted plant, also suited for forcing. Var. atrosanguinea, Hort. With deeper scarlet fls. Var. Thunbergi, Hort. (T. Thunbergii, Lam.). Fls. bright scarlet, with very short tube and reflexed lobes. Often a var. of T. radicans is cult. under the name T. Thunbergii. There are probably also hybrids of this and the preceding species. Var. praeox is advertised.

10. Ricasoliana, Tanfani (T. Mackéinii, W. Watson. Puadrera Ricasoliana, Buitl.). Evergreen climbing shrub; fls. odd-pinnate; fls. 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, 2-2 1/2 in. long, sometimes reflexed, with spreading 5-lobed limb, light pink, striped red. 2 in. long; calyx 5-toothed: fr. linear, tetrate, 10-12 in. long. S. Africa.

11. Australia, R. Br. (Rimia Choisinae, Sinai). WOONDA-WONGA VINE. Evergreen high-climbing shrub: fls. odd-pinnate; fls. 3-9, elliptic-ovate to ovate-lanceolate, acuminate but bluntly pointed, entire or sometimes coarsely crested, shining above, glabrous 1 1/2-2 in. long; leaves many-fl.: corolla funnelform-campanulate, with 5-lobed spreading limb, white to yellowish, white to yellowish, spotted violet in the throat, 2 1/4 in. long; fr. oblong-pointed, 2 1/4-3 in. long, S. Australia. H.M. 845. Ginn. 57, p. 94.

12. Jasminoideae, Lindl. (Biguanio Jasminoideae, Hort.). POWER-FLOWER OF AUSTRALIA. Evergreen climbing shrub; fls. odd-pinnate; fls. 5-9, almost sessile, ovate to lanceolate, acuminate but bluntly pointed, entire, glabrous, 1 1/2 in. long; panicles rather few-fl.: corolla funnelform-campanulate, with large spreading 5-lobed limb with crested lobes, white, rose pink in the throat, 1 1/2-2 in. long; calyx small, 5-lobed. Aug.-Oct. R.M. 6: 400. F.H. 1895. p. 159. Var. alba is a trade name.

2476. Trumpet Vine — Tecomia radicans (x 1/4). TECOMIA. Evergreen shrub with 5-lobed, villose, orange, tinged red, 1 1/2 in. long; stem.


2477. Tecoma grandiflora on a clothes post. "TECOMA grandiflora is a trade name."
TEEDIA (J. G. Teede, German botanist, who lived some time in Portugal and died at Surinam). Scrophulariaceae. Two species of South African plants, with pink 5-lobed fls. 5½—¾ in. across. They are tender to frost. T. lucida was introduced to southern California in 1900, and Franceschi records that it blooms all the year. The larger—bd. species, T. pubescens, seems not to be known to the American trade. Both plants emit the rank herbaceous smell peculiar to heneses when their foliage is bruised, and T. pubescens has the same sort of greasy pubescence. These plants hardly seem worth culturing in northern greenhouses. When they were new to cultivation they were supposed to be binomial herbs, but Bentham and Hooker call them still sub-specific. The plants act like annuals in southern California. It is rather pretty but weedy. It seeds freely. Seems to prefer half shade. The smell of the foliage is very objectionable."

Generic characters: calyx deeply 5-cut; corolla-tube cylindrical; lobes 5, rounded, subequal; stamens 4, didynamous, included; anther-cells parallel, distinct; ovules numerous in each locule: berries subglobose, indehiscent.


TELEANThERA (name refers to the fact that all ten parts of the staminal cup are equally developed). Amaranthaceae. Alternanthera. Apparently all the Alternantheras used by gardeners as bedding plants belong to the genus Telianthera, which is distinguished from the true genus Alternanthera by having 5 anther-bearing stamens and 5 elongated antherless staminodes 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 Teliantheras 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 axis, whitish or sometimes colored, perfect, each subtended by 2 bractlets. The Alternantheras of gardeners are much in use 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 inappreciable 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° during winter, and rather dry to hold them more or less dormant. Place them where they will receive only enough light to keep them healthy. (1) Cuttings are usually made in August from strong plants growing in the open. The cuttings 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 hotbed 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.

x. Les, essentially lanceolate or elliptic.

amena, Regel. Fig. 2478c. 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: fls. heads sessile, single, in pairs or 3's, and terminal. I.H. 12:445. 15:558.—To this species appear to belong the garden names amabilis, spectabilis, amena, roxa, Reinhardi.

AA. Lvs. essentially spatulate.

Betzichiana, Regel (Alternanthera paronychioides, Hort.). Fig. 2478a. Lvs. narrow, spatulate, gradually narrowed into a long petiole, orange-red shaded with green: fls. heads sessile, single, in pairs or 3's, terminal and axillary. I.H. 12:445. To this species appear to belong the garden names petea, tricolor, aurea, aura mara compacta, paronychioides, versicolor aurora and p. major kuntzi, magnifica.

versicolor, Regel. Fig. 2478c. Usually becoming taller, much branched, and apparently less used for short-bedding than the others. Lvs. round-spatulate, narrowed into a short petiole, the colors mostly in shades of copper-red or blood-red, with patches of green between the veins: fls. heads sessile, single or in pairs. I.H. 12:440. T. ficoides is probably to be referred here.

L. H. B.
TELFAIREA (Charles Telfair, 1778-1833, Irish botanist; died in Mauritius.)  *Cucurbiteae*. Telfairea pedata, (E. F.) Willd. *Telfairea* pedata, Hook. Root stout, fleshy, in the ground, covered by a brown scurf. It is offered for outdoor cultivation in summer, with Australian shrubs in general. The plants are called "Star Flowers" in California. The flowers are fragrant, with plenty of water while growing.

TEMPLETONIA (J. Templeton, botanist of Belfast, early part of nineteenth century. *Leguminosae*). The *Corall Bush of Australia*, *Templetonia reticulata*, is a tall shrub with showy scarlet flowers, 1-1½ in. long. The flower presents a very different appearance from the papilionaceous or sweet pea type, with the flower petals being all rather narrow and about the same length, with the standard strongly reflexed. This plant was formerly cult. in European greenhouses, where it generally flowered in April or May. It was usually grown 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 Australian shrubs in general. It has been offered for outdoor cultivation in southern California, where many choice plants of its class are being cultivated. The fruits are not as showy or fragrant as the flowers, but they are large and juicy. The seeds are ellipsoidal, 1-2 in. long, and are usually planted in a greenhouse border rather than in pots.
shriveled, ovate-elliptic or linear, completely dehiscent. Flowers: stamens 3-11, rarely 25; filaments white; anthers alternately long and short and versatile; pod sessile or stipitate, broadly obovate or narrowly oblanceolate, sometimes all under 1 in., sometimes all over 1 in., long, emarginate or truncate, somewhat red or brownish white; calyx with 4 very short, broad teeth, the lowest longest; pod 1-2 in. long. B.M. 2234; 2088. B.R. 5:381; 10:859. L.B.C. 7:844. W. M.

TENNESSEE, HORTICULTURE IN. Fig. 2479. The horticultural products of Tennessee are greatly diversified on account of the varied soil and climatic conditions. A knowledge of the natural divisions of the state is essential to a thorough understanding of its adaptability to the various branches of horticulture.

The Unaka region, on the eastern border, contains about 2,000 square miles. Some of the peaks are over 6,000 feet above sea-level, and the average elevation is 5,000 feet. The soil is gravelly and thin, but contains areas that are fairly productive. Apples are grown to a limited extent.

The Tennessee Plateau, or Slope, of West Tennessee is the next division. It contains 9,200 square miles, and an average elevation of 1,000 feet. The soils are generally well adapted to fruits. Records taken at Knoxville during a period of twenty-six years show an average annual rainfall of 59.92 inches.

A thousand feet above the valley of East Tennessee lies the Cumberland Tableland, containing 5,100 square miles. This section for the most part is sterile, the soils being sandy and thin. There are, however, areas of land which produce fruits and vegetables of the highest quality. The climate is particularly healthful.

West of the Cumberland Tableland are the Rimlands, or Highlands, which have an area of 9,300 square miles and an average elevation of 1,000 feet. This section is well watered, having great variety of soils, some of which are highly fertile and well suited to orcharding. Numerous streams cut the land into valleys, which are generally deep and low.

The soil is fertile and well adapted to small fruits and vegetables. The average annual rainfall at Nashville is 49.33 inches.

The next natural division is the valley of the Tennessee river. It has an elevation of about 360 feet and an area of 1,200 square miles.

The Plateau, or Slope, of West Tennessee is the most important horticultural region commercially in the state. It contains 8,850 square miles and has an average elevation of 500 feet. This section is well watered, having generally fertile and easily cultivated, but demand careful treatment to prevent serious damage by washing.

The last natural division, the Mississippi bottoms, has an area of 850 square miles and an average elevation of 200 feet. It is little used for horticultural purposes.

The possibilities of Tennessee for the cultivation of fruits and nuts are evidenced by the profusion of these products in a limited area. Wild blackberries are found thoroughly distributed. Blackberries thrive everywhere. In favorable localities they attain a very large size, surpassing in this respect some of the cultivated varieties. Wild blackberries are marketed in large quantities in many sections. Red and black raspberries grow in most parts of the state; and in some sections the best of the wild blackcaps when transplanted to the garden, give better results than any of the cultivated varieties. Wild grapes abound throughout the state. Plums are also found in profusion and the Wild Goose variety have originated in Tennessee. Other wild fruits are dewberries, cherries, crab apples, damsonberries, pawpaws, per- amorons, and huckleberries. Of the nuts, chestnuts and filberts are the most valuable, especially in the hilly and mountainous sections. The chinkapin flourish in East Tennessee. Black walnuts are exceedingly numerous. Pecans thrive in the low sections. Hazelnuts, and butternuts or white walnuts, are also plentiful.

Some of the native seedling fruits are highly valued. This is especially true of apples, peaches and strawberries. Many well-known varieties introduced from other states are not satisfactory to the rule, the induced kinds are not so well adapted to the climate and soils as those of local origin. This fact is becoming more and more evident 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 of 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 these sorts have commanded remunerative prices in connection 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 on 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 counties in large quantities. Strawberries are also 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 the harvest.

The following special crops are produced to some extent, and are promising for more extensive cultiva-
TENOCLOCK. *Oenothera laciniata.*

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 pointed spikes being free from one another. By many botanists it is considered the original form of maize. It is known to botanists as *Reinum laciniata,* Dur., but is properly *Euchlaena Maculata,* Schrad., for the botany of which see B.M. 111, where the plant is called *Euchlaena laciniata.* The plant is pictured in Bull. 11, Div. of Agron., 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 terminal and may amount to a dozen $4., each 6-12 ft. high and tillers freely, 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, and the yield per acre may result. The single cut made in the fall, however, 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 will plant one acre. The plant is hardy, and 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.

**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 monstrosities. Malformations among plants are due to a disturbance of the ordinary course of the growth and development of the organs. Such a derangement of function may be looked upon as a disease. The malformation may be occasioned by merely local disease, or it may be a symptom of general disease. Malformations may be brought about by the direct influence of external physical conditions or by the action or presence of some other organism—plant or animal; or by the operation of unknown internal causes. The experimental study of the causes of malformations is yet in its infancy, and in only a few cases can specific explanations of their origin be given. Having once occurred, malformations may be inherited and the form, at first monstrosity, may become characteristic of a race. Thus the rock-scented (*Calamincea*) 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 distinguish between malformation and variation, except arbitrarily. When the difference between the ordinary and unusual forms is very marked, and particularly when the alteration gives rise to grotesque forms, having all abnormal functions, one speaks of malformation rather than variation.

Malformations have been found in all groups of plants, though they are most noticeable in the forms and flowering plants. A very large number have been recorded; Penzing, seen below, has collected data of monstrosities in more than 4,000 species, and the list has been augmented since the publication of his work. Classification of such numerous and diverse phenomena is a most difficult task and involves an extensive technical terminology. Here only a few of the more important categories can be mentioned.

II. ALTERNATION IN THE NUMBER AND SIZE OF ORGANS.

1. *Polycarpy* is the term applied to the increase in the number of leaf-like organs. The number of members of a whorl may be increased; or the number of whorls; or the number of distributed organs may become greater than usual. Double flowers—often show polycarpy. Fig. 2480. Extra free pistils of the orange persisting even in fruit.

2. Abnormally protuse branching of the stem is often produced by a fungous parasite. The branches are usually irregular and more or less fasciate, producing what is called "witch brooms." These are not uncom-
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 plantain.

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 Compositae; or by the development of branches in the axils of the petals and sepals, e.g., in cauliflower, or the rose shown in Fig. 24h2.

Fig. 24h2. Some double flowers are made “extra double” by this sort of proliferation. Proliferous embryos have been found in the almond, a smaller embryo lying between the seed-leaves of the larger, and sometimes a third within the second. They are quite separate at maturity. 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 fleshy in these fruits, but this is a mere conjecture as yet. Sometimes spurs and nectarines do not develop. Figs. 24h0-7.

II. ALTERATION OF FORM, involving no considerable change in nature or function of the organs.

1. Fasciation in stems (Fig. 24h3) 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 or are less 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 having been stretched out into irregular spirals. Unequal growth in two dimensions by the tissues of a leaf produces the “crenate” or crispate leaves, characteristic of many cultivated plants. Figs. 1257, Vol. 2.

4. Local deformities, such as swellings, tubercles and galls of various forms, are usually due directly to the presence of a plant or animal parasite. Fungii, either inhabiting the particular region deformed, 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 tubercles 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 bulges out at one spot to form a deep pocket or pouch; sometimes the blade of a leaf is rolled or folded, with or without thickening; all degrees of thickening or outgrowths are produced, from a slight tumor to a perfectly 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 various 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 saw-flies of the order Hymenoptera. The gall-apples of the oaks, the prickly galls of the rose, the irregular brown swellings on canes of the blackberry, and the smooth gall-apples of the willow leaves and twigs are well-
known examples. The gall-gnats among the true flies (Diptera) also produce a large variety of malformations, of which the cone-like galls resulting from deformed buds of the willow and the goldenrod are best known. Plant lice (Aphidae) are responsible for the large smooth red galls on the petiole of sumachs, and for the flattish serrated galls on elm leaves. The flush 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-bran- ching in the dahlia. Branching in the plane of flattening, both in foliage leaves and petals, has also been observed, and the branch described as an “outgrowth.”

6. Peloria. When usually irregular flowers, such as those with some spurred or separate petals or sepals, develop all the parts of each set alike, thus becoming radially symmetrical, the phenomenon is called peloria. It was first observed by Linnaeus in Lavena vulgaris, Fig. 2485, and the term peloria, derived from the Greek word for monster, was given by him. Flowers often become peloric on account of changes in their relations to light, but other causes certainly cooperate. A reverse change, by which radial flowers become zygomorphic, occurs in many Compositae when the corollas of disk flowers become strap-shaped, as in the cultivated asters and chrysanthemums, but no notice seems to have been taken of it as a malformation. Sometimes all spurs fail to develop. Figs. 2486-7.

III. TRANSFORMATION OF ORGANS: i.e., alterations more profound than those of form, which result in the production of organs different from those which normally occupy the position; often called metamorphosis. (The term substitution would be preferable at present, because non-committal as to processes and causes.) It is common to speak of progressive and retrogressive metamorphosis, but these terms involve assumptions as to the origin of foliage leaves and floral parts which are not justifiable in the present state of knowledge. Transformations occur chiefly in the region of the flower, though they are not found exclusively there. Examples are to be found in the development of leaves or leaflets as tendrils (Fig. 594); of sepals as petals; and of petals as stamens or pistils. These transformations are usually more or less imperfect. On the other hand, the pistils and stamens often develop as petals (Fig. 367), and many double flowers owe their fullness chiefly to such transformations, though other changes may cooperate as noted above. Fig. 2888. Petals may develop as sepals, bracts, or even imperfect foliage leaves, while sepals and bracts frequently become foli
ose. Indeed, all parts of the flower, even to the ovules, may appear as green leaves of more or less irregular shapes. To this category belong the so-called green roses, which are not uncommon.

IV. CONCLUSIONS. The actual union of parts may take place in the course of their development, though usually the apparent unions are to be explained quite otherwise (see Flower, p. 392), also Fig. 2489 (after Dudley).

The above notions, but 111 plants in all kinds of materials, may be elucidated through many arguments, more ingenious than sound, have been based upon them.

The most important general work are the following: Mosquin-Tandon, "Elements de teratologie vegetale," Paris, 1811; Masters, "Vegetable Teratology," London, 1869; Penzig, "Pflanzen-teratologie," Vienna, 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). *Combretum.* 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 polygamous; petals none; calyx tubular and constricted above the ovary, the upper part urn-shaped or bell-shaped and 5-lobed; stamen 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. Teranalia are tropical plants, chiefly of the Old World. One of them, *T. Catappa,* is widely cultivated in tropical countries. Two other names have appeared in the American trade: *T. elegans,* which is *Polyscias paniculata;* and *T. clitigena,* which is unknown to the writer and which is very likely to belong to some other genus.

*CATOMPA,* Linn. *Tropical Almond.* *Desmocarpa Almond,* Myrobalan. Fig. 2480. Tall deciduous tree (sometimes 80 ft.), with leaves and branches in horizontal whorls or layers; lvs. broadly ovate-oblong, obtuse, the narrow base slightly narrowed or cuneate, simple and entire, very short-petioled, 6-9 in. long; spikes solitary from the axis, not exceeding the leaves; fls. greenish white, the upper ones stamineate 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. Fig. 2490. Catappa or elephant’s foot tree and for its allibert-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.

**TERNSTREMINIA** (Christopher Ternstroem, Swedish naturalist; traveled in China, died 1745). *Ternstroemiana.* About 25 species of tender evergreen trees and shrubs mostly native of tropical America, a few being native to Asia and the Malay Archipelago. They have shining, leathery foliage and small, white, 5-petaled, drooping flowers, which are solitary or clustered in the axils and borne on unbranched peduncles. Other generic characters: sepals 5; petals connate at the base; stamina numerous; ovary 2-3-loculed; locules securid: fr. reniform; 2- or 3-valved. The following species is offered by importers of Japanese plants.

*Japonica,* Thunb. *Chevretia Ja-""monica,* Thunb. Small tree or shrub, 10-12 ft. high; lvs. alternate, short-stalked, entire, oblong-oblong or oblong, glabrous, feather-veined; fls. clustered; berries about the size of peas. Japan. No. 1381.

W. M.

This rather showy and interesting evergreen shrub of dense bushy growth is flourishing finely in the winter's garden in Florida, in company with other choice shrubs and trees introduced into this country from Japan and China. The Ternstroernia grows well in light, rich soil and attains finally the habit of a small, bushy tree. The young leaves have a reddish color, which changes to a dark glossy green when reaching their full size. My plants, raised from seed in the greenhouse and planted out in the garden when about ten inches high, have attained a height of six feet in five years. The plants have not yet flowered, but they seem to revel in the climate of Florida, being neither influenced by the occasional frosts in winter nor by the heavy rains in summer. In poor soil the color of the leaves has a yellowish hue, but as soon as they have received their share of bome or cottonseed meal they change to a fine deep green.

H. NEBELING.

**TERRACE.** Consult Landscape Gardening.

**TESTUDINARIA** (name explained below). *Dioscora-""ceae.* The *Hottentot's Bread, Tortoise Plant or Ele-""phant'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 root-stock lies above ground and looks something like the back of a tortoise, whence the generic name Testudinaria. The popular name "Elephant's Foot" refers to the uncouth and mas-
sive appearance of the same thing. From the top of the rootstock springs a twining vine which attains a height of 8-10 ft., flowers from July to Nov., and dies down each season. The plant twines by means of the tips of the slender branchlets. It has a weak kind of growth to issue from such a mighty tuber.

The inner part of this "hub" is beautifully contrasted to a turpentine green, texture and color. The Hottons are used to cut it in pieces, make it in the umbrellas and eat it. Old and green bulbs have from time to time been brought from the Cape-as-there is 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 sunflower-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: flower, ovary, male perianth bell-shaped with a short tube and 6 subequal, oblanceolate segments: stamens 6; female perianth smaller: ovary 3-loculed; ovules 2 in a bundle, superposed: stigma 3, recurved, 2-lobed: capsule rigid, nearly trigonous. Flora Capensis 6:232 (1896-97).

Elephantipes, Salish. Rootstock studded with angular woody protruberances: stems slender, glabrous, much branched: lvs. alternate, subumbrellar, 1-2 in. broad, entire, bright green or glaucous, mucronate: flowers inconspicuous, in racemes, greenish yellow or white. S. Africa. B.M. 1347. B.R. 11:221. 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. cunea, is the best known. Its heads have only 4 flowers. They are yellow and about 2-3 in. long. This plant was observed in the East in 1881 for western collectors but has no horticultural standing. For a full botanical account, see Gray's Synoptical Flora of N. A.

TETRAGONIA (Gr., four-cornered; referring to the usually angled fruit). Foundor or Mosch端午aceae. Herbs or subshrubs from the southern hemisphere and Japan. Usually deciduous: lvs. alternate, short petioled, somewhat fleshy: fls. yellow, green or reddish, axillary, apetalous; calyx 2-3 lobed. Only one species known in cultivation.

expansa, Thumb. NEW ZEALAND SPINACH. NEW ZEALAND ICE PLANT. Fig. 231. A hardy or half hard annual 3-6 in. high, often spreading 4-6 ft.; lvs. triangular, larger ones 1-5 in. long by 2-3 in. broad; fls. small, yellowish green. New Zealand. B.M. 2362. New Zealand Spinach is chiefly useful for furnishing greens during the summer when the common spinach cannot be grown. It tastes good cooked 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 room early in January. The seed usually requires about 1 week to germinate. After growing about 1 week the seedlings should be transplanted to boxes and kept about a month later in 4 inch pots. Growing vigorously in this condition they will be large enough to move into the garden toward the end of April, where they should be set 3-4 ft. apart each way, and as the plants grow will entirely cover the ground. They should be handled with great care in transplanting, otherwise growth will be so checked that it will require several weeks for recuperation. Again, plants should never be allowed to become potbound, as this will immediately bring them into flower and fruit and thus stunt their further growth, as well as greatly shorten their period of productivity. 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 for 3 inches of the tops ends of the larger plants should be taken. In the South, it is usually dwarf, not generally exceeding 6 inches.

There is another and somewhat easier method of growing the crop, though a green area will be less productive. In much 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 14 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 1 square foot from November to May inclusive. A crop may also be grown beneath the shelter of their period of productivity.

TETRAGONIA (Greek, four-cornered; referring to the usually angled fruit). Found or Mosch端午aceae. Herbs or subshrubs from the southern hemisphere and Japan. Usually deciduous: lvs. alternate, short petioled, somewhat fleshy: fls. yellow, green or reddish, axillary, apetalous; calyx 2-3 lobed. Only one species known in cultivation.
**TETRAMICRA** (Greek words, referring to the four small divisions of the anther). _Tetramicra_. A genus of small terrestrial or epiphytic herbs of slender habit forming a long terminal spike. The erect stems, which are not pseudobulbous, grow from a creeping rhizome and bear 1-3 flexy linear lvs. from the base of the column; lateral lobes large, spreading or small, auricle-like, middle lobe large, entire, contracted at base, column with 2 wide wings; pollinium 4 perfect and 2 imperfect. Six species in Brazil and West Indies. Culture as for _Laelia_ (p. 572).

**biclor**, Rolfe ( _Leptotes biclor_, Lindl.). Lvs. solitary on the short stem, semi-cylindric, 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, folding over the column; terminal lobe oblong-lanceolate, bright rose, with white lip and margins. A pretty plant. B.R. 19:1925. A. F. 6:653. Var. _glaucaphylla_, Hook. Lvs. glaucous. B.M. 5754. HEINRICH HASSELBECK.

**TETRANEMA** (name refers to the four stamens). _Scrophulariaceae_. A single little Mexican perennial herb, with many nodding purplish flowers crowded on the tops of radical scapes, and grown under glass or in greenhouses for its pretty blossoms. True stem very short or almost none; lvs. crowded at the crown or opposite on the very short stem, obovate or oblong-obovate, shallowly crenate-dentate; fls. purplish or violet spotted with red on the throat; calyx 3-parted, segments narrow and acute; corolla long-tubular, 2-lipped, the upper lip emarginate, the lower longer and 3-lobed; _stamens_ 4; _stigma_ capitate; fr. a 2-valved capsule. _T. Mexico_ 

- _T. multiflorum_, 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 purple scapes 6-8 in. high. Although it is native plants. Usefully as a greenhouse subject, but it makes a good window plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds.

L. H. B.

**TETRATHÉCA** (Greek, 4-celled; referring to anthers). _Tremandraceae_. _T. ericifolia_ is a heath-like Australian shrub which grows about a foot high and bears in July numerous 4-7 or 4-celled pink fls. open only in sunlight. The fls. 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 warns nurserymen to Â®

- This shrub is useful in the landscape for its handsome foliage. It bears a long terminal spike. It is an Australian genus of subshrubs with red or purple flowers. Eighteen species are distributed in Flora Australiensis 1:129 (1863). They vary greatly in foliage, the lvs. being alternate, whorled or scattered, heart-like and entire, or flat and toothed, or reduced to minute scales. Generic characters: stamens apparently in a single series, the anthers contiguous with the filament. 2-celled, or 4-celled with 2 of the cells in front of the 2 others, more or less contracted into a tube at the top; capsule opening only at the edges; seeds appendaged.

- In European greenhouses all the plants of this family are considered difficult of cultivation. They are treated like many other Australian heath-like plants, being placed in dry sand. They are not natives of the state, but are interesting ornamentals. They are not particularly celebrated for their fragrance or beauty. They are usually propagated by greenwood cuttings, but in California the seeds are offered.

ericifolia, Sm. This species is distinguished from its congeners by the fact that its leaves are linear with revolute margins. Heart-like, tender subshrub, much branched and diffuse; sepals not exalted; very with 2 superposed ovules in each locule or rarely a single ovule below the top of the locules. Very abundant about Port Jackson, N. S. Wales. W. M.

**TEUCRUM** (Teucer was the first king of Troy). _Labiatea_. _Teucer_. One hundred or more perennial herbs or undershrubs, mostly of the Old World, four of which are offered in this catalogue. Many are evergreen in the wild state, entire or dentate; fls. mostly purple or pinkish, in whorls forming a terminal interrupted spike; calyx campanulate or tubular, more or less equally 5-toothed, 10-16 teeth; corolla large lower lip, and the upper lip very small or split so as to appear to be wanting; stamens 4, in 2 pairs, inserted through the split or notch in the upper short lip. The _Teucers_ are hardy herbs, with aromatic foliage, suitable for the wild garden or rockwork. They are little known horticulturally. A. _Fls. in distinct 2-fl., whorls, forming a lax terminal inflorescence._

Chamaedrys, Linn. One to 2 ft. tall, from a decumbent base, branching, with age becoming woody below, pubescent or villous; lvs. ovate or oblong, petiolate, incisecrente, truncate at the base, somewhat crenate beneath, the floral ones smaller and scarcely dentate; fls. bright rose, with red and white spots, § in. long, rather showy, in many 2-6-fl. whorls. Europe.—A good border plant for late summer bloom.

- _Fls. solitary or not more than 3 at a whorl, forming a long terminal spike._

Canadensis, Linn. Erect, 1-3 ft. tall, soft-pubescent or crenate; lvs. oblong, obtuse, usually linear-lanceolate, sharp-serrate; fls. purple to cream-color, the corolla about ¾ in. long, the calyx crenate and the 3 upper lobes oblate. Low ground, eastern states, from north to south. The R. 8:97. — Offered by plant dealers in native plants. Useful for low grounds and moist borders. In general habit resembles a Stachys.

AAA. _Fls. on opposite axillary 1-fl., peduncles._

- _Fls. small, with 2-fld. corolla, the upper lip small, or split so as to appear to be wanting; it may be made to flower most of the year. It is usually regarded as a warmhouse subject, but it makes a good window plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds._

**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:

1. The Gulf Coastal Plain.
2. The East Texas Forest Region.
3. The Red River Valley.
4. The Black Waxy Prairies.
5. The Brown or Chocolate Plains.
6. The Pecos Valley.

1. 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, blanched sandy prairie. The streams are bordered in southeastern Texas with timber and undergrowth of many species, including the giant magnolia, holly, palms, and millions other beautiful flowering trees, shrubs and perennial herbs. The rainfall in the southwestern extension of this belt is much less than that of the northeastern part. At Galveston Island, near Brownsville, bananas, oranges and pine-apples are grown to some extent. Figs, flourished everywhere in the coast country. The canned fig industry is developing, and promising fruit for the future. The Dewberries grow to perfection, and wild varieties are marketed in considerable quantities. The Long Cones, Reifer and Garber pears do better in this region than elsewhere. Some of the Chinese fruit group of peaches,
also the Honey and Peen to types, succeed well. Japanese plum, persimmon, and various American and foreign grapes also succeed, the latter requiring to be grown in sheltered places, and not against walls which are found in the numerous vine-walls of the state.

Ornamental horticulture, in all its branches, is here characterized by a profusion and luxury of growth in foliages and flower of a semi-tropical character. Even blooming roses continue to flower most of the winter. Broad-leaved evergreen trees and shrubs, known in the North only in conservatories, are here seen in all walks and gardens of the southern grounds and cemeteries. Cape jasmine hedges, with their dark glossy green foliage and pearly white, camellia-like, sweet perpetual flowers, are very popular. Commercial plant- and cut-flower growers do a good business in the cities of Galveston and Houston. During the winter holidays they collect from the woods great quantities of long ("Spanish") moss, holly, magnolia, mistletoe, palmetto, sandal, 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 blossoms.

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 from the Sabine river on the east to the Red river and south, over 150 miles 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 live oaks, the burr, post and short, are the most common ones of the region. Numerous other kinds, elms, maples, beeches, white and black walnuts, gums, poplars, pecans, hickories, magnolias, holly, persimmons, sassafras, and numerous handsome shrubs and perennials, are found in profusion almost everywhere, 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 000 feet. The rain falls fairly uniformly from 40 to 60 inches annually—the climate is very mild, and altogether it is an almost ideal place to live and to have a good time. The greater part of East Texas is a beautiful forest, but the great lumber mill-interests, and lack of market facilities, nearly all agricultural 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 successful operation for a number of years and these interests are rapidly increasing. This region is one of the wealthiest and most fertile in the state, and yet it has no wealthy or enterprising people. It is a region of tobacco, rice and cotton, but not suitable for most fruits. The climate is warm enough for the growth of most tropical fruits, but the rains are too heavy for the growth of many of the warmest fruits; the soil is too rich, and the temperature too cold for the growth of many of the warmer fruits. The climate is very mild, and altogether it is an almost ideal place to live and to have a pleasant time. The climate is very mild, and altogether it is an almost ideal place to live and to have a pleasant time.

3. The Red River Valley is a long extension to the westward—some 250 miles—of the soil, climate and forest conditions of East Texas, excepting the pines, and some other trees in the eastern part. But, as the Red river runs eastward in a broad, deep, heavily timbered valley, its southern bluffs, some 5 to 10 miles wide, enjoy peculiar immunity from late frosts. From Palestine to Shreveport, Louisiana, and southward to the Arkansas and Mississippi, and pines have not failed entirely in fruit during the twenty-five years of residence of the writer at Denison, Texas.

4. The pecan region is that 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. The population is better off than in the cities of Texarkana, Paris, Sherman, Denison and Gainesville, in which are found many beautiful residences and grounds, many orchards, vineyards, and berry plantations. Railway facilities are excellent, and good markets lie in every direction. Trucking is also extensive. Cut-flower and general nursery business flourish in the places named. The people, coming from the desert elsewhere, are not a very enterprising people, with the northern types prevailing and northern ideas generally appear in the architecture and gardening, yet nice samples of the southern style are not infrequent.

Similar conditions prevail in some parts of the Trinity River valley as along Red river, especially about Dallas and Ft. Worth; also on the Brazos at Waco, but more enterprising, with the northern types prevailing and northern ideas generally appear in the architecture and gardening, yet nice samples of the southern style are not infrequent.

4. The Black Waxy Prairie Region of Texas lies next to East Texas on the west and to the Red River Valley on the south, extending west to about 98° and south to within 150 to 100 miles of the Gulf, a broken irregular arm of the East Texas region extending south-westward between it and the Coastal Plain. This region has an altitude in its southern parts of 400 to 500 feet and rises in the northwest to 1,000 feet or more. The rainfall varies from 30 inches or more in the western parts to 30 inches in the western parts. The foundation is white, chalky limestone, the soil very black, sticky and exceedingly rich, highly adapted to grains, grasses and cotton, but not suitable for most fruits. The town from which to live is Waco. Onions are largely grown in Collin county, of which McKinney is county seat. Most shiurhby does well. The Bermudas grass flourishes in Texas wherever there can grow and is the best for hay grass. Very handsome yards are made by some of the farmers and many who live in the towns and cities; but most farmers in Texas have done little or nothing to beautify their homes horticulturally. Nowhere is there the more apparent than in the Black Waxy Lands, the homes generally surrounded by corn-crops, stock-pens, cotton bins, and exposed farm machinery. There are splendid exceptions to these, that very beautiful homes can be made even in the black lands of the state, where the richest general farming region exists.

5. The Brown, or Chocolate Plains Region of Texas, devoted principally to grazing and small grains, lies to the westward of the Black Land Region, is about 200 miles wide by 600 long, extending from Oklahoma on the north to the Rio Grande on the south, running from 1,000 feet altitude on the south and east to 5,000 feet, where it ends abruptly against the cliffs of the still high Staked Plains Region. Horticultrue is in its infancy in all this vast semi-arid, high, rolling prairie country, and can do little without irrigation. A very rich country, and the soil is well adapted to fruits. For as far west as the Staked Plains Region, the land is a great black plain, the country almost a dead level, except where canals have cut out it, its altitude from 3,000 to 4,500 feet, its climate dry and very sanitory. Irrigation-horticulture in a small way is sustained from driven wells, which strike plenty of water at 10 to 30 feet. Stock-grazing is the only commercial occupation. Five or six counties northwest from Austin, in the central parts of the Chocolate Belt, are very broken, hilly and picturesque, well adapted to fruits. Nearly every home there is supplied with fruits, but stock-grazing is the chief occupation.
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 horticultural conditions are pretty much the same. At El Paso and Ysleta, a little way south on the Texas side, considerable quantities of vinifera grapes of table varieties are grown under irrigation and shipped to other Texas and to northern cities.

Farther down on the Rio Grande, at El Paso, Eagle Pass and Laredo, grapes, figs and onions are considerably grown and shipped to the larger Texas cities and the North. The grapes are of the Old World varieties, and ripen in June; consequently have no competition and bring fine prices. The conditions are such that immense quantities of these grapes of this class can be grown in this part of Texas as in the best regions of California, and the cost of getting to market is not more than half as much. Undoubtedly the triangular region between San Antonio, Laredo and Del Rio will in the near future have extensive commercial vineyards of vinifera grapes.

The Spanish taste in home grounds among the wealthy of southwestern Texas, who are chiefly stock-growers and merchants, prevails largely. It consists of a plaza, or open square in the center of the residence, having fountains (where water is to be had abundantly), and borders, beds and vases of rare tropical and subtropical flowers, shrubs and fruits. Around this highly artistic garden the house is built, often of adobe, sometimes of stone, cut and carved, in large rooms adjoining and opening into each other, all on the ground-floor and one large door opening out to the street or small front yard from a big hall, sometimes having grand arches and marble columns. No windows are in the outside walls, except perhaps in the front, the rooms all being lighted from within the plaza. Thus great seclusion is secured and a perpetual conservatory scene is had from every room. Paved walks, usually covered, run around the plaza next the rooms and similar walks crossing through the plaza.

The plaza-park prevails also in the finer hotels, as seen in some at San Antonio; and these, on an enlarged scale at various places in the denser parts of the city, give a very refreshing appearance. In the central and western parts of the state the northern and eastern style of park, cemetery and private grounds decoration is mostly copied, as is also the architecture. Some very creditable examples are seen in Dallas, Waco, Austin, Paris, Sherman, Gainesville, Fort Worth and other places.

There are numerous small, and a few fair-sized nurseries scattered over the state, chiefly in the Red

2492. Texas Horticulture.

Circles indicate localities devoted to grape culture; black dots to strawberries; broken horizontal lines indicate areas suitable for apples; vertical lines for peaches.
African, Giant  Pet,
Becool, El Paso,
Clifford, Clara,
Climber, (Oak's)
Indian),
Crab, (Crab's)
Late),
Carman, Chilow
Blackberries.
Dewberries.
Mulberries.
Peaches.

T. V. MUNSON.

THALICTRUM

INDEX.

A. Plant covered with a white powder.
debata, Fras. Stemless: petioles 1-2 ft. long; lvs.
canlike, corollae, ovate, 6-9 in. long; scape terete,
5-5 ft. high; panicles erect; spikes erect. June-Sept.
Ponds and marshes, N. C. and west, B. M. 1090. B. L.
1:355. — A fine and stately aquatic when well grown. It
should be placed in shallow water or in wet soil.

AA. Plant not powdery.
divariata, Chapin. Stemless: petioles longer than
in T. debata; lvs. canlike, 1-3 ft. long; olbange-
ovate; scape 8-10 ft high; panicles 2-3 ft. wide; spikes
zigzag, pendulous. Sept., Oct. Ponds, Apalachee, Fla.—According to Reasoner Bros., this magnificent
native ornamental-based marsh plant thrives in garden
soil with canna and like plants. Does well under culti-
vation in southern California.

F. W. BARCLAY

THALICYTRUM (ultimately probably derived from
Greek thalio, to grow, by application doublatif.

B. Filaments widened near the anthers: authors acute, ob-
tuse.

beatus, 1. petaloideum
B. Filaments filiform: authors linear, acute or mucronate.

A. Flowers perfect.
B. Filaments widened near the anthers: authors acute, ob-
tuse.

beatus, 1. petaloideum
THALICTRUM

cc. Fruits longiitudinally coiled: stigma terminal, minute, not dilated, style persistent.

1. glaucum

AA. Filaments pubescent, not glandular; lfts. three to four times narrower or terminally pinnate; lfts. oblong or orbicular, bases variable, 3-5 apical lobes; fls. in a long, leafy, panicle, polygamo-dioecious; sepals white; filaments broadened when young; anthers short; akenes ovoid, stipitate, 6-8-winged or ribbed, with stigmas as long, which become curled. July, Aug. Low or wet grounds, Canada to Fla., westward to Ohio.

7. aquilegiifolium, Linn. Feathered Columbine. Fig. 2493. Stems large, hollow, 1-3 ft. high, glaucous; lvs. once or twice 3-parted; lfts. stalked or the lateral ones nearly sessile, slightly lobed or obtusely toothed, smooth, subapiculate: fls. in a corymbose panicle, dioecious; sepals white; stamens purple or white: fr. 3-angled, winged at the angles. May-July. En., N. Asia. B.M. h. 2925 (as var. formosum). Gn. 47, p. 355. 50, p. 117. - The old name T. Cornuti, Linn., may be a synonym of this, and if so it is the older name, being published on a preceding page, but T. Cornuti was described as an American plant, while T. aquilegiifolium is not. As the description and old figure of T. Cornuti do not agree with any American plant, the name may well be dropped. Those plants advertised as T. Cornuti are probably T. aquilegiifolium or T. polygamum.

8. dioicum, 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 pedicles, dioecious; stamens much longer than the greenish sepals; anthers linear, obtuse, exceeding their filaments in length; akenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Female spring. Woods, Labrador to Ala., west to the foot of the Rockies.

9. venulosum, Trel. Allied to T. dioicum: stem simple, erect, 10-20 in. high, glabrous, glaucous, bearing 2-3 long-petioled Irs. 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; akenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. Dak. westward and southward in the mountains.

2093. Thalictrum aquilegiifolium (X 3/4).

10. Delavayi, Franchet. Slender, 2-3 ft. high, glaucous, lower lvs. mostly sessile, two to three times 3-parted; lfts. long-stalked, 3-5-lobed, base cuneate, rounded or cordate; fls. pendulous, dioecious; sepals purple or lilac, 1/2 in. long, equaling the slender stamens, anthers linear: carpels 10-12: fr. winged at
1792

THALICTRUM


11. occidentale, Gray. Allied to T. troncata, 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, Engelm. Fig. 2494. A variable species. Plants 1-3 ft. high, rather stout and leafy: lvs. four to five times pinnatifid, upper stem-lvs. sessile; fls. rather firm, ovate to orbicular, usually with many shallow rounded or acuminate lobes; bases variable; fls. dioecious, in rather compact panicles; stamens many, anthers long: akenes nearly sessile, obliquely ovate, flat-tended, 3-4 ribs on each face. July. W. Texas to Montana.


THAMNOCALAMUS. See Bamhoo, p. 127.

THAMNOCARIS (Greek, bushy fern). Polypodiaceae. A genus of simple-leaved ferns growing in crowns, sometimes united with Aspleniurn. 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 Thamnophylax Nidus-Avis, Hort.). Bird's Nest Fern. Lvs. bright green, growing in a crown, 2-4 ft. long, 3-9 in. wide, the midrib rounded and usually green. Japan, East Indies. T. strictum, Hort. (Asplenium strictum, Hort.), is a more slender, upright form said to be a garden hybrid between T. Nidus and Selopendrium 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). Umbelliferae. 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.

säurum, Nutt. Stem branched, 1½ ft. high: root-lvs. mostly cordate; stem-lvs. ternate; fls. ovate to lanceolate, serrate; fls. yellow. June, July. Var. trifoliatum, Coulter & Rose, with crenate lvs. or lfts., is a common western form. Var. atropurpureum, Coulter & 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.

2495. Thlesperma hybridum (flower X 3/4).

THEOBROMA. Commercial Cacao or "Cocoa" is produced by trees belonging to the Linnaean genus Theobroma. The estates devoted to its culture are usually known as "Cacao plantations" and are largely on the increase in all suitable climates, owing to the increased demand for the manufactured article in the different forms in which it is now prepared for consumption. The larger proportion of commercial Cacao is produced by Theobroma Cacao. Other species native to central America and the West Indies are T. pentagona, T. spe-
Theobroma pentagona is a species which in vigor of growth and productive capacity resembles to a very large degree the generally cultivated varieties of \textit{T. Cacao}, but it differs in the flowers, in the size of the beans, and especially in the shape of the pods. The beans are larger in size than those of \textit{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 "Alligator 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 \textit{T. Cacao}. In Nicaragua \textit{T. Cacao} and \textit{T. pentagona} are grown together, and the produce is mostly a mixture of the two species. From the presence of \textit{T. pentagona}, it is possible that hybridization has taken place between two species. It has been noted that the pods of \textit{T. Cacao} produce much larger seeds or beans in Nicaragua than in countries where this species is not grown in company with \textit{T. pentagona}; and the beans of the two species are almost impossible to distinguish when cured together. The product of Nicaraguan plantations also requires much less time for fermentation than the produce of Grenada, Trinidad or Venezuela, some forty-eight hours being the usual period, while more than four times that number of hours will be required for the proper fermentation of the produce of the last mentioned countries.

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, warted, and of a dirty brown color when ripe.

Theobroma bicolor 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, in which there can only be a very slight cavity. 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 sweetsmeats in the same manner as \textit{T. Cacao} seeds, but cannot be made into commercial Cacao, suitable for the manufacture of chocolates. This species, though without doubt a true \textit{Theobroma}, is very widely distinct from any of the varieties of \textit{Cacao} that produce commercial Cacao. The produce of \textit{T. bicolor} is known in some parts of Central America by the names of "Wariba," "Tiger," and "Pas-taste" Cacao.

Many names have arisen for the varieties of \textit{Theobroma Cacao} which are in cultivation, as many as forty having been listed by a Trinidad cultivator of large experience. Looking at the matter from a practical point of view, all these are merely strains of the one species, produced by natural cross-fertilization of the older types. According to Hart's "\textit{Cacao}," Trinidad, 1900, there are but three major strains or classes of \textit{T. Cacao}, respectively, "Criollo," "Forastero," and "Calabacillo." The type of the first is found indigenous in Trinidad and various places on the mainland, its distinctive character being its bottle-necked pod, with a thin skin and finely ribbed exterior, together with its white or whitish seeds or beans, which are mild in flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corrugated or containing ribbed, flat or flatted seeds, of a purplish color. It is a tree having greater vitality than "Criollo," and gives a much larger crop. "Fora-stero" is the form this text is said to have been found on the mainland of South America, whence it was imported to Trinidad by Arangueño Capuchin Fathers about 1757. (De Verteuil, History of Trinidad, 1884.)

"Calabacillo" is the third form, its chief characteristics being the vigor of its growth and its small flat and strongly flavored bean. By some it is considered as a degraded form of "Forastero.

While the above gives a sketch of the chief characters of the principal types, it must be understood that there are varieties intermediate between the forms;
the larger proportion of the original fat retained, while the so-called "Cocoa" preparations are the same material in fine powder, sweetened or unsweetened, but with the greater proportion of cocoa fat extracted. This is a pure white substance, almost as hard as beeswax, and is used in many pharmaceutical preparations. Chocolate and Cocoa are both made from the beans or seeds of Theobroma Cacao and T. pentagona, and only differ in the method of preparation.

The word "Cocoa" is a market corruption of the original Spanish "Cacau" which was adopted by Tournefort as a generic name but has since been displaced by the Linnaean Theobroma.

J. H. Hart.

THEOPHRASSTA (Theophrastus was a Greek naturalist and philosopher, 370-286 B.C.). Megasstemon. According to Bentham & Hooker, this genus has but a single species, T. Jussieui, of San Domingo. J. Decaeste, in Annals des Sciences Naturelles for 1876 (ser. 6, vol. 3) contrasts three species. Pax, in Engler & Prantl's "Phanerogamae," written later than either of the above, recognizes four species. Five names occur in the American trade, only one of which is a true Theophrastus, 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 (of the family Sapotaceae). The chief technical differences between Theophrastus and Clavija are in the flowers and fruits. In Theophrastus the corolla is cylindrical and comose; while in Clavija the corolla is attached to the base of the corolla: fr. large and many-seeded. In Clavija the corolla is suborbicular and deeply 5-cleft; staminodia attached on the tube of the corolla; fr. many-seeded. Theophrastus itself includes a glabrous shrub with erect, nearly simple stem, the simple lvs. crowded at the ends of the branches, the lvs. large, white, in racemes. The fr. are perfect and gamopetalous; calyx and corolla with 5 divisions that are imbri-cate in estivation, the corolla bearing a corona in the throat; stamens 5, fixed at the bottom of the corolla-tube; pistil one, with short style and capitate stigma. This name belongs to this species or one of the two following.]

busca, Decne. (T. Jussi. Hort.). Stem simple, with ash-gray bark: lvs. linear or linear-spatulate, 18 to 20 in. long and about 2 in. wide, obtuse, varying from nearly entire to repand-dentate, the strongly spinose, midnervous and tawny red at the base, the secondary nerves confluent at the leaf-margin: inflorescence paniculate or racemose; the racemes short and densely 5-fl., on slender pedicels, bracteolate, the calyx-lobes orbicular and ciliolate, the corolla urceolate-campanulate, dull brown, the corona 5-lobed. Probably not West Indian, but the species found on cult. specimens. — The name T. busca is not known to occur in the American trade.

densilora, Decne. Stem with black spines, the bark brownish: lvs. linear-oblong, 14-16 in. long and 2-2 1/2 in. wide, coarsely spinose-dentate; the secondary veins and crowns and somewhat pubescently: inflorescence terminal and corolla-like, compact, the branches 5-6-fl.; fr. short-pedicelled, campanulate and white; the calyx-lobes orbicular and shortly ciliolate, the corolla-tube, the corona 5-lobed. San Domingo. B.M. 1209 (as T. Jussieui). — The name T. densilora is not known to occur in the trade.

rr. Corolla mostly shallow and deep-lobe: fr. often 1- or 2-seeded (Clavija). — The leaves obtuse.

macrophylla, Hort. (properly Clavija grandis, Decne.). Lvs. large, arnosa, subovate, obtuse-spatulate and obtuse, entire or subacute-rended: petiole thick and dark violet, the secondary nerves slender and simple or forked: fr. orange-yellow, in short, erect racemes; calyx-lobes orbicular and nearly glabrous, the corona 5-lobed. Brazil. B.M. (as Clavija macrophylla) 5829.

LL. cv. Lvs. acute.

longifolia, Jacq. (properly Clavija ornata, D. Don.). A tender tree, often 20 ft. high: lvs. crowded, subverticillate, oblong-spatulate to lanceolate, narrowed at the base, mucronate, spinose-dentate and obtuse, entirely or subacute-rended: petiole thick and dark violet, the secondary nerves slender and simple or forked: fr. orange-yellow, in short, erect racemes; calyx-lobes orbicular and nearly glabrous, the corona 5-lobed. Brazil. B.M. (as Clavija macrophylla) 5829.

liatophila, Wild. (properly Clavija latiloba, C. Koch.). A smaller tree: lvs. oblong-petioled and somewhat elliptic, the ends, mucronate-serrate; racemes erect. W. Indies. — The species seems to be imperfectly known to botanists.

L. H. B.

THEMOPHIS (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-foliate, stipulate leaves and showy yellow or purple flowers in terminal or axillary racemes. The following species are all handsome hardy perennials bearing yellow flowers in early to midsummer. 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. labacca and T. rhombifolia, which spread extensively by the root, but in general the better way is by seed, although the seed is rather slow to germinate and should be sown as soon as ripe or in the spring with some heat.

A. Pod strongly recurved.

**Thermopsis**

**AA.** Pod straight or only slightly curved at the apex.

**bb.** Plant 2-3 ft. high.

**Caroliniana, M. A. Curtis.** Stem stout, smooth, simple; lvs. long-petioled; lfts. obovate-oblong, silky beneath; stipules large, clasping; raceme 6-12 in. long, erect, rigid, many-flowered; pod 2 in. long, erect, villous and hoary. June, July. Mts. of N. C.

**bb.** Plant 1-3 ft. high.

**montana, Nutt.** Plant 1½ ft. high, somewhat silky-pubescent; lfts. obovate to oblanceolate, 1-3 in. long: fls. in long spikes; pod straight, erect, pubescent. May, June. Western states. B.M. 3611. B.R. 15:1272 (both erroneously as *T. fabaceae*). Sometimes called "Buffalo pea" in the west.

**cc.** Stipules longer than the petiole.

**d.** Racemes axillary.

**fabaee, 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.

**mollis, M. A. Curtis.** Stem erect, branched, 2-3 ft. high, pubescent; lfts. oblong-obovate to oblanceolate, 1-2 in. long; racemes 6-10 in. long; pod slightly curved at the end, 2-4 in. long. May-July. Va. and North Carolina.

**T. Cashmeriana, Hort. Sant. does not appear to be known to botanists. J. B. KELLER and F. W. BARCLAY.**

**Thespesia** (Greek, divine; application doubtful). *Malvaceae.* A genus of a few species of tall trees or shrubs native of tropical Africa, Asia and the islands of the Pacific. They have the aspect of Hibiscus and may be distinguished by the confluent stigmas, more woody capsule and the obvoid compressed seeds.

**populnea, Solaod.** A small tree with the younger portions covered with peltate scales; lvs. long-petioled, ovate, cordate, acuminate, 3 in. across; fls. axillary, 2-3 in. across, yellow. Trop. Asia, Africa and the islands of the Pacific. - Cult. in S. Calif., where, according to Franchetti, it succeeds only in warm and moist locations. He also notes the fls. as varying from yellow to purple.

**THEVEIA (André Thevet, 1542-1599, a French monk who traveled in Brazil and Guiana and wrote a book on French Guiana in which the plant is mentioned).** *Apocynaceae.* A tropical American genus of about 7 species of trees or shrubs with alternate, 1- or 2-nerved or lightly pinnate leaves and rather large yellow flowers in terminal few-flowered cymes.

**Thevetia nerifolia,** the Yellow Oleander of Florida gardens, is a very ornamental small evergreen shrub, growing luxuriantly in rich, sandy soil, not too moist and not too dry, ultimately attaining a height of 6 to 8 feet and almost as much in diameter. The foliage is abundant, light, glossy green and reminds one of the oleander, but the lvs. are narrower. The pale yellow flowers are abundantly produced. The fruit, which is of the size and somewhat of the form of a history nut, is regarded as poisonous by the negroes. The *Thevetia* can stand a few degrees of frost, but it was killed out on February 7, 1857, when the thermometer went down to 18° F. If banked with straw or hay it does not suffer much, though the top may be killed.

**lvs.** 2-3 in. long, about 2½ 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.

**d.** Lvs. 2-3 in. long, less than ½ in. wide.

**nerifolia, Juss.** Known locally in Florida as *"Trumpet Flower"* (incorrectly as *"Yellow Oleander.* A tender shrub; lvs. linear, shining, margins revolute; lfts. about 3 in. long, yellow, fragrant. West Indies, Mexico. B.M. 2309 (as *Corbena Thevetia*). - Cult. in S. Fla. and S. California.

**F. W. BARCLAY and H. NEHRING.**

**Thinning Fruit.** All fruit grows larger and better, and often becomes more highly colored, when being equal, when it has an abundance of readily available food. The supply of crude food materials is increased by allowing room enough to each plant and by enriching the soil sufficiently. The plant may set so many fruits, however, that it cannot possibly grow all of them to large size even though an abundant supply of crude food material is readily available. The leaves build up the crude material taken from the soil and air into organic compounds which the plant must have to sustain its life and support its growth. Fruit-growers often fail to recognize that the fruit depends upon the leaves most 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 overlaid 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 treated under the topic of Thinining Fruit.

In its broad significance Thinning Fruit includes not only picking off some of the immature fruit, but also any forming 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 grapes in autumn as soon as the leaves fall. It is then easy to cover the vines if winter protection is needed. The more hardy orchard fruits may be attended to at any time when the leaves are off; the more tender kinds should be left till the set of fruit is better have passed, so that the amount of bearing wood which is taken off may be varied in proportion to the loss of fruit buds by winter injury. The work on peaches and apricots is thus sometimes deferred till the trees bloom, or even later. The sooner a fruit can be relieved from struggling with other fruits for its food, the better its chances are for reaching extra large size. If it, 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 of ordered, or 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 open, but it is well to remember 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, labor applied to thinning 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.

**2497. Thinning fruit.** (Drawn from photographs and reduced to ½ natural size.) The large separate fruits indicate the relative gain in size in thinning plums. The right-hand twig shows relative stage of development at which peaches should be thinned; the twig at the left indicates relative distance between thinned peaches.

**Thimbleberry. Rubus occidentalis and odorus.**
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 fruits is concerned. Although the yield is thus lessened, the ripe fruit 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 are 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.

Fig. 2497 shows the improvement in size attained by thinning the Burbank. Those plums which at their best produce very large fruit, such as Wickson, Diamond and Guilti, usually give better returns for thinning. With all kinds of fruit, those varieties which return most profit when practiced on varieties well adapted for fancy trade.

An exceedingly heavy crop of fruit may seem a fruitful seed to thin the tree that it either fails to fruit the next year or produces less than an average crop. Such a result is more often seen with some kinds of fruit than with others, and different varieties of the same kind of fruit may vary much in their natural tendencies in this direction. By judicious selection of varieties and by skillful management much may be done towards securing more regular bearing and more abundant crops. Thinning fruit has a place in the management of the commercial fruit plantation, along with the maintenance of soil fertility, 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, mature, well-nourished trees on which the fruit had been systematically thinned annually, bore no more regularly than corresponding trees on which the fruit was not thinned. In other cases the beneficial effects of thinning were unmistakably apparent in somewhat increased fruitfulness the following season. The profit from thinning fruit in any one season comes largely from the increased amount of the better grades of fruit which are obtained by the process. The yield of inferior grades may be reduced or may not be greater because the fruit was thinned.

Thinning Fruit has now come to be an established horticultural practice with those who cater to the best markets and aim at the highest ideals in fruit culture. Thinning assists the grower in securing several results, chief among which are the following: (1) in maintaining the vigor of the tree; (2) in producing fruit of maximum size, appearance and quality; (3) in securing annual crops instead of alternate, and (4) in preventing the spread of parasitic diseases.

It does not pay to thin all classes of fruit. Only early or fancy varieties of apples will reward the cultivator for the expense and labor of thinning, though it usually pays to pick the earliest varieties successively, removing the last and leaving the largest. There are some large varieties which, when first, which in effect is a process of thinning. Standard pears are to be classed with apples; dwarf pears are partly thinned by winter pruning, and partly by the removal of surplus fruit in summer. Small fruits, as currants, are thinned more amply than other kinds. Peaches and plums may be thinned by winter pruning, but this is often inadequate. Our best peach-growers now thin to 6 and 8 inches apart and find that when this is coupled with high culture the results are usually satisfactory.

Whether it will pay to thin plums or not will depend upon the variety and the market. The Japanese varieties are much improved in appearance and quality by judicious thinning. The larger varieties of the domestics may under favorable circumstances be profitably thinned, but the wisdom of thinning the smaller varieties of natives and domestics must be determined by the individual grower. Many varieties have a tendency to overbear; these should be thinned in the interest of the health and vigor of the tree. Grapes respond to thinning by increased size of bunch and berry, but there is little or no money in the operation, except where the fruit is grown for a very special market or for exhibition purposes. Thinning the grapes should be accomplished by close inspection of the clusters and the berries are thinned by special methods of culture, such as growing in hills and narrow matted rows. The way in which the operation is performed varies somewhat with

2498. The results of thinning Japanese plums. Lower branch not thinned.
Plate XLII. Prominent American Horticulturists
the fruit. Sometimes small shears are employed, but as a rule the fingers and thumbs of an active man are the most effective instruments available. Practice gives deftness. Eight to ten mature peach trees could be thinned in a short day. As it is important to thin early in the season, experience has shown that much labor is saved if the work is deferred until the "June drop" or first drop after the setting of the fruit occurs. After this, thinning should become prompt.

John Craig.


THLADIANTHA (Greek, to crush and flower; the author of the genus is said to have named it from pressed specimens). Cucurbitidae. A genus of 4 species of tender, juicy, herbaceous vines with tuberous roots, usually ovate-cordate leaves and axillary, yellow flowers. The genus is native of southern and eastern Asia and the island of Java. Male fls., solitary or racemed; calyx-tube short, bell-shaped, the bottom shut by a horizontal scale; segments 5, lanceolate; corolla bell-shaped, 5-lobed, the lobes revolute half way down; stamens 5 with calyx and corolla of male; ovary oblong; style 3-cut: seeds many. Thladiantha has recently been offered in this country under the name of Golden Creeper.

dubia. Bunge. A tall climber with light green foliage and numerous yellow flowers. Male fls. solitary, in the axils without bracts: fr. ovoid-oblong, about 2 in. long, red; seeds black, smooth. Summer. N. China. G. C. H. 23:299. B. M. 5469 (male fl. only).—According to R. I. Lycyn, in G., 56, p. 518, the plants are of easy cultivation and by planting both sexes and artificial pollination the fruit may be grown. He further states that the root-tubers are without buds but form buds promptly. John Craio.

THLAPSPI (Greek, crushed; referring to the strongly flattened pods and seeds). Cruciferae. A genus of 25-30 species of annual or perennial herbs, mostly from the temperate and alpine regions of the northern hemisphere. Mostly inconspicuous plants with radical rosettes of leaves and leafy scapes of small white, rose or pale purple flowers. T. arvense, Linn., known as Penny Cress, is a naturalized annual weed from Eu., 4-12 in. high, simple, with terminal clusters of small flowers; sepals purplish white. T. alpestre, Linn., is a perennial species native of the Rocky Mts. An early-flowering alpine plant of a tufted habit, variable but with the younger Downing. Two of his works, "Farm Implements and Machinery," and the series of nine volumes called "Rural Affairs," deal with the practical every-day matters of life on the farm in a manner at once pleasing and original, there being nothing that spurs the reader's interest so promptly. F. W. Barclay.

THOMAS, JOHN JACOBS (Plate XL), one of the three pomologists who may be said to have created the science in this country (the others being Patrick Barry and the elder Downing), was born January 8, 1816, near the lake of Cayuga, N. Y. He was long out of print and much sought after by fruit men. He was a member of the "orthodox" branch of the Society of Friends, he exemplified in a marked degree the peculiar virtues, both simple and unobtrusive faith, the respect and admiration of those who knew him. Gilbert M. Tucker.

THORNBURNE, GRANT (Plate XLII), founder of the seedhouse of J. M. Thorburn & Co., New York, and horticultural author, was born in 1773 in Dalkeith, Scotland, and early came to New York to seek his fortune. His father was a wrought-nail maker, and the son engaged in the same trade in this country. He soon married, and his wife attended a store which he established in Nassau street, near Liberty. Misses in his business, square-cut and ribbons, thimbles, thread, scissors, and Oxberry's needles. The living rooms were in connection. "A glass door opened opposite the fireplace, where she rolled the dulling or broadening the knife, or squint on the store with the other.." The introduction of cut-nail machines deprived young Thorburn of his trade, and the establishment of a pretentious grocery business on the corner of Nassau and Liberty streets took away his customers. He therefore gave attention to other means of livelihood. The women of the city had begun to show a taste for flowers. These were grown in pots, and the pots were sold by grocers. In the fall of 1802, there being various pots in his stock, Thorburn thought to attract the attention of purchasers by painting the pots green. Four pots were first painted. They sold quickly. Then he painted twelve. They sold; and thus the pot business grew. Thorburn had been in the habit of buying his meat at the Fly Market, at the foot of Maiden Lane. In April, 1803, he bought a rose geranium there, thinking to be able by its means to still further advertise his pots. But the next day a customer bought both pot and plant; and Thorburn quickly returned to the market and bought two more plants. These sold; and thus the plant business grew.

The man, George Inglis, of whom Thorburn bought the plants, was long out of print and nearly 800 engravings,—not to mention a colored frontispiece and highly pictorial binding; and this was followed, ten years later, by a revised reprint in plainer and more tasteful style, illustrating the engravings yet reached, 519. This edition, the last issued during the life of the author, sold well, like all the others, and was long out of print and much sought for. A so-called "second edition," very liberal-minded member of the "orthodox" branch of the Society of Friends, he exemplified in a marked degree the peculiar virtues, both simple and unobtrusive faith, the respect and admiration of those who knew him. F. W. Barclay.

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THINNING FRUIT
seed store in New York, it was arranged that Inglis should grow seeds also. This was in 1855; 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 Calendar" was the first outcome. The third edition of this, in 1821, by "Grant Thorburn, Seedman 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 literary career, "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 1852. He died in New Haven, Conn., January 21, 1863, at the age of 90. The portrait in Plate XLII is reproduced from his autobiography.

L. H. B.

THORNBURY. See Ctenogyne. Christ's T. is Pauurus Spinus-Christi; also Parkinsonia aculeata. Swallow T. is Hippo&ae rhomaicidae.

THORN APPLE. Datura Stramonium; also Parkinsonia.

THORN BROOM. Ulex Europaeus.

THORNY. Armeria.

THRINAX (Greek, thron). Palmadoe. About 10 species of fan palms native to the West Indies and Florida. Spineless palms; trunks low or medium, solitary or cespitose, ringed below, clothed above by the fringed leaf-sheaths: lvs. terminal, orbicular or truncate at the base, flabellately plicate, multifid; segments induplicate, bifid; rachis short or none; ligule free, erect, concave; petiole slender, smooth on the margins; sheath usually beautifully fringed: spadices long; axis clothed with tubular sheaths; papery-coriaceous, split; fls. on rather long, slender pedicels, the pedicel with a caduceous bract at the base; fr. the size of a pea. For the new Porto Rican species, see Cook, Bull. Torr. Bot. Club, Oct., 1901.

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. elegans, see Acrocomia elegans.

A. Under surface of leaves green.

1. radiata, Lodd. (T. elegans, Hort.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; segments united to or beyond one-third, ligule broadly rounded, with a short, blunt appendage at the middle. Cuba to Trinidad.

2. parviflora, Swz. Caudex 10-20 ft. tall; lvs. 10-25 in. long, minutely pubescent, becoming glabrous, green beneath; segments united to or beyond one-fourth or one-sixth their length; ligule blunted deltoid, 1½ lines long. Bahamas, Jamaica. Florida. S.S. 10:510.


4. argentea, Lodd. Caudex 12-15 ft. high, 2-3 in. thick: lvs. shorter than the petiole, silvery gray beneath; segments united at the base; ligule concave, semilunar, erose. 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. grandiflora, Hort.). Stem medium, 6-8 ft. high; sheaths ragged, flabellately reticulate, tomentose: young lvs. white woolly-tomentose; blade equaling the petiole, lanceolate; segments united one-half their length, eniform-acuminate, rather stiff, glaucous beneath; ligule transversely oblong, sinuate, 3-lobed. Haiti. I.H. 31:542.

T. cristata, Grisch. & Wenn. Cuban. Descriptions available. Only one plant known. Cult. by W. C. Wilson, ed Astoria, N. Y. T. daucina, Hort. seems to be unknown to botanists. -T. Mooreana, Wenn. A native of Anguilla, grows 1 ½ ft. high, and has lvs. which are glaucous beneath. Segments free for about two thirds or three fourths their length. Lately offered in Fla. G.C. III. 11:133. JAREG G. SMITH.

THYRTOMENE (Greek word said to refer to the low heath-like appearance of the plant). Myrtaceae. About 18 species of heath-like shrubs from Australia, with small, opposite leaves and small or minute flowers, which are solitary in the axils or fascicled. Mitchelliana, F. Moell. A compact, bushy shrub with slender branches: lvs. oblong, flat, ½-¾ in. long; fls. in the upper axil 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.

THUJA. See Thuya.

THUJOPSIS. See Thuyaopsis.

THUNBERGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnaeus; died 1828). Acanthaceae. Mostly tall perennial greenhouse climbers producing flowers in great profu-
sion: Ivs. opposite: fls. blue, yellow, purple or white. 

olitary and axillary or in racemes; calyx annular and 
carcefly lobed or toothed or 10-15-toothed, surrounded by 2 large bracts which often inclose also the corolla- 
tube; corolla tube curved or oblique, often compressed, enlarged 
toward the mouth; stamens 4, didynamous, fixed near 
the base of the tube, filaments thickened at the base, 
above are easily raised from cuttings or layers in sum-
mer. T. erecta is not a climber but has a somewhat 
struggling habit. It has small, dark green lvs. and 
large, deep purplish blue gloxinia-like fls., which are 
white at the base side. It is a pure white variety of it. 
It blooms all summer and autumn. It is readily raised 
from cuttings during the rainy season. H. NEHRING.

2309. Thunbergia alata (X 1/2):

INDEX.

aflinis, 1  coerulea, 5  H.  462.
ala, 2  corollae, 1  intus-alba, 7.
alka, 2  coccinea, 2  laurifolia, 7.
doddsii, 2  earrings, 2  Myosorensis, 8.
saurantica, 7  fragrans, 3  sulphurea, 2.
backeri, 2  Fryeri, 2  unicolor, 2.
chrysops, 5  grandiflora, 6  grandiflora, 7.

A. Fls. axillary, solitary.
B. Lvs. entire
BB. Lvs. angarally toothed
C. Petalos not winged
D. Color of fls. white: corolla-
lobes truncate and similarly 
toothed at the apex
DD. Color of fls. blue (white only 
in varieties)
E. Plant suberect
EE. Plant climbing
F. Throat of the corolla yellow
FF. Throat of the corolla white
GG. Fls. terminal or axillary racemes

AA. Fls. in terminal or axial 
or racemes
BB. Color of lvs. blue
BBB. Color of lvs. yellow

1. aflinis, S. Moore. A rambling shrub, 10-12 ft. 
high. Smooth: branches 4-angled; lvs. short-petioled, 
toothed, rough-pubescent, tomentose beneath; petioles 
winged, about as long as the lvs.; fls. solitary, on 
axillary peduncles; calyx very small, surrounded by 2 
large inflated bracts; corolla tube shorter than the 
involute, dark purple within; limb rotate, oblong, 
of 5 rounded segments, buff or cream-colored. S.E. 
L.B.C. 11:1045.—A perennial climber which may also 
be propagated by cuttings. It is used either as a
houseplant 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 varie-
ties, some of which have been described as species.

Var. alba, Paxt. (T. aflinis, var. albiflora, Hook.). 
Var. surautantica, Ktze. (T. surautantica, Paxt.). 
Fls. bright orange, with a dark center. The best of the 
group. P.M. 6:289. Subvar. Doddsii has variegated 
Bakkeri or Backeri, Hort.). Fls. pure white. Var. 
Fryerii, Hort. (T. Fryerii, Hort. T. alata, var. intus-
alba, Hort.). Pale orange, with a white center. Var. 
(T. alata, var. sulphurea, Hort.). Fls. entirely yellow.

lanecolate to triangular-ovate, cordinate or subordinate, 
mostly angularly toothed on each side of the base, 
rough on both sides, petiole: fls. white, axillary 
corolla-tube narrow; limb spreading, 1½ in. across, 
lobes truncate and repandly toothed at the end. Sum-
er. India.

H. NEHRING.
Var. levis, Clarke, is glabrous. B.M. 1881. L.B.C. 20:1913. Var. vestita, Clarke, is more hairy and the flowers are not fragrant.

4. erecta, T. Anders. (Meigninia erecta, Benth.) Shrub, 2–4 ft. high, with loose spreading branches, half-erect; lvs. opposite, petiolate, ovate or subrhomboid, smooth, entire or sinuate-toothed; fls. solitary on axillary peduncles; calyx cut into 12–14 short teeth, concealed by the large bracts; corolla funnelform; tube bell-shaped; limb 3 in. across, of 5 large, spreading rounded lobes. Bengal. B.M. 2306. P.M. 7:221. L.B.C. 4:324. B. 2:76. B.R. 6:49.5. Gn. 47:1003. l.H. 11:221. F. 1844:193. – Naturally a climber, but said to become somewhat erect if grown in a coolhouse.

5. chrysops. Hook. Stem climbing, slightly hairy: lvs. opposite, petiolate, oblong-lanceolate, 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 concave, with reflexed side lobes, lower lip of 3 subequal, spreading lobes, India, B. 4:476. l.B.C. 12:752. S.M. 2, p. 130. – A tall greenhouse climber which flowers, according to treatment, at all seasons.

6. grandiflora, Roxb. Fig. 2501. Stem tall, climbing: lvs. broadly ovate, angularly cordate and toothed or lobed, somewhat rounded on both sides, petiolate; fls. solitary or in short, dense 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. 2306. P.M. 7:721. L.B.C. 4:234. B. 2:76. B.R. 6:485. Gn. 47:1006. 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.


8. Mysorënsis, T. Anders. (Hexacéntris Mysorënsis, Wight). Climbing shrub with long, slender branches: lvs. opposite, petiolate, oblong-lanceolate, acuminate, entire or somewhat distantly toothed; racemes long, pendulous; fls. yellow, 2 in. across, the tube enclosed by the spathe-like bracts; limb 4-lobed, the upper lip concave, with reflexed side lobes, lower lip of 3 subequal, spreading lobes, India. B. 4:476. l.B.C. 12:752. S.M. 2, p. 130. – A greenhouse climber which flowers, according to treatment, at all seasons.

9. coccinea, Wall. (Hexacéntris coccinea, Nees). A very tall greenhouse climber which flowers, according to treatment, at all seasons. Axils and petioles similar, spreading; labellum convolute over the column, spurred, ornamented with several crests consisting of lines of stiff hairs; pollinia: fls. subtended by large membranous bracts.

The species of Thunia occur in northern India, Burma, and in the S. Himalaya region ascending to a height of 6,000 ft. The culture of the Thunias is very simple. They begin growth naturally at the end of February or early in March. As soon as new growth is visible the plants should be given new material consisting of throm beak or fern-root and sphagnum mixed with loam and some sand and pot-herbs for drainage. In their native home the plants are said to be epiphytic, and when treated as terrestrial orchids they require a native habitat 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 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 suberect, 2–3 ft., clothed with of 4 angled; lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cordate angled base, the upper ovate, cordate, all angularly toothed or the upper entire: fls. terminal or axillary racemes, 1–3 ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B.M. 5124. L.B.C. 12:1195. F.S. 23:2447. R.H. 1890, p. 197.

Bensonia, Hook. (Phaius Bensonianus, Benth.). Stems fascicled, 1-2 ft. high, leafy: Ivs. linear-lanceolate, 8-10 in. long; fls. white, acuminate, with 3-lobed, widely spreading lobes surrounding the column, middle lobe wavy and crisp. The color of the labellum is yellowish white, with five orange-fringed keels in the throat: wings of the column toothed. May-Aug. India. B.R. 21:229. G.H. 47, p. 223. S.H. 2, p. 335. — A var. ionophila, Reichb. f., has the center of the labellum yellow, paler toward the margin.

Marshalliana, Reichb.f. (Phaius Marshallianus, Nichols.). Closely related to T. alba. Stems somewhat stronger; segments pure white, acuminate; labellum evidently 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisp. The color of the labellum is yellowish white, with five orange-fringed keels in the throat: wings of the column toothed. May-Aug. India. B.R. 21:229. G.H. 47, p. 223. S.H. 2, p. 335. — A var. ionophila, Reichb. f., has the center of the labellum bright yellow, paler toward the margin.

HEINRICH HASSELBRING.

THURBER, GEORGE (Plate XLI), botanist, naturalist and editor, was born in Providence, R. I., September 2, 1821, and died at his home near Passaic, N. J., April 2, 1890. He obtained his early education at the Union Classical and Engineering School of his native city. Afterwards he served an apprenticeship as pharmacist, at the termination of which he began business for himself in partnership with Joshua Chapin. During these years he devoted himself eagerly to the study of chemistry and natural sciences in general, but especially to botany, so that at an early age he was already well known as one of the most prominent botanists of the country. This brought him in close intimacy with Drs. John Torrey, Asa Gray, George Engelmann, Louis Agassiz and other eminent scientists, whose warm friendship he enjoyed until his death. In 1850 he obtained the appointment as botanist, quarter-master and commissary of the United States Boundary Commission, for the boundary line 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 hitherto unknown regions. His herbarium collected there comprised a large number of species new to scientists, 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 Novus Thurberinanus," 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 ties 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 Buchanan campaign fund, 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 principal of the Michigan Agricultural College, which position he held for four years. Here his wide and varied knowledge, of which he had ready command, his alertness of brain, and varied knowledge of natural sciences, arts and industries, his quick perception and rare judgment as to cause and effect had fitted him so admirably. Few men have exerted so powerful and effective an influence on progressive horticulture and agriculture as has Dr. Thurber. During his connection with the "American Agriculturist" he was a most painstaking and scrupulous editor and would not accept any article or statement about the correctness and accuracy of which he was not fully convinced. In order to convince himself to his own satisfaction of the value of new plants, fruits and vegetables, he established an extensive experimental and botanical garden in connection with his home on the Passaic river, which he named "The Pines," after a clump of tall white pines growing in front of it. The results of these observations and experiments formed the basis of a regular and valuable series of "Notes from the Pines." But in no part of his editorial work has he taken so much delight as in the "Doctor's Talks," and thousands of now gray-haired men and women will long hold in grateful and affectionate remembrance "The Doctor," who through his letters to the "boys and girls" has added so much to the delights of their childhood days. Although Dr. Thurber was never married and had no children, he was always fond of young people and was never happier than when he could teach and assist them in whatever lay in his power. The amount of his writings in the "American Agriculturist" during the twenty-two years of his connection with it was enormous, but as his name but rarely appeared with his articles it would be impossible to estimate the aggregate, yet whatever he wrote bore the stamp of accuracy of detail and naturalness of style. While in Michigan he revised and partly rewrote Darlington's "Agricultural Botany," which was published under the title of "American Weeds and Useful Plants." He wrote also the entire botany of Appleton's "New American Encyclopedia." An important part of
his contributions to horticultural literature consisted in editing, revising and bringing out the horticultural and agricultural books of the Orange 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 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 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, sham and impostors of every kind.

F. M. HEXAMER.

THUYA (Thuya or Thvia, an ancient Greek name for a resinous tree or shrub). Also spelled Thuya or Thuia. Including Thuya, Concordae, Arborvitae. Ornamental evergreen trees 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 hardly north and also T. japonica. T. gigantea and several forms of T. orientalis are hardly as far north as Maws. 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 procured 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. decussata and Meldensis. Consult Retinixpora.

Five species occur in N. America, E. and Cent. Asia. Resiniferous trees with short horizontal, much ramified branches; the branchlets flattened and frond-like aranged: Ivs. decussate, scale-like, appressed, usually glandular on the back; fls. monocious, globose, small, terminal on short branchlets, staminate yellow, consisting of usually 6 opposite stamens, each with 2-4 anther-cells; pistillate consisting of 8-12 scales in opposite pairs, of which only the middle ones, or in the section Brusa, the lower ones, are fertile, each scale with 2 ovules inside at the base; strobiles globose-ovate to oval-oblong, with 2 seeds under the fertile scales. The wood is light and soft, brittle and rather coarse-grained, durable in the soil; it is much used for construction, cabinet-making and in cooperage. T. occidentalis contains a volatile oil and thuja and is sometimes used medicinally.

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. Ivs. yellowish or bluish green beneath; usually 2 pairs of fertile scales.

2503. Typical form of Thuya occidentalis (× 1/4).

2504. Seedling of Thuya occidentalis (× 1/4).


2506. Thuya occidentalis, var. Ellwangeriana (×⅔). of foliage; the younger and lower branchlets with spreading acicular lvs. like those of var. ericoides, but thicker in texture; the upper branchlets slender and sparingly ramified much like those of var. douglasii.


BB. Lvs. with whitish markings beneath.

gigantea, Nutt. (T. plicata, Don. T. Mruzessi, Donel. T. Lobbi, Hort.). Tall tree, attaining 200 ft., with short horizontal branches often pendulous at the ends, forming a narrow pyramid; trunk with a much buttressed base and clothed with cinnamon-red bark; branchlets slender, regularly and closely set; lvs. bright green and glossy above, dark green beneath and with whitish triangular spots; lvs. of vigorous shoots ovate, acuminate, glandular, of the lateral branchlets acute and scarcely glandular; cones cylindrical-ovoid, little over 3/4 in. long; scales 8, 10, elliptic-oblong, usually the 3 middle pairs fertile; seeds winged, notched at the apex. Alaska to northern Calif. and Mont. S.S. 10:533. G.C. III. 21:258. G.F. 4:116. Var. aures, Beissn. With yellowish foliage. Var. gracilis, Beissn. Smaller tree, with more slender branches and smaller foliage of paler green.

Japonica, Maxim. (T. Staudishii, Carr. T. gigantea, var. Japonica, Franch. & Sav. Thuya gigantea Staudish, Gord.). Similar to the preceding but lower, usually only 20-30 ft. high; branchlets more irregularly set, thicker and less compressed; lvs. ovate, obtusish, thickish, lighter green above, darker beneath and with whitish, triangular spots; cones oval, little over 3/4 in. long; scales 8, oval, usually the two middle pairs fertile. Japan. G.C. III. 21:258. R.H. 1896:160. 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, Linn. (B. 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, 3-4 in. long; usually 6 ovate scales, each with a horn-like process, the uppermost pair sterile. From Persia to E. Asia, in Japan probably only cult. There are many garden forms, of which the following are the best known: Var. athrotaxoides, Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. K.H. 1861, p. 290. Var. aures, Hort. Low,
compact, globose shrub; golden yellow in spring, chang-
ing to bright green. Var. aurea conspicua, Hort. More erect, the intense golden foliage partially suffused with green. Var. aurea nana, Hort. Golden yellow foliage and very dwarf and compact habit. Var. aurea vari-
gata, Hort. Of pyramidal habit, branches variegated with yellow. Var. decussata, Beiss. & Hochst. (Ret-
unia purpurascens, Carr. Chamaecyparis decussata, Hort.). Fig. 2508. Dwarf, globose form; lvs. linear,
linear-oblong, spreading, stiff, acute, bluish green. A juve-
nile form; see also, Retinia purpurascens, Hort. elegan-
tissima, Carr. Of low, columnar habit, bright yellow in spring, yellow-green in autumn. Var. falsata, Lindl. Of dense, pyramidal growth, deep green, the horns of the branches curved backwards. Var. filliformis stricta, Hort. Round-headed, dwarf bush, with upright, thread-
like branches. Var. gracilis, Carr. Of pyramidal, somewhat loose and slender habit, with bright green foliage. Var. tenuifoliae and var. Nepalis are hardly different from this. Var. Meldensis, Veitch. Of col-
umnar pyramidal, somewhat irregular growth; lvs. scie-
cular, bluish green, sometimes passing into the normal for-m. Intermediate between the var. decussata and the type. Var. pendula, Parl. (var. filliformis, Henk. & Hochst. T. pendula, Lamb. T. filliformis, Lindl.). Branches pendulous, thread-like, sparingly ramified, and with the lvs. wide apart and acuminate. Var. funi-
spreaading 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 obovate-oblong, obtuse, acumi-
cate except at the apex, the lateral ones spreading, ovo-v-lanceolate and curved (hatchet-shaped), obtuse; scales of staminate fls. 8-10, much thickened at the ob-
tusely pointed apex, the middle ones fertile and with 3-5-angled edges; under each scale. Japan. 8.2-5:119, 120.
G.C. II. 18:556.- Var. nana, Sieb. & Zucc. (T. ha-
teriens, Lindl.). Dwarf form, with more slender and narrow branches of a lighter green. Var. variega-
Forte. Tips of branchlets creamy white.
T. brevifolia, Hort.—Chamaecyparis-Naumann—T. Sieb.,
Gord.—Thuja japonica. Alfred Rehrer.

THYMUS

THYME. See Thymes.

THYME, WATER. See Eulalia.

THYMUS (classical name of doubtful origin, perhaps from the Greek for incense). Labiata. Thyme. Prob-
ably about 50 species, although more have been de-
scribed, 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-
currative. The flowers are mostly in shades of blue or purple, but are
sometimes white; they are borne in whorls, forming a
terminal spike or head-like cluster. Thymes are erect
or prostrate plants with strong mint-like odor. Most of
the species are grown as a ground cover on banks, in
borders or rockwork. The creeping or prostrate habit,
ability to persist in dry places and poor soils, and the
colored or woolly foliage of some species make them
adaptable to a variety of uses. The common T. Ser-
pyllum is evergreen. T. vulgaris is the Thyme of sweet
herb gardens, being prized in cookery. All Thymes are
mostly cultivated for their foliage, although seed-
lings may sometimes be used to renew plantations of
some of the species, particularly of T. vulgaris. Se-
veral names occur in American catalogues, all of which
seem to be referable to three species, one of which is
not a true Thyme. See Sage, where general culture
of such herbs is given.

vulgæris, Linn. COMMON THYME. Plant erect,
the base sometimes decumbent, 1-5 ft., the branches
stiff and woody, usually white-pubescent: lvs. sessile,
linear to ovate-lanceolate, aculate, 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, wery-stemmed, slightly pu-
baceous: lvs. small, seldom 1/2 in. long, narrow-oblong to oval, obtuse to narrowly inclined to a distinct p- to the, the margins sometimes slightly revolute: its. minute, lilac, much shorter than the lvs., in axillary whorls. Temperate parts of Europe, Asia and N. Africa. — A common plant in old gardens, vulgar as an ornamental green edging and as cover for rockwork and waste places; also run wild. The leaves are sometimes used for seasoning, as those of T. vulgaris are. The nodes and short, making it a very leafy plant. Variable. Some of the cult. forms are: var. citriodorus, Hort. (T. citriodorus, Schreb.), the Lemon THYME, has small, strong-veined lvs. and a pronounced lemon odor. Var. menthaefola, Bl. (T. montana, Waldst. & Kit. T. Chamodorus, Fries.), 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. Folage golden, particularly in spring. Var. argenteus, Hort. Lvs. variegated with silvery white. Var. variegatus, Hort. White-variegated lvs. Var. coenococcus, Hort. Plts. nu- merous, scarlet. There is a form with white fls. (see Gr. 43, p. 108). All forms are hardy.

Coryssia, Pers., is properly Calamintha Corsica. Both. Prostrate, small, glabrous or nearly so: lvs. very small, 2 lines or less long, nearly orbicular, peltated: fls. small, light purple, in whorls, the floral leaves similar to the others. Coryssia.—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 panicled thyrse. Calyx short, 5-parted; corolla long-tubular, the limb 4-cut, slightly 2-lipped; stamens 2; staminodia 2, small, at the base of the filaments: capsule oblong; seeds 4 or fewer by abortion.

Schomburgkianus, Nees (T. rutilans, Planch.). Fig. 2599. A shrubby plant, becoming 6 ft. high: lvs. oblong-lanceolate: racemes 8-10 in. long or even 3 ft. long from the upper axis, slender, drooping: fls. tubular, red, about 1 1/2 in. long, pendulous. Dec.-March. Colombia. B.M. 4851. R.H. 1852:160. Gn. 42, p. 482. F.S. 7:732. 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 umbrelalike habit and pendulous grace of its long sprays of slender, red, tubular flowers. Like many other acanthus, it becomes leggy and weedy in old plants, even if cut back severely. Hence, plants are rarely kept after the second season. The culture of Thyrsacanthus is easy. It is an ideal plant for a general collection, as it requires no special treatment. Some English writers advise a stove temperature, but the undersigned has grown it for many years in a coolhouse. Ordinary potting soil such as suTs geraniums will do for Thyrsacanthus. It flowers about April and remains in flower a long time. Cuttings may be made at any time in early spring and will produce flowering plants 2-2 1/2 ft. high the first season. After flowering, they should be cut back severely. It is not necessary to have more than one plant in a pot, nor should the young plants be pinched the first season, as the banana is preferable to that of a compact, much-branched bush. The penu- lous habit of Thyrsacanthus has suggested to some gardeners the use of this plant for hanging baskets and brackets. ROBERT SHORE.

THYROSOSTACHYS (Greek, thyrse and spike). Gramineae. T. Staminus is a tall Indian bamboo which has been offered in southern California since the article Bamboo was written. It is a rather novel plant. The stems included in Miffld's Bamboo Garden, its horticultural status is uncertain. Franceschi writes that 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- men-, a 2-keeled pala and the pericarp free from the seed. For generic characters of Thyrosostachys, see The Flora of British India 7:387 (1897).

Thyrosostachys is a genus of 2 species of arborescent bamboos native to Upper Burma and Siam. The stem-sheaths are long, thin and persistent, with a long, narrow blade. The lvs. are small or moderate-sized. As nearly as may be judged from the only available description, this species could be inserted at the bottom of page 128 of this work, being distinguished from species 12 and 13 by the narrowness of the lvs.

Siamensis, Gamble. A tender, deciduous, "giant bamboo," very graceful tufted stems 25-30 ft. high and 1 1/2-3 in. thick. Stem sheaths waved and truncate at the top, 9-11 x 4%-6 in.; auricles short-triangular; blade narrowly triangular: lvs. small, narrow, linear, 3-6 x 1/2-3/5 in. Siam. W. M.

THIARELLA (Latin, a little tiara or turban; in reference to the form of the pistil). Saxifragaceae. False Mistflower. 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-foliate, 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 locules.

a. Lvs. simple.

cordifolia, Linn. FOAM FLOWER. Fig. 2510. A handsome native perennial, forming a tufted mass, 6-12 in. high, of broadly ovate, lobed and serrate leaves and simple, erect racemes of white flowers borne well above the foliage in May Fls. about 1/2 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. 511; 55, p. 456; 58, p. 415. — 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
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 1½).

BB. Petals filiform, inconspicuous.

unifoliata, Hook. Hardy 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 laming of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

Tri. 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). Melastomeae. 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 Hs., solitary or in terminal panicles. Fls. 5-mecrous, rarely 4- or 5-merous; calyx more or less armed with rigid spreading bristles which are thickened at the base. Brazil. B.M. 42:2. P.M. 15:27. F.S. 12:1212 (as Lasiandra elegans).—Once cult. by John Saul.

F. W. BARCLAY.

TIGRIDA (tiger-like; referring to the peculiarly marked flowers). Iridaceae. Eight or ten species of cornous plants ranging from Mexico to Peru and Chile, 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-leaves 1 or 2, leaf-like, each bearing one or few blossoms. Flowers in shades of yellow, orange, purple, or violet, variously spotted, often very showy; perianth wide-spread, with no tube, the segments 6, in two dissimilar series: 3, usually united to the base; stamens 3, the filaments united into a long cylindrical tube including the style; pistil with 3-loculed ovary, long style with three 2-parted branches. *Tigridia pavonia*, from Southern Mexico, was in cultivation in Europe in the sixteenth century. L’Oelad described it in 1556. The younger Linnaeus referred it to the genus Ferraria, and some of the Tigridias are yet cultivated under that name. *Ferraria*, however, is a South African genus, and all the parts of the perianth are nearly equal. *T. pavonia* is cultivated in many forms, and is the only common species in gardens. The flowers of all Tigridias are fugitive, lasting only for a day. See Baker, Iridea, 67 (1892).

Tigridias are tender "bulbs" requiring the treatment given Gladiolus. Plant in well-prepared soil when settled weather comes, 2 or 4 inches deep and 4 to 8 inches apart. The principal blooming period is July and August. Allow the corms to remain in the ground until danger of frost approaches, then store in a dry place where dalias 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; style-long, dark red. *Tigridia pavonia*. 1807

**Pavonia**, Ker-Gawl. Tiger-flower. Shell-flowers. 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, only marked, with a cup-shaped or saucer-shaped center and wide-spread limb formed by the obovate outer segments which are bright red on the limb, and purple, yellow or red-spotted on the claw; inner segments panduriform (fiddle-shaped), about half the length of the outer ones, the blade ovate-acute, orangy-yellow and copiously spotted. Mex. and Guatemala. B.M. 532 (as *Ferraria Tigridia*). I.H. 38:114. Var. *conchiflora*, Hort. (T. conchiflora, Sweet), has bright yellow flowers. Var. *Watkinsonii*, Hort. (var. *alba*, Hort. *T. conchiflora, Watkinsonii*, Paxt.). Raised from seeds of var. *conchiflora* pollinated by *T. pavonia*, 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. conchiflora*, the female parent; the large outer sepals, however, are of a very deep yellow, inclining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free a bloomer, and as easy to cultivate and increase as *T. pavonia*, whereas *T. conchiflora* is rather delicate, increases slowly, and is easily lost." Dutch bulb dealers still offer it. P.M. 14:51. Var. *alba*, Hort., has white fls., but has red spots in the throat. Var. *alba immaculata*, Hort., is a spotless white variety, a sport from var. *alba*. Gn. 49, p. 361. Var. *flava*, Hort., has pale yellow fls., with red-spotted center. Gn. 50:1074. Var. *cariciformis*, Hort., is also a pale yellow-flowered form, but named as if an inhabitant of the Canaries. Var. *lilacca*, Hort., has lilac fls., with spotted center. Gn. 45:235. Var. *spplocosa*, Hort., is a partially dwarf form with deep red color, the interior of the cup being similar in color to the limb. Described in 1843. Var. *grandiflora*, Hort., has flowers much like those of *T. pavonia* itself except that they are larger and brighter colored. Gn. 35, p. 263. Identical with this, or subtypes of it, are the forms known as *Wheeleri, cocinea, splendens*. Most of the marked depature in color of *Tigridia pavonia* is 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-
Tilia (the classical Latin name). Tiliaeae. Linden. Basswood. Trees distributed generally throughout the northern temperate zone, with soft, light, white or light-colored wood, tough fibrous inner bark, serrate alternate petioles, mostly cordate, and ciliate petioles, in rosulate cymes, the peduncle attached to, or adnate with, for about half its length, a ligulate membranaceous bract: fls. small, yellowish; sepals 5; petals 5; stamens many, with long filaments near colored; fr. globose, nut-like. In some species, small petaloid scales are found among the stamens.

The soft white wood of several species is in great demand for making fruit, honey and other light packages, the facility with which the wood is cut into veneers rendering it admirable for such use. The fibrous inner bark is used as a tying material and in the manufacture of Russian bass or bast mats. Extensively planted as an ornamental tree and for bee pasture. As a source of honey supply per lucrative. But it is not in the American trade. See page 1436–1437. F. Hort. The wood is Hydroscopic

The Linden. A mediunm-sized species with slender somewhat pendulous branches, fine pale green above, silver and finely tomentose underneath, 3–5 in. long; petiole slender, as long as the blade. July. E. Europe. B.M. 6737. Gng. 5:210. A very elegant species and one of the best of the European kinds, holding its foliage throughout the season.

2513. A young Linden tree, five or six years old, until they root; when the trees severed from the old stump and planted in the nursery rows. Rare varieties are usually increased by budding or grafting.

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B. Fls. with petaloid scales at the base of petals: petals spreading, shorter than stamens. 1. petalóris

C. Corolla many, small, with a carpel at the insertion of the petal: fr. large. 2. Mandshurica

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H. Winter-buds covered at the base; fr. thin, slightly glossy above. 6. vulgaris

I. Winter-buds covered at the base. 12. ulmifolia

1. petalóris. DC. (T. Americ
tica, var. pendula, Hort. T. argentea, var. pendula, Hort. T. alba, var. pendula, Hort. T. alba, var. pendula, Hort.) Silver Linden. Weeping Linden. A medium-sized species with slender somewhat pendulous branches, fine pale green above, silver and finely tomentose underneath, 3-5 in. long; petiole slender, as long as the blade. July. E. Europe. B.M. 6737. Gng. 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: lvs. large, 5-8 in. long, orbicular to broadly ovate, cor- date or truncate at the base, rather coarsely and re- motely serrate with spreading teeth: floral bract adnate almost to the base of peduncle: fr. globose, thick- shielded, with 5 arrows and a slight elevation at the insertion of the petal. E. Asia. A variety has the lvs. edged with yellow or a lighter green.

3. tomentosa. Moench (T. argentea, DC. T. alba, Waldst. & Kit., and probably Ait. T. alba, T. alba, var. spectabilis, and T. alba, 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; lvs. suborbicular, 3-5 in. across, un- equally coriaceous, serrate, densely pubescent; fr. white-tomentose be-neath; blade 2-4 times longer than petiole: fr. tomen- tose and slightly ribbed. Very variable in time of flowering. Eastern Europe.—This is a very distinct and striking species.

4. heterophylla. Vent. (T. alba, Michx., not Ait.) Tree, attaining 70 ft.: lvs. very large, 5-8 in. long, smooth and shining above, whitish and tomentose be-neath; floral bract short-stalked: fr. globular, not
This has been TILLAGE properly be-ribboned. July. Alleghany. S.S. 1:27.—This has been sent out as T. macrophylla, a name that properly belongs to a large-leaved var of T. Americana.

6. pubescens, Ait. (T. Americana, var. pubescentis, Loud.). Similar to the better known T. Americana, but a smaller tree: winter buds finely pubescent: lvs.: ovate, truncate or slightly cordate at base, gradually acuminate, rather coarsely serrate with incurved teeth, 4-6 in. long: floral bract almost to the base of the peduncle: fr.: globose, thick-shelled, 5-ribbed only at the base. Japan. G.F. 6:113.

7. Americana, Linn. (T. Cornutifolia, Hort.). American Linden.—Tilia Americana. Large, ribbed. July. Eu. N. A. 1:124. Mn. 6:155.—This is our most common American species and the one most frequently planted. Variable in its habit, size and shape of lvs. and in the color of its bark. As a forest tree it was formerly abundant in the eastern and middle states, but with the general destruction of the forests and the greatly increased demand for its white wood for manufacturing purposes, good specimens are becoming scarcer, and the source of supply is constantly moving westward. Vars. in the trade are macrophylla, Hort., a large-leaved form; Moltkei, Hort., a very strong-growing large-leaved form which originated in cultivation in Europe. What is sold sometimes as T. Americana var. pubescentis, is a form of T. petiolaris.

8. Mongolica, Maxim. A slender tree with very small circular or ovate 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. platyphyllos, Scop. (T. quadrifolia, Ehrl.). 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, peltate and veins hairy: fr.: 5, rarely 4-angled, kentomose, 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 to the same species as that described above, with red shoots; rubra, bark of branches very red; aurea, with yellow bark on branches; laciniata and laciniata rubra, with deeply cut leaves and reddish young bark: suaveolens aurea, with scented leaves.


11. vulgaris, Hayne (T. Europaea, Hort., in part). This species has large unequal or oblique cordate lvs., smooth and green on both sides; tufts of hairs in axils of veins whitish: fr.: globose or oval, tomentose. shell. June, July. Eu. 6:225.—This is said to be the celebrated species of Berlia and is often sold in this country under the name of T. europaea. It is a week or ten days later in blooming than T. platyphyllos, and abounds 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 earlier discussions of scientific matters, as applied to agriculture in recent years, there is danger of forgetting that the fundamental practice in all kinds of farming is, after all, the tillage of the land. The knowledge of the importance of tillage has developed late in the world's history. In fact, it is only within the latter part of the century just closed that the real reasons for 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 1735, in England. This book awakened such much discussion that the system of "horse-hoeing 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 benefited 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 explained the good effects of burning or "devourishing" land, and also the benefits that followed the application of ashes: the minute particles of the ashes are so small as to be absorbed by roots. Although this explanation of the benefits of tillage was erroneous, nevertheless Tull showed that tillage is necessary to the best agriculture and that it is.

2514. Basswood or American Linden — Tilia Americana. (x 1.5)
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 underdrainage 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.

Land that is well tilled has different chemical relations from that which is neglected. Nitrification, decoloration and other chemical activities are hastened. The stores of nitrates are rendered available. The composition and natural chemical activities are hastened.

2515. Cryptanthus zonatus, commonly known as Tillandsia zebrina (× 14).

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 unnecessary parts are removed, and most of it is brought into such condition that the plants can utilize it. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage in the bottom of his pots or boxes. Often the gardener may produce more plants from a handful of soil as a farmer will produce from a bushel.

L. H. B.

TILLANDSIA (Elias Tillands was professor of medicine at the University of Uppsala, Sweden; 1622-1674) is the catalogue of plants of the vicinity of Uppsala. Bromeliaceae. Tillandsias are mostly epiphytes and all natives of America. They are allied to billbergias, schencaea, guzmania, pinguicula, and various others. Many species have been described in horticultural literature as having been introduced into cultivation, but most of these are known only to amateurs and in collections where species of botanical interest are chiefly grown. In the American trade about 30 names occur, many of which are to be referred to other genera. The generic limits of Tillandsia, as 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 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 "De Candolle's graphism Phanerogamarina," 1896. The latter work, which regards Vriesia as a separate genus, admits 248 species of Tillandsia. Some of these species extend northward into the United States, growing chiefly in Florida, although one or two reach southern Georgia, and the Spanish moss (which is Tillandsia usneoides) reaches Virginia and is common throughout the South. The native upright Tillandsias are not in the trade, but they are offered by one dealer in southern Florida; of such are T. recurvata, T. tenuifolia, T. fasciiculata, T. utriculata.

Tillandsias are usually known as "air-plants" to gardeners. They are perennial herbs, mostly of upright growth (the common T. usneoides being a marked exception), the bases of the narrow entire leaves often dilated and forming cups that hold water and in which utricularias and other water plants sometimes grow. The flowers are usually borne in spikes or heads, singly beneath bracts; they are perfect, with 3 sepals and 3 petals which are twisted or rolled in the flower. The flowers, 3-stamened, are enclosed within a superior ovary with filiform style: fr. a 3-valved capsule, containing hairy or plumose seeds. Vriesia is distinguished by having one or two seales or lipules at the base of the petals on the inside, while in the petals of Tillandsia are eliptagone; 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. schizina, which is properly Cryptanthus zonatus (Fig. 2515). This is an odd plant, producing reflexed 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 scurvy and sometimes 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. A few species, however, grow on the ground. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept nearly dormant, although not completely dry. They need a warm temperature and plenty of light while growing rich. Give a richer soil if necessary. In many cases sphagnum may be added to advantage. Prop. by suckers; also by seeds. For further cultural notes, consult Billbergia. Other bromeliaceous genera described in this book are Bromelia, Cryptanthus, Ananas, Pitcairnia, Puya, Guzmania.
trees; the stems very slender and often several feet long; leaves scattered, narrow-linear, 1-3 in. long; flowers 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. 6301. — This is one of the most characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cultivated, although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the lichen Usnea.

2G7.-This is one of the characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cultivated, although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the lichen Usnea.

2516. Spanish Moss—Tillandsia usneoides. (Much reduced.)

2517. The Spanish Moss—Tillandsia usneoides, hanging from the trees. Gulf coast.

A. Plant-body slender and hanging; flowers solitary in leaf axils.

B. Spanish Moss—Tillandsia usneoides. (Much reduced.)

2517. The Spanish Moss—Tillandsia usneoides, hanging from the trees. Gulf coast.

A. Plant-body slender and hanging; flowers solitary in leaf axils.

A. Plant-body still and nearly or quite erect.

B. Stamens shorter than the petals.

C. Flowers few in the cluster.

recurvata, Linn. (T. Bidtrami, Ell., at least in part).

A few inches high, tufted, with scurfy terete or filiform recurved 2-ranked leaves: flowers 1-5 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. Flowers many, distichous.

ánceps, Lodd. (Vriphia ánceps, Lem.). Erect, the flowers-stem 6-12 in. tall and bearing a spike with large distichous green bracts from which small blue flowers emerge; leaves, about 1 ft. long, dilated and striped at the base: flowers 2 in. or less long, blue or purple, the perianth much exceeding the calyx. Costa Rica, Trinidad. L.B.C. 8-771.


BB. Leaves gradually narrowed from a broad base.

fasciculata, Swarts (T. fasciculata, Champ.; T. glauca, Baker; Vriphia glauca, Hook.). Tall, strong species with stem 4 ft. tall: leaves 1-1½ ft. long, concave or channelled above, erect or ascending, scurfy and bluish; stem longer than the leaves and branched, the branches or spikes bearing distichous keeled acute spreading segments bluish purple. Ecuador, Peru, B.M. 16:610; 27:370 (as var. Regelia). G.C. II. 12: 161. R. H. 1872:230; 1926:200 (as var. tricolor). F.M. 1872:14.-A handsome and popular species.

BB. Leaves gradually narrowed from a broad base.

c. Stem thicker and bulb-like at the base.

bulbosa, Hook. Small scurfy plant a few inches high, the stem swollen at the base; leaves 3-5 in. long, much dilated and clasping at the base and terete above; flowers few, in racemose short spikes, long and narrow, the much exerted but not spreading petals purple. Var. pica, Hook., has the upper lips and bracts scarlet. S. Fla. to Venezuela. B.M. 4288. F.S. 5:221.

polystachya, Linn. (T. angustifolia, Swartz. T. parrispica, Baker). Leaves rosulate, 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: flowers blue. S. Fla. to Brazil.

tenuifolia, Linn. (T. caraguata, Leconte, not Champ. & Schlecht. T. Bidtrami, Ell. in part). Plant less than 5 ft. tall, reddish, clustered; leaves, awl-shaped and erect, nearly terete, concave at the base, scurfy; flowers few in a simple or somewhat compound spike, the blue petals exceeding the bracts and recurving at the apex. S. Fla. to Brazil.

DD. Leaves gradually narrowed from a broad base.

fasciculata, Swarts (T. fasciculata, Champ.; T. glauca, Baker; Vriphia glauca, Hook.). Tall, strong species with stem 4 ft. tall: leaves 1-1½ ft. long, concave or channelled above, erect or ascending, scurfy and bluish; stem longer than the leaves and branched, the branches or spikes bearing distichous keeled acute mostly greenish and red-tinged bracts: flowers narrow, exerted, blue. S. Fla., West Indies and Central Amer. B.M. 4445. F.S. 5:432.-Very variable.

urticulata, Linn. Plants 2-3 ft. high: leaves glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base and forming pocked that hold water: inflorescence branched, the flowers far apart on the branches: flowers pale blue (pale colored forms), narrow, the petals twice longer than the sepals. S. Fla. to S. Amer. B.K. 7:49 (as T. reznovii, var. pallida).—For full description of this species, together with plate, see Trelease, 5th Rept. Mo. Bot. Gard. (1894).

T. biflora, Linden, is Cryptantha biflora. See p. 501.—T. ferox, Hort., is Pityopsis pyramidales. See p. 503—T. La saltiana: "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, loose soil mixed with sphagnum." (Schultes.)—T. mounana, Linden, is properly Guzmania mounana, Mez. It is acrostem: leaves 1-3 in. less in a rosette, erect and oblong but with a crop with transverse lines on both surfaces: flowers in a rounded head on the end of a red-bracted scape, the corolla white. Colombia. B.M. 6653. I.H. 24:286 (as Caraguata mounana). It is an excellent plant, with broad leaves 2 ft. long. In the American trade, this plant is sometimes known as a Massangea (see p. 992.)
TIMOTHY. Phleum pratense.

TINANTIA fagi (Scheidw.), is sometimes seen in old gardens but is not in the trade. It is a tradescantia-like herb from tropical America, with blue fis.; in bracted curved terminal clusters, 1-2 ft. Grown indoors and out. Known also as Zauschneria coccinea, and as Z. latifolia, B.Jtt. 1340. U.K.

TOADSTOOL. Consult Mushroom and Fungi.

TOAD  FLAX. Linaria vulgaris.

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.

TOCOCa (Toceo, the native name of T. Guianensis). Melastomaceae. A genus of 38 species of tropical shrubs native to the northern part of South America, including several handsome foliage plants for hot-houses. Their beauty is similar to that of the well-known Cyrtomium, for which see Miconia. The fis.; are usually ample, petiolate, membranous, rarely leathery, entire or denticulate, usually 5-nerved; fis.; rather lateral, but usually terminal or subterminal. Panicles white, red or ros; 5-merous, rarely 6-merous; stamens 10; ovary 3-loculed, rarely 5-loculed.

TOLMIEA (Tolmiea, a western relative of the Bishop's Cap or Mitella, according to several names are accounted for under Vriesea: carinata, caerulea, aurantiaca, guttata, Sanadore, splendens, tessellata, schwartzi (in part). L. H. B.

TOLMIA (Kake Tolbaté, Malabar name of T. sectata). Rutáceas. About 8 species of trees, shrubs and climbers native to the Old World tropics and the Cape. Introduced in 1802. One of the most popular species is T. muscosa, Hort., is Pitcairnia muscosa, as described by the following names: T. muscosa, Hort., is Pitcairnia muscosa. B.M. 1340, R. & K. 17:1403. L.B.C. 13:1300.

TIPUANA (name apparently Latinized from a Brazilian name). Leguminosae. A genus of 3 species of handsome South American trees with odd-pinnate fis.; numerous alternate leaflets; and 1 flower, in low, terminal panicles. Here belongs the plant recently introduced to southern Calif. as Machaerium Tupa, which Franchetti says yields one of the rosewoods of southern Brazil.

TIPULARIA (Latin, Tipula, a insect, 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; fis.; in a long, loose, terminal raceme, green, nodding; leaflets 1-2 in. long, aristate, spreading; label-uml 3-lobed, produced into a long spur behind; column erect, winged, narrowly wedge shaped.

TIPUANA, Bentham (Machirion Tepu, Benth.). Tender yellow-flf. tree; fis.; 11-21, oblong, emarginate, entire, 1¼ in. long; veins somewhat parallel; standard larger than the heel: pod veiny, S. Amer.

TIPSAX (T. Gigantea, Boiss. & H. B. K.). A genus of 38 species of tropical shrubs and trees, known Cyranophyllum, for which see Miconia. The fis.; in clusters, 1-2 ft. long, regularly placed at the nodes; the other species of the section have shrubby and glabrous branches. A very beautiful plant, but considered to be difficult to grow.

Tococa 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 of the leaves, with the sporangia borne on the under surface of the leaf. The last species—among them frequently united with Toceo—more properly form a distinct genus of their own, containing perhaps, differing widely in habit from the original Toceo; they form delicate foliage plants resembling the filmy ferns in habit.

For culture, see Ferns.


b. Texture thin: fis.; with linear divisions.

hymenophylloides. Rich. & Less (T. peltidaea, Hook.). Fis.; in 1-2 ft. long, 18-24 in. wide, pinnas erect spreading, sometimes 2 in. wide; sori closely placed, often covering the whole under surface at maturity. South Africa to New Zealand.

supéra, Col. Fis.; 2-4 ft. long from a woody caudex; pinna often crissed, the lower gradually reduced; rachises densely tomentose. New Zealand.

b. Fis.; bipinnate.

Thrésér, Hook. & Grev. Fis.; 1-2 ft. long, from an erect woody caudex 18-24 in. high, lowest pinna nearly as large as the others; rachises mostly naked. New Zealand.

hymenophylloides. Rich. & Less (T. peltidaea, Hook.). Fis.; in 1-2 ft. long, 8-12 in. wide, lowest pinna about as long as the others; rachises mostly naked. New Zealand.

supéra, Col. Fis.; 2-4 ft. long from a woody caudex; pinna often crissed, the lower gradually reduced; rachises densely tomentose. New Zealand.

b. Fis.; bipinnate.

Thrésér, Hook. & Grev. Fis.; 1-2 ft. long, from an erect woody caudex 18-24 in. high, lowest pinna nearly as large as the others; rachises mostly naked. New Zealand.

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supéra, Col. Fis.; 2-4 ft. long from a woody caudex; pinna often crissed, the lower gradually reduced; rachises densely tomentose. New Zealand.

b. Fis.; bipinnate.
TOLMIEA

and with the same style of beauty. It is a perennial herb 1-2 ft. high, with loose racemes of small greenish or purplish flowers. The species seems to have been culivated abroad, and twenty years ago it was offered in the eastern U. S. for western collectors. It is probably hardy and doubtless requires some shade.

TOLMIEA menziesii L. is a native of the Pacific coast and is probably the only plant of the Saxifrage tribe that has 3 stamens. All the others have 2. It was described under Tiarella and Heuchera and has been known since 1846. It resembles in foliage and inflorescence. It seems to be the only plant of the Saxifrage tribe that has 3 stamens.

Menzieii, Torr. & Gray. Perennial herb 1-2 ft. high, with slender creeping rootstocks and some summer runners: lvs. round-cordate, more or less lobed and ovate. and eapsil, line or tinged purplish, subtended by a stalked, all alternate, those of the stem 2-4 in number: racemes 0-1 ft. long; fls. and capsules nearly ¼ in. long; greenish or tinged purple. Forests of Mendocino Co., Calif., to Puget Sound.

Propagated naturally by adventitious buds, produced at the apex of the pedicles of the radical lvs. and rooting when these fall to the ground.

W. M.

TOMATO (Plates XLII). The Tomato is Lycopersicon esculentum (which see), one of the solanum or night-shade 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. 2518-20. The flat angled and wrinkled Tomatoes (Fig. 2520: 1333, Vol. II) are much inferior to the former. 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, 2529) 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 Lycopersicon pimpinellifolium (Fig. 2523). It sometimes hybridizes with the common species (Fig. 1338, Vol. II).

The Tomato requires a warm soil and climate, a sunny open position, and a long season. The plants are usually started in hotbeds or glass houses, being transferred to the open as soon as settled weather comes. The plants are usually set from 4-5 feet apart each way and are allowed to grow as they will, finally covering the ground. For home use, however, the plants are often trained, in order to forward their ripening and to secure larger and better colored fruits. The best method is to train to a single stem, as recommended for forcing below. The stem is supported by a stake or perpendicular wire or cord (Fig. 2524); or sometimes it is tied to the horizontal strands of a trellis. This single-stem training requires close attention, and if the time cannot be spared for it, the vines may be allowed to 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 usually does not give such perfect fruits as the single-stem training, since the number of fruits is limited in the latter. The most serious general difficulty in Tomato growing is the rot of the fruit. This usually causes most damage, following close, wet weather when the fruit is ripening. It is apparently worst on plants that cover the ground thickly, and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop beyond a few pickings; and if the plants are brought into bearing early and are kept in thrifty condition for subsequent bearing, the percentage of total injury is greatly reduced. The Tomato is tender to frost. The green fruit remaining when frost kills the plants may be ripened in tight drawers or cupboards, if it is nearly or quite full grown. The Tomato is probably a short-lived perennial; but in cold climates it is grown as an annual plant.

General Advice on Tomato Culture. - The Tomato comes from tropical America and in its natural habitat the conditions of temperature and moisture during the entire growing season are constantly favorable for its rapid development. The fruit is set in May or June, and if we are to have the best possible results with it under cultivation, we must provide them and see that it is properly treated from the start. Of course care in transplanting, care in the dressing of the soil, and care in the removing of suckers will be of the utmost importance. But when the plant is young, will surely lessen the quantity and lower the quality of the fruit produced. This is a strong statement, but we are convinced of its truth by scores of experiences like the following:

Two adjacent fields of similar character were set with plants from the same coldframes. Those in one field were carelessly set out just before a cold, dry wind-storm and received a check in transplanting. The effect of which was evident for at least ten days; but the plants ultimately became as large as those in the second field, which had been kept in the coldframe during the storm and were set out rather more carefully than the first lot, but six days later. They suffered scarcely perceptibly from the transplanting, and actually commenced a new growth sooner than those that six days earlier. The subsequent treatment of the two fields was as nearly identical as possible; but the second field yielded over 100 bushels per acre more fruit than the first and it was so superior in quality that, sold by the same man in the same market, it brought an average of nine cents per package more money.

We were familiar with the fields and their treatment, and know of no reason for the difference in results except that one lot received a check in transplanting. All our experience with Tomatoes convinces us that the first and great essential to the best results is a steady constant growth from start to finish, but more especially when the plant is young. This
leads to a method of culture which differs somewhat from that usually recommended. We plant the seed in flats placed in a greenhouse or hotbed, some forty to fifty days before we think the plant can be set in the field without danger of frost, or what is quite as bad, a cold, dry wind storm. As soon as the plants can be handled (which ought to be ten or twelve days from the sowing of the seed), we transplant into other flats or into 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 plants able to stand erect when set in the field, even if they are a little wilted. A plant which has once bowed its head suffers from it forever.

For tomatoes we prefer a field that has been made rich by fertilization in previous years, but if manure is used we aim to have it thoroughly worked into the soil. There is no crop in which this is of greater importance than with tomatoes. If we have to depend upon commercial fertilizers we select those comparatively rich in nitrogen, and phosphoric acid and work in two-thirds of it just before setting the plants and the balance some four or five weeks later. We prepare the field by plowing as early as it can be worked, and repeated reploving or 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, running the cultivator as deep as possible, and go through again every two or three days, as the need arises, but we aim to make each cultivation shallower than the preceding one until it becomes a mere stirring of the surface soil.

When quantity and quality are of little importance compared with earliness, the best results are obtained by a method almost the opposite of that given above. The seed is sown very early so that, though growth is kept in check bycrowding and scarcity of water, the plants have set the first cluster of fruit, which is sometimes nearly full grown by the time danger of severe 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 the soil be at all cold. When the plants are to be staked and pruned they may be set as close as 30-40 inches apart. We have obtained the best results from the use of a single stake, some 2 inches square and 6 or 8 feet long, to each plant. As soon as the plant shows its first cluster of flowers it divides, and the two branches are allowed to grow, being tied to the stake as necessary; all branches starting below the division are cut or pulled off, and any above are cut off just beyond the first leaf or cluster of blossoms. Most of the fruit produced in the Gulf states for shipment north is grown in this way.

For market or for canning and pickling, quantity and quality of crop and clean production are of prime importance, and the best results are secured by following the general cultural directions as just given. As the gathering of the crop is one great element of its cost, we have found it profitable to set 15 to 20 rows and then omit one to form a driveway, at the same time omitting every sixth or eighth plant in the row to form a cross-walk. This facilitates the distribution of the empty, and the collection of the full crates, and enables one to gather the fruit with less injury to the vines; consequently one secures nearly as much marketable fruit, particularly if it is gathered green for picking, as if the entire space was covered.

Although the Tomato has been in cultivation a much shorter time than most of our garden vegetables, there have been developed a great many varieties, differing materially in habit of vine, size, form and color of fruit as well as other qualities; and these differences are so divergent, and individual taste and the demands of different markets so varied, that it is difficult to classify the varieties or arrange them in order of merit.

The extra-early sorts are of two types, one represented by Early Minnesota, with a vigorous vine producing in abundance large clusters of small, round, smooth fruits which ripen early but are too small for market; the other represented by the Atlantic Prize, in which the vine is short-lived, lacking in vigor, and produces very early-ripening fruit, too rough to be salable after the smoother sorts reach the market.

Of varieties for a general crop there are quite a number, varying greatly in type and quality, from the Optimum of medium size, perfect form, fine flavor and brilliant vermilion-red color, through the larger Favorite and Matchless, to the perfect-shaped, large-sized, late-ripening Stone; or if one prefers the purple-red, from the Acme through the Beauty to the later Buckeye State.

If one prefers the dwarf-growing plants, we have the purple-fruited Dwarf Champion or the fine-flavored and beautiful red Quartz Centaur, Purple Good Luck, and to meet individual tastes we have the immense and solid Ponderosa and the Honor Bright, which can be
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 a peach. For picking we have the Red Plum and Yellow Plum, the Red Pear-Shaped, the Red Chili, and the Yellow Chili-like exquisite-flavored Burbank's Preserving. Every season there are new and more or less distinct 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.

W. M. Tracy.

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 a sheltered place on the south side of a bank or erect seed by hand; the sash is then put on close to the & at the lower end of the bed the frame is put on as soon as the dirt is warm, rake it over it and line, then sow the seed in drills which are made about 2 inches apart by a marker. Sow soon conn- uji. All. r the plants at night. When the plants are four or five weeks old, and are not growing fast, while a slender, weak plant will not start to grow as soon. Transplanting the plants from the sowing bed into the cold beds helps the plants, and they will produce earlier fruit than those set in the fields from the hotbeds. Take them up with a trowel that all of the dirt possible may go with them from the bed into the field. In case the ground is dry, take a large box with clay in it and make a regular mash, 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 wellrowed, then mark it off 4 x 6 or 5 x 6, and when the ground is very rich 6 x 6 feet, and set the plant in the cross. Use the hands to fill the dirt around the plant. Set the plants that are transplanted under sash first, as they are the oldest and strongest. These can be risked in the field first; then fill that bed with plants again, as plants may be needed for replanting in case cutworms or other causes destroy some of the first setting.

Never put manure under the plants set in the field. The best way to manure the ground is a year before, for some other crop, such as cabbage, potatoes or pickles; then you can grow Tomatoes several years after. Never put Tomatoes in ground prepared with fresh manure, for the manure burns the roots and causes trouble, and the flavor of the Tomatoes is not so good. As soon as a field of Tomatoes is planted, go over the area with hoes and draw up some soil to the plant, and fill in around the plant with earth so it will not get dry into the roots. After the plants begin to take root, go through the field both ways with the cultivator, and keep this up during the season. One cannot cultivate them too much. Some farmers think that because there are no weeds growing around the plants they need very little cultivating, but this is a mistake. When the season is dry they need more cultivation in order to keep up the moisture.

Half-bushel baskets are very useful in picking Tomatoes. Our own practice is to take about six rows in a piece and throw the vines of a row around so that we can drive a team through the field. If the rows are 6 feet apart a team can go through without destroying many Tomatoes. In that way one can pick more Tomatoes in a short time because he does not have to carry them so far. Have boxes alongside where the team will go and the Tomatoes are carried to these bushel boxes, and when the team comes are loaded and driven to the factory. Picking is done mostly by children. A man is with them who keeps account of what they pick and gives them instructions in picking. H. J. Heinz Co.

Tomato Culture in the South.—The Tomato is one of the most capricious of market-garden vegetables. It is of greater relative importance in the South than in the North. Essentials of habit and cultivation do not materially differ in either section. While by no means s
gross feeder, the plant demands a fairly good soil, light, porous and well drained, and is generally responsive to judicious fertilizing, though it is sensitive to the slightest accumulation of soil water. Under fertilized, it is unprofitable; too liberally manured, especially with nitrogenous matter, it runs to vines at the expense of fruit and is subject to excessive molds from internal decay. The well rotated or well watered results more from wet seasons or 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— to select a moderately dry, sandy loam, well manured the 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, fungus 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, 1,350 lbs.; nitrate (or sulfate) of potash, 260 lbs.; total, 2,000 lbs. This may be used to the amount of 1,000 lbs. per acre with safety on a well-selected soil if applied sufficiently early in the season. Such an application should produce a yield of 300 bushels per acre in a normal season with any of the better standard varieties.

Varities.—All things considered, the following short list presents for the South the best of half a century's effort in development: Crimson Cushion, Stone, Ponderosa, Freedom, Amece, Trophy, Paragon and Perfection. The medium-sized, smooth, round, red, firm, solid red, and glossy varieties represent the type 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 status is entirely due to its adaptability and maintenance. Yet local experience and preference must ever differ with this as with all other soil products.

For slicing, Golden Queen or Yellow Amece is incomparable, but it is valueless for cooking by reason of the muddy tint developed thereby. Fruit of the Ponderosa type is too large, gross and frequently too unsymmetrical for successful shipping; it finds a ready sale in local markets. Extra-large 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:

<table>
<thead>
<tr>
<th>Vigor (covering freedom from disease)</th>
<th>Per cent</th>
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<tbody>
<tr>
<td>Good</td>
<td>20</td>
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<tr>
<td>Produciveness</td>
<td>20</td>
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<td>Shipping quality</td>
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<td>Shape</td>
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<td>Color</td>
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<tr>
<td>Flavor</td>
<td>8</td>
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<tr>
<td>Cooking quality</td>
<td>4</td>
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Cultivation.—Whether grown on a large or small scale, Tomatoes 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—to open ground in the lower latitudes, farther north into boxes or "Nepomex" 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 bedding on the fertilizer drilled in, though compost is usually distributed "in the hill." For garden culture the latter plan is strongly recommended, though broadcasting is preferable for limited areas. A shallow or reasonably even bed should be prepared, and the top dressing of superphosphate in early spring, gives excellent results.

Distance naturally varies with character of soil—sometimes with variety. Tomato, and depends on the mode of training. Where no supports are used 6 x 4 ft. is not too great. When treilled with 3 ft. posts, at intervals, and one strand of No. 12 wire, either 6 x 4 or 6 x 5 will do, and when trained to 5 ft. single stakes, 5 x 5 ft.

The crop should be rapidly 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 pinching back weak or inconsequent laterals is necessary. All lower laterals when stake-training is employed must be pruned until a main stem is established, which is trained spirally around the stake and secured with raffia, after which laterals are to be short pruned or trained to form a "fan." This is an ideal, and also a practical system, and though necessarily the most expensive, will generally justify its use by the results. With the trellis-system two or three shallow intervals, allowing the plant to spread laterally, is sometimes restricted to the stem for "fan" results. When no support is used only the more stocky and fungus-resistant varieties should be planted and securely pinned to stakes or supported by the use of the stake-pump. It is certain the most economical form of cultivation everywhere, at least to outward appearance.

Without his spray-cart and fungicide the tomato-grower is lost, and knows it. The prayer 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 sprayings to consist of an admixture of four parts Bordeaux mixture, two parts seaweed and one part of lime, or three parts of Bordeaux mixture to one part of lime. It is certain the most economical form of cultivation everywhere, at least to outward appearance.

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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 the fruit as it 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 canner as first grades and hence the standard of excellence may always be maintained without material loss.

Fungal Diseases. — Of the fungal affections of the Tomato, damping-off in the seed-bed is the first to be noted, and is familiar to all. Provoked by excess of moisture, warmth and confined air, it may be controlled by withholding water from the young plants except at midday, stirring the soil to break up and destroy the mycelium of the fungus, and otherwise thoroughly ventilating.

Mildew, Cladosporium fulvum, is a common malady in the South during wet seasons, and may be easily recognized by the continuous and successive death of the foliage from below upward along the main stem, and the great effort of the plant to set new leaves and branches above, thereby maintaining its life at the expense of production. Steady spraying with Bordeaux mixture is the remedy.

Florida blight, an undetermined species of Sclerotia, is less common, though sometimes quite serious. It produces a wilted appearance in the plant somewhat resembling that caused by the "bacterial blight," and like it generally causes death. The peculiarity of this fungus consists in the fact that the greater portion of its life is passed under ground and it is hence unaffected by fungicides applied to the foliage. Even when applied to the surface of the ground beneath the plant Bordeaux mixture is of little value, since the precipitate formed by the copper salt in suspension is more or less arrested or strained out by the soil as the liquid filters through. The ammonical solution of copper carbonate, and eau celeste, are not liable to this objection, and may be used as remedies with fairly satisfactory results.

Leaf curl, edema, is also well known and while it seldom, if ever, completely destroys the plant, yet it greatly reduces its productiveness and is all the more insidious from the fact that it frequently escapes notice until it reaches an advanced stage. It is a form of vegetable dropsey 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 Macrosporium — 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, nuisible, of penetrating the outside tissues of the fruit, but rapidly developing on abraded surfaces or in insect wounds of any kind.

2523. Foliage of the two cultivated species of Tomato. Lycopersicum pimpinellifolium — Currant Tomato — above; L. esculentum — common Tomato — below. (× ½)
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 successful rows of all the various vegetables and leguminous vegetables, the selection of areas not recently planted with solanaceous crops, and finally the importation of seed from large commercial plants as well as from districts known to be exempt from the blight.

**Infested Pests.**—While these are relatively numerous, their ravages are much less of a menace to the grower than are the disease-producing bacteria and fungi. Only the more important are here mentioned.

First, the leaf worm, *Heliothis armigera.* The problem of the damage done by this insect is of almost equal interest to the cotton planter and the Tomato grower. The corn grower, too, being largely concerned, it might well be left in their hands for solution, but for the fact that the latter's main interest is not confined to the direct destruction of their crops, but that they are maimed through the pestilence of the blight candida. It is true, however, that not only the corn grower, but the tomato grower, is interested in the "bolt" worm's interest in the "bolt" worm is paramount. Unfortunately, no adequate remedy beyond hand-picking, the use of corn as a "trap plant," and the destruction of worm's eggs 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 as equal in efficacy. Except the "chogenic reds," *Helicoverpa celerior," which usually proves effective, in combination with the process of poisoning followed by tobacco growers by means of a solution of cobalt and sugar deposited on the ground in and around the corolla of the Jinnson seed, *Datura Stramonium," which the tobacco moth frequents.

The bean beetle, *Phyllophaga citrina," pinching the foliage in clumps, cloudy weather and thereby assisting the invasion of fungi and bacteria, is sometimes repelled though not destroyed by Bordeaux mixture.

Nematode galls, Fig. 214, p. 151, caused by the "chogenic reds," *Helicoverpa celerior," which attack cotton, peas and certain other garden plants, frequently do much damage to the Tomato. They can be avoided only by rotation of areas and preventing the contiguity of any of their hosts plants—particularly peas.

After all, the chief injury wrought by insects upon the Tomato consists not so much in direct depredation as in the incidental transfer of bacteria, in which their agency. Botulism, thrips, Colorado and flea beetles, and other forms relatively innocuous in themselves, become, for this reason, a serious menace. Were their complete extermination as well as their commercial prospects and possibilities of the Tomato plant be indefinitely improved.

H. N. NEAL.

**Tomato Growing Under Glass.**—The Tomato is now one of the most popular vegetable crops for forcing. It is grown to a considerable extent near most of the large eastern cities. Very often it is grown in connection with carnations or other plants. The houses may be

used for carnations during the winter season and for Tomatoes in late winter and early spring when the outside temperature becomes warmer. In many cases, however, houses are used almost exclusively for Tomato growing. The forced crop usually comes into market during holidays and runs until May or even June. The winter crop is usually relatively light and the Tomatoes small. In the later crops 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 Tomato growers aim to have crops from two sets of plants. One set of plants produces a crop in midwinter or somewhat later, and the other set comes later bearing in April or May. These crops may be raised in different houses, succeeding other plants. If they are grown in boxes, however, they may be handled in the same house, the pots for the second crop being set between those of the first crop before that crop is off. In many instances, however, only one crop is grown; that is to say, the effort is made to secure a more or less continuous picking from one set of plants running over a period of two months or more.

The Tomato requires a uniform and high temperature and is very subject to diseases and difficulties when grown under glass. There are many risks in the business of Tomato growing in winter. It is probable that there is no money to be made from it when the price falls below thirty cents per pound, and perhaps the limit of profit, taking all things into consideration, is not much below forty cents.

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 feet of the stem covered with earth; the top then renews itself specially 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.

A grown in this country winter Tomato plants are usually trained to a single stem, being supported by a wire framework near the base of the plant to support overhead. In this system of training the plants are started and 2 feet above the ground in one way or even less. The side shoots are pinched out as fast as they appear, the main central shoot being allowed to grow. It is loosely tied to a cord or wire as it ascends. Usually when the main stem is stopped it reaches about 5 feet in height. Some persons prefer to start 3 to 5 stems from near the crown of the plant and to train them fan-shaped. 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 day temperature should run from 75 to 80°. The house should have an abundance of light and should be high enough 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 odema, or dropsy. This disease manifests itself in brown elevations on the stems and in the curling of the leaves. When a plant is once seriously affected it is worthless. The preventive is to keep the houses well ventilated and relatively dry in spells of dark weather. This caution applies particularly to the duller and damper parts of the house.

The Tomato flower needs hand-pollination to enable it to set fruit. The pollen will ordinarily discharge readily if the flower is jarred quickly at midday when the sun is shining and the house is dry. When the flowers are ready for pollination a bright day should be looked for and the house should not be watered that morning. The pollen is jarred into a spoon or a watch-glass, and into this pollen the protruding stigma of the flowers is rubbed. It is necessary to apply an abundance of pollen in order to secure large and well-formed fruits. The pollinating should be done freely and with great thoroughness, as upon this operation depends the chance of securing a full and good crop. One can rarely expect to secure from a house an average of more than 2 to 4 pounds of fruit to a single plant for the winter crop when the plants are trained to a single stem. Similar plants fruited in April or May, however, may produce considerably more than this. If the fruit clusters begin to get heavy, they should be supported by cords secured to the main stem (Fig. 2525). Many varieties of Tomatoes force with ease. There are few which seem to be specially 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 continuously 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-galls that 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 numerous spor-patches on the under sides of the leaves, may be held in check by spraying with Bordeaux mixture or other fungicide. There are several forms of blight which are apparently bacterial troubles. These seem to follow unsanitary conditions of the house, as too close temperature, too little 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, 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 the trouble is not definitely known. After the rot has proceeded to a certain stage, filamentous fungi develop, and these were formerly considered to be the cause of the trouble. The only remedy so far known for rot in houses is to...

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Dray Plough, which is good to be used for mucky Clays in Winter; but is not so proper to be used in Clays when they are hard.

No. 5. The Figure of a single Wheel Plough, used in Sussex.

No. 6. The Figure of the Hoosier Plough, which is of the easiest Draught; proper for any Grounds, except muddy Clays, which are apt to clog the Wheels. The several Parts of this Plough, being understood, will explain to us the Use of the Neck, or Share Beam, A the Plough Beam; B the Handle, Tail, Stilts, or Staves, C the Neck, or Share Beam, D the Earth Board, E the Sheath, F the Share Iron, G the Counter, H the Plough Pin and Collar Links, I the Plough Pillow, K the Wheels.

The American farmer is known by his tools and machinery. Labor costs much and land costs little. The

No. 1. Figure of an ancient Plough, supposed to be used about the Time of the Romans.

No. 2. Figure of a Spanish Plough, which some suppose preserves somewhat of the Manner of the Roman Plough, only altered to be drawn by one Horse, instead of a Yoke of Oxen. It is 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. It is pulled along by one Man; sometimes cutting the Turf half an Inch thick, sometimes an Inch or two. At A is an Iron turned up with a sharp Edge, to cut the Turf from the rest of the green Sward.

No. 4, 1st Figure of the common

TOMMASINIA (Tommasini, a magistrate and naturalist of Trieste). *Undulata.* 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, Boissieri and others. It has the habit of Angelica. From Peucedanum it differs chiefly in having the petals involute on the margin. Involucr none; involucel many-leaved; margin of carpels dilated; fiss. somewhat polycamous. 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; tvs. with many small yellow-green flowers, 3-lobed, the leaves ovate, acute-serrate and the lateral ones often 2-lobed and the terminal one 3-lobed, the petals much dilated at base. Piedmont region, S. Europe.

L. H. B.

TOOART TREE. *Eucalyptus gomphocephala.*
American is inventive. The result is that there is a tool to expedite and lighten almost every labor. The effort of each man is multiplied. Not only are the American tools numerous and adapted to almost every agricultural labor, but they are trim, light and comely in design.

A tool is properly a hand implement, used to facilitate mere manual labor. A machine is a contrivance, usually more elaborate, that multiplies and transmits power or motion. Yet tools and machines merge so completely that it is impossible to make a definite category of one or the other. The word implement is more generic, and applies to any intermediary device by means of which a man accomplishes a given work. The phrase "agricultural implements," as used by tradesmen, usually refers to both tools and machines.

In general discussions the word tool is used somewhat indefinitely, as in this sketch; but even then it does not include complicated machinery.

The tools used by horticulturists can be thrown into four general categories:

1. Tools for tilling the land, as plows, harrows, rollers, cultivators, weeder-s, hoes, rakes. See Tillage.
2. Tools to facilitate various handwork, as seed-sowers, tran-planter, 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, harrows.

In the multiplicity of tools, one is often at a loss what to purchase. The buyer should have a definite idea of the kind of labor that he needs to have performed and he should then consider how well adapted the tool may be to perform that labor. Once purchased, the tools should be cared for. A tool shed or room is the greatest convenience and often the greatest economy. Labor is expedited and annoyance saved if each tool has its place. Every farm or garden should be provided with a room that can be warmed in cold weather, in which repairs can be made on tools and machinery. No general farm barn is complete without such a room. The care of tools not only contributes to the longevity and usefulness of the implements themselves, but it sets distinct ideals before the farmer and thereby is a means of educating him. The greater the variety and the better the quality of the tools the more alert the user of them is likely to be. One should look up the new ideas in tools each year as he does in markets or crops. The advertising pages of rural papers are suggestive in this direction.

The original tool for opening or tilling the ground is the hoe. Fig. 2532. This light and simple tool, usually 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 well after the year 1800, and that it is doubtful if the invention of any of the most important machines of modern times has really meant so much for the welfare of the race as the birth of this humble implement. To many persons the credit of the invention of the modern plow, for the implement seems to have originated independently in different countries, and even in America there are various contestants for the honor. Thomas Jefferson, Charles Newbold, David Peacock, and others have received the honor. There is reason for ascribing the modern type of plow to Jethro Wood, of Scipio, Cayuga county, New York.

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 1843 or 1844. (See "Jethro Wood, inventor of the Modern Plow," by Frank Gilbert, Chicago, 1882.) The study of plows is a curious and profitable undertaking, and one that still needs to be prosecuted. Some of the forms of plows, ancient and modern, are shown in Figs. 2537-39.

The large-area farming of North America and the apprehension of the principles that underlie tillage have resulted in the invention of a large number of such hand-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.
The hand-wheel hoe.

The plants are easily raised from seed, but may also be grown from which root quickly. But it may be bordered with T. flava. The plants are Asia and Africa. Calyx tubular, plicate or 3-5-Winged, decumbent and creeping: Ivs. 1-2 in. long, ovate to oblong, coarsely crenate; petiole half as long as the blade ends of the branches in pairs on an erect rachis; corolla-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. obtusifolia, Hort., not Bentii). Fig. 2534. Low, bushy, usually annual, becoming nearly 1 ft. high: stem 3-angled; lvs. pedate, corolla-rotate, 1-1½ in. long, serrate-serrate; petiole 1 in. long; corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lip not cut, pale blue, the anterior 3-lipped: lobes round obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. I.H. 29:249. R.H. 1876, p. 465. B.M. 6747.—Var. álba, Hort. (var. White Wings) has pure white flowers. A.F. 5:401. G.M. 36:87. Var. grandiflora has somewhat larger lfs. and is more free-flowering. In the neighborhood of Philadelphia I met self-sown seed sometimes germinates in the spring; also seeds of T. flava.

T. Fournieri in Florida is an excellent substitute for the pansy, which is cultivated only with difficulty so far south. Young plants come up by the hundreds around the old plants from self-sown seed during the rainy season. The species can also be propagated with great ease by cuttings. The Torenia shows its full beauty when planted in beds or borders or in masses in front of small evergreen shrubs. It flowers abundantly throughout the summer, and even late in full isolated flowers may be found. The best results are obtained by treating it as an annual. Any good and rich light soil seems to meet its requirements. It succeeds almost everywhere but prefers shade and moisture. It even grows luxuriantly in wet places along ditches and water-courses where forget-me-nots grow in the North. If such localities, however, are very shady, the flowers, though much larger, are neither produced as abundantly nor are they colored so brightly as in sunny situations. On the other hand, it is sometimes found in such dry positions, where only cacti and yuccas manage to live, that one can scarcely understand how it is able to succeed. In good soil the Torenia attains a height of from 8 to 10 inches, and when planted about 8 inches apart soon cover the ground entirely. There is already a great variety in colors, but the typical plant has beautiful light blue and royal purple flowers, with a bright yellow throat, in texture rivaling the most exquisite velvet.

Torenia Fournieri


TORREYA (after Dr. John Torrey, one of the most distinguished of the earlier American botanists: 1796-1873). Syn., Taminon, Caryaotxus, Conifera. Ornamental evergreen trees, with spreading, usually whorled branches, clothed with yew-like, two-ranked, dark green foliage; the fruits are drupe-like and about 1 in. long. The Torreyas are but little known in cultivation and rarely seen in a flourishing condition. The southern...
T. taxifolia survives the winters in very sheltered positions in the vicinity of Boston. But T. lucifera, the sunflower, is not hardy in New England. The Japanese, T. nucifera, is probably the hardiest and most desirable species, but seems not yet to have been tested north. 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 Cephalostachys. 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 C. America. Trees, rarely shrubs; lvs. 2-ranked, linear or linear-lanceolate, with 2 narrow glaucous lines beneath, becoming fainter with age; when bruised the foliage emits a disagreeable odor; fls. discicous, rarely monocious; staminate fls. ovulate or oblong, composed of 6–8 whorls of stamens, surrounded by the base of the pistillate fl.; 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 Tamus has recently been taken up as the proper name for this genus, since the name Taxifolia 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 \( \frac{1}{2} \) in. broad or less.

b. Length of lvs. \( 24 \) to \( 134 \) in.

taxifolia, Arnott (T. taxifolium, Green). Fig. 2355. Tree, attaining 40 ft., with spreading, slightly pendulous branches, forming a pyramidal or, in old age, a round topped head; bark brown, tinged orange; lvs. linear, acuminate, dark or dark yellowish-green above, with narrow white lines beneath, \( 24 \) to \( 134 \) in. long; fr. oblong, dark purple, 1–2 in. long. Pl. S.S. 1873. 255.

b. Length of lvs. \( 1 \) to \( 2 \) in.

Californiwm, Torr. (T. Majestix, Hook, f. T. Tamus Californicum, Green). California native. Tree, attaining 70, or occasionally 100 ft., with spreading, slightly pendulous branches, forming a pyramidal or, in old age, a round topped head; bark bright red; lvs. lanceolate, acuminate, acute or pinnate, pointed, dark green above, with white lines beneath, \( 4 \) to \( 14 \) in. long; fr. oblong, less than 

mucifera, Sieb & Zucc. Tree, usually 30 ft., but occasionally 80 ft. high, with spreading branches, forming a compact head, sometimes shrubby; bark bright red; lvs. lanceolate, acuminate, rigid and pinnate, pointed, dark green above, with white lines beneath, \( 4 \) to \( 14 \) in. long; fr. oblong, less than \n

AA. Lvs. lanceolate, ovate, or somewhat lvs.

TOXICOPHELAE. See Impatiens and bitters.

TOXICOPHILA: A. See Acokanthera

TOXYLON (Bow-wood, from the Greek). Urticaceae. Osage Orange. One species, a thorny North American small tree, much used for hedges. Formerly known by Nuttall'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 of garden heliotrope but not sweet-scented: lvs. elliptic, oblong, wavy, marginate, pedunculate terminal, 2–3 times branched, bearing a 1-seeded, 2-ranked raceme of many fls.: calyx 5-ribbed, hairy; corolla-tube yellow, the limb 3-lobed, lirate. Buenos Ayres. B.H. 3:386. — Self-sown and comes up in the garden spontaneously. Not popular in North, but a good shrubbery plant in the South.

F. W. B. BARCLAY.

TOWSENDIA (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). Compositae. About 17 species of low, many-stemmed herbs, nearly all of which are natives of the Rocky Mts., with linear or spathulate, entire lvs. and rather large heads resembling those of Aster; the numerous rays from violet to rose-purple or white; flowering from early spring to summer. The annual or biennial species have larger heads than most of the perennials. Judging from the literature, the largest fl. of the perennials are T. condensata, Weledoceras and Rothrockii, three species which seem to be in cultivation as yet. The species mentioned below are presumably among the most desirable of the genus. They are offered by collectors of Colorado wild flowers.

As a genus Townsendia is distinguished mainly by its stems, which are commonly green with briefly duplex hairs, having a forked or glandular capitulum apex. Townsendia is practically unknown to floriculture. For fuller account see Gray's Synopsis Flora of North America.

grandiflora, Nutt. Biennial or annual, 9–18 in. high; stems spreading from the base: upper lvs. often linear; bracts of involucre conspicuously alternate-acuminate; heads large; rays \( \frac{1}{4} \) in. long; bright blue or violet. Summer. Foothills western Neb. to Colo. and New Mex.

sericea, Hook. Nearly stemless perennial with sessile heads surrounded and surpassed by the linear lvs.: heads \( \frac{1}{4} \) in. across; rays white or purplish tinged. April. May. Dry hills, plains or mountains, Saskatchewan to Rockies, south to New Mex. and Ariz. — Known as "Easter Daisy" in Colorado.

W. M.

TOXICOPHILA. See Impatiens and bitters.
are venerable feeders and rapidly deplete the soil. Hardy as far north as Massachusetts. A tree with deciduous, simple, alternate, petiolate, entire leaves and milky-sip branches, particularly the lower, beset with numerous straggly, stipitate, penultimate, pendulous, calyx-5 parted, with its segments valvate, standards, the pistillate borne on branches of the current year, sessile, capitiate, peduncle short, the calyx enclosing the sessile ovary; style simple, bifid. Long and exserted; ovary superior, one-seeded, ovary solitary; fr. a dense aggregation of enlarged, fleshy coalesces into a globular syncarp with a mammillate surface, light green or yellowish in color; syncarp 6-8 in. in diameter, falling as soon as ripe in the autumn.

2536. Osage Orange Toxylon pomiferum (A. Gray) pomiferum, Raf. Ménard annuus, Nutt. Osage Orange. Fig. 2536. Tree, 30-50 ft. high: lvs. ovate or oblong, 3-6 in. long: f. white or yellow: simple stems and terminal panicles of small blue flowers. The species are native to the Mediterranean region of Europe. Calyx subulate; lobes 3, narrow; corolla yellowish tubular, fall within 2 weeks. The young growth is the proper shape for a hedge in 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 differing from the one described has been follows by some. Strong two-year-old plants are procured and are planted in a planting position. As the new growth is made it rises in an upright way as a stem and produces a latticelike 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.

JOSEPH MEHAN.

TRACHELOSPERMUM (Greek, trachelos, neck; from its supposed efficacy in diseases of the throat, Compo- nemus. Woodbine. True Woodbine. A genus of 4 or 5 species of perennial herbs or low shrubs, native to the Mediterranean region of Europe. Calyx subulate; lobes 3, narrow; corolla yellowish tubular, fall within 2 weeks. The young growth is the proper shape for a hedge in the conical form, though it may be flat sided, almost square, the upper branches never overlap the lower. Of late years a system of planting the Osage Orange differing from the one described has been follows by some. Strong two-year-old plants are procured and are planted in a planting position. As the new growth is made it rises in an upright way as a stem and produces a latticelike 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.

TRACHELOSPERMUM (Greek, referring to the fact that the seed has a neck). Apocynaceae. Trachelosper- mum is a genus of 8 species of climbing shrubs native to eastern Asia and Malay. They have opposite lvs., white or purple, flowers in cymes. Generic char- acters: calyx 5 parted, amphil, or scaly to the stig- mata, lobes aovate, overlapping to the right, twisted to the left; stamens are numerous, equal, and attached above the middle of the flower. The fruit is a capsule, the seeds are large and flat, with a large seed coat. 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 wavy-mar- gined petals (or rather corolla-lobes) are rolled back. See Fig. 2537.

"Rhynehospermum" is a most satisfactory greenhouse shrub for a general collection. The young growth 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 sown in a greenhouse with flowers, and fill a greenhouse with their delightful fragrance. The blossoms are about an inch across, 5 or 6 in a cluster, pendulous, and of a very spirited appearance, which is largely due to the manner in which the 5 wavy-mar- gined petals (or rather corolla-lobes) are rolled back. See Fig. 2537.
The propagation is best affected in Florida by layering, and strong plants can be raised in this way in about two years. H. Nehrling.
A. Trunk clothed with old leaf-sheaths. Himalayan species.

Martiànus, H. Wendl. (T. Khasiônus, H. Wendl. T. Griffîthi, Deene.). 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. B.M. 7128. R.H. 1879, p. 212.

Excéllus, H. Wendl. (T. Fortunei, H. Wendl.). Fig. 2539. Trunk clothed throughout with the old leaf-sheaths: fls. clustered, triparted, with linear, acute, 3-cut lobes; peduncles long, bearing an umbel 2-3 in. across of very numerous blue fls.; calyx-teeth obsolete; petals unequal, the external being longer. July-Oct. Australia. B.M. 2875. B.R. 15:1225. p. 214.

T. fluminicenus, Veill. (T. microdusa and T. atillitad, Kresh.). T. virolis, Veill. (T. virolis, Veill. (T. Sinuata, Veill. (T. angustata, Veill. (T. discolor, Hort., Hort., Hort., Hort., Hort., Hort., Hort., Hort., Hort.) in part). Wandering Jew in part. Figs. 2539-41. Glabrous, with shining stems and leaves, the nodal connivence, trailing, or the ends of the shoots ascending; fls. ovate-aecine, without distinct petiole, ciliate at the very base, the sheaths 1-3 in. long; fls. white, hairy inside, the fl-sheath all alike, borne several together in a sessile cluster, 2 or 3 united fls. or brasses, the pedicels not all of the 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 T. virolis. T. virolis var. discolor, Focke, has a purplish shoot, with leaves striped yellow and white, but these color usually do not hold unless there is abundance of sunlight. In light places, the leaves become 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 plants are known as Wandering Jew, and although they belong to the same genus, it is not necessary to tell them apart when not in flower (Fig. 2539). These plants are Tradescantia fluminicenus, shoots hairy or ciliate only at the top, fls. white; Zebrina pendula, shoots hairy throughout or at least at base and top, fls. redder beneath and always colored above, fls. rose-red; Commelina nudiflora, sheaths glabrous, fls. blue. The two first are tender to frost; the

TRADESCANTIA (John Tradescant, gardener to Charles I.; died about 1638). Commelinaeae. Spider-weeds. Thirty-six species are included by C. B. Clarke, the latest monographer, 1881 (D. Monner. Phaner. 3). This enumeration does not include T. Regimb. and other recent species. They are all American perennial herbs, ranging from Manitoba to Argentina. In habit they are various, varying from erect bushy species to trailing plants rooting at the nodes. The plants are more or less soft and succulent in texture, although usually not fleshy. The leaves are alternate, sheathing, varying from ovate to long-linear-lanceolate. The flowers vary from red to blue and white, sometimes solitary but usually in simple cymes or umbels; sepals and petals each 3, free, the sepals 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 or 3 seeds each locule, the style single; fr. a 3-loculed dehiscing capsule. The genus Zebrina, usually confounded with this by gardeners, differs, among other things, in having a tubular petal.

To horticulturists, Tradescantias are known as hardy herbs, coolhouse plants and greenhouse plants. T. fluminicenus, Veill. (T. microdusa and T. atillitad, Kresh.) is the best known of the hardy species, withstanding the climate of the United States. The hardy species are essentially foliage plants. Several species have handsomely striped leaves. All Tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

A. Plant prostrate, rooting at the joints.

fiuminicenus. Veill. (T. microdusa and T. atillitad, Kresh.) T. virolis, Veill. (T. Sinuata, Veill. (T. discolor, Hort.) in part). Wandering Jew in part. Figs. 2539-41. Glabrous, with shining stems and leaves, the nodal connivence, trailing, or the ends of the shoots ascending; fls. ovate-aecine, without distinct petiole, ciliate at the very base, the sheaths 1-3 in. long; fls. white, hairy inside, the fl-sheath all alike, borne several together in a sessile cluster, 2 or 3 united fls. or brasses, the pedicels not all of the 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 T. virolis. T. virolis var. discolor, Focke, has a purplish shoot, with leaves striped yellow and white, but these color usually do not hold unless there is abundance of sunlight. In light places, the leaves become 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 plants are known as Wandering Jew, and although they belong to the same genus, it is not necessary to tell them apart when not in flower (Fig. 2539). These plants are Tradescantia fluminicenus, shoots hairy or ciliate only at the top, fls. white; Zebrina pendula, shoots hairy throughout or at least at base and top, fls. redder beneath and always colored above, fls. rose-red; Commelina nudiflora, sheaths glabrous, fls. blue. The two first are tender to frost; the
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 Convolvulus and Zebina.

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.

fusca, Lodl. (properly Porrhimia Lodigesi, Hassk.). Stemless, brown-tomentose or hairy; lvs. oblong-ovate, entire, about 7-11 vert. short-petioled; fls. blue or blue-purple, 1 in. or more across, borne in the midst of the lvs. on very short pedicels, stamens 6. S. Amer. L.B.C. 4:374. B.B. 6:492. B.M. 2:230. -Lvs. 6-8 in. long. Now referred to Pyrrheima, being the only species.

cv. Stem evident, usually branching.

d. Lvs. distichous (in 2 rows).

e. Stamens all equal and similar.

Warscewicziana, Kunth & Burch (Dictorrhiza Warscewicziana, Planch.). Fig. 2542. Dichorissa-like, having a stout canes or trunk, marked by leaf-scars and finally branching; lvs. green, stiffish, 1 ft. or less long, clustered at the top of the stem, recurving, lanceolate-acuminate; fls. blue-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5188. R.H. 1860, p. 136.


EE. Stamens unequal,—3 long and 3 short.

elongata, Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1-2 ft.; lvs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath; peduncles 1-5, terminal; fls. rose-colored, the sepals green. Tropical Amer.

TRADESCANTIA

2542. Tradescantia Warscewicziana.

TRAGOPOGON

Virginiiana, 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 pedicels recurving when not in bloom; fls. blue or violet-blue, in various shades, 1-2 in. across, produced freely nearly all summer. N. Y. to S. Dakota, Va. and Ark. B.M. 165; 3546 (as T. caricata).—B.C. 16:153 (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. 3541. Var. aroterangiana has dark red fls. Var. cocinea has bright red fls. Var. caerulea 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 annual; lvs. mostly from near the ground, linear-lanceolate, more or less acutate; fls. about 1 in. across, blue or rose-purple. Ky. to Mo.

c. Umbels polunaeled.

rosea, Vent. Slender and nearly or quite simple, glabrous, 12 in. or less tall; lvs. very narrow-linear; bracts short and scale-like; fls. 1 1/4 in. across, rose-colored, Md. to Mo. and south. Mu. 2, p. 36.

T. crassinervis, Cav. Something like T. Virginiana, but lvs. oblong and nearly or quite oblongate, ciliate, as are the stem fls. 1 1/4 in. across, blue-purple in terminal and axillary sessile umbels, the stamens all equal. Mex. B.M. 1958. T. cyanus, Link & Otto. Somewhat succulent, ascending; lvs. thick, oblong and nearly or quite oblongate, ciliolate on the edges; fls. about 1 1/2 in. across, white, in terminal and lateral often alternate umbels, the calyx and pedicels hairy. Brazil B.M. 2543. B.B. 6:139. T. decora. Bulk foliage plant, lvs. long-lanceolate, dark olive-green with a central gray band. Brazil—T. decorana is Rhoeocallis, which see (p. 1526).—T. decorana—"A noble and graceful flowering plant, with handsome foliage. The leaves in many respects resemble a daisy and are a deep green, marked with chocolate or black. ... When full grown the plant will send out long runners, bearing out tufts of leaves at the end." John Lewis Childs, Catalogue 1896.—T. quadrata, Hort. See Zebina.—T. quadrata, Lindl. & R. Lvs. scabri-bracteolate, acuminate, sessile, purple beneath, dark metallic green with a white band on either side of midrib. Peru. B.B. 53:155; 40:127:16. (ft. 46, p. 165). Perhaps not a Tradescantia.—T. zebina, Hort. & Royle, Peruvian.

L. H. B.

TRAGOPOGON (Greek for goat's beard). Compstilo, Goat's Beard. Between 30 and 49 species of erect biennial or perennial herbs with narrow grass-like leaves and heads of yellow or purple flowers, belonging to the Composite family (trichogyne acer). Flores perfect, with slender style-branches and sagittate anthers; pappus composed of bristles in a single series and mostly raised on a beak; involucre cylindric or nearly so, with approximately equal bracts in a single row. The Tragopogons are mostly weedy plants with a tap-root. They are native to Southern Europe, northern Africa and central and southern Asia. One of them is used 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.
TRAGOPON

Porrorolius, Linn. Salsify. Vegetable Oyster. Oyster Plant. Figs. 2258, 2543. Tall stiff biennial, sometimes 1 ft. high when in bloom, glabrous: its, sheaves, closing at noon or before, the outer rays exceeded by the involucre 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 involucre scales: peduncle scarcely swollen. A weed from Europe. L. H. B.

TRAILERS. See Vines.

TRAILING ARBUTUS. Epigama repens.

TRAILING BEGONIA. Cissus discolor.

TRAINING. See Pruning.

TRANSPIRATION is the process by which water is given off in the form of vapor from leaves and stems. Instead of a circulation of the sap in plants similar to the movements of the blood of animals, water containing mineral salts is taken in at the roots in liquid form and carried upward to the leaves through the woody tissue, and then evaporated, leaving the mineral or ash behind in the leaf, where it serves in making food. The chief purpose of transpiration is, therefore, to carry a stream of mineral food from the soil to the green parts of the plant, although it also serves to aid in the exchange of gases with the air, and to preserve more equal 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 organ it is of no further use and must be evaporated. It is estimated that 99 per cent of the energy received from sunlight by the plant is used in this important work. That an enormous amount of work is performed by the plant in transpiration may be seen when it is known that a single sunflower plant will evaporate a pint of water from its leaves in a single day, and about seventy times this much in the course of its development. A birch tree with 200,000 leaves will transpire from 700 to 1,000 pounds of water daily in the summer. A single oak tree will throw 120 or 130 tons of water into the air during the course of a season, and an acre of beeswax trees containing 400-600 specimens will transpire about 2,000,000 pounds in a single summer.

To determine the exact amount of water transpired by a plant, a specimen not more than a yard in height growing in a pot may be used. Set the pot on a square of oil-cloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring glass, and balance. Allow the plant to remain in the warm sunshine for eight hours, then pour water into the measuring glass until the scale shows original position or reading. The water in the glass will represent the amount of transpiration.

To demonstrate that water vapor does actually come from the leaf, cut off a small leafy shoot of any convenient plant and thrust the base of the stem through a piece of cardboard into a tumbler of water; now cover the exposed part of the shoot with another tumbler and set in a warm, light place. Moisture, which could have come only from the leaves, will soon gather on the glass. Some transpiration occurs over the entire surface of the plant, although only about one-thirtieth as much is given off by a stem as from the same amount of leaf surface. The leaves are specially adapted to carry on this function. The interior of the leaf is made up of a great number of loosely arranged cells which evaporate water into the air between them. The air in the leaf communicates with the atmosphere through openings called stomata, which are generally placed on the lower side of the leaf. Consequently the watery vapor diffuses out through the stomatal opening. 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 weather and soil conditions. 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 exactness of an example of this type, and this plant transpires only about one three-hundredth as much water as a leafy plant of the same volume. As might be expected, the character and amount of the mineral salts in the soil also affect the amount of transpiration.

D. T. MacDougal.

TRANSPLANTING is a general term used to designate the removal of living plants whereby they may become established in new quarters. Transplanting may be performed when the plant is in a dormant condition, as in winter, or when it is still actively growing. Small herbaceous plants are usually the ones that are transplanted when in a growing condition, and this only when the plants are living under special garden conditions where they may have the best of attention as to watering and shading. Considered from the standpoint of the plant, transplanting is always a violent operation, for it destroys a considerable part of the root-system, loosens the plant's attachment to the soil and arrests for the time being a large part of its progressive vital activities. In order to overcome these dangers the earth into which the plant is set should be well prepared and moist, so that the plant may quickly reach in 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 moisture it holds, the more successful the transplanting operation will be, other things being equal. The operation is also more successful in humid regions, as in the Atlantic states, than it is in dry regions and westward. In the more arid parts of the country transplanting is performed as little as possible, whereas in the eastern part great quantities of annual and other garden plants are transferred by methods from seed beds to flower gardens.

The successful transplanting of any plant depends in part on the condition of the plant itself. The younger the plant, as a rule, the better it withstands the opera-
Transplanting

Herbaceous or growing plants that are relatively short and sturdy, and commonly in growth transplanted better than those that are long, leggy, and weak. The stocky plants are better able to withstand the vicissitudes of inclement weather when they are transplanted from a protected place to the open. They also have more recuperative power to make new roots and to attach themselves again to the earth. Many plants may be "hardened-off" or gradually inured to sun and cold before they are transplanted. More frequently a given plant is transplanted the more readily it endures transplanting. The root system becomes loose and compact and there is relatively less injury to the roots at each subsequent removal, providing a long interval does not take place between the operations.

The success of transplanting also depends to some extent on the weather at the time the removal is performed. If cool, cloudy and damp weather follows the transplanting, the plants are much more likely to live. Plants usually establish themselves more quickly in freshly turned soil, because it contains a relatively large amount of moisture. In order to bring the earth into contact with the roots, it should be firmed closely about the plants. This packing of the soil tends to bring the subterranean moisture upwards where it may supply the roots; it also tends to increase evaporation from the surface of the soil and thereby to waste the water, although much of the moisture is utilized by the plant as a passive to prevent. In order to save the essential moisture from the surface of the soil, it is customary to cover the ground with a mulch, from one to three inches in depth, of litter, sawdust, leaves or course manure. When practical 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 grown and growing fast, as tomatoes, cabbages and other annnuals. The watering may best be done at nightfall. The water should be applied in a hole or depression about the plant or on one side of it, rather than on the surface; and the following morning the loose, fresh earth should be drawn over the roots in order to provide a surface mulch and to prevent the soil from packing.

All kinds of plants can be transplanted, but some of them remove with great difficulty. In these cases the special skill which is born of experience with these particular plants must be inveterous for success. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and the hickories. In these instances the plant may be prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust underneath the crown. In other cases the difficulty is the inability of the plant to make fresh feeding roots quickly, as in some of the asiminas or paw 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 plants are to be removed. In other cases the inability to be transplanted is probably due to the excessive rate of transpiration from the foliage. In these instances cutting back the top rather severely and covering the plant may contribute to success. In some cases the difficulties are so great as practically to prohibit transplanting.

So-called transplanting machines have been perfected in the last few years for setting small herbaceous stuff, as cabbages, tobacco and tomatoes. These are really vehicles, drawn by horses, that open a furrow and drop a small quantity of water which is spread over by the hands of an operator who rides on the machine. The plants, already prepared for setting, are carried in a tray or hopper, and the operator places these between guards which automatically measure the distance. These machines are particularly

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2544. A dibber.

One of the most useful implements is a dibber in the transplanting of small plants. The plant is dropped into a hole made by the dibber; this hole is closed by inserting the dibber at the side and moving it against the plant.

2545. A transplanting box, specially designed for melons.

It is made of a "flat" or split 14 in. long and 3\(\frac{1}{4}\) in. wide, bent 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 set in small quantity, the dibber is a most useful implement to expedite the operation. Fig. 2544.

Plants grown in pots and small shallow boxes transplant more readily than those grown in the open soil. Particularly is this true of pot-grown plants, for the 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 transplanted. Fig. 2545. The seeds are sown directly in these boxes. Tomatoes, cucumbers and other plants that are difficult to transplant are often grown on pieces of inverted turf, taken from old pastures.

In the case of large trees and shrubs, success often may be attained by transplanting in the winter, when a ball of frozen earth may be removed. Fig. 2546. It is usually better to give the transplanting of large trees into the hands of an expert, than to attempt to perform it with unskilled help and inefficient appliances. Only a small proportion of the efforts in transplanting very large trees are really successful. The trees may live for several years and yet never fully recover nor make satisfactory subjects. The surest and best results are usually secured only when the trees are nursery-grown and have been transplanted two or three times within a few years of their final removal. There are some species that remove from the wild with relative ease when they are of large size, among which are elms, maples, pin oak, basswood; but the large number of species do not readily recover 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.

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.

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 turntable 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 short 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 avoid 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 hoisted and unloaded by derricks. The derrick legs usually interfere with the full circle of roots, and as the derrick has to be set up twice for each tree moved, the operation is slow, and, with the tree swinging in midair, somewhat dangerous.

For moving trees a few feet, a derrick may be used, with or without small wheels in the base of the derrick legs. Many kinds of machines may be used, but in order to make this discussion concrete, the following account has reference to the device shown in Plate XLIII. Other successful moving operations are shown in Figs. 2547, 2548.

For operating the mover shown in Plate XLIII, the tree, of say 18-26 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 burlap and bent up, out of the way of the diggers. See Fig. 2549. If the roots are to be shown 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 5 ft. of the center, the tree is slightly tipped over to loosen the central ball, which consists of the sub-soil near the extremities of the downward roots. On sand or hard-pans sub-soil this is at a depth of 2 to 5 ft. In deep soil it may be necessary to cut some downward roots. A ball of earth is left in the center from 3 to 12 ft. in diameter, and is 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 beech, it is difficult to pick out the soil, while with coarse-rooted trees, like the oak, 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 been first 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, 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 drawn axle. The tree is lifted by the pole and driver's seat, and the wheels are not placed under the axle. The mover is pulled out of the hole by tackle.

The hole to receive the tree is prepared with a layer of soft mud at 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 in the right operation until the center is made solid. The packing sticks are 2 in. in diameter, 6 ft. long, and placed at one end and round at the other. The side roots are next unwrapped and covered at their natural depth.

2546. Moving a tree in winter, with a large ball of frozen earth.

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. The outside should be cut back 1 to 3 ft., cutting to a crotch or bud, and the remaining twigs thinned out about one-third. Hardwood trees and trees with few roots need the most severe pruning.
TRANSPLANTING

The soil should be friable loam, not baking clay nor sterile sand, and it should be made fertile. The surface should be covered with a soil or straw mulch 3 inches deep and the earth kept moist by watering once a week or less frequently, as required. The roots may be damaged by too thick mulch, deep planting, excess of water or lack of drainage, all of which exclude the air. Decaying manure and nitrogenous fertilizers in direct contact with the roots are injurious.

The tree may be secured by guy wires. Anchor posts are set stunting, $4\frac{1}{2}$ 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 wires are run from the post, through a piece of hose around the tree, and back to the post. It is twisted tight, with two sticks turning in the same direction and moving toward each other. To prevent the sun from drying out the bark on the south side of the tree, the trunk should be wrapped with straw, especially thin-barked trees, like beech and silver maple.

The best trees for moving are those with abundant small roots. These have fibers branching from them which take in the water and plant-food. The large roots in the center of the root-system are conduits for the sap, and braces for the tree. Trees which transplant successfully are the maple, horsechestnut, elm, catalpa, ash, linden, willow, poplar and pin oak. Trees with few fine roots and hard wood, as the hickory and white oak, are difficult to transplant with good results, as well as the tender-rooted trees like magnolia and tulip. Trees grown in the open are much better for moving than those in the woods. The roots are more numerous, and not mixed with the roots of other trees, the bark is thicker and does not dry out so quickly, the branches and twigs are closer and better developed to stand exposure, and may be thinned out without destroying the beauty of the tree, and more plant-food is stored for the new growth of leaves and roots. A young tree of large size is better to move than an old tree. In friable loam the roots are straighter and tougher and less liable to injury in digging, than in hard or rocky soil.

The popular prejudice that moving large trees is an ultimate failure, or that small trees quickly overtake them, arises from moving trees 1 to 2 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 setting 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 forceps, or by upright straps of wood, or hoops in the form of a 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, hoisted upon a truck.

In planting, the hammock is reversed and holds the ball, while the platform is pulled out by the windlass, leaving the tree in the hole. By this method, trees 20-40 feet high and 6-12 inches in diameter may be moved.

Trees grown in fertile clay loam are best for transplanting, but with care the canvas will hold balls of sand or gravel. Root-pruning, one or more years pre-

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2548. The roots wrapped, and the tree being moved on skids.

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2549. Diagram to illustrate the operations in the removal of a large tree for transplanting.
TRAVELER'S JOY

* Clematis vitalba *


bispinosa, Rech. Sinhara Nut. Petiole of floating lvs. 3-4 in. long, scabrous; blade 2-3 in. long, slightly erect in the upper half, very villos beneath; r. 1 in. thick, with 2 of the spines sometimes absent. Indin. 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 tubs. 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.

W.M. TANNER.

TRAUTVERTERIA. Transvettter, a Russian botanist, Kurmanniaceae. A genus of but two species of North America and eastern Asia. Tall, erect, perennial herbs, less or broad, palmately lobed; fl. white, small, corymbosaceous, panicled; segms 7-9, unequal; petals many; 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.

Caroliniana, Vahl. (Hyacinth Carolinianus, Walt. 7-pet. blue-flowered, Flishing. & Msv.,) Stem 2-3 ft. high: fls. alternate, reticulated, radial ones very large, with blue-snow toothed and cut. July. Pa. and south and west. B.M. 163 (as *Clematis pratina*).

grändis, Nutt. (Dorothy-palm, Hook. A. pyramidal, Dier. 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*. 


bispinosa, Rech. Sinhara Nut. Petiole of floating lvs. 3-4 in. long, scabrous; blade 2-3 in. long, slightly erect in the upper half, very villos beneath; r. 1 in. thick, with 2 of the spines sometimes absent. Indin. Ceylon. W.M.

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TRAVELER'S JOY. * Clematis vitalba*.
TRAVELER'S TREE. See *Nertera*.

TREASURE VINE. Name proposed by J. L. Childs for *Hidalgoa Wrekleia* or *Childesia Wrekleia*.

TREE. *Candelabrum*, or *Chandelier T*. *Pleurites Candelaebrum*.

TREE OF HEAVEN. See *Ailanthus*.

TREES. Plate XLIV. Figs. 2551-2596. 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*.

The age attributed to many of the tallest trees is based more or less on speculation, and opinions often differ widely. *Taxodium distichum* is believed to reach 6,000 years of age. *Adansonia digitata* 3,000. *Taxodium mucronatum* and *Platania 4,000*. *Cupressus sempervirens* and *Tetras granda* 3,000. *Castanea sativa*. *Quercus pedunculata*. *Sequoia gigantea* and *Cedrus Libani* more than 2,000 years.

Although the trees are the most conspicuous features of the vegetable kingdom, they represent only a small percentage of it as regards the number of species. In the United States, where about 550 trees occur, they represent only about 0.5% 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

2551. A pasture elm.
Trees belong to many different natural orders, but of the orders of monostyledous plants only a few contain trees and none of them is hardy north. None of the larger orders contains trees only, but there are some which consist exclusively of woody plants and include a large proportion of trees, as Coniferae, Cupuliferae, Salicaceae, Juglandacea, Magnoliacea, Sapindaceae, Elaeagnaceae, Urticaceae, Hamamelidaceae, Lauraceae, Anacardiaceae, Ebenaceae, Syracaceaee and others.

The uses of trees are manifold, and a country from which the forests have been destroyed becomes almost uninhabitable and worthless to mankind. The forests furnish wood and timber, exercise beneficial influences on the climate, act as regulators of the water flow, prevent erosion and also the removal of soil by the wind. Besides furnishing wood and timber, many trees yield other products of great economic importance, especially the numerous kinds bearing fruits. The esthetic 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 arbiculture, of which sylviculture is a branch and deals with the reseeding and maintaining of forests and the producing of wood crops. Orchard culture is a branch of arbiculture or of horticulture and deals with the cultivation of fruit trees; it is usually included under pomology, which comprises both the science and practice of fruit growing. As ornamental subjects, trees are more permanent, easier of cultivation and cheaper in the long run than herbs. It is curious to note how little attention the average gardener who has the care of a park or garden gives to the most prominent feature of his domain. He usually knows fairly well the greenhouse plants and his herbaceous perennials, which cost most in time and money, but the trees and shrubs he often barely deigns to look at. This is apparently due to the fact that after being once planted, and often not by him-
and to furnish shade and shelter. The enjoyment the trees give by beautiful flowers, various foliage, splendid autumn 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 to be taken in an absolutely 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 native trees of growth of the locality will give many good hints. Other considerations are the height the trees attain, the character of growth, color and effect of foliage, flowers and fruits, and winter effect (in preparing 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 article on Landscape Gardening, Park, Shrubbery and Herbs.

Selections of Trees for Special Purposes.—The following lists include trees of proved hardiness and are not intended to be complete but merely suggestive, and chiefly for the northeastern states.

1. Trees with Showy Flowers.

A. Blooming in early spring before or with the leaves.

- **Acer rubrum** (fr. blood-red).
- *Amelanchier Canadensis* (fr. white).
- *Cornus fruits* (fr. white, also pink).
- *Cornus Mas* (fr. white).
- *Magnolia Yulan* (fr. white).
- *Magnolii Soulangeana* (fr. white to purple).
- *Prunus virginiana and other cherries* (fr. white).
- *Prunus americana and other plums* (fr. white).
- *Prunus Davidiana* (fr. pink, also white, the earliest of all Prunus).
- *Prunus pendula* (fr. pinkish, branches pendulous).
- *Prunus ideofergus* (fr. white to pink).
- *Pyrus laciniata and other species* (fr. white to pink).
- *Salix* (staminant plants with yellow catkins).

AA. Blooming late in spring after the leaves.

- *Fagus Hippocastanum and other species* (fr. white or red).
- *Catalpa speciosa* (fr. white).
- *Celastris timorea* (fr. white).
- *Cornus Forsa* (fr. white).
- *Crataegus* (fr. white).
- *Fagus* (fr. white).
- *Laburnum* (fr. yellow).
- *Magnolia hypophylla* (fr. white).
- *Phrengigia* (fr. white).
- *Robinia* (fr. white or light pink).
- *Syringa vulgaris* (fr. white to purple).

AAA. Blooming in summer and autumn.

- *Aralia Chinensis* and spinosa (fr. Aug. and Sept.).
- *Castanea Americana* (fr. white, July).
- *Gordonia palrecaea* (fr. white, Sept., Oct.)
- *Koelreuteria paniculata* (fr. yellow, July, Aug.).
- *Oxleodendrum arborescens* (fr. white, July, Aug.).
- *Rhus semiarborea* (fr. white, Aug., Sept.).
- *Robinia Nesusosa* (fr. light pink, Aug.).
- *Sophora Japonica* (fr. white, Aug.).
- *Syringa japonica* (fr. white, July).

2. Trees with showy fruits.

- *Acer rubrum* (fr. bright red in May and June).
- *Alliabhus glandulosa* var. erythrocarpa (fr. red).
- *Cornus Florida* (fr. scarlet).
- *Crataegus coerulea and other species* (fr. scarlet or red).
- *Hippophae rhamnoides* (fr. yellow).
- *Ilex opaca* (fr. red).
- *Pyrus bacatta and allied species* (fr. yellow or scarlet).
- *Rhus Cotinus* (fr. feathery panicles).
- *Rhus typhina* (fr. scarlet).
- *Sassafras officinalis* (fr. dark blue with red stems).
- *Sorbus Americana* and *Aceroparia* (fr. red).
- *Taxus bacata* (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* (lvs. yellow).
- *Acer palmatum, var. atropurpureum* (lvs. purple).
- *Acer platanoles, var. Reitenbach* (lvs. becoming dark red in summer).
- *Acer platanoles, var. Schweidleri* (lvs. bright red in spring).
- *Acer Pseudoplatanus Walter* (lvs. yellowish).
- *Betula alba, var. purpurea* (lvs. purple).
- *Fagus-sylvatica* (var. purpurea (lvs. purple).
- *Populus alba, var. japonica* (lvs. white in heath).
- *Populus deltoides* (var. monilifera (one of the best-yellow-leaved trees).
- *Quercus pedunculata, var. atropurpurea* (lvs. pur-
- *Quercus pedunculata, var. Concordeia* (lvs. yellowish).
- *Salix alba, var. argentea* (lvs. silvery white).
- *Tilia tomentosa* (lvs. white beneath).
- *Ulmus campestris, var. argenteo-variegata* (lvs. whitish).

AA. With large, bold foliage.

- *Acer negundo*
- *Acer macrophyllum*
- *Aralia Chinensis* and spinosa.
- *Asimina triloba*
- *Catalpa speciosa*
- *Magnolia hypophylla*
- *Magnolia tripetala*
- *Paulownia imperialis*
- *Quercus dentata*

AAA. With small narrow or finely cut foliage.

- *Acer palmatum, var. dissectum*.
- *Acer saccharum, var. Loricrii*.
- *Ailanthus altissima, var. imperialis*.
- *Ailanthus atropurpurea* (lvs. purple).
- *Acer ideofergus* (fr. white, July).
- *Fagus sylvatica* (var. asplenifolia).
- *Gleditsia triacanthus*
- *Gymnocladus Canadensis*.
- *Hippocastanum*
- *Rhus rhamnoides*
- *Ulmus regia, var. hainaita.*
- *Quercus pedunculata, var. liliofiora*.
- *Salix nigra*
- *Sambucus nigra, var. hainaita.*
- *Tamarix Gallica*
- *Taxodium distichum*.

4. Trees with brilliant Autumnal tints.

- *Acer rubrum* (scarlet).
- *Acer saccharum* (scarlet and orange).
- *Cornus Florida* (scarlet).
- *Crataegus oxyacantha* (yellow and purple).
- *Crataegus* (mostly scarlet and orange).
- *Fagus sylvatica* (yellow and violet-purple).
- *Liquidambar* (scarlet).
- *Liriodendron* (bright yellow).
- *Nyssa*, (yellow).
- *Oxleodendrum arborescens*.
- *Quercus alba* (vines, purple).
- *Quercus ilex*, (yellow).
- *Rhus* (mostly scarlet).
- *Sassafras* (orange and scarlet).

5. Evergreen Trees.

A. Conifers (see also Vol. 1, p. 538).

- *Abies, Chamaecyparis, Juniperus Virginiana*.
- *Fir*.
- *Pine*.
- *Pseudotsuga*.
- *Thuja*.
- *Tsuga*.

AA. Broad-leaved evergreens (only Ilex opaca and Rhododendron hardy north).

- *Ilex opaca*.
- *Magnolia*.
- *Rhododendron*.

Acer Negundo (branches light green).
Acer Pennsylvanicum (striped bark).
Betula papyracea (smooth, silvery white bark).
Catalpa speciosa (bark exposed to the sun).
Crataegus oxycantha (red leaves).
Robinia pseudacacia (purple leaves).
Prunus nigra, var. Italic.
Salix alba, var. Fastigiata.
Salix babylonica.
Ulmus americana.

7. Very Tall Trees.

Gleditsia triacanthos.
Juniperus virginiana.
Liriodendron tulipifera.
Platanus occidentalis.
Pinus strobus.
Populus deltoids.
Quercus macrocarpa.
Quercus palustris.
Quercus rubra.
Quercus velutina.
Tilia americana.
Ulmus americana.

8. Columnar or Narrow Pyramidal Trees.

Abies (most species).
Acer negundo, var. monnumentale.
Betula alba, var. Fastigiata.
Carpinus betulus, var. Fastigiata.
Chamaecyparis lawsoniana.
Chamaecyparis nootkatensis.
Juniperus communis, var. Cinerea.
Juniperus virginiana (especially var. pyramidalis).
Liriodendron tulipifera, var. pyramidalis.
Pinus (most species).
Populus alba, var. Italic.
Populus nigra, var. Italica.
Quercus pedunculata, var. americana.
Taxodium distichum (especially var. lucidum).
Tilia Fastigiata, var. Fastigiata.
Thuja.
Ulmus campestris, var. monumentalis.
Ulmus serotina, var. Fastigiata.


Acer saccharinum, var. Fastigiata.
Betula pendula, var. pendula.
Fagus silvatica, var. pendula.
Fraxinus excelsior, var. pendula.
Prunus padus, var. Pendula.
Prunus spinosa, var. pendula.
Quercus pedunculata, var. brachyphylla.
Salix viminalis, var. pendula.
Salix Babylonica.
Salix babylonica.
Sorbus aucuparia, var. pendula.
Tilia pedunculata.
Ulmus serotina, var. pendula.

10. City Trees (see also No. 11).

Ailanthus glandulosa (pistillate tree).
Carpinus.
Crataegus Ozarkana.
Fraxinus Americana.
Hippocastanum.
Ginkgo biloba.
Gleditsia triacanthos.
Platanus orientalis.
Populus deltoids.
Populus nigra, var. Italica.
Prunus serotina.
Robinia pseudacacia (often attacked by borers).
Sophora japonica.
Ulmus americana.
Ulmus campestris.
Tilia philadelphica.

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 for avenue subjects.

Acer campestre.
Acer carpinifolium.
Acer pedunculatum.
Acer saccharinum.
Acer saccharum.
Alnus glutinosa.
Amelanchier canadensis.
Betula alba.
Betula pubescens.
Broussonetia papyrifera.
Catalpa speciosa.
Celtis occidentalis.
Fagus grandifolia and P. Sylvatica.
Liriodendron tulipifera.
Lonicera sempervirens.
Prunus ursina.
Quercus coccinea.
Quercus macrocarpa.
Quercus palustris.
Quercus phellos.
Tilia americana.
Tilia tetracarpa.
Tilia phillipsii.

12. Trees for Seaside Planting.

Ailanthus glandulosa.
Crataegus Ozarkana.
Elaeagnus angustifolia.
Hippocastanum.
Juglans regia.
Pinus sylvestris.
Populus deltoids, var. Caroliniana.
Populus tomentosa.
Quercus rubra.
Salix alba.
Salix caprea.
Sassafras albidum.
Taxodium distichum.

13. Trees for Dry Situations and Dry Climates.

Acer campestre.
Acer rubrum.
Alnus glutinosa.
Betula alba.
Cornus mas.
Elaeagnus angustifolia.
Fraxinus pennsylvanica.
Ptelea trifoliata.
Pinus contorta.
Pinus nigra.
Pinus sylvestris.
Quercus coccinea.
Quercus rubra.
Quercus prinus.
Quercus velutina.
Ulmus fulva.


Acer rubrum.
Acer saccharinum.
Alnus glutinosa.
Amelanchier canadensis.
Betula alba.
Betula nigra.
Crataegus pinnatifida.
Hibiscus syriacus.
Nyssa sylvatica.
Picea abies.
Pinus nigra.
Pinus radiata.
Populus (most species).
Quercus alba.
Quercus borealis.
Quercus palustris.
Quercus phellos.
Salix (most species).
Taxodium distichum.

Ornamental Trees for the Middle Southern States.

1. Deciduous Trees. - Acer saccharinum (A. dasycarpum) 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. - Celtis occidentalis. Valuable as an early spring-flowering tree. - Catalpa speciosa. One of the most distinct trees: an excellent shade tree. - Catalpa. Seldom planted.

ALFRED REHDER.
TREES

south as an ornamental tree, because of the repeated attacks of cankerworms. The latter are frequently used for fish bait. — <i>Celtis stenophylla</i>. Very desirable as a flowering lawn tree. — <i>Celtis occidentalis</i>. 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. — <i>Celtis</i>. Taking into account the various shapes, the foliage and the bright colored fruit in fall and winter, the best are: <i>C. occidentalis</i> or Washington Thorn, <i>C. arborescens</i>, <i>C. sapinifolia</i> and <i>C. asteroides</i> or Apple Haw. — <i>Celtis occidentalis</i>, known as 4' locusttrees, is one of the best for dry soils. The typical species produces like-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. — <i>Diospyros virginiana</i>. Sometimes planted for shade or for its fruit. Adapts itself to nearly all soils. There are many forms varying both in the foliage and size and shape of fruit. — <i>Flava formosissima</i> is frequently used for street planting in sandy soils. The red-leafed 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. — <i>Fremontia americana</i> and <i>F. pubescens</i>. Both thrive best in rich soils and are very desirable for street planting being seldom attacked by insects. — <i>Gleditsia</i> or <i>Sclerodendron</i> 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. — <i>Gleditschia triacanthos</i>. The fertile tree is sometimes planted for its large foliaceous pods, which are reviled by many for the sordid, acrid, succulent pulp. The finely pinnate foliage is very ornamental. — <i>Halesia tetraptera</i>. 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 10 to 30 feet high are frequently found. Valuable for landscape planting. — <i>Heteromeles</i> or <i>Garya</i>. 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. — <i>Heteromeles praecox</i> is scarce, but its foliage is more attractive than that of any other species. — <i>Heteromeles</i> <i>delavayi</i>. The foliage and the fleshy red peduncles in autumn make it an excellent shade and ornamental tree. — <i>Halesia polyandra</i>. A handsome tree when grown in partial shade; the bark blisters in full sun. — <i>Juglans</i>. <i>J. nigra</i> is one of the most valuable ornamental period during February. <i>J. sachaliniana</i> is a very ornamental tree and very productive at an early age. <i>J. cinerea</i> is suited only to the mountain regions of the South. — <i>Katsura</i> <i>puniculata</i>. Very desirable for its pinnate foliage and panicles of yellow flowers, which 2554. A tree growing in the open, with full rounded head. are succeeded by bladdery fruits. — <i>Lagerstroemia</i> <i>Indica</i>. The Crape Myrtle is one of the most characteristic features of southern homes. It has become almost naturalized south. It trained to a single stem it will form a tree 25 to 30 feet high; otherwise it attains 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. — <i>Lagerstroemia indica</i>. One of the most valuable and rapid growing shade and ornamental trees; thrives best in rich soils. Trees taken from woods transplant badly. They should be grown in nursery and occasionally transplanted until sufficiently large for using in street planting. — <i>Liquidambar</i>. A most symmetrical shaped tree; adapts itself to all soils; valuable for street planting. Some trees assume a deep purple or crimson tint in the foliage during autumn, others a golden yellow. — <i>Magnolia</i>. Of the native deciduous species, <i>M. macrophylla</i> 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 <i>M. tripetala</i> at the North. — <i>M. floribunda</i>, Earlyaved Magnolia and Wahoo of the western North Carolina mountain-trees, is also a very ornamental tree. <i>M. tripetala</i> is objectionable in gardens owing to the unpleasant odor of its flowers. Few Chinese species, with the exception of <i>M. hypoleuca</i>, attain the size of a tree. <i>M. yulan</i> and <i>M. spectabile</i> 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. — <i>Melia azedarach</i> (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 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 great durability for posts. *M. alba* is naturalized planted for shade; it is valuable for its wood, which is **sylvatica.** Only .1. brilliant red tint of middle Georgia some years ago and called Stubbs in landscape work. — Morns, *M. rubra* is frequently unique appearance and can be used with great effect dwellings, owing to the dropping of the fruit. — Nyssa *californica.* Only desirable in landscape work for the brilliant red tint of its autumn foliage. — *Osageorange*

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2555. *Apple,* one of our most picturesque trees.

*Arboreum.* Desirable for its flowers and highly colored autumn foliage. — *Pervoscoa americana,* Retoma or Horse-bean, of southern Texas. A small tree with green bark, feathery foliage and yellow flowers. Valuable for shrubbery. — *Pavonia 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. — *Paulownia.* 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 seen as a stately poplar. Weeping, willow-leaved and golden-leaved varieties are interesting. — *Praes.* Hortulanum or Chieseaw plants are sometimes planted for ornament, though commonly for fruit. — *Prunus virginiana* is abundant everywhere but not valued owing to being usually infested with tent caterpillars. — *Prunus cerasoides* is the best purple-leaved tree for the South, as it retains its color during summer. — *Prunus pachys.* This very ornamental small tree is seldom seen under cultivation, as it grows naturally in wet and boggy soils. — *Pyrus coronaria.* The crab apple, a small tree with very fragrant flowers in spring, is excellent for shrubbery. — *Platanus occidentalis.* One of the most desirable trees for street planting. — *Polus.* The variety which is of greatest value for street planting is *P. deltoides* or *monelli,* commonly known south as cottonwood. It is of rapid growth and grows in nearly all soils that are not too acid. All southern nurseries name 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 *Ligustrum japonicum,* often forms a tree 25 feet high. Berries blue-black, retained during winter.
Plate XLIV. THE FRAMEWORK OF TREES AND BUSHES. To illustrate the article TREE.
**TREES**

Magnolia. *M. grandiflora* is justly considered the glory of southern broad-leaved evergreen trees. There are three forms, varied in the size and shape of the leaves and 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. The trees are found in Washington, D. C. *M. glauca* has white flowers 2 to 3 inches in diameter and delightfully fragrant. *Osmanthus fragrans*, var. ruber and *O. Agrippina*, var.atifolius, can be trained to single stem. The flowers of the first are delicately fragrant and produced twice a year. *Prunus Carolinensis* is justly considered by the U. S. Patent Office, or Chinese Evergreen Thorn, has white flowers and dark red autumn foliage. *Prunus Carolinensis*. Known south as Carolina Cherry, Carolina Laurel, Mock Orange, etc. One of the most ornamental southern trees. *Quercus Suber*. Acorns are distributed by the most ornamental southern trees. *Quercus Suber*. Acorns were distributed by the U. S. Patent Office in 1860 and many large trees are now found in several sections of the South, where they have fruited. Some small plantations are made for the purpose of producing cork. It grows well in comparatively poor and stony soils. *Sabal Palmetto* is now freely used for street and avenue planting on the coast. It is conspicuous for its tropical appearance. It is not successful further than 40 miles from the seashore.

III. Conifers or Narrow-Leaved Evergreens. *Abies*. Of this section few species 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. *Cupressus*. From the compact, spiral or "stout" growth, to the large, open forms. — *Cupressus"* or Cypress of Goa, has numerous forms with foliage of an ash green and pendulous branches, to others of a more dark tint and rigid form. Of *Chamaecyparis Lawsoniana* there are endless forms, from a compact, erect habit and vivid green foliage to those of open or pendulous shape and with glaucous or golden foliage. *C. Jununci* has varied less in its seedlings. — *Juniperus*. The Irish Juniper is of fine pyramidal form, and reaches a height of 15 feet. *J. excelsa*, *J. Pseudoplatyphylla* and *J. chinensis* differ in the tint of their foliage and are all of tall growth. — *Tsuga*. The California Arbor-Vitae, with its graceful feathery foliage and conical shape, is one of the most ornamental of conifers. *Pines*. Few of the exotic species are suitable to the South. *Pineus Extensor*, or the White Pine, is undoubtedly the best adapted to the middle South of all kinds. *Retinispora* is a valuable group of Japanese Cypress, but with the exception of *R. obtusa*, *Fulleri*, *plumosa* and *squamosa* *Picea* is of much greater habit. *Thuja*. The Asiatic section is better adapted to the middle South than the American species. Of the former the best forms are known to nurseries as *Biotia pyriformis* and *var. arborescens*. If, in a height of 15 to 18 feet, *B. japonica*, *var. nilotiformis* (Thuja orientalis) is a remarkable variety, with thread-like foliage and compact habit to 10 to 12 feet.

In the foregoing list of Conifers no mention is made of species or varieties of low or shrub-like growth, such as *Podocarpus*, *Cephalotus*, *Thuya*, and *Seludepis*, of which there are many good specimens in various parts of the South. Araucarias are also omitted, owing to their liability of failure from extreme heat or other unfavorable climatic conditions. This applies also to Sequoia, and Frenelas (properly *Calitrias*): these frequently make an extraordinarily rapid growth until late in autumn, and are often injured by a cold wave early in winter.  — P. J. BERCKMANS.

**Trees on the Great Plains.—** The Plains are not absolutely treeless, as strangers often suppose, but the whole vast area is dotted here and there with small groves, or narrow belts which fringe the borders of the streams. The number of native species, however, is much smaller than in the rich tree flora of the northeastern United States. The number of species cultivated for shade and ornament, for a long time, at least, must be relatively small owing to climatic and other causes. In general the people of the Plains are necessarily more interested at present in planting trees for profit than for pleasure, but in the older parts are already to be found many fine public parks and private grounds. To a large extent, however, their point of view is that of forestry rather than horticulture.

In studying the forest trees of the Great Plains of central North America we find that most of the species have migrated out upon the Plains from the great forest body of the Mississippi valley. These trees found their way upon the Plains by way of the forests which border the Missouri river and its tributaries. As we pass down the river, along the eastern edge of the Plains, the forest belt becomes larger and larger, until
It eventually merges into the great body of forest trees
lying on the easterly side of the Mississippi valley.
The principal trees which have come upon the Plains by
this route are the common red cedar, papaw, half a
dozen willows, one cottonwood, basswood, two or three
clms, hackberry, mulberry, three ashes, wild apple,
four oak kinds, white oak, ironwood, black locust, June-
berry, wild cherry, choke cherry, wild plum, coffee bean, bony locust, red
bud, sycamore, two species of buckthorns, buckeye, one
maple, boxelder, sumach, two species of walnuts, five
or six hickories, white or oak, ironwood, bluebeech, and
one birch. But ten species of trees have come from the
Rocky Mountain forests, and these have made much
less impression upon the forests of the Plains than
those which have come from the eastern forests. In this list
are the bull-pine, the western red cedar, four species of
cottonwoods, the buffalo berry, a maple, and two birches.

Although the present forest area of the Plains is not
relatively great, it is large enough to be seriously con-
sidered in regard to its preservation. There
is danger that with the habits acquired
by our people in the thickly wooded
portions of the United States
of cutting down forest trees
wherever found, much of
this small forest area
will be destroyed. It
is much easier to
preserve an area
of forest land
than to create it anew.
First, all forest fires
must be kept down. Where
a mass of
woodland
adjoins the
open prairie,
fireguards
should be
made so that
the fires will
not sweep into the
forest growth. The
greatest de-
stroyer of the
forests of the
Plains in the past
has been fire, as it
swept over the
prairies into wood-
land. 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 unjured 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 off 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 places which are the trees that leave
have an opportunity for growing into usable timber.
Care should be taken to encourage the tendency to
spreading which is so strong in nearly all parts of the
Plains. With a little care every present living forest
area may be made to extend itself spontaneously, or
nearly so. The forest should be effectively inclosed by a
fence placed at some distance from its outer border,
leaving a narrow belt of improved 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 borders of the forest will be gradually expanded.
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
these need give no trouble, for this is merely nature's
way of regaining possession of the soil. Little if any cultivation need be
given to such a nursery belt, as the weeds which spring
up will soon be shaded out by the new growth 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 on the newly occupied
natural forests. Where there are natural forests the
planting should be around their borders, so as to extend
them in much the same way as indicated in the preced-
ing paragraph in regard to natural spreading. Where
there are no natural forests at all it is neces-
sary to select the more favorable
places for planting. Since the nat-
ural forests on the Plains occupy the depressions rather
than the hill tops or the slopes, this should give us a hint as to what
we must do. Wherever the land slopes into a depression many
favorable conditions for growing
trees. These depressions, gener-
ally called "draws," may be filled with
trees, and when once a growth of a
few acres is secured it will not be difficult to extend the
forest far up the hillsides. On the
western portions of the Plains vac-
ular positions should be taken under
the digation of the rivers. In
the selection trees for the formation of for-
est 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 condition as those under
which they grew in the native forest. On the east-
cern third of the Plains, the walnut, white oak, shell
tree hickory, white elm, red elm, hackberry, wild cherry, catalpa and bony locust are recommended
for planting. On the extreme eastern portions border-
ing the Missouri river, many more kinds can be planted,
spring up low shrubs of various kinds. In the Sand Hill region the list grows smaller. On the central
Plains the list is reduced, and also somewhat
changed in species. The two elms may be planted, as
also the hackberry, the green ash in places, the
ash, wild cherry, honey locust, and in many places the
bull-pine. On the western Plains, especially that por-
tion lying west of the main body of the Sand Hills,
which have an elevation above the plains of about
1,000 feet, the list is still smaller. The white elm is still
included, and also the hackberry, the bull-pine, and in many
places the red cedar.

The trees mentioned are of the more durable and profit-
able kinds. But on all parts of the Plains people
must often have quick-growing trees which soon pro-
duce 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, to which may be added, here and there, one or more of the western species of cottonwood.

Now for the horticultural point of view. About the country homes the first trees are usually cottonwood, silver maple and box elder, followed later by green ash and white elm. Very commonly the red cedar is planted with the first mentioned species, and often Scotch and Austrian pines are soon added. It must be remembered that the settler’s house on the Plains stands in the open instead of being hemmed in by forest trees, as in the eastern portions of the American continent. The settler’s problem is to surround his house with trees, not to clear the trees away. In towns and cities the cottonwood, silver maple and box elder are generally the pioneer trees, since they produce a shade sooner than any others, and later these are gradually replaced by green ash and white elm. Hackberry, black walnut 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 (Elaeagnus), and in proper situations, the white willow. The coniferous trees of greatest value for ornamental purposes on the Plains are the Austrian pine, Scotch pine and red cedar. With proper care these may be grown on all parts of the Plains where water enough to maintain life may be obtained. On the extreme eastern border the Norway spruce and even the balsam fir have proved valuable. Among deciduous trees the white elm holds first place, followed by the hackberry (which is not as much planted as it deserves) and the green ash.

C. E. Bessey.

**TREES**

*TREES GROWN FOR SHADE AND ORNAMENT IN CALIFORNIA.*—The mild and equable climate of California allows a wide range of available species from which to select trees for shade, ornament and shelter. On account of the long rainy season, the low humidity of the atmosphere, and the relatively high mean, and freedom from low winter minima in temperatures, the trees which thrive best in middle California are those indigenous to the arid and semi-arid warm-temperate regions of the globe, e. g., southern Australia, the Mediterranean region, South Africa, northern Mexico and Chile. Many trees of the temperate-humid regions also thrive in this state, particularly in the relatively humid climate of the coast, and are offered by our nurseries. Several of the species mentioned in this list are not described in this Cyclopædia, as they did not appear to be in the general trade when the pages were written.

1. **The Species Most Extensively Planted.**—The 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 Pseudacacia, probably more widely distributed and occurring in more remote and out-of-the-way places than any other species (except, perhaps, *Eucalyptus Globulus*). The seeds may have been brought across the Plains by the earliest settlers at the mines.
7. *Schinus Molle*.
8. *Acacia melanoxylon*.
9. *Acacia mollissima*.
10. *Magnolia grandiflora*.
12. *Washingtonia robusta*.
13. *Cordyline australis* and other species.
14. *Araucaria Bidwillii*.
15. *Araucaria excelsa*.
16. *Grevillea robusta*.
17. *Junipus Californica* and spp.
18. *Ulmus racemosissima* and spp.
20. *Salix Babylonica*.

2559. Two types of conifers—pine and spruces.
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.

<table>
<thead>
<tr>
<th>Species</th>
<th>Per cent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus globulus</td>
<td>35.24</td>
</tr>
<tr>
<td>Cupressus macrocarpa</td>
<td>26.43</td>
</tr>
<tr>
<td>Eucalyptus viminalis</td>
<td>15.83</td>
</tr>
<tr>
<td>Plusi radiata</td>
<td>4.67</td>
</tr>
<tr>
<td>Melia Azedarach, var. unbranchiformis</td>
<td>2.75</td>
</tr>
<tr>
<td>Phoenix Canariensis (Fig. 2563)</td>
<td>2.71</td>
</tr>
<tr>
<td>Acer moehneiycylon</td>
<td>2.20</td>
</tr>
<tr>
<td>Acer mollissima</td>
<td>1.55</td>
</tr>
<tr>
<td>Robinia pseudoacacia</td>
<td>1.07</td>
</tr>
<tr>
<td>Magnolia grandiflora</td>
<td>1.45</td>
</tr>
<tr>
<td>Aver saccharum</td>
<td>1.47</td>
</tr>
<tr>
<td>Juglans Californica</td>
<td>1.14</td>
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<tr>
<td>Acer Negundo, var. Californicum</td>
<td>0.89</td>
</tr>
<tr>
<td>Populus deltoides, Caroliniana</td>
<td>0.81</td>
</tr>
<tr>
<td>Ulmus Americana</td>
<td>0.81</td>
</tr>
<tr>
<td>Betula alba</td>
<td>0.81</td>
</tr>
<tr>
<td>Washingtonia filifera</td>
<td>0.85</td>
</tr>
</tbody>
</table>

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 are particularly well adapted to certain conditions of climate and soil, and will doubtless replace others now in use.

A. Small Trees or Tall Shrubs.

<table>
<thead>
<tr>
<th>Species</th>
<th>Common Names</th>
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<tbody>
<tr>
<td>Acanthopanax rieinfolia</td>
<td>Erythrea armata</td>
</tr>
<tr>
<td>Aralia Chinensis</td>
<td>Falsa Japonica</td>
</tr>
<tr>
<td>Aralia Chinensis, var.</td>
<td>Falsa papridera</td>
</tr>
<tr>
<td>Mandshurica</td>
<td>Musa Ensete</td>
</tr>
<tr>
<td>Aralia spinosa</td>
<td>Prenas Lascaerensis</td>
</tr>
<tr>
<td>Arundinaria falcata</td>
<td>Ricinus Cambidgei</td>
</tr>
<tr>
<td>Gomphocarpus humilis</td>
<td>Ricinus macrophyllus</td>
</tr>
<tr>
<td>Dicksonia antarctica</td>
<td>Ricinus sanguius</td>
</tr>
<tr>
<td>Eriobotrya Japonica</td>
<td>Ricinus Zanzibarensis</td>
</tr>
</tbody>
</table>

AA. Larger Trees.

<table>
<thead>
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<th>Species</th>
<th>Common Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalpa bigbimodetus</td>
<td>Jubara spectabilis</td>
</tr>
<tr>
<td>Catalpa ovata</td>
<td>Livistona australis</td>
</tr>
<tr>
<td>Catalpa speciosa</td>
<td>Magnolia grandiflora</td>
</tr>
<tr>
<td>Cordyline australis</td>
<td>Paulonia imperialis</td>
</tr>
<tr>
<td>Cordyline BANKSII</td>
<td>Phoenix Canariensis</td>
</tr>
<tr>
<td>Cordyline indivisa</td>
<td>Phoenix dactyliora</td>
</tr>
<tr>
<td>Cordyline striata</td>
<td>Phoenix roblinata</td>
</tr>
<tr>
<td>Cordyline laxicarpa</td>
<td>Phoenix salveavris</td>
</tr>
<tr>
<td>Erythrea longipes</td>
<td>Phytolaca dioica</td>
</tr>
<tr>
<td>Erythrea calophylla</td>
<td>Trachycarpus exelus</td>
</tr>
<tr>
<td>Eucalyptus filifolia</td>
<td>Tristania conferta</td>
</tr>
<tr>
<td>Ficus Carica</td>
<td>Washingtonia filifera</td>
</tr>
<tr>
<td>Ficus macrophylla</td>
<td>Washingtonia robusta</td>
</tr>
</tbody>
</table>

Eucalyptus Globulus can also be used effectively if cut down periodically when the falcate 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 hardiness, it has been impossible to give precise information as to the exact degree of frost-tolerance of the several species, as we can find but meager published data on the subject.

A. Susceptible to light frost.

The following would probably succumb to a temperature of 28° Fahr.:

- Eucalyptus calophylla
- Eucalyptus citriodora
- Jacaranda ovifolia

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 glaucescens
- Eucalyptus sideroxylon, var.
- Acacia pycnantha
- Magnolia Kobus
- Cratægus mollis
- Alnus glutinosa
- Catalpa ovata
- Catalpa bignouoides
- Acer Baileyana
- Acer euphorbioides
- Acer elata
- Acer fulva
- Acer laurifolium
- Acer mollissima
- Acer neriifolia
- Acer pendula
- Acer salicinum, etc.

AAA. Hardy.

- Acer pseudoplatanus
- Acer saccharinum, var.
- Acer saccharinum, var. Wieria
- Carya ovata
- Fraxinus americana
- Fraxinus velutina
- Quercus lobata
- Quercus shumardii
- Ulmus americana

B. Susceptible to frost (30° Fahr. and perhaps less).

- Acer saccharinum, var. Wieria
- Carya ovata
- Fraxinus americana
- Fraxinus velutina
- Quercus lobata
- Quercus shumardii
- Ulmus americana

BB. Growth somewhat slow.

- Acer campestre
- Acer saccharinum, var. Wieria
- Carya ovata
- Fraxinus americana
- Fraxinus velutina
- Quercus lobata
- Quercus shumardii
- Ulmus americana

B. Growth rapid: trees susceptible to 25° Fahr.

- Acer pseudoplatanus
- Acer saccharinum, var. Wieria
- Carya ovata
- Fraxinus americana
- Fraxinus velutina
- Quercus lobata
- Quercus shumardii
- Ulmus americana

AA. Evergreen.

- Cupressus sempervirens
- Cupressus sempervirens, var. fastigiata
- Juniperus communis, var. Hibernica
- Taxus baccata, var. fastigiata

BB. Outline conical or spiral, usually pointed.

- 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 bidwillii
- Araucaria cooki
- Araucaria cunninghamii
- Araucaria excelsa
- Araucaria imbricata
- Pinus canariensis

DD. Hardy.

- Abies balsamea
- Abies calophylla
- Abies concolor
- Abies deltoidea
- Abies grandis
- Abies koreana
- Abies finsapo
- Cupressus sempervirens
- Cupressus sempervirens, var. fastigiata
- Juniperus communis, var. Hibernica
- Taxus baccata, var. fastigiata

AA. Purple or bronze.

- Cuscuta europaea
- Cuscuta europaea

BB. Susceptible to 25° Fahr.

- Rielinosa cambodgensis
- Rielinosa communis, var. Gibsonii

BB. Hardy.

- Acer platanoides, var. Reitenbach
- Acer platanoides, var. Schwedleri
- Betula alba, var. atropurpurea
- Fagus Sylvatica, var. purpurea
- Fagus Sylvatica, var. purpurea
- Prunus Persica var.

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.

- Betula alba
- Betula leucodendron
- Betula lutea
- Betula papyrifera
- Fagus Sylvatica, var. purpurea
- Picea abies
- Populus alba
- Robinia pseudacacia
- Ulmus americana
- Ulmus glabra
- Ulmus americana
- Ulmus campestris
- Ulmus pumila
- Ulmus pumila

B. Susceptible to frost (possibly 20° Fahr.).

- Acer saccharinum, var. Wieria
- Carya ovata
- Fraxinus americana
- Fraxinus velutina
- Quercus lobata
- Quercus shumardii
- Ulmus americana

C. Deciduous; hardy.

- Gingo biloba
- Quercus cerasifera
- Quercus涅ga
- Sorbus aucuparia
D. Susceptible to severe frost (probably 20° Fahr. and even less).

Cinnamomum Camphora, Cryptocarya Mierelli, Cinnamomum tschori,
Corynocarps latifolius, Sterculia diversifolia, Ulmus gibbosa.

E. Hardy.

Acacia melanoxylon, Acacia melanoxylon var. vicaria, Alectryon excelsum, Bursaria spinosa, Eucalyptus calophylla, Eucalyptus corymbosa, Eucalyptus corynocalyx, Eucalyptus globulus, Eucalyptus imbricata, Eucalyptus Gunnii, Eucalyptus leucoxylon, Eucalyptus robusta, Hymenodorum flavum, Myracodia bicornis.

AAA. Drooping trees.

C. Evergreen.

*Populus grandidentata, var. pendula.*

Morus alba (Tees' Weeping), Populus grandidentata, var. pendula, Ulmus gibbosa, Ulmus scabra var. horizontalis.

BB. Hardy.

Betula alba, var. pendula elegans, Betula alba, var. pendula laevis, Eucalyptus obliqua, Eucalyptus rostrata, Eucalyptus rotundifolia, Eucalyptus vicinalis, Ulmus glabra, var. pendula, Ulmus montana, var. pendula, Ulmus scabra var. horizontalis.

AAA. Outline more or less rounded, but trees not as wide-spreading nor as shade-giving as in class C.

B. Deciduous.

C. Susceptible to frost (25° Fahr.).

Phytolacca dioica, Juglans nigra, Koelreuteria paniculata, Robinia Pseudacacia, Ulmus scabra var. horizontalis, Ulmus fulva var. pendula, Ulmus glabra, var. pendula, Ulmus montana, var. pendula, Ulmus scabra var. horizontalis.

BB. Evergreen.

Betula alba, var. pendula sororia, Ulmus glabra, var. pendula, Ulmus montana, var. pendula, Ulmus scabra var. horizontalis.

AAA. Drooping trees.

B. Deciduous.

*Populus grandidentata, var. pendula.*

Morus alba (Tees' Weeping), Populus grandidentata, var. pendula, Ulmus gibbosa, Ulmus scabra var. horizontalis.

BB. Hardy.

Acacia cyanophylla, Acacia cyanophylla var. leucophylla, Acacia dealbata var. glandulosa, Betula alba, var. pendula sororia, Ulmus glabra, var. pendula, Ulmus montana, var. pendula, Ulmus scabra var. horizontalis.

AAA. Outline more or less rounded, but trees not as wide-spreading nor as shade-giving as in class C.


The number of tree species suitable for street planting is limited by the necessary heavy restrictions, as to height, spread, sewer-penetration and sidewalk-raising, imposed by municipal street departments. In European countries the first-named objections are overcome by means of frequent and systematic pruning to a uniform standard, while this necessity can be obviated by the selection of trees which naturally keep within the desired bounds, the labor of maintaining them in a slightly condition is minimized and the result much more pleasing.

For town streets not more than 60 feet in width, it is important to have trees that will not give too much shade and prevent the rapid drying of the roadway after showers, nor be so tall nor wide-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 eucalyptuses, some araucarias and a few other species mentioned below.

It is not wise to use trees of very rapid growth on town streets; they soon become too large and require frequent trimming, which is usually equivalent to mutilation, and are likely to interfere with sewers.

It cannot be said that street planting in California towns has, in most cases, been satisfactory. In spite of the much larger variety of suitable material than is available in most of the states, there are few examples of good street-planting to be met with. In most of our towns the eye is greeted with a few struggling trees, of which perhaps not more than two are of one kind, recalling Professor Waugh's apt simile of "nine most strongly 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
Acer campestris  
Acer macrophyllum  
Acer Negundo  
Acer Negundo, var. Californium  
Acer platanoides  
Acer saccharinum  
Acer saccharum  
Acer negundo  
Acer Rubrum  
Acer pseudoplatanus  
Acer rubrum  
Acer saccharinum  
Acer rubrum  
Acer saccharinum  
Acer Rubrum  
Acer pseudoplatanus
Melia Azedarach, var. umbraculiformis, is found unsatisfactory in the immediate vicinity of the coast; as a sidewalk tree it is exceedingly subject when losing its leaves, and is also much subject to scale insects.

Acacia melanoxylon is generally debarred from the coast belt by its troublesome nature when mature; it is said to suffer quickly from the effects of drought. In the moist-climate of the immediate vicinity of the coast, near San Francisco, however, it proves entirely satisfactory.

Populus alba, Robinia pseudoacacia and Ulmus rubra are excessively troublesome when used as sidewalk trees on narrow streets; their surface roots often break the concrete sidewalk or asphalt sidewalks, and the suckers come up in the midst of lawns several yards away from the parent tree.

Ficus macrophylla is another tree injurious to sidewalks.

Eucalyptus Globulus, and in fact all species of the genus, are frequently debarred by town ordinance from growth within 60 or even 70 feet of a sewer, on account of the remarkable length and penetrating power of their roots.

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 Phoenix and Jaba should be avoided on account of their low, wide-spreading habit, except for avenues and boulevards where there is no sidewalk or where there is from 20 to 30 feet space between sidewalk and driveway.

Attendant phormis has a bad reputation on account of its disagreeable odor, but as this is only found in the staminate trees, it can sometimes 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.

The most alkali-tolerant of those yet tested is Kirlreuteria paniculata, a high, with feathery, pinna yellow blossoms.

A. Tolerant of strong "black" alkali (Sodium carbonate). The most alkali-tolerant of those yet tested is Kirlreuteria paniculata, a small species 15 to 20 feet high, with feathery, pinnate leaves and ornamental yellow blossoms.

AA. Tolerant of medium alkali (chiefly "white" salts). Arceia melanoxylon, Alhagi glandulosa, Albizia jophantha, Carissa squamosa, Eucalyptus angustifolia, var. angustifolia (apparently the least sensitive of the Eucalyptus).

Eucalyptus rostrata (Fig. 3).

Eucalyptus sideroxylon, var. roosei, Phoenix dactylifera, Platania orientalis, Prosopis fremontiana, Quercus lobata, Robinia pseudoacacia.

AAA. Only fairly tolerant.

Cinnamomum Camphora, Gleditschia triacanthos, Ulmus spp., Washingtonia filifera.

AAAA. Tolerated and found unsuitable.

Most of those trees of the humid regions, e.g., the eastern states and N. Europe, which have been tried on alkali soils, have been found to suffer and to remain dwarf and stunted. This is particularly true of Livistona, Podocarpus, Quercus pedunculata and species of Tilia.

Since writing the above, the following additional information on the alkali tolerance of ornamental trees has been brought to light through the investigations of Dr. R. H. Loughridge of the Agricultural Experiment Station at Berkeley, and has courteously been placed at my disposal.

Total amount of salts actually found in the upper four feet of soil in which the following trees were growing, expressed in tons per acre:

<table>
<thead>
<tr>
<th>Tree Name</th>
<th>Total Amount of Salts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kirlreuteria</td>
<td>32</td>
</tr>
<tr>
<td>Phoenix</td>
<td>26</td>
</tr>
<tr>
<td>Eucalyptus</td>
<td>20</td>
</tr>
<tr>
<td>Washingtonia</td>
<td>8</td>
</tr>
<tr>
<td>Acacia</td>
<td>5</td>
</tr>
<tr>
<td>Camphora</td>
<td>5</td>
</tr>
<tr>
<td>Cinnamomum Camphora</td>
<td>5</td>
</tr>
</tbody>
</table>

IV. TREES FOR SOUTHERN CALIFORNIA.—Street Trees: Sterculia diversibolia, Australian Bottle Tree; Acacia melanoxylon, Blackwood Acacia; Cinnamonum Camphora, Camphor Tree; Sterculia diversibolia, Australian Flame Tree; Eucalyptus robusta, Swamp Mahogany Gum; Grevillea robusta, Silk Oak; Acacia dealbata, Black Wattle; Javacaranda, Japanese Laurel; Pisonis erecta, Monterey Pine.

The above are the best ten trees for street purposes, but among these might be placed Cordyline australis and C. indivisa, and several kinds of palms. Of other deciduous trees is much used—Melia Azedarach, var. umbraculiformis, the Umbrella Tree. Though less known or used, Eucalyptus calophylla is by far a better street or sidewalk tree than E. robusta, a small species 15 to 30 feet 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 personal preference.

TRICHOLYSA (Greek, trichos, hair, and slender; allied to Trichloris). A small genus allied to Rodriguezia (Burlingtonia). The plants grow in dense matted tufts. Pseudobulbs very small, usually bearing a broad, rounded leaf. The flowers are yellow or orange, and pink or straw-yellow, produced in dense racemes. A single flower can sometimes be found on a single segment of the raceme. The petals are free from the Calyx and Corolla. The fruits are large and juicy, with a yellowish seed. Each fruit contains one seed.

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to which fact the cultivated species owes its ornamental appearance. Albeit to Paniceum, from which it differs in having the second empty glume (which, on account of the first glume being small or wanting, is apparently the first) provided at the base with a conical calus, and this and the third glume more or less awned between the cleft apex.

rosea, Nees (T. violacea, Hort. Paniceum Tenerifae, R. Br.). First glume wanting; spikelets (second and third glumes) clothed with violet silky hairs; awns short or wanting; culm 2–3 ft. South Africa.

A. S. Hitchcock.

TRICHOMANES (Greek, soft hair). Hymenophyllece. A genus of slender ferns distinguished by its tubular, cup-like iudusium and filiform elongate receptacle. Fig. 2567. Very delicate in texture and capable of being grown successfully only under shaded glass. Over 100 species are known. Various species may be found in the collections of fanciers, but the following appear to be the only ones regularly in the American trade. For culture, see Ferns.

radicans, Swz. Lvs. 2–8 in. long, 1–1½ in. wide, bipinnatifid; pinnae ovate-lanceolate; soft; 2–12 to a pinnule, small, axillary; indusia terminal, on short lobes. Tropical regions, extending into our southern states as far as Kentucky.

Priesuril, Kunze (T. dpeeas, Hook.). Lvs. 12–18 in. long, 6–12 in. wide, tri-quadrupinnatifid; pinnae ovate-lanceolate; soft; 3–12 to a pinnule, small, axillary; indusia with a much dilated lip. Tropical America.

L. M. Underwood.

TRICHONEMA. See Romulea.

TRICHOPILIA (Greek, hair and cap; the anther is concealed under a cap surmounted by three tufts of hair). Orchidaceae. About 20 species, ranging from Mexico to South America. Pseudobulbs crowded on the short rhizome, flattened, and often elongate, 1-lvd., surrounded with dry scales at the base: lvs. large, solitary, erect, fleshy, keeled; fls. abundantly produced on short, nodding or decumbent scapes; sepals and petals narrow, spreading, often twisted; labellum large, forming the most conspicuous part of the flower, united with the column below, lateral lobes convolute, middle lobe spreading; anther bent over, pollinia on a triangular caduice; clainardia fimbriately winged. The flowers keep fresh a long time, both on the plant and when cut. Handsome orchids, usually grown in pots, although exceptionally epiphyllous. They need an intermediate or greenhouse temperature. If grown too warm, they suffer. Prop. by division.


fragrans, Reichb. f. (Pityrma frgearns, Lindl.). Pseudobulbs clustered, flattened, 3–5 in. long, 1-lvd.: lvs. oblong-lanceolate, acute, 6–8 in. long; scape pendant, 1 ft. long, about 6-fl.: fls. on pedicels 3 in. long; sepals and petals spreading, linear-lanceolate, 2½–3 in. long, wavy and twisted, greenish white; labellum folded over the column, spreading in front, and somewhat lobed, white with a yellow stain in the throat. Summer. Colombia. B. M. 565. —Fls. almost-scarce.


crispa, Lindl. This plant was described by Lindley in Linden's catalogue. It is closely related to T. marginata, TRICHOPILIA 1849

suavis, Lindl. Fig. 2568. Pseudobulbs thin, compressed, 2 in. long: lvs. broadly oblong, 8 in. long; scape pendant, about 3-fl.: fls. on long, curved stalks, large; sepals and petals lanceolate-obovate, 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, white and crenate. May, June. Cent. America. B. M. 4654. F. S. 6:751; R. H. 1859, pp. 220, 221; 1867, p. 454. Gn. 4, p. 511; 31, p. 452; 38, p. 185; 45, p. 79; 51, p. 371. R. B. 23:256. G. M. 38:281. —Var. alba, Warner. Fls. white with a yellow spot in the throat of the labellum.

marginata, Henfr. (T. cocinea, Warse. T. crispa, var. marginata, Hort.). Pseudobulbs clustered, oblong, compressed; lvs. broadly lanceolate, suddenly acuminate, subobovate at the base; scape about 3-fl.: fls. large, white; whitish outside, reddish purple within; sepals and petals linear-lanceolate, margined with white, the former slightly twisted; labellum trumpet-shaped, with a large,
TRICHOSANTHES (Greek, hair and flower; alluding to the fringed edge of the petals) Cucurbitaceae. About 40 species of climbing herbs, annual or perennial by tuber-like roots, natives of southeastern Asia and Australia. They are tender plants with unusually large, roundish, lobed leaves and white axillary flowers. The male fls. are usually in racemes, while the female are nearly always solitary. The fruit is often ornamental and highly colored. In T. anguina 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 fimbriate; stamens 3 (in the male flower). D. C. Mon. Planer. 3:351. The plant flower in July from seed sown in March. They may be treated as tender annuals.

TRICHOSMA (Greek, hair and ornament). Orchidaceae. A genus of 6 species of American plants, mostly low, aromatic, annual herbs with entire leaves and solitary white, yellowish or purplish, fragrant, sepals ovate-lanceolate; petals oblong; labelum ovate-oblong, streaked with purple; disk yellow, middle lobe with several crenate ridges. Himalaya. B.R. 26:21.

TRICYRTIS (Greek, three convexities; 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 6-parted fls., which are generally an inch or more across, and of whiteish color, spotted with purple. They are very distinct members of the lily family by reason of the season of bloom, quantity spotted flwers, 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. hector, var. nigra. T. hector is perfectly hardy and has more fls. and larger ones than the other species, and with good drainage would bloom in September. Sometimes, however, it blooms so late that its flowers are prematurely destroyed by frost. For this reason some gardeners prefer to grow the plant in pots, which may be brought indoors when all danger of frost is over. The variety nigra, which differs in having darker colored spots, is said to bloom two or three weeks earlier than the type and can therefore be recommended to gardeners of choice having home reservation: it should not be placed in the ordinary mixed border where it will have to struggle against stronger-growing plants. It should be established in a bed where the plants need not be disturbed for years. If placed in a dozen plants in a circular bed could be made by division and spread in sections in 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 expert, W. Golfinus, has suggested as a companion to the Tund Lilies, either Lady Slippers (Cypripedium spectabile) or Wood Lilies (Trillium grandiflorum). This happy idea is worth a trial, as the species named bloom at different seasons and would probably not come into competition 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 average 2 or 3 ft. in height and have numerous fls., green on both sides and with many parallel nerves. Fls. bell-shaped, then spreading; perianth-segments sessile, white, rounded, superposed: capsule leathery, 3-valved: seeds minute. Tricyrtis is one of the aberrant species of the lily family. It is placed by Bentham and Hooker in the Uvularia tribe,
in which it is the only genus with a sepalsic capsule. Monographed in Latin by J. G. Baker in Journ. Linn. Soc. 17:463 (1880). In this account the lvs. of T. macropoda 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. flavus, 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.  
AA. Base of lvs. clasping the stem.  

B. Stem piliouse, with spreading hairs.  
BB. Stem not prominently hairy, puberulous or very slightly pilose.  

C. Fls. yellow, unspotted.  

D. Spots rather large.  
EE. Style as long as the stigmas.  

F. Spots minute.  

G. Style half as long as the stigmas.  

H. Style as long as the stigmas.  

I. latifolia, Maxim. Stem glabrous, flexuous, 2-3 ft. high; lvs. broadly oblong or the uppermost ovate; fls. few, in a terminal corymb, white to rose-red, with minute purple spots; style as long as the stigmas. Japan.

macrópoda, Miquel. Stem 2-3 ft. high, puberulous above; lvs. oblong; fls. in a loose corymb, whitish purple, with minute purple spots; style half as long as the stigmas. Blooms in June and July, according to J. B. Keller, Japan. B.M. 6544 (segments broadly ovate, decidedly yellow, spotted red and veined red near tips). -In F.S. 18:1820 is figured a plant with sessile lvs. striated with white, and no fls., which he refers to T. macropoda. This was sent out by Van Houtte as T. hisruta, but it is a glabrous plant and probably lost to cultivation.

grandiflora, Hort., should be compared with T. hirta, var. nigra. It is a name scarcely known to botany. Eilwanger & Barry say it has orchid-like, fragrant fls. in Oct. and Nov. (Baker says the genus has no fragrant lvs.) Krehage says that T. grandiflora has white lvs. mottled with black. W. M.

TRIENTÁLIS (Latin for the third of a foot; referring to the height of the plant). Primulaceae. STAR FLOWER. CHICKWEED-WINTERGREEN. A genus of two species of low, glabrous, hardy perennial herbs: stems simple, with small scales on leaves below and a whorl-cluster of obovate or lanceolate, 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 found in wild garden borders.

A. Les. acuminate at both ends.  


AA. Les. obtuse (acute in var. latifolia).  

Europea, 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. Alasks, Eu. and Asia. -Var. arctica, Ledeb. Dwarf; lvs. 1 in. long, decreasing below: corolla 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. BARCLAY.

TRIFÓLIO (name refers to the three leaflets). Leguminosae. CLOVER. Trifolium is a large genus, comprising between 200 and 300 species, most abundant in the north temperate zone. They are low herbs, with digitately 3-foliolate (rarely 5-7-foliolate) lvs., stipules adnate to the base of the petiole, and small papilionaceous flowers mostly in dense terminal heads or spikes. The calyx is 5-toothed, the 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 and green manures. See Clover, p. 351. For the role 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. agrarium, Linn., Yellow or Hop Clover, with oblong-obovate sessile lfs.; T. repens, Linn., Low Hop Clover, more spreading, lfs. obvate and the terminal one stalked; T. dubium, Sibth., with lfs. truncate or emarginate at apex and the terminal one stalked. A silky-pubescent white-flowered species, from Europe, T. arvensis, Linn., is the Rabbit-foot.
by most authorities to be the shamrock of Ireland. A form of it is offered by Blanc, as T. minum, "the genuine Irish shamrock." See Shamrock.

**TRILISA** (anagram of Liatris). *Compulsia*. Here belongs a native perennial herb known as the Vanilla Plant, from the odor which the leaves emit when bruised. It is not, however, the vanilla plant of commerce (see Vanilla). TRILISA is a genus of two species.
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 panicled instead of racemose or spike-like, and the involuval bracts are in only 2 or 3 series, while those of Liatris are in many series. Trillium 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 hardy. Twenty years ago it was advertised by a Massachusetts dealer in native plants. It is mentioned in some English beds as a hardy plant, thriving in light soil and props in division or by sowing seeds in autumn. It is more fully described in our native botanies.

**odoratissima**, Cass. (Liatria 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 1-1½ in., oblong, ovate or oval: inflorescence corymbose paniculate: fls. heads about ½ in. long. Aug., Sept. B. B. 3:319. — The other species (T. ponticulata, Cass.) has a similar range and is distinguished by its viscid-pubescent stem and thyrsoid-paniculate inflorescence.

**TRILLIUM** (Latin, tripulum, triple: leaves and floral parts in threes). Liliaceae. Wake-Robin. Birthroot. 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 Himalayas to Japan. All the American species and none of the others are in the trade in this country. The stems are 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 woods mold. The root is a deep-seated perpendicular tuber or rhizome (Fig. 2572). It is customary to complete, although the plants are difficult to find at that time and because the desire to grow them is strongest when the plants are in bloom. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous season. After flowering, the plant stores energy for the succeeding year. By midsummer this work is accomplished and the tops die: then the plants are at rest and they are in proper condition to be moved. However, good results are sometimes obtained by moving them in spring. These remarks will apply to most early spring-blooming small herbs. Give Trilliums a rich, deep, rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums are amongst 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 are usually attained, however, when they are obtained alone from the flowers in the woods. There are amongst the relatively few plants that are very showy and yet not coarse.

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**A. Ovary 3-angled, not winged.**

1. **nivale**, Ridd. A dwarf species, 5 in. or less high, early, lvs. narrow and obtuse, 1-2 in. long: fls. white, on a short erect or declinate pedicel, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B. M. 649.

2. **undulatum**, Wild. (T. erythrocaryon, Michx. T. pictum, Pursh.) Of medium to large size, 8 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. rather large, white, on a short but slender erect or inclined pedicel. The petals oblongate and wavy, about 1 in. long and usually purplish or purplish at the base. Woods, Nova Scotia to Missouri and Georgia. B. M. 3002. L. B.C. 13:122.

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**B. Ovary 6-angled, often winged.**

3. **sessile**, Linn. Strong-growing, 1 ft. or less high: lvs. broadly ovate or rhomboidal, acute, more or less spotted; fls. 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. 9:875. F. S. 22:2311.—Variable.

Var. gigantennm, 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. 3:221.

Var. angustipetalum, Torr. Similar to Var. giganteum, but the lvs. somewhat petiolate and the petals narrower. Calif., Ore. Apparently not in the trade. This and var. giganteum appear to be the only Trilliums native to California, except *T. ovatum*.

Var. rubrum, Hort. A form of Var. giganteum with fls. deep red-purple.


Nattallii, Wats. (T. viridiflorum, Nutt.). Lvs. pubescent beneath, as also the upper part of the stem: petals linear-lanceolate, purplish green with brown base. Ark.

4. **lancelolatum**, Boykin (T. recurvatum, var. lancelolatum, Wats.). Plant often more than 1 ft. tall: lvs. lanceolate, sessile: fls. dull or brown-purple, an inch or more long, narrow-lanceolate or linear, the segals ascending or somewhat reflexed, the filaments usually exceeding ½ 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, on short but slender pedioles: 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 sparingly arising above the ground: lvs. ovate-elliptic to reniform, with stalks as long as the blade or even longer (blade 3-5 in long); fls. purple, the petals 1-2 in. long and narrow-ob lanceolate, the sepals erect. Idaho, Ore., and Wash. Little known in cult.
erect: fls. brown-purple to greenish purple, the petals usually about 1 in. long, ovate to lanceolate, not much if rhombic. Calif, to B. C— The Pacific coast representative of T. grandiflorum.

high: lvs. ovate to nearly orbicular, often somewhat the petals narrow-lanceolate or narrow ovate, the sepals usually nearly as long as the petals: plants 1 ft. or less high occur with petiolate lvs. A. G. 1892:200. T. ijmndiflorum is the best and handsomest species for cultivation. Sporting forms are not uncommon. Sometimes forms

C. Pedicel longer than the flower: lvs. nearly or quite sessile.


Var. viridiflorum, Hook. Fls. greenish. B. M. 3250. Not known to be in the trade.

cc. Pedicel generally not exceeding and usually shorter than the flower.

d. Fl. declinate under the lvs.

10. cernuum, 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. novumum and T. Catesb.) Ell.). Slender, 12-18 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.

TRIÓSTEUM (name shortened by Linnaeus from Triosteospermum, which is from Greek for three long seeds). Caprifoliaceae. Fever-Tree. Horse Gentian. 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, solitary or in small clusters in the leaf-axils, followed by orange or reddish fruits.

perfoliátum, Linn. Stem 2-4 ft. high, stout: lvs. ovate, shortly acuminate, narrowed below into connate-sterile or simply connate base: corolla dull brown-purple. Rich soil, New England and Canada to Ill. and Ala. B. B. 3:234. — Is occasionally offered by collectors. It is a weedy plant of very easy cultivation.

TRIóPHASIA (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. Fls. small, white, 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 brownish, immersed in mucilage; testa coriaceous, embryo often with unequal plano-convex cotyledons. Only one species.

aurantíola, Lour. (T. trilólium, 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...
TRIPHASIA

in greenhouses. Produces an abundance of elliptical or nearly globular, gland-dotted red berries about 1/4-1/2 in. across. They are sweet and agreeable and are said to be delicious when preserved. In trade catalogues the

TRISTANIA (in honor of Jules M. C. Tristan, 1856–1881, a French botanist). Myrtaceae. A small genus of subtropical evergreen Australian trees or small shrubs. Lvs. alternate or rarely opposite, somewhat whorled; fls. axillary, pedunculate, cymose, often fragrant; bracts ovate or cataphylls; calyx-tube turbinate-campanulate, lobes 5; petals 5, spreading; stamens numerous, united in bundles opposite the petals; capsule 2-valved, many-seeded, partly exerted or included; seeds numerous, wingless, usually linear-cuneate. Cultivated as greenhouse-shrubs in N. Europe; hardly in Calif. north to San Francisco, also in Fla. Propagated by half-ripened cuttings in sand under glass, or by seeds.

TRITELEIA (three and complete; referring to the 3-merous fls.). Lipidaceae. Triteleia has been referred to Milla and Brodria; but when the group is restricted to the South American species, it seems to be advisable to keep it distinct. In Brodria the 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 Brodria and Milla.

About 16 Triteleias are known (see Baker, G.C. III. 20, p. 459). These are of two series, those with perianth-tube usually as long as the segments, and those with tube shorter than segments. To the former section belongs the common T. uniflora, the only species in general cultivation. The species are native to the Andes and Argentina as far east as Buenos Ayres. They are all low grass-leaved bulbous plants, hardy or half-hardy, useful for planting in the border or for spring blooming in pots. Sometimes the color is unpleasant.

uniflora, Lindl. (Milla uniflora, Graham. Brodria uniflora, Baker). Spring Star-flower. Fig. 2579. Lvs.

TRITICUM (old Latin name for wheat). Gramineae. The genus as now limited comprises two sections, Aegilopis, 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 spelts, that are referred to by Hackel to 3 species. Annual grasses with flowers in a terminal spike. Spikelets 2-5-flowered, placed flat-wise, singly on opposite sides of a zigzag rachis; empty glumes ovate, 3-many-nerved, these and the flower glumes more or less awned: grain free. The three species of our cultivated wheats are:

monoecium, Linn. One-grained Wheat. Spikes compact, the joints readily separating at maturity; spikelets as in preceding, but one awn and one one-grained 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 crossores with T. sativum, as is also the case with T. monococcum, while the races of T. sativum themselves produce fertile crossores. Cultivated in Spain, but not extensively elsewhere.

sativum, Lam. Wheat and Spelt. Hackel divides the numerous varieties into 3 races: (a) Speelt. (T. spelta, Linn.). Spikelets loose, 4-sided: rachis articulate at maturity. (This race and the next are easily distinguished by the fact that the grain does not fall out when threshed.) One of the widest of the cultivated wheats, 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, Schrunk). Spikelets more or less 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 for feeding horses. Both of these races are being tested in this country by the Department of Agriculture.

TRITONIA (apparently triple Thrinax; application not obvious). Palmaeae. Four species of South American fan palms, one of which was offered for cult. in Fl. 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.

TRITRINAX (apparently triple Thrinax; application not obvious). Palmaceae. Four species of South American fan palms, one of which was offered for cult. in Fl. 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.

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 corms), allied to Crocosmia, Acidanthera, Sparaxis and Gladiolus. Baker admits 31 species (Handbook of the Irideae, 1892). Few of them are in general cultivation, although many of the species have been introduced at one time or another. Those of the Montbretia class are showy, hardy summer-flowering bulbs, to be handled like Gladioli; or they may be left in the ground perma...
nently if given protection of mulch in cold climates. As far north as New York and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best known kinds are *T. crocosmiflora* and *T. Pottsi*. Most of the Latin names in catalogues belong to these, as *supplya*, *Tyrionca pyramidalis*, *grandiflora*, *elegans*, *floribunda*. To gardeners, Tritonias are usually known as Montbretias. Garden Tritonias grow 1 ft. or more tall, producing several to many showy flowers of a yellow, orange or red color, and bearing several stellish linear or sword-shaped leaves. Corms small, covered with strongly reticulated sheaths or tunics. The perianth is tubular, with a spread-

cemes, and few or several firm narrow lvs.; fl. about 1 in. long, bright yellow tinged red, the tube broadly funnelform and twice longer than 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 corms form one above the other.

**TROLLIUS**

(old German *trol*, something round; in allusion to the shape of the flowers.) *Rumexuliceae*. **GLOBE FLOWER.** A group of neat, hardy, herbaceous perennials of about 10 species, mostly found in marshy places, of the north temperate zone. Roots fibrous, thickened: Ivs. palmately divided or semicircular: fls. usually solitary, 1 to 2 in. across, yellowish-white, with a nectariferous pit at the base of the perianth-limb. The upper part of the tube and anthers just protruding from the tube. Cape Colony. B.M. 7280. — Can be left in the open as far north as Mass., if well protected, but usually safer if taken up.

**Pottsi**, Benth. (*Montbretia Pottsi*, Baker). Fig. 2580. Strong, branching plant 2-4 ft. tall, with several lax ra-

2580. Tritonia Pottsi (X 1/4).

2581. Tritonia crocosmiflora (X 1/2).

**L. H. B.**
TROLLIUS


Var. albiflorus, Gray. (T. Americana, Hook.) Much like the type but usually lower, more slender; fls., usually 5; fls. pale or white; petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

fuscus, Lindl. Plant only 3 or 4 in. high: Ivs. as in the above, or only 5-parted; fls. lemon-yellow, spreading, on stems hardly reaching from the ground; sepals 10, nearly lancelolate, acute, sometimes toothed; petals spatulate, shorter than the stamens. Northern India. B.R. 29:32.

Europaicus, Linn. (T. glabrous, Lam.). Stems erect, 15 in. or more high, often branching; lower Ivs. petioled, others sessile; fls. only 5-parted, lobed, cleft and toothed, those of the root-leaves on short petioles; fls. 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. bunch as in T. laxus. Wet upland meadows of N. Eu. May–July. G. 40:816. — Var. Loddigesii, Hort., has deep yellow fls.

Asiaticus, Linn. Fig. 2582. Plant much like T. Europicus, often taller, the smaller bronze-green Ivs. more finely lobed and cleft. fls., a rich orange color with sepals spreading. May. Siberia. B.M. 219). — The blossoms 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 fls. in early spring, is by some referred to this species. K. C. DAVIS.

TROPÆOLUM (from Greek word for trophy: the leaves are shield-shaped and the flowers helmet-shaped). Geraniaceae. NASTURTIUM. About 40 species of soft

growing herbs, mostly climbing, of South America, chiefly of the cooler parts of Peru and Chile. They are grown for their showy odd flowers. The common species, T. minus and T. majus, are also grown for their young pods and seeds, which are made into pickles. The puppery-tasting leaves are sometimes used like cress, in salads, whence the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly T. tuberosum, pro-

duce edible sub-terranean tubers. The flowers of Tropæolum are very irregular: sepals 5, connate at the base, the posterior one produced into a long slender spur: petals 5 (sometimes fewer by abortion), usually narrowed into distinct claws; petals 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 are alternate and usually often deeply lobed or even usually peltate; stipules none or very small. The petals of the flowers are usually simple. The sepals, alternate, al-

dissected, small. The flowers are usually pedunculate. For references to recent botanical literature on Tropæolum, see F. Buchenau in Engler's Bot. Jahrb. 30, p. 396.

Tropæolums 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. Lobbianum, 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 per-

cennial. 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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1. azureum, Miers. Very slender glasshouse climber: Ivs. peltate, 5-parted nearly or quite to the base, into narrow-oblanceolate divisions: fls. small, the calyx and short spur green, the wide-spreading corolla azure-blue, the petals 2-lobed or emarginate. Chile.

a. Flowers blue.
TROPÆOLUM


A. 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. Jarrettii, 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 penciled with brown. Chile. P. M. 5:29.

BB. Petals conspicuous and mostly wide-spreading.

c. Spur not as long as the calyx-lobes.

4. bracteoceras, Hook. & Arn. A very slender climber, resembling T. tricolorum in habit; lvs. peltate, nearly orbicular, deeply parted into 6 or 7 oblong or obovate obtuse lobes; fls. small, on short pedicels, the calyx green and very short spurred, the corolla with spreading yellow petals. Chile. B. M. 3851. B. R. 23:1926. F. S. 4:368. P. M. 4:55.—Half-hardy perennial.

cc. Spur much longer than calyx-lobes.

d. Lvs. parted nearly or quite to the base, or distinctly compound.

5. speciosum, Poepp. & Endl. Half-hardy slender climbing vine; lvs. peltate at the base, short-petioled, parted to the base into 6-10 obovate-oblong obtuse divisions or leaflets; pedicels very slender, red, fls. shaped much like those of T. majus, but smaller, vermilion-red,

6. pentaphyllum, Lam. Slender climber, the glabrous colored stems arising from a tuberous root; lvs. divided to the base into 5 oblong or obovate segments or leaflets; fls. small (about 1½ in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B. M. 3190. B. H. 22:73.—A half-hardy species, showy because of the great number of bright small flowers.

EE. Blossoms yellow.

7. polyphyllum, Cav. Perennial, half-hardy; stem succulent, prostrate or climbing; lvs. peltate, orbicular, cut beyond the center into 7-9 narrow divisions; fls. much like T. majus in shape, but smaller; spur slender but rather short, the calyx-lobes triangular; petals unguiculate, yellow, wavy or emarginate, the 2 upper ones streaked with red. Chile. B. M. 4042. P. M. 10:175. F. S. 20:2066. G. C. II. 20:341. Gn. 45, p. 158.—It is a tuberous-rooted species, the stem naturally prostrate.


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.). Canarian-Bird Flower. Fig. 2584. Annual, tall-climbing; glabrous; lvs. peltate near the margin, cordate-orehicular, divided to about the middle into 5 lobes, which are mostly apiculate; fls. canary-yellow, ovoid and very irregular, spur green, hooked; 2 upper petals erect and large, obote-clawed, much fringed; 3 lower petals small and narrow and ciliate. Colombia, B. M. 1531. B. R. 9:718.—An excellent quick-growing vine, although the fls. can scarcely be called showy.
10. *Tuberolimum*, 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. 3714. F.S. 5:470. P.M. 5:49. R.H. 1855:1831. T.H. III. 30:385. — Plant stands some frost. 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.

11. *Lobbiannum*, Veitch. Annual, climbing, hairy all over except the under parts of the lvs. and the petals: lvs. very long-stalked, petalate, 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. Colom. B.M. 4097. P.S. 2:67. P.M. 11:271. Var. *Lobbiannum*, Hort., has all the petals toothed or fringed. R.H. 1856:101. — Seldom seen in its pure state.

12. *majus*, Linn. Figs. 2585, 2586. Strong-growing, somewhat succulent climbing annual: lvs. peltate, nearlv 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 clawed and coarsely toothed on the claw. Peru. B.M. 23:3375 (var. *atrosanguineum*). F.S. 12:126. (var. *atrocarpum aroraum*). P.M. 1:176 (var. *atroangulatum*). There are double-flowered forms. G.C. II. 11:665. These appear to have been introduced into this country about 1865 or 6. There are also dwarf forms. — This species has been in cult. in Europe since 1684. It is the foundation of the common climbing nasturtium. Some of these garden forms are probably the off-spring of hybridization with *Lobbiannum*.

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 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. 2588. 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, Pére 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 in the West Indies.

Many fruits practically unknown in northern latitudes are readily available here in small quantities, but insufficient to maintain a paying market. They could be grown in larger quantity and in uniform quality, there is no serious obstacle to their being regularly placed upon the northern market. The system of transportation now in use is not thoroughly efficient, and 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, Garcinia Mangostana, native of the Straits Settlements. This has been cultivated in Jamaica and Trinidad, and the fruit has been sent in good order to the English market and it is, however, slow-growing and as yet 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. Varieties 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 Cyclopaedia):

**Tropical Fruits of the West Indies and Central America:**

4. Mango, Mangifera Indica. Figs. 2588, 1300-1.
5. Mangosteen, Garcinia Mangostana. Figs. 885.
6. Sapodilla, Achras Sapota. Fig. 2249.
7. Pear (Alligator Pear), Persea gratissima. Fig. 1724.
8. Sugar Apple, Annona squamosa. Fig. 94.

The Governor’s Pluot, Pluvialis Ramontchi. P. 589.

15. Pomme Cythere, Spondias dulcis.
17. Water Lemon, Passiflora laurifolia.
18. Star Apple, Chrysophyllum Cestia. Figs. 469.
19. Genip, Malvaviscus bipinn. Fig. 1288.

Of this list probably not more than half the number are cultivated in selected varieties, and some are mere wayside fruits, as the guava, genip and cashew. The bananas, cocoanut 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 is quite a favorite with the shipping companies of export. The last, or sour-sop, is particularly well suited for flavoring ices, it being considered by many as the best of all the fruit flavors for this purpose. It could be easily

2588. Flower of the Rose Apple or Jambos, one of the minor Tropical Fruits. Natural size. (See p. 555.)
exported in lee. The akee might be exported if preserved. The part used is the large arillus 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 fruit was once useful when preserved, but is too tender for export. The large seeds, roasted and bottled for preservation, form one of the best table nuts known. The guava can only be exported in the term "the williams guava jelly. When a few years ago any 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 new deliciously sweet.

Tropical Fruits

The citrus tribes are, of course, sub-tropical fruits, but it is possible to grow them to perfection in the tropics. When grown upon the 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 flowering, 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 tow and periwinkle," 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 pipin.

Another View of Tropical Fruits. — The fruits most grown for export from the West Indies are bananas, oranges, grape fruit or pomelo, pineapples and cocoa-nuts. Others that are prized, but not exported to any extent, are mangoes, grapes, star-apples, naseberry or sapodilla, apricots, pear, granadilla, cherimoya, sweet sou and mangosteen.

Banana. — There are between 20 and 30 different varieties of banana, and about half as many of the plantains or other forms of banana best. The enormous export of over 8,000,000 bunches of bananas annually from Jamaica is almost entirely of one particular variety, which goes under various names, — "Jamaica," "Martineau," "Grow 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 soil most suitable for banana culture is a deep loam with a large proportion of humus. Good drainage is essential. Bananas grow well under irrigation, but the application of the water must be carefully watched. The only disease that is known is a species of Marsna, a fungus that attacks the roots. It has not done much harm, and in fact has not attracted any notice except in Trinidad. Insects do not interfere with plant or fruit. Nematode worms are known in other countries to have caused great loss, 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 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. It was sent out from the Botanic Garden of Jamaica to the 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, 1594), says: "The first Spaniards named many things at the Indies with such Spanish names as they did most resemble, as Fines... although they be very different fruits to those which are so-called in Spain... 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 Riple 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

2589. Fruits of the Mango, Mangifera Indica (x 1.5). See also Mangifera, Vol. II.
The banana, citrus fruits, cocoyam, mangosteen, carambola, litchi, Nilgiri blackberry, tamarind, pomegranate, grape, avocado, breadfruit, and jackfruit are introduced from other countries.

Mangoes, breadfruit, jackfruit, cho-cho (Sect. edulis., Fig. 2281), ochra and avocado pear are fruits used as vegetables.

Great improvements have lately been made in the mode of packing fruits for export. The Government of Jamaica is about to appoint inspectors of fruit for export, who will stamp all packages that pass as well-graded, well-packed, etc., with the Government mark. It will be optional for exporters to take advantage of such inspection.

The Imperial Department of Agriculture in the Lesser Antilles, and the Botanic Gardens of Jamaica, Trinidad, and British Guiana are devoting a considerable amount of attention to fruit with gratifying results.

The inauguration in January, 1901, of a new line of steamer, with a subsidy of $250,000 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.

WM. FAWCETT.

Botany of Tropical Fruits. All the tropical fruits mentioned above are described in this work at their proper places, with the exception of some of the following:

Barbadoes Cherry is Malpighia glabra, which see. Nilgiri Blackberry is Rubus racemosus. Ochra is another spelling for 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. mollis.

The genus Spondias of the family Caricaceae 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 lfs, and yellow fruits as large as common plums. Botanically the fruit is a fleshy drupe with a 5-loculed bony endocarp. The genus is distinguished by the following characters: ovary 3-5-lobed; oval pechred; lvs. pinnate; fls. polygamous; stamens 5-8-10; styles 4-5, free at apex. The following are widely cult. in the tropics.

A. Locules of the ovary stout and distant, connected only by the common base.

B. Locules panicked, often exceeding the lvs.; fls. yellowish white.

Bt. Linn., (S. Mombin, Jacq., not Linn.). Golden Apple. Jamaican Plum. Tall tree; lfts. 7-17, ovlanceolate or lanceolate, subentire or serrulate; panicle ½-1 ft. long; fr. ovoid, 2 in. long, yellow. Cosmopolitan in tropics.

Purpurea, Linn. (S. Mombin, Linn., not Jacq.). Spanish Plum. Low tree: lvs. deciduous; fls. ovlanceolate or ovlanceolate-oblong, bluish, usually serrate; fr. obovoid, 1 in. long, yellow or tinged purple. American Tropics.

Troximon (Greek, edible; which does not apply). Calliandra. 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-
cies 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 thick: lvs. entire, linear-elliptate, thickish, 4-10 in. long; scape about 1 ft. high; fls. yellow: akene not beaked. Prairies of Ill. and Wis. to Dak. - Cultivation easy in any good border. Not unattractive. It has rather large dandelion-like heads of flowers in late summer. Offered by collectors.

TRUE LOVE. Paris quadrifolia.


TRUMPET CREEPER. Tecoma, especially T. radicans.

TRUMPET FLOWER. Tecoma, especially T. radicans.

TRUMPET HONEYSUCKLE. Lonicer a sempervirens.

TRUMPET VINE. Tecoma radicans.

TSUGA (its Japanese name). Conifera. HEMLOCK. Hemlock Spruce. Ornamental evergreen trees of pyramidal habit, with spreading, irregularly whorled, many 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 and the Japanese species and T. Caroliniana have proved hardy as far north as Ontario. T. Hookeriana is almost as hardy as T. Canadensis and T. Brunoni ana are more tender. There are probably no more beautiful hardy conifers than the Hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff, formal appearance of many of the conifers, but are graceful and stately at the same time. T. Mertensiana is the most vigorous species and is more graceful than the Canadian Hemlock, but tenderer. T. Hookeriana is noticeable for its light bluish green foliage and the more narrow pyramidal habit. The Japanese grace more than the Canadian Hemlock, but tenderer. 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 grace more than the Canadian Hemlock, but tenderer. 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 grace more than the Canadian Hemlock, but tenderer.

The genus contains 7 species, natives of N. America, E. Asia and the Himalayas. Tsuga is closely allied to Abies and Picea and differs little in the structure of the 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 of T. Sieboldii, which is esteemed for its ornamental value. 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 was a poisonous umbelliferous herb described in this work as Conium maculatum.

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A. Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½-¾ in. long.
B. Margin of lvs. entire: apex of lvs. nanoely emarginate, sometimes obtuse.
C. Scales of cones suborbicular.
D. Branchlets yellowish brown, glabrous

trivialia, 1.
Sieboldi

1. Sieboldi

2. diversifolia

3. Caroliniana

4. Canadensis

5. Mertensiana

6. Hookeriana

2591. A young Hemlock Spruce (×3/4).


2. diversifolia, Mast. (Abies diversifolia, Maxim.). Tree, very similar to the preceding, chiefly distinguished by the reddish brown pubescent branches: lvs. linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base: cone smaller, ½-¾ in. long; peduncle not exceeding the bud-scales: bracts truncate, crenulate, not or slightly bifid. Japan. G.F. 6:495; 10:493.

3. Caroliniana, Engel. 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...

4. Canadensis, Carr. (Abies Canadensis, Michx.). Common Hemlock. Fig. 2591. Tree, attaining 100 ft.; young branchlets yellowish brown, pubescent; lvs. linear, obtuse or acutish, dark green above, obscurely grooved about 1/2 in. long; cones ovate, 3-4 in. long, pubescent; seeds almost orbicular. New Brunswick and Wisc., south to Ala. S. S. 10:663. — The Hemlock Spruce yields the lumber most commonly used in the East for framing and pilings, as well as for shipbuilding. It is not used for flooring lumber. A number of garden forms have been raised; the following are the most important: Var. albo-spicata, Nichols. Tips of the young branchlets cream-colored. Var.Compacta, Sénècl. (var. compacta, Beissn.). Dwarf conical pyramid with numerous short branchlets clothed with small leaves. Var. globosa, Beissn. (var. globulalis eratca, Kunkel). Dense, globose, much branched form with numerous upright branchlets nodding at the ends. Var. gracilis, Gord. — More or less drooping at the ends; lvs. very small, and glossy above, with 2 whitish lines beneath, K.-M in. long; creamy white. Var. compressa, Sénècl. (var. compacta, Beissn.). — More graceful than the next. Var. nana, Carr. Dwarf and de-pressed form with spreading branches and short branchlets. Var. parvifolia, Veitch. Lvs. very small, 1/2-1 in. long, or shorter; branchlets closely set, achene-morous. Var. pendulina, Parsons (var. Sargentii pendulina, Hort., var. Sargentii, Kent.). Flat-topped form with spreading branches and drooping branchlets. G. C. III. 32:763; 29, p. 51. Var. D. m. D. G. I. 1900:307, 368, 491. Very distinct and desirable form.


ALFRED REHDER

TUBEROSE. Consult Polianthus.

TUCKER, LUTHER (Plate XLI), born at Brandon, Vt., May 7, 1828, was the founder of "The Horticulturist" and the proprietor of that valuable and unique magazine during the period of its greatest glory — from July, 1846, until the autumn of 1852. The statement, on page 105 of this Catalogue, that he died in 1839, is incorrect; he having been the salaried editor, while the enterprise was Tucker's alone. To Downing, notwithstanding, belongs all the credit and all the blame of its great and eventually worthless 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 tulifsh, turban; which the inverted flower resembles.) Lilaceae. T. T. Plate XLI. Bulb tunicoid, the outer skin often hairy or woolly on the inner face; stem 2-50 in. high, usually 1-3 ft., rarely 2-3 or 4-5 ft.; lvs. linear or broad: fls. erect, rarely nodding, showy; perianth deciduous, campanulate or slightly funnelform; segments distinct, often spotted or bladdered at base, without pitted nectaries: stamens 6, hypogynous, shorter than perianth-segments; filaments longer or shorter than anthers, with 5-10 stigmatic discs; anthers dehiscing laterally; very slender, sometimes narrowed at the top, rarely into a distinct style; stigma minute; seeds numerous, flat. Difiers from Fritillaria in the absence of nectariferous pits and usually erect (never pendulous) fls., and from Erythronium in its usually filiform, much longer than the fls., and usually 1-3-5 stamens. Native of Oriental countries, Siberia, Asia Minor, China and Japan, and naturalized in the Mediterranean countries of Europe. It is now in cultivation only about half of which are in cultivation at present. The latest monograph is Baker, in "Gardener's Chronicle," for 1883. Solms-Laubach is the leading authority on the botanical history of Tulips (see his "Weizen und Tulpe, und deren Geschicchte," Leipzig, 1899). See Burbridge, G. Sept. 22, 1900.
Plate XLV. The Modern Garden Tulip
The production of large, perfect flowers depends entirely upon a large supply of fibrous roots. Size of bulbs is not nearly so important: a large bulb can compensate for the deficiency of roots.

For outdoor cultivation the bulbs should be set in September to November in New York. They should be planted before hard freezing weather comes. The soil should be loose and well drained, and enriched with leaf-mold and well-rotted cow manure. Fresh manure of any kind should never be used near bulbs of any sort. On heavier soils Tulips may be raised if extra care is taken to insure perfect drainage. Drainage is important under all conditions. The bulbs will never prove satisfactory in low, wet situations, and if there is danger from standing water it is best to raise the beds several inches above the surrounding ground.

Plant the bulbs 4 inches deep (to the bottom of the bulbs) and from 4 to 5 inches apart, depending upon the size of the plants. A handful of sand under each bulb is recommended in soils that do not already possess a friable base. The sand should be mixed with enough clean sand to make the mass easily friable, and 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 with soil, leaves or litter, so that they will be out of reach of the morning sun. For the first few days at least the temperature should be moderate and even, and the atmosphere of a living room is drier than that of a greenhouse. On cold nights the plants should be removed as much as possible, and in cold weather protect them from freezing. For a succession, pot every week or 10 days from September to December or pot early and bring into the house at fortnightly intervals.

Of course, the water must be kept in the pots to give them plenty of light and air. Avoid gaslight as much as possible, and in cold weather protect them from freezing.

Propagation.—Tulips may be increased by the side offsets, but these are not as constant as new bulbs produced within the outer tunic by means of cutting the old bulbs. Fig. 2592 shows a section of a bulb with new inner bulb and outer offset in place. The new bulb is completely inclosed in a sac which afterwards becomes the outer dry, membranous tunic. The presence, 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 it has originated. Each new bulb-tunic (including the outer sac) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 2592 shows the separate leafy bulb-scales, and indicates the homology of tunics and leaves. Sports among the offsets are often present mainly dependent 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 practiced only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is very likely a probability of the near future.

The Original Tulip.—The origin of the garden Tulip seems to be lost beyond recovery. It is often said that our cultivated flowers originated directly from the early wild species, 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. zuaveolens, with the distinct understanding that these names do not represent an original wild stock.

Tulipa zuaveolens requires explanation. This name, which dates from 1799, 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 scapes. From the early records it appears that there were fragrant, early-blooming flowers among the first Tulips received.
TULIPA 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. Greneriana* given below are those of Baker, who appears to have had *T. suaveolens* 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. Greneriana*. 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. Greneriana*, 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 1557 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 homegrown seed and by new importations from Turkey. In 1559 Gresnier first saw the flower at Augsburg, and it is mainly upon his descriptions and pictures that the species *T. Greneriana* was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated Tulips on a rather large scale. Fig. 2393. 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’s 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. Eleven thousand dories were paid for a single bulb of Semper Augustus. Governmental interference was necessary in order to end the ruinous speculation. After the craze subsided, the production of varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the Tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected by the rich for the many new plants from America. The Tulip was considered more or less a poor man’s flower, though it has at no time been without many staunch admirers among the upper classes.

With the Turks the narrow acuminate flower-segments were in favor, while western taste preferred the rounded segments. For instance, in the first sowings of Turkish seeds the majority of the resulting blooms were of those colors. It thus came about that flowers so colored were considered common and undesirable in the European gardens and all effort was directed to the production of the rarer white-grounded varieties with finely and distinctly marked stripes, those with a sharp bright red being the favorites. Indisputable evidence of this is seen in the old Holland "still-life" paintings of that time, where one finds none but the rarer forms represented (Soma-Laubach). All the early Tulips of direct Turkish origin had acute more or less narrow and reflected segments. Indeed, among all the old engravings, including those of Pena and Lobel, 1570, Clusius, 1576, Do degen, 1578, and Jan van der Slik, 1613, no round-petaled forms are found. Besler’s work, "Hortus Eystettensis," contains many recent copper plates, the first in any book on plants. In some copies the plates are beautifully colored by hand. The 53 figures of Tulips in this grand work show how widely diversified was this flower even at that early date. In this and in Parkinson’s "Paradisus Terrestris," 1629, many are figured with inner segments rounded and outer acute, but none vice versa (so far as can be seen), though that form is mentioned in the text. The broad, rounded, erect-petaled forms were developed later, apparently first by the Dutch growers previous to and during the tulipomania, and produced wholly by selection. This ideal has prevailed down to the present time, for the narrow-petaled varieties are practically unknown among our common garden forms; so much so that the extreme typical ones are referred to a separate species (*T. acuminata*, Fig. 2692). In the Dutch fields they are now known as "thieves," and are destroyed as soon as they make their appearance.

Parrot Tulips became known towards the end of the seventeenth century. They were oftentimes considered...
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Horticultural Society and the favor with which they were received as critical and indeed, an audience as ever gathered around an exhibition table.

The late Isaac Buchanan propagated the Tulip very successfully from offsets at his nursery in Astoria, L. I., at the same time, and exhibited them at the first spring exhibition of the first New York Horticultural Society, carrying off the highest honors.

Recent attempts in cultivating the Tulip in various parts of the country, particularly in the florist 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 can be profitably grown only on a light sandy soil, as in such the bulbs increase more rapidly and are larger and more attractive in appearance, the skin being of a lovely reddish brown, while those grown in a heavy soil are smaller and of a dirty brown color. Nearly all the soil on the Atlantic coast from Maine to Florida is admirably adapted to early Tulip cultivation, as is much of the upland soil from Virginia southward, the light sand being almost identical with that of Holland, where the Tulip is almost exclusively grown.

While the Tulip loves moisture, perfect drainage is requisite to success. The best results are obtained when the soil has been made very rich for a previous crop; it matters but little what—some root crop being preferable. The best manner is that from the cow-stall, which must be thoroughly rotted and evenly incorporated in the soil. Even though the soil be light and fine, it must be thoroughly worked before the bulbs are planted, which should be by the 15th of September. Plant the bulbs 4 inches below the surface in beds 4 feet in width, the rows 6 inches apart and the larger or stock bulbs 6 inches apart in the rows. For propagation the largest and finest bulbs are always used, and selected by the dealers before filling orders. The sets can be planted 2 inches apart in the rows, the space to be increased according to the size of the bulb. Upon the approach of winter the tulips should be given a light mulch to prevent the ground freezing below the bulb. Not that the Tulip will not endure as much frost as any hardy perennial—for it will—but nearly all bulbs make certain preparations for forcing the 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 free from weeds. The bulbs are made to keep down the weeds and prevent evaporation until the flowers appear. The beginning of bloom is the

TULIPA

1869

2594. The common contemporaneous garden Tulip.
It is a matter of great regret that the key used below is based upon a technical botanical character of no interest to the horticulturist, but it seems 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 scattering appressed hairs all over inside... Species 13-20*

IV. *Outer bulb-tunic pubescent inside, densely setal apex... Species 21-23*

V. *Outer bulb-tunic pubescent inside... Species 24-26*

VI. *Outer bulb-tunic woolly inside... Species 27-30*

VII. *Outer bulb-tunic everywhere woolly inside... Species 31-32*

VIII. *Outer bulb-tunic always hairy at base inside around root crown, and usually with a few scattering hairs above but sometimes without them... Species 37-42*

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**GROUP I. Outer bulb-tunic glabrous inside.**

A. *Perianth yellow, flushed with green outside... 1. fragrans*

AA. *Perianth crimson tinged with yellow outside... 2. Hageri*

1. *frangrans, Munby. Height 6-12 in.; proper lvs. 3, crowded at middle of stem, linear or lorate; fls. yellow, greenish outside; perianth funneliform-campanulate, 1-1½ in. long, 2½ in. across, slightly fragrant; segments all acute; bladders bearded at base; ovary slightly narrowed at collar; stigmas small. Algeria, Gn. 43:905. — Allied to *T. sylvestria*, differing in position of the leaves and segments uniformly wide.*

2. *Hageri, Held. Height 6 in.; lvs. 4-5, lorate acute, not undulate; fls. chiefly red, about 2 in. across; perianth broad-campanulate, 1½ in. imodorous; segments acute, red, with a large, green or purple, black-based blotch margined with yellow; stamens purple-black; bladders linear, bearded at base; ovary narrowed at collar; stigmas small. Hills of Parnes range in Albania. B.M. 6242. P. 1577:169.*

2956. The open spreading form of Tulip (× ½).
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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. Greigi
AA. Stem glabrous (T. Kolpakowskiana sometimes obscurely pubescent).
C. Filaments bearded at base. 5. Kolpakowskiana
D. Filaments not bearded. 7. violacea
E. Lvs. obtuse or broadly lanceolate.
F. Lvs. acute or broadly lanceolate.
CC. Filaments bearded at base. 10. sylvestris
BB. Lvs. linear or linear-lanceolate.
C. Filaments bearded at base. 12. Sprengeri

3. Greigi, Regel. Height 2-8 in.; lvs. usually 4, obscurely downy, much undulate toward cartilaginous border; perianth campanulate, 3-3½ in. long, 5 in. across, spreading abruptly from about the middle, bright crimson flushed with purple, yellow with a large dark basal blotch, margined with yellow; segments uniform, obvoid, cuspitate or emarginate; anthers yellow; filaments black, glabrous; ovary narrowly oblong at collar; stigmas yellow, twice as broad as neck of ovary, reflexed. Turkestan. B.M. 6177. F.S. 21:2261. F. 1876:217. — Early blooming.

4. Eichleri, Regel. Height 6 in.; lvs. 12-15 in. long, lanceolate acuminate, margins plane and smooth; perianth broadly campanulate, 2-½-3½ in. across, deep scarlet with a broad, cuneate, dark violet-blue basal blotch margined with yellow; segments rounded at top with a red spot, margined with yellow at top; anthers violet-brown; filaments black; stigmas very thick, undulate, pale yellow. Georgia in Asia. B.M. 6091. F. 1877:168. — Allied to T. Greigi.

5. Kolpakowskiana, Regel. Height 12 in.; lvs. 3-4, obscurely ciliate on margin: bud nodding; perianth narrowly campanulate, 2-½ in. long, 4½ 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, crisp. Introduced from Turkestan and Central Asia, 1877. B.M. 6710. G.n. 60, p. 182. — A near ally of T. Gesneriana, which it bids fair to rival in beauty and variability under cultivation.

6. pulchella, Fenzl. Height 4 in.; lvs. 2-3, crowded and spreading close to the surface of the ground, channelled, obscurely ciliate on edges: perianth funnelform, erect, 1-1½ in. long, 2½ in. across, bright mauve-red above, passing downward into a slaty lilac without any dark-colored blotch, but bright yellow at base; segments all acute, densely pilose at base; filaments linear; ovary elliptic: stigmas less than ovary-diameter. Alpine region of Cilician Taurus, 1877.

7. violacea, Boiss. & Buhse. Less than 12 in. high; lvs. 3-5, crowded; perianth campanulate with a contracted base, 1½ in. long, 2 in. wide, fragrant, typically bright mauve-red or rosy crimson flushed with purple, varying to white with a slight flush of red outside, with a large brown or black basal blotch, usually bordered with white; segments uniformly oblong, subacute; stamens black or purple; stigmas small. Persia. Int. to cult. 1890. B.M. 7440. G.M. 39:390. — Allied to T. Hageri and pulchella.

8. carinata, Hort. Krelage. Lvs. 3, not crowded, as long as flower stalk, slightly undulate, slightly ciliate on edge near base; perianth ovate, ovary narrowly campanulate, 3 in. long, dark scarlet, tinged with green just above and blending into a bright yellow basal blotch; segments acute, cuspitate; stamens yellow; ovary prismatic; stigmas white, not undulated. Habitat unknown. Var. rubra und violacea, Hort., are offered.

9. vitellina, Hort. Lvs. 4, not crowded, as long as flower 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. sarcolemens and T. Gesneriana." It is one of the "Cottage Garden Tulips", a class of old-fashioned Tulips which have been preserved from oblivion in the gardens of the poor. Attempts have been made recently to restore them to popular favor. Well worth attention.

10. sylvestris, Linn. Fig. 2601. Height 9-15 in.; lvs. usually 3, at base of scape, channeled, linear-lorate: peduncle sometimes 2-fl. in cultivation: bud nodding; perianth funnelform-campanulate, 18-2 in. long, yel-low; segments all acute, inner narrower: ovary bladd-erform (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.


12. Sprengeri, Baker. Height 10-18 in.; lvs. 4, close together, long, linear-lanceolate, stiff: peduncle wiry, tinged with deep red under fl.: perianth open-campanulate (star-shaped), 2 in. long, bright scarlet with a somewhat dull-brown basal blotch margined all around with dull orange-yellow, all blending into one another;
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, narrow gradually to a very acute point; anthers violet; filaments glabrous; stigmas larger than ovary-diameter, yellowish.—Known in gardens only. Krelage catalogues a variety as "Cottage elegans picta," which has larger lvs. and white flowers edged with rose, and without basal blotch. "I probably a hybrid between *T. acuminata* and *saxatilis."

14. **maculata**, Hort. Height 12-18 in.; lvs. 3-4, lorate-lanceolate; perianth campanulate, 2½-3 in. long, 2½ in. across; segments obovate, ciliate; 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, borne-lanceolate, ciliate; peduncle sometimes obscurely pubescent; perianth campanulate. 1¾-2 in. long, bright yellow, flushed with red and green outside; inner segments subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diameter. Turkestan. B.M. 6734.

16. **saxatilis**, Sieber. Height 12 in. or more; stem usually branched low down and bearing 2 fls.; lvs. usually 3, sometimes lowest 12 in. long; perianth oblong funnelform, 2½-3 in. long, 3 in. across, light mauve-purple, at base bright yellow; segments pubescent at base, inner obovate, outer oblong; anthers dark; filaments bright yellow; stigmas small. Crete. 1878. B.M. 6574. G.t. 56:1293.

17. **Korolkowii**, Regel. Height 6-9 in.; lvs. 2-3,olate, margin crisped; perianth campanulate, red, with a distinct black basal blotch; inner segments oblong, color obovate; filaments lanceolate; stigmas small. Turkestan, 1875.

18. **Kaufmanniana**, Regel. Less than 12 in. high; lvs. 2-3; perianth subcampanulate, 2½-3 in. long, 2½ 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 cultivated 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, ½ in. across, inodorous, bright yellow, flushed with red; filaments uniform, narrowed gradually to a very acute point; anthers violet; filaments glabrous; stigmas not equal to ovary-diameter, yellowish.—Known in gardens only. B.M. 6374. G.t. 56:1234.

20. **Didieri**, Hort. Height 12-18 in.: lvs. 4, placed in whorl-like at middle of stem, linear-lanceolate, recurved, 6-9 in. long, 1½ in. wide, with edges rolled in; stamens same color as basal blotch; stamens same color as basal blotch; filaments yellow, with dark striae; ovary narrowed at collar: stigma light yellow, very large and crisped. Savoy, Italy. B.M. 7253. G.t. 38:311. — One of the late Tulips.
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blotched without yellow border; segments narrowly oblong; filaments filiform, glabrous; stigmas broader than ovary-diameter. Mt. Lebanon, 1889. Gt. 38:1300. —Allied to T. limifolia and Maximowiczii.

GROUP V. Outer bulb-tunic pleated inside.

A. Lower lvs. lanceolate.
B. Lvs. slightly or not at all undulated. 24. Armena
C. Lvs. very much undulated. 25. platystigma
D. Lower lvs. linear. 26. Maximowiczii

24 Armena, Boiss. Lvs. 5, crowded at base of stem, falcate, glaucescent and glaucous on edge all around, longer than fl.-stalk: peduncle glabrous, finely dotted, perianth open campanulate, slightly sweet-scented, 2 in. long, dark scarlet with black basal blotch marked 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. Gesneriana, 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 oblong-oblong; claw blue tinted with a yellow spot in the middle; filaments not bearded: anthers violet-colored: ovary prismatic: stigmas very small. France.


GROUP VI. Outer bulb-tunic woolly at apex inside.

A. Filaments not bearded.
B. Perianth crimson or scarlet, with a distinct basal blotch. 28. linifolia
C. Perianth yellow, without basal blotch. 30. Batalinii

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 oblong; anthers pinkish; pollen gray; filaments bluish black: ovary pyramidal: stigmas very small. Mts. of Syria and Palestine, 1874.

28. linifolia, Regel. Stem somewhat shining, sometimes 2-headed: lvs. 7, linear and grass-like, spirally arranged, spreading, glabrous: perianth open-campanulate, small, bright scarlet; basal blotch bluish black; inner segments oblong, outer ovate and slightly wider; anthers pinkish; pollen gray; filaments bluish black: ovary pyramidal: stigmas very small, yellowish white. Bokhara.


2601. Tulipa sylvestris, known also as T. Florentina, var. odorata (⅓).

2602. One of the acuminated-petaled forms — the old Turkish-garden ideal (⅓). No. 21.

GROUP VII. Outer bulb-tunic everywhere woolly inside.

A. Filaments bearded at base. 31. bilfera
B. Filaments not bearded. 32. Galusiana


2601. Tulipa sylvestris, known also as T. Florentina, var. odorata (⅓).

2602. One of the acuminated-petaled forms — the old

Turkish-garden ideal (⅓). No. 21.
31. biiflora, Linn. Height 3-6 in.; stem glabrous or slightly pilose, usually 2- or 3-fld.; lvs. often 3, sometimes 3, linear; perianth funnelform-campanulate, 1 in. long, 2m. 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. 7:535. B.M. 6015.

32. Clusiana, Vent. Height 12-18 in.; stem slender, glabrous; lvs. 4-5, very long and narrow and folded double, linear-acuminate, pendent; peduncle slender, tinged with brown directly under fl.; perianth small, when open 2 in. across, funnelform-campanulate, very fragrant, bright lemon-yellow tinged with green outside, or white flushed with red; segments acute; claw hispid 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.

2603. Tulipa acuminata (×8). 20

33. Biebersteiniana, Schult. f. Height 6 in.; stem slender, glabrous; lvs. 2-4, crowded together, long, channeled, glabrous, slightly ciliated on edge; bud slightly nodding; perianth open-campanulate, 2-3 in. long, bright yellow tinged with scarlet-pink on edges and sometimes green outside; at base a brownish yellow slightly nodding; perianth open-campanulate, yellow, outside reddish; segments all acute; filaments glabrous; anthers yellow; 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. 839.

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, acutellus, erect; segments very acute, the inner ones often less so; anthers yellow; filaments purple; ovary prismatic. South of France, Italy and Switzerland. B.M. 5:339 (as T. Gesneriana).—Var. lortetii, 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 subediloid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. Var. Alipeppica, Baker. A form with lvs. considerably smaller than W. European type, with a smaller black basal blotch. Asia Minor, Syria and Palestine.

35. praeox, Tenore. Height 12-18 in.; stem slender, glabrous; lvs. 3, lorate-lanceolate, acute, undulated at margin; perianth campanulate, 2-3 in. long, 3 in. across, erect, scentless; basal blotch purplish black, margined with yellow; segments obtuse, slightly incurved, outer slightly longer, acute, pubescent at apex; inner shorter, obtusely cupuloid; anthers yellow; filaments long, dark purple, glabrous; ovary prismatic; stigmas pubescent, reddish. Italy and Southern France; also Algeria, Greece, Syria, Palestine and Persia. Very closely allied to last, and figured as such in B.R. 3:204; 14:1143; 17:1419.—One of the oldest known species.


GROUP VIII. Outer bulb-tunic always hairy at base inside around root crown, and usually furnished with a few scattering hairs above, but sometimes without them.

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, fraying, bright red or yellow or variegated, segments all acute; filaments glabrous; anthers yellow; 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. 839.

38. australis, Link. Height 12-18 in.; stem slender; lvs. 2-3, crowded together at lower portion of scape, channeled; bud nodding; perianth 1½ in. across, funnelform-campanulate, yellow, outside reddish; segments oblongaceous-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. 171. Gn. 45:946.

39. viridiflora, Hort. (1). Outer bulb tunica glabrous except around root-crown, where there is a dense fringe: stem glabrous and glaucous: lvs. lorate-lanceolate, undulated, glabrous, glaucous, edges slightly ciliated near base: f. large, soft green, edged with yellow or white. Gn. 32:625.—Garden form. Bears some resemblance to a Parrot Tulip.

40. folgens, 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, flattened, glabrous; ovary prismatic; stigmas small, not wavy.

41. macrospelia, Baker. A supposed hybrid of unknown origin: height 10-18 in.; lvs. 3-4, long and narrow, lowest long lanceolate, flat, pendent; peduncle wiry; perianth campanulate, slightly funnelform, emitting a heavy, sweetish, unpleasant odor, bright crimson to cerise or cherry red, with a distinct, nearly black cuneate basal blotch broadly margined with yellow or yellowish white at top; segments obtuse or outer sometimes acute, outer reflexed, inner erect; filaments dilated, white at base, black, violet or striated above, glabrous; ovary prismatic, creamy white; stigmas same color, large, slightly undulated.

42. Gesneriana, Linn. COMMON GARDEN OR LATE TULIPS. Figs. 2594-2600. Height 6-24 in.; stem erect; lvs. 3-4 or more, lower lorate-lanceolate or ovate-lanceolate, often undulated, glaucous, pubescent variable; peduncle erect; perianth campanulate, 1-2½ in. long, indorsous, bright red or vari-colored, when bright red, with only an obscure basal blotch, which is usually yellow, but may be dark or even blackish or mixed, sometimes white; segments all obvolute-oblong, obtuse, broadly rounded at apex, often with a small cusp in the

TULIPA
Plate XLVI. Flat Turnips and Rutabagas.
The Turnips (Brassica Rapa) are the two tubers showing in front and on the left. The Rutabagas (Brassica Campestria) 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 form. Sturk (Fig. 2597) are a recent strain of long-stemmed, late, self-colored tulips.

Var. Dractónia, Baker (Fig. 2599). Parrot Tulip. Similar in habit: perianth usually yellow and red striped and splotched; segments deeply cleft and lacinately dentate. F.S. 21:2211 (as T. Turtica). Darwin tulips (Fig. 2597) are a recent strain of long-stemmed, late, self-colored tulips.

Var. spathuláta (T. spathuláta, 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. Strangewyásius, Rehoul. Very large, brilliant, dark scarlet flowers, with a handsome dark basal blotch. One of the naturalized Tulips found without disposition to vary in fields near Florence, Italy. F. 1880:65.

Var. Áblo-oculáta, Krelage. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a large black spot at the base of each of the segments. Italy. Var. Strangewyásius, Rehoul. Very large, brilliant, dark scarlet flowers, with a handsome dark basal blotch.

T. flava. Hort., Krelage is often confused with Meléthna 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. lanita, Regel. Dwarf; its. large, gobo-shaped, rich vermilion, with a large black spot at the base of each of the segments. Imperfectly known.—T. Persica, Wild., is a synonym of T. patens, Agardh, a Siberian species not known to the trade. It has fls. about 3 in. across, greenish outside, whitish inside, with a yellow eye. The outer segments are narrower. It is figured in B.M. 3067 as T. tricolor. T. Persica of the trade has been confused by the Dutch with T. Brenyliana, Linn., the proper name of which is Besomera Columbularis, Salisb. Besomera is a monotypic genus native to South Africa. There are no true Tulips in South Africa. The important generic distinction between Besomera and Tulips lies in the dehiscence of the capsule; that of the former is septical, of the latter loculical. Besomera is figured in B.M. 267 as Melanthium uniformum. It is a dwarf plant 4-6 in. high with funnel-shaped fls. about 1 in. across, yellow within, tinged with deep brownish red outside. The segments are oblong and subequal. Although a native of the Cape, the plant is supposed to be hardy.

ARNOLD V. STURENRAUCH.

TULIPA. See Lobelia.

TUPELO. See Nyssa.

TURK'S HEAD. Melocactus communis.

TURNIP (Plate XLVI) is a name somewhat loosely applied to two species of vegetables. In this country, and apparently properly, it is applied to vegetables characterized by thick light-fleshed roots that are usually more or less flattened or at least not greatly elongated, with leaves that are hairy and not glaucous. These vegetables belong to the species Brassica Rapa (see page 178). In the term is sometimes included the Swedish Turnip or Rutabaga, a plant that is characterized by having a more uniformly elongated-oval yellow-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 tend to run wild in old fields and to lose their thickened roots. They are then sometimes, though erroneously, known as charlock. The nativity of these species is unknown, but they are almost certainly 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 "logan." According to Vilmorin, the plant that we know as Rutabaga is known to the French as chou-navet and in England as Swedish Turnip and turnip-rooted cabbage.
The culture of Turnips and Rutabagas is very similar, except that the Rutabaga requires a longer season in which to grow. The Rutabaga is nearly always grown as a main crop, whereas the Turnip is usually grown for winter use. They are 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, the turnip crop is from the middle of July to the middle of August for winter use, or on the first approach of weather plants and demand loose, moist soil. Usually the seeds are sown in drills which stand from 10 to 20 inches apart. In the drills the plants are thinned until they stand from 6 to 10 inches apart, depending on the variety that is to be grown. For general field operations, the rows are sometimes placed as far as 30 inches apart, in order to allow horse tillage. Sometimes the late or winter crop is raised from seed sown broadcast, but this method gives good results only when the soil is well supplied with moisture, very thoroughly tilled beforehand and is free from weeds, since subsequent tillage is impossible. The seeds of Turnips and Rutabagas are of similar size, two or three pounds being required for broadcasting to the acre, although the average is much less than this.

The Turnip needs no special care as to cultivation. The greatest difficulties are the root maggot, which is the larva of a small fly, and the flea beetle. The maggot may be killed by injecting bisulphide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, this treatment is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea beetle may be kept in check by spraying the plants with Bordeaux mixture, or perhaps better by sprinkling them with Paris green diluted with water. Rutabagas have firmer and richer flesh than the Turnips. They are usually more prized for consumption in winter than are Turnips, whereas the Turnip may be used as a main season crop, whereas the Rutabaga requires a longer season to grow. The Turnip is a hardy vegetable, in order that tutors may be had for the early spring and early fall markets. Rutabagas are also more prized for stock feeding. They yield heavily, are rich and succulent and keep well in any ordinary cellar. Rutabagas have been solidly frozen, and send up flower-stalks in the spring; but unlike salsify and parsnips the roots are not toothed or parted; petals 4-5, long and free; staminal tube 4-5-toothed; disk none: ovary 5-, 10- or 20-loculed: fls. %-% in. long. Upper Guinea. B.R. 30:4 (as T. botata).—Not cult.

Florsibunda, Hochst. (heterophyls, Sond.). Shrub: foliage falls away before, and is rarely offered for sale, except by collectors of wild plants. It spreads too fast to be a denizen of the flower garden, but it is desirable for wild gardening operations. It grows naturally in moist places on steep raw banks in the stiffest 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. The Coltsfoot, with its downy head of fruit, but it is not as large, round and attractive as a dandelion. After the flowers have lost their beauty, the leaves appear. They are heart-shaped and rounded at first, but as they grow they become more and more angled. They are covered with a soft cottony matting which diminishes toward the end of the season. The Coltsfoot is generally considered rather coarse and pelargonium-like, and is, except by collectors of wild plants. It spreads too fast to be a denizen of the flower garden, but it is desirable for wild gardening operations. It grows naturally in moist places on steep raw banks in the stiffest 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. The Coltsfootbear solanaceous, the "Winter Heliotrope," is a Petasites, which see. The leaves of the Coltsfoot are said to be used in making cigars which are smoked in cases of asthma.

Tussilago is a genus of one species. It is more closely related to Petasites than to Taraxacum. For generic description, see Gray's Manual and Britton and Brown's Illustrated Flora.


TUTSAN. Hypericum Androsaemum.

TWAYBLADE. Lepia tiliifolia.

TWIN FLOWER. Linnaea borealis.

TWIN LEAF. Jeffersonia.

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 monoecious 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.

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A. **Staminate and pistillate spikes contiguous.**

*latifolia*, Linn. Fig. 2607. Stem stout, 4-8 ft. high; lvs. wider than in the following species, usually 1 in. wide; pistillate spikes becoming about 1 in. in diam. June, July. N. Amer., Eu., Asia. B.B. 1:62. R.B. 20:196. V. 2:197.

AA. **Staminate and pistillate spikes separated.**

*angustifolia*, Linn. Stem more slender than *T. latifolia*, 5-10 ft. high; lvs. usually less than ½ in. wide; spikes usually longer than in *T. latifolia* and much narrower, being about ½ in. in diam. June, July. N. Amer., especially in the east and also Eu. and Asia. B.B. 1:63. G.M. 32:779.

F. W. Barclay.
ULEX (ancient Latin name of this or a similar plant). *Leguminosae. Furze. Gorse. Whin.* Ornamental, much-branched shrubs with dark green spiny branches, usually almost leafless, and showy yellow, papilionaceous flowers which are axillary and often crowded at the ends of the branches. The Furzes are shrubs of various regions and not 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; var. and rarer kinds also by grafting in spring in the greenhouse on *U. Nirei.* A genus of about 20 species, native of W. and S. Europe and N. Africa, closely allied to *Cytisus* and chiefly distinguished by the deeply 2-lipped calyx. Very similar: *S. vitifolium* is mostly reduced to scales, only the leaves near the ground bearing fully developed lvs.: fls. axillary at the end of the

2608. *Furze—Ulex Europaeus (X 2 3/4).* branches; pods small, usually few-seeded. The Furze is sometimes cult. as a winter fodder plant in Europe, the green sprigs of one year’s growth being eaten. The fls. yield a yellow dye.

ULMARIA (derived from *Ulmus;* alluding to the resemblance of the foliage of the common European species to that of the elm). Syn., *Filipendula. Rosaceae. Meadow Sweet.* Hardy herbaceous perennials with rather large pinnate 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 brooks, 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: Ivs. stipulate, interruptedly odd-pinnate, the terminal leaf 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. *Ulmaria* has usually been united with *Spiraea,* but is very distinct in its herbaceous habit, pinnate, stipulate lvs. and indehiscent 1-seeded akenes. **INDEX.**

(Including names under *Spiraea.* s. L. = Supplementary list.)

alba, 5. Filipendula, 1.
albicans, 2. flore-pleno, 1, 6.
angustifolia, s. l. gaponca, 4.
aurea, 6. hexapetala, 1.
Cantachica, 4. lobata, 2.
duotinta, 3. palustria, 2, 3, 5.
elegans, 5. palustria, 6.

A. Lfs. numerous, almost alike, small, pinnately lobed

1. Filipendula, Hill. *Spiraea Filipendula, Linn. Filipendula hexapetala, Gledh.* MEADOW SWEET. Dropwort. Fig. 2609. One to 3 ft. high, with tuberous rootstock, glabrous: radical lvs. 6-20 in. long; lfts. sessile or oblong, palmately lobed and separated 1 in. long; fls. in a loose corymbs, white, about 1/4 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.
ULMUS

AA. Lifts, few, the terminal one much larger and palmately 3-9-lobed.
B. Lateral lift, 5-5-lobed.

2. rubra, Hill (Spiraea rubra, Gronov. Spiraea palmita, Linn. Filipendula rubra, Maxim.). Queen of the Prairie. Height 2-6 ft.; leaf glabrous; terminal lift, large, 7-9-parted, with oblong, acuminate incised serrate lobes; lateral lifts, smaller, 3-5-lobed, on the upper leaf missing, green, often on both sides, only pubescent on the veins beneath; fls. pink, in a rather large paniculate cyme; akenes about 6-10, glabrous. June-July. Europe, W. Asia to Mongolia; naturalized in some places in the eastern states. B.B. 2:224.—Var. aures variegata, Hort., has the leaves variegated with yellow. Var. flore pleno. Fls. double.


ALFRED REHDER.

ULMUS (ancient Latin name of the Elm). Urticaceae, tribe Ulmeae. ELM. Ornamental deciduous, rarely half-evergreen trees, sometimes shrubby, with alternate, short-petioled, serrate leaves and with inconspicuous, generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy north, but U. cassinoides and alata are tender; U. parvifolia and U. serotina are of doubtful hardiness, although they have persisted near Boston. The Elms are mostly tall and long-lived trees and very valuable for park planting and for avenue trees, especially U. americana, which is the favorite tree for street planting and as a shade tree for dwelling houses in the northeastern states. It is the most characteristic tree of this region and one of the most beautiful. Its habit is at once majestic and graceful, and the spreading habit, borne usually on a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American Elm several other species are used as avenue trees, as Ulmus laevis, racemosa and the European U. campestris and sabura. Of U. campestris, the vars. Clammeri, Cornubienesis and rufa are among the best for street planting; of U. scabra, the vars. Belgica, Dendri and Fillionia. In the southern states U. serotina, cassinoides 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. monomoranicus, 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. unguiculata, with a dense, globe-shaped and rather small head, may be used as an avenue tree for formal gardens. Several species and vars. are interesting in winter on account of their branches being furnished with broad corky wings. The foliage of most species turns pale yellow in fall, but that of the European species remains green much longer. Unfortunately many insects and fungi prey upon the Elm, especially on the American Elm. One of the most destructive is the elm leaf-beetle, Galleruca xanthocephala, which devours the foliage. To keep it from the trees, band the trunks a few feet above the ground with

2009. Ulmaria 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 digyna, Willd.). Height 2-3 ft.; leaf glabrous or whitish-tomentose beneath; leafy terminal lift, very large, 5-7-parted, stipples large, semi-cordate; fls. pale pink at first, changing to white; akenes 4-8. July. Siberia, Kamchataka and Saechalin. This species is but rarely cult.; the plant common under the name Spiraea palmata belongs to F. purpurea.

Bn. Lateral lift, none, few and ovate.

4. Camtschatica, Rehd. (Spiraea Camtschatica, Pall. Spiraea gigantea. Hort. Filipendula Camtschatica, Maxim.). Height 5-10 ft.; leaf glabrous or villose beneath, often with rufous veins; leafy terminal lift, very large, 5-7-parted, with broadly ovate, doubly serrate lobes, lateral lifts, usually none; stipules large, semi-cordate; fls. white; akenes usually 5, ciliate. July. Manchuria, Kamchataka.

5. purpurea, Rehd. (Spiraea palmata, Thunb. Filipendula purpurea, Maxim.). Height 2-4 ft.; leaf glabrous; terminal lift, very large, 5-7-parted, with oblong, acuminate, doubly serrate lobes; lateral lifts, none or few, oblong-ovate; stipules narrow; fls. carmine or deep pink, in large paniculate cyme with crimson peduncles and stamens; akenes usually 5, ciliate. June-Aug. Japan. B.M. 5726. I.H. 15:577. F.S. 18:1851. Gn. 17:36. — This is undoubtedly the finest of this genus. It is also sometimes grown in pots and forced. Var. alba, Hort., has white fls. and var. elegans, Hort., white fls., with red stems and usually several lateral lifts.; the latter is said to be a hybrid. R.B. 4:17.


2011. Fruit of Ulmus Americana.
cloth covered with a sticky substance, which prevents the ascent of the wingless female. Spray. A borer, Saperda tridentata, sometimes does considerable damage to the wood. "U." Elms grow best in rather moist soil, and the American Elm especially requires such a soil to attain its full beauty, but some species, as U. racemosa and U. alata, do well in drier situations. Elm trees are not difficult to transplant, and to transplant large trees may be successfully done 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. Trees raised from layers are said to bear seed one year. A moist and rather light soil is best for this kind. Elm trees are not difficult to transplant, and rather do not need much attention of this kind. Elm trees are propagated by cuttings under glass, the cuttings growing most readily when most of the vars. are propagated by suckers. In nurseries the ascent of the wingless female. A borer, Saperda tridentata, sometimes does considerable damage to the wood. "U." Elms grow best in rather moist soil, and the American Elm especially requires such a soil to attain its full beauty, but some species, as U. racemosa and U. alata, do well in drier situations. Elm trees are not difficult to transplant, and to transplant large trees may be successfully done if the work is done carefully. They bear pruning well, but generally do not need much attention of this kind.

Propagated by cuttings under glass, the cuttings growing most readily when taken from forced plants. U. americana and some of its vars. are also propagated by suckers. In nurseries most of the vars. are propagated by grafting, either by budding in summer, or by whip- or splice-grafting in spring outdoors, or on potted stock in the greenhouse. U. americana, campestris and scabra are used for stock.

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 water junce:—Iv. shepherdi-petioled, usually unequal at the base, with caducous stipules: its, perfect or rarely polygamous, apetalous, in axillary clusters or racemes; calyx-campanulate, 5-lobed, with an unequal number of stamens (Fig. 2616); ovary superior, with a 2-lobed style, usually 1-located and with 1 ovule: fr. a slightly compressed dry nutlet, with a broad, rarely narrow membranous wing all around. Figs. 2611-16. 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 medullary bark of the branches of U. fulva is used medicinally and that of some Chinese species is made into meal and used for food. The tough inner bark of some species furnishes a kind of bass which is sometimes woven into a coarse cloth, especially that of U. campestris, var. laciniata, in Japan.

INDEX.

1. America, Linn. (U. alba, Rafin.). White Elm, Water Elm, American Elm. Figs. 2619, 2611, 2617, 2618. Tall, wide-spreading tree, attaining 120 ft., usually with high, light gray trunk, limbs gradually outward-curving with pendulous branches; branchlets pubescent when young, glabrous in fall; buds acute, glabrous; lvs. obovate-oblong, very unequal at the base, acuminated, double serrate, pubescent when young but soon glabrous and rough above, pubescent or almost glabrous beneath, 3-6 in. long; fls. in many-fld. clusters; stamens 7-8, exserted: fr. oval or elliptic, veined, deeply notched, inclosing reaching to the nutlet. Newfoundland to Fla., west to the base of the Rocky Mts. S.S. 7:311. Enum. 2:362.
incision not reaching the nutlet. Middle Europe to western Asia.-Rarely cultivated and with less valuable qualities. The trunk and branches are often 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 branches, forming an oblong round-topped head; branchlets pubescent usually until the second year and mostly irregularly corky winged when older: buds acute, pubescent; lvs. oval to oblong-obovate, unequal at the base, short acuminate, sharply and doubly serrate, pubescent or smooth, with what 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, ½-3 in. long.

Quebec to Tennessee, west to Nebraska. S.S. 7:312.

4. *alata*, Michx. Wahoo or WINGED ELM. Fig. 2613. Tree, attaining 50 ft., with spreading branches forming an oblong, round-topped or open head; branchlets pubescent: lvs. ovate-oblong to oblong-lanceolate, often falcate, acute or acuminate, doubly serrate, subconspicuous, glabrous above, pubescent beneath, ½-2½ in. long: fls. in short, few-flowered racemes; stamens usually 5: fr. elliptic-ovate, with narrow wing and with 2 incurved horns at the apex, villose, ½ in. across. Va. to Fla. west to 111 and Tenn. S.S. 7:313. — Handsome round-headed tree, sometimes used as an avenue tree in the southern states not hardy north.

5. *fulva*, Michx. (U. vulgarna, Michx.). SLIPPERY ELM. RED ELM. Figs. 2614, 2615. Tree, attaining 70 ft., with spreading branches, forming usually a broad open, flat-topped head: branchlets pubescent: lvs. 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-oval, little notched at the apex. ½ in. across. Quebec to Fla., west to Dakotas and Tex. S.S. 7:314. Em. 2:534.—The much 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. H. yangeri, Späth. U. Schieren, Hort.), a native of western Siberia, Turkestan and Persia, with longer and larger lvs. and grayish pubescent buds.

6. *scabra*, Mill. (U. mououtæa, 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 ovate to oblong-obovate, abruptly acuminate or sometimes 2-lobed at the apex, 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, ½-1 in. long. Europe to Japan and the Far East: a variable species of which many forms are cultivated; the following are some of the most important:


7. *campéstris*, Smith (U. campesoria, Willd., U. super- flexa, Stokes). ENGLISH ELM. Figs. 2617, 2618. Tree, attaining 100 ft., with spreading branches forming an oblong round-topped or sometimes open head, usually producing suckers: branchlets pubescent when young or glabrous, sometimes becoming corky: buds acute or glabrous: lvs. distinctly petiolated, broadly ovate to ovate-oblong, unequal at the base, acuminate, doubly serrate, usually glabrous and smooth above at length, pubescent or glabrous beneath, ½-5 in. long: fls. short-petioled, stamens 4-6: fr. obturate, with the nutlet near the above the middle, reaching almost the incision at the apex. Middle Europe and northern Africa to Japan. Em. 2:236, M.D.G. 1900:577. —This tree is often planted as an avenue tree; it succeeds very well and fine old trees may be occasionally seen in the northeastern states. The foliage remains green several weeks longer than that of the American Elm. U. campéstris is still more variable than the foregoing species and four vars., very distinct in their extreme forms and sometimes considered distinct species, can be distinguished.

Var. *vulgáris*, Planch. (U. suberósa, Ehrh. U. minor, Mill.). Small tree or shrub, with often corky branches: lvs. broadly oval or rhombic obovate, rough
above, pubescent beneath, 1-3 in. long: fls. with 5-6 stamens: fr. obvate to oblance-obvate.


263. A Feathered Elm—Ulmus Americana

Var. lievis, Spach (U. nitens, Münch. U. glabra, Mill., not Huds. U. carpinifolia, Lindl.). Tree without suckers: branches spreading, sometimes pendulous, more or less pubescent-oblance-oblong, and smooth above, glabrous or pubescent only at the veins beneath, 2-4 in. long: lvs. distinctly petioled, with 5-9 exserted stamens: fr. obvate.

Var. japonica, Sarg. in herb. Tree, attaining 80 ft.: branches light yellowish-gray, covered with short pubescence when young: petals densely pubescent, ½ in. long: lvs. oblong-obovate, glabrous above, grayish pubescent beneath, 4-6 in. long: fls. almost sessile. Japan. G.F. 6:327. — This form very much resembles the American Elm in habit, foliage and pubescence, but the lvs. and fr. are like those of U. campesi: it may prove to be a distinct species.


2619. Lamperdown Elm—Ulmus scabria, var. pendula.

Var. suberbora, Loud. English Corky-Barked Elm. Branches corky: lvs. rather small and rough above. Var. suberbora alata, Hort, has very broad corky wings and var. suberbora pendula, Hort, has corky pendulous branches. M.D.G. 1901:66. Var. unbrancliata, Hort. (U. campesi: H.); sp. (U. pancheri, Hort.). Shrubs or trees, with slender branches forming a dense, round head: lvs. small, obtusely serrate, rather smooth. M.D.G. 1900:579. Similar forms are U. Turkestana, Hort, and U. pancheri, Hort. Var. vegeta, Dipp. (U. montana, var. vegeta, Loud.). Of vigorous growth, with bright green, large, oblong-obvate lvs., somewhat rough above. Supposed to be a hybrid of U. compestes, Hort, and U. speciosa, Hort, and has more the habit of the latter. Var. viminalis, Loud. (U. scabria, var. viminalis, Koch. U. strict, Hort.). Small tree, with slender spreading branches: lvs. elliptic to oblong, incisely serrate, 2-3 in. long. Var. Webbiana, Hort. Lvs. small and broad, somewhat curled, dark green. There are also several variegated vars., of which var. argenteo-variegata, with the lvs. striped and spotted white, and var. Louis van Houtte, with yellow foliage, sometimes spotted green, are the most cultivated.

8. pumila, Linn. (U. microphylla, Pers. U. Scabria, Hort.). Small tree or shrub, with slender pubescent, sometimes pendulous branches: lvs. ovate-elliptic to elliptic-lanceolate, short-petioled, acute, firm, dark green and smooth above, pubescent when young beneath, 2½-2 in. long: fls. short-petioled; stamens 4-5, with violet anthers: fr. obvate, with the nutlet somewhat above the middle, incision at the apex reaching about half way to the nutlet. Turkestan to Siberia and N. China. — A graceful small hardy tree, U. pumila pentaloba, Hort. [Poiana repens, Hort.], has slender, more pendulous branches. U. pinnata-variegata, Dieck, with the slender branches very regularly pinnately branched, is probably a distinct species.

9. parvifolia, Jacq. (U. Chinensis, Pers.). Chinese Elm. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obvate 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, 2½-2 in. long: fls. short-petioled in clusters; stamens 4-5, much escorted: fr. oval to elliptic, notched at the apex, with the seeds in the middle of this spines.

10. crassifolia, Nutt. Cedar Elm. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished when older with opposite corky wings: lvs. short-petioled, ovate to oblong-obvate, usually very unequal at the base, obtuse or acute, doubly and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath, 1-2½ in. long: fls. in few-flowered very short racemes; stamens 5-8, little exserted: fr. oval-elliptic, pubescent, notched, ½ in. long. Aug. Miss. to Ark. and Tex. S.S. 7:315. — Tender north.

11. serotina, Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular corky wings: lvs. obtuse to obvate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2½-3 in. long: fls.
in $\frac{3}{4}$-1 in. long pendulous racemes; calyx 5-6-parted to the base; fr. elliptic, deeply notched, densely eiliate, $\frac{1}{4}$ in. long. Sept. Tenn. to Ga.; sometimes planted in avenues in Ga.; has proved hardy at the Arnold Arboretum, Boston.

UMBRELLA LEAF. See Diphylleia.

UMBRELLA PINE. Sciadopitys.

UMBRELLA PLANT or UMBRELLA PALM. Cyperus alternifolius.

UNGRIA (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). Ungerindraceae. A genus of one species, the Mexican Buckeye, a small tree closely related to the horse chestnut but with smaller foliage like a hickory, the lvs. being alternate and pinnate, and rose-colored fls. which are borne in small lateral clusters or simple corymbs, appearing with the lvs. in the 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 fls. are about $\frac{3}{4}$ of an inch across, polygamous, 4-petalled, and the staminate ones have 8 stamens. For fuller account, see Sargent’s Silva.

URARIA (Greek oura. tail, referring to bracts). U. s. Hitchcock.

URARIA. Martynia proboscidea.

UNIOLA (an ancient Latin name of some unknown plant, derived from unus, one, and unio, to have been applied by Linnaeus to this genus on account of the union of the glumes). Gramineae. Perennials with creeping rootstocks. Species 5, all American. Spikelets broad and very flat, in loose panicles, several fl., with some of the lower glumes empty; glumes keeled, nerved, pointed, but awnless. Cultivated for the ornamental panicles, which are suitable for dry bouquets.


USHIO. Lafoleia. Spike-grass. Fig. 2621. Culms 2-4 ft. lvs. broad and flat, often 1 in. wide: spikelets large and thin, at maturity drooping on slender pedicles, forming a very graceful and ornamental panicle. Pa. to Kan. and southward. - Often grown in Hardy borders. One of the best of our Hardy native, perennial grasses.

UNIOLA. Linn. Sea Oats. Culm taller, 4-8 ft.: lvs. narrow and convolute: spikelets narrower, upright on short pedicles, forming an elongated panicle. Sandhills along the seashore of the southern states.

A. S. Hitchcock.

URARIA. Gramineae. Perennials with creeping rootstocks. Species 5, all American. Spikelets broad and very flat, in loose panicles, several fl., with some of the lower glumes empty; glumes keeled, nerved, pointed, but awnless. Cultivated for the ornamental panicles, which are suitable for dry bouquets.

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URARIA. (Greek oura, tail, referring to bracts). Leguminosae. Eight species of perennial herbs with woody bases, all of which are accounted for in the Flora of British India. They have 1-10 lfs. and very numerous, small or minute fls. in racemes. Standard broad: wings adhering to the obtuse keel; stamens diadelphous: ovary sessile or short-stalked, few-ovuled: style infields: pod of 2-6 small, turgid, 1-seeded, indeliscent joints, often placed face to face.

The following species is the most desirable of the genus. It grows about 5 ft. high and is crowned by a single terminal raceme sometimes 2 ft. long, densely

gent describes it as "one of the stateliest and most beautiful inhabitants of the North American forests, and no evergreen tree of temperate regions surpasses it in the beauty of its dark dense crown of lustrous foliage and in the massiveness of habit which make it one of the most striking features of the California landscape and fit it to stand in any park or garden."

Joseph Burtt Dav.
URARIA

crowded with 200 or more pea-shaped fls, each \(\frac{1}{4}\) 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.

crinlta, Desv. Erect, little-branched, subshrubly perennial, 3-6 ft. high, distinguished from other species by having its upper lvs, composed of 2-7 oblong lfts, and pedicels clothed with long bristles. Lfts. 4-8 x 1-2 in.; racemes dense, 1 ft. long, 1-1\(\frac{1}{2}\) in. thick; standard ovate, violet-purple within, pale blue outside; wings-pinkish. Bengal to Assam, eastward through Burma to China, south to Malacca and the Malay Islands to Timor Laut, but not Australia and not indigenous in Ceylon. B.M. 7377.

W. M.

URCEOLINA

hybrid, introduced about 1892, between Urceolina pendula and Eucharis grandiflora, or in gardener’s language Urceolina unica and Eucharis Amazonica. A flower of the hybrid and of each of its parents is shown in Fig. 2622. The hybrid lacks the beautiful staminal cup of Eucharis, and has a distinctly bell-shaped perianth. The showy part of Urceolina is the urn-shaped portion of the flower, the spreading tips being very short. The perianth of Eucharis is funnel-shaped, the sepals being much larger and showy. The perianth-tube and ovary of the hybrid are like those of Urceolina, the ovary being deeply 6-lobed instead of globose-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 Eucharis belong to the Paneratium tribe, characterized by having the stamens appressed toward the base and often united into a distinct cup. Twelve of the 17 genera in this tribe are from the An- des and 8 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 appressed in Urceolina, while in Eucharis they are quadrate and sometimes united to make a cup.

This generic hybrid was introduced to the trade under the name of Eucharis Clibrani, but the changes brought 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, pitchcr; alluding to the pitchcr- or urn-shaped flowers). A genus of 3 species of South American bulbous herbs, with thin oblong to long lanceolate, petioled leaves and a naked scape bearing an umbel of pendulous red or yellow flowers. Perianth-tube often narrow and often somewhat stem-like at the base, and the flowers inserted at or below the throat of the tube, indistinctly appendiculate at the base.

The species of Urceolina are attractive plants and easily grown, flowering every year, but for some reason they are rather scarce. The bulbs are about 3 in. across and during the growing season have 1 or 2 lvs. The plants flower in December. After flowering the bulbs may be removed from the stove to the intermediate house and placed in a spot where they will be kept dry. Just before growth begins in the spring the bulbs should be taken out of the pots and the exhausted soil removed. The bulbs may then be replaced, one bulb in a 3-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.

minista, Benth. & Hook. (Pentlandia minista, Herb.). Bulb about 1\(\frac{1}{2}\) in. through; lvs. produced after the fls., short-petioled, about 1 ft. long, 1\(\frac{1}{2}\) in. wide, notched at both ends; scape over 1 ft. long, 6-fls. 2-4, bright scarlet. Andes of Peru and Bolivia. B.R. 25:68. R.B. 23:49. — Offered by Dutch bulb-growers.

2021. Uniosia latifolia (x 3). (See page 1883.)
URCEOLINA

AA. Fls. yellow.

pédula, Herb. (U. aestiv. Lindl.). Bulb about 1½ in. through: Ivs. 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. 5461. G.C. III. 12:211.

F. W. Barclay and Robert Cameron.

URÊRA (meaning not obvious). Urticaceae. About 18 species of shrubs and small trees, rarely subshrubs, native to tropical regions, with alternate Ivs., 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.

CANDILARIA SEEDLING. At the left, Eucharis grandiflora; next, Urcellina pendula; at the right, the hybrid Urciella Cibranii. All half size.

alceololia, Gaud. (Urtica Cacanicolus, Jacq.). Tree or shrub: Ivs. broadly ovate, acuminate, basal sinus wide and open, crenate-dentate: fls. dioecious, in regularly dichotomous cymes; male cymes 4-6 times dichotomous, stinging or not, rose-colored: female fls. many times dichotomous, the fls. solitary or in 3's. Trop. America. W. M.

URGINEA (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 Ursinia maritima. It is a bulbous plant native to the Mediterranean region, which grows 2 or 3 ft. high and has a long raceme of small, whitish, 6-parted flowers. The raceme is often 1½ ft. long and contains 50-100 or more fls. each ⅛ in. across. It has the same style of beauty as Ornithogalus pyramidale but unfortunately it is only half-hardy. As an ornamental plant it is little known in America. The name seems not to appear in American catalogues, but the Dutch bulb-growers offer the bulbs in at least 5 sizes. A plant erroneously called Sea Onion stores by the name of Squill, and to gardens as Uricinea maritima. is a bulbous plant native to the Mediterranean region for the drug trade. It is much praised by newsellers, 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 Ursinia are treated as separate genera, the distinctions being as follows: the akene is cylindrical in Sphenogyne, but obovate or pear-shaped in Ursinia, distinctly tapering to the base; the pappus is uniseriate in the former, biseriate in the latter, the inner series consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursinia.

URSINIA (John Ursinus, of Regensburg, 1608-1666; author of "Arboretum Biblicum"). Compositae. Here belongs the hardy annual known to the trade as Sphenogyna speciosa. It grows about a foot high, has finely cut foliage and yellow or orange flower-heads 1½-2 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. It has been in cultivation since 1836 but was not correctly described until 1877. It is much praised by newsellers, 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), Sphenogyme and Ursinia are treated as separate genera, the distinctions being as follows: the akene is cylindrical in Sphenogyme, but obovate or pear-shaped in Ursinia, distinctly tapering to the base; the pappus is uniseriate in the former, biseriate in the latter, the inner series consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursinia.

Ursinia 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: Ivs. alternate, serrate, pinnatifid or usually pinnatisect; rays the same color on both sides or paler beneath: the pappus is uniseriate, involute or broadly campanulate: akene often 10-ribbed. For further particulars, see Flora Capensis, vol. 3. There are said to be many other desirable species besides the following:

pulchra, N. E. Br. (Sphenogyme speciosa, Knowles & Weste.). Annual, 1-2 ft. high, with Ivs. bipinnately
URSINIA


dissected into linear lances and yellow or orange fl.


URSINIA

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 compared to the years of failure. The chief difficulties here are, first, the short season, which does not admit of the ripening of fruits that require more time for their development than the Concord grape, for example, and second, the great liability to late spring and early autumn 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 borders of the state without irrigation, and this is a factor which determines to a very great extent the sections and even the particular localities devoted to fruit-growing. The conditions in the Cache valley illustrate this point. This region is a mountain valley lying in the heart of the Wasatch range of the Rocky Mountains in the northern part of the state, and is some 60 miles long by 12-18 miles wide. The soil of this entire valley, with the exception of a few alkali areas and some boggy districts, is well suited to fruit-growing, but the rivers which furnish the water for irrigating all enter the valley 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 to such land that it might otherwise be profitably used for fruit. Artesian wells supply water to some lands to which the river waters cannot be brought, but here again the difficulty is that comparatively 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 corporations 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 good quality of sage-brush have been changed into good farms. In order to increase the sale of these lands many orchards have been set, these operations have served as a wonderful stimulus to the fruit-growing industry. In all the northern portions of the state where late frosts 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 until six or seven the next morning. They are almost as regular as clockwork. They come from the canions and blow with such force as to necessitate thick wind-breaks to prevent their effects within a mile or so of the 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 cold air from settling and producing frost. So marked is their influence upon the occurrence of frosts that it is no uncommon thing after a cold night in the spring or autumn to find that while the plantations in the districts influenced by the cañon winds have come through without injury, yet just around a spur of the mountain out of reach of the wind, the blossoms have nearly all been injured. Perhaps in time satisfactory varieties may be developed which will bloom late enough to avoid this danger, but as yet the problem of frosts is even more difficult to solve than that of water.

Another factor which has contributed in the past toward restricting the areas devoted to fruit is the 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 people lived in villages and drove out to cultivate their farms. Naturally the fruit plantations which needed the personal and constant oversight of the owner to insure a crop or at least a harvest, were confined to the plantation in the village and the farm was given over to grains and hay crops. It is only in the comparatively few districts where the village system did not obtain, or within more recent years when it has been somewhat abandoned, that the larger available areas of the farms have encouraged the planting of larger orchards.

So far as most insect pests are concerned, the Utah fruit-grower is neither more nor less fortunate than his brothers of other states. It is true there was a time when the somewhat isolated position of the state seemed to warrant the belief that it would escape from the inroads of many of the pests which troubled growers elsewhere, but with the advent of better transportation

2623. Map of Utah.
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 situation 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 insure a fair one, but its mountain climate seems to give a superior quality to the fruit grown and with the more erect foliage of the ordinary type. These often form are common in the tropics and are characterized by much dissected lvs. with thread-like segments, a type of foliage seen in the water crowfoot genus. The terrestrial kinds usually have simple, unbranched stems, and are characterized by the terminal inflorescence. 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 de-idealized of the genus are U. montana, Eulonemia and longifolia, each of which represents a different color. Well grown baskets of these plants have numerous scapes 4-5 feet or so high bearing 5-20 lvs., each 1'-2' in across. In general, such plants are grown in warm houses. U. Eulonemia requiring a low 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 lfs. 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 axils of the leaves. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the leaf-axils of Vriesia and other bromeliads live certain Utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which finds another bromeliad and propagates another Bladderwort.

UTRICALARIA (Latin, a little bag or skin; referring to the bladders). Lastbutterburs. BLADDERWORT. Utricularia is a genus of hermaphroditic plants possessing little bladders which trap small aquatic animals. The bladders are 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 in the water. The seeds are attached to 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 species propagate themselves by seeds and also by winter-buds. (A winter-bud of another aquatic plant is figured under Elodea, p. 526).

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 de-idealized of the genus are U. montana, Eulonemia and longifolia, each of which represents a different color. Well grown baskets of these plants have numerous scapes 4-5 feet or so high bearing 5-20 lfs., each 1'-2' in across. In general, such plants are grown in warm houses. U. Eulonemia requiring a low 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 lfs. 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 axils of the leaves. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the leaf-axils of Vriesia and other bromeliads live certain Utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which finds another bromeliad and propagates another Bladderwort. Utricularias have numerous slender, wiry scapes bearing one or many flowers. Calyx large, 2-parted or 2-lobed. Petals in the water. Flowers are generally borne in the water. Fruits are usually numerous and similar to one another. Seeds are round or oblong. Utricularia has about 150 species. U. longifolia (X 2)
**UVULARIA**

UVULARIA (Latin, uvula, palate, referring to the inflorescences, Liliaceae, BELLWORT, "Wild Oats"; siccus parts. A genus of two species of very graceful, woodland, perennial herbs native to North America. The plants grow about 15 in. high, with a number of clustered-slim stems which are forked and leaf-bearing. 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 Oak-sia, see that genus, to which some of the plants commonly known as Uvularia are referred.

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**Vulgáris.** Linn. Hardy native aquatic plant, with crowded, 2-3-pinnately divided floating lvs. 1/2 in. long, provided with numerous bladders and yellow fls., 1/2 in. long or more, borne in 1-2-ft. clumps. June-Aug.

**Montána.** Poir. Tropical American epiphyte, with clusters of tubers 1-3 in. long, minute, defoliated, useless lvs, and large white fls. with a yellow palate, the fls. 1 in. across; scape about 1 in. long, elliptic-lanceolate. Trunks of trees, West Indies and S. Amer. B.M. 5923. P.S. 19:1942. I.H. 1:41. A lovely species.

**Biílda.** 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 palate. 5-8 in. long. B.M. 8688. Int, by Sander, 1889.

**Janthina.** Hook. Epiphytic Brazilian species growing in the leaf-axils of a broom (Vireya), with kidney-shaped lvs. and beautiful pale red or lilac fls. 1 in. across, ornamented by 2 vertical violet lines on the palate edged with dark violet. Lvs. with stalks 4-6 in. long and blades 2-4 in. across: scape about 6 in.; upper lip hemispheric, arching; lower lip transversely oblong, entire. B.M. 7466. -Int. by Sander, 1889. "Janthina" is the same as "ianthina," meaning violet-colored.

**Reniúrnis, A. St. Hil.** Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 2 darker lines on the palate; upper lip truncate, emarginate; lower lip 3-lobed, the lateral lobes broad, the midlobe much shorter and scarcely produced. Brazil. Once advertised by John Saul, but probably lost to cultivation. Very large for the genus, the lvs. 1-4 ft. long and scapes 1-2 ft. high.

**Humboldtii, Schomb.** Guiana species, with long-stalked, cordate or ovate, mostly solitary lvs., and deep purple-blue fls., 1 in. across, with a triangular lower lip. Scapes about 5 ft. F.S. 13:1390. -One of the showiest species. Commonly cult. in Eng., apparently not in America.

**Endressii, Reiche.** Epiphytic Costa Rican species, with tubers about 3 in. long, solitary lvs. and dark purple-blue fls., 1 in. across, with a yellow palate; lvs. 1-2 in. long, narrowly elliptic-lanceolate; scape about 5 ft. B.M. 6636. Var. május, Hort., was offered by Pitcher & A. Mand. 1885. A deciduous species found at altitude of 2,000 feet.

**Longíolia, Gardn.** Fig. 2624. A Brazilian species, the typical form of which is perhaps not in cultivation. T. Euphyllácea, 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 G.V. 18:182 (adapted in Fig. 2624) under the erroneous title of T. latífolia. It has beautiful violet-purple fls. nearly 2 in. across, with a yellow palate. Lvs. lanceolate, erect; scapes 12-20 ft. and fls. last well. G.C. HI. 13:718.

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**2625. Bellwort — Uvularia perfoliáta (XZ).**

**A. Lvs. pubescent beneath.**

**Grandíflora, Sm.** Stems 1-1/2 ft. high, with 1 or 2 lvs. below the fork; lvs. oblong, oval or ovate, somewhat acuminate; fls. pale yellow, 1 1/2 in. long; segments usually smooth on both sides; stamens exceeding the styles: capsule obtusely 3-angled, truncate. May, June. Rich woods, Quebec to Minn. south to Ga., Tenn. and la. B.B. 1:409.

**AA. Lvs. not pubescent beneath.**

**Perfoliáta, Linn.** Fig. 2625. Stems more slender than in U. grandíflora, with 1-3 lvs. below the fork; lvs. oval, oblong or ovate; fls. pale yellow, about 1 in. long; segments glandular papillose within; stamens shorter than the styles; capsule obtusely 3-angled, truncate. May, June. Rich wood, U. S.

J. B. Keller and F. W. Barclay.
VACCINIUM (classical Latin name of the European Whortleberry; etymology uncertain). Ericaceae, including Bilberry, Blueberry, Huckleberry, Whortleberry, Cranberry. Branching shrubs, creeping vines, or small trees, sometimes epiphytic, lvs. alternate, evergreen, deciduous or membranaceous: fs. small, white, pinkish or reddish, in lateral racemes or terminal clusters, sometimes solitary in the axis, mostly nodding on slender stalked pedicels and being borne 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 slits; pistil single, with a 4-5- or 8-10-located ovary, which is glabrous or hairy. Flowers borne in spring with or before the leaves; berries ripe in summer and autumn, sweetish or sometimes acid, mostly edible. The genus includes about 125 species of wide geographic distribution, extending from the arctic circle to the tropics, and occurring in the mountain districts of the Himalayas. With very few exceptions (e.g., V. corymbosum in Java and Emmenopteryx in Madagascar) the genus is represented 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" are usually and generically applied to such "common names" as the American writers are seldom or never heard among the common people in this country; while "Huckleberry" is usually applied indiscriminately for plants of this genus and for the common Blueberries of Northern America, and the Himalayas. With very few exceptions (e.g., V. corymbosum in Java and Emmenopteryx in Madagascar) the genus is represented in the southern hemisphere and in the lower regions of the tropics.

Among the plants which lend tone to the landscape in October and November by reason of their bright colorations, there is a little attention has been given to garden cultivation. In the wild state the Blueberry was originally worthier of notice than was the blackberry, raspberry or currant, but the natural supply is so abundant that little attention has been given to garden cultivation. At the American Agricultural Experiment Station systematic work is in progress, and several instances of successful amateur cultivation are recorded from Massachusetts. The plants of some species are very susceptible of improvement under good cultivation; the best in order of merit being V. corymbosum, var. Standleyi and V. corymbosum, var. foliosum. The bushes should be transplanted in the fall and treated much the same as currants. Any good garden soil is suitable.

Of all the American species used for food, the most important are V. corymbosum, V. americana, V. ovata, and V. macrocarpon. The first of these, 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, grows 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 at the Blueberry which is grown in the United States. 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, etc., and their fruits are inferior to those of V. corymbosum, especially on dry sandy "barrens"—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 the Appalachians and West Virginia—there are many thousand acres of land, worthless for agricultural purposes, which after the pine is removed send up an abundant growth of Blueberry bushes, alders, poplars, gray birches and spireas. These lands are, for the most part, considered as public property and are recklessly burned over by irresponsible 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 an important operation. In some instances 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 operators in the Blueberry business. The Blueberry crop as seen in the cities or at the canning factories is produced thereon. The Blueberries are grown as a crop in the wild state, and the Blueberries grow as a crop in the wild state.

The method most commonly used in burning a given area is for the operator to pass around the section to be burned, dragging after him an ordinary torch or mill-lamp. He then retraces his steps and follows over the burned area, to find the portions which have escaped and back-firing if there is danger of spreading unduly over areas which it is desired to leave unburned. A device occasionally used consists of a cylinder of gas-pipe, bent into the end at an angle of about 60°. The end opposite the bent part is closed with a cap or plug, and in the other end, after filling the pipe with kerosene, is placed a plug of cotton waste or tow. This device is by many their shining box-like foliage, are effective as edging for the shrubbery border. Overall, the state of the Blueberry was originally worthier of notice than was the blackberry, raspberry or currant, but the natural supply is so abundant that little attention has been given to garden cultivation. At the American Agricultural Experiment Station systematic work is in progress, and several instances of successful amateur cultivation are recorded from Massachusetts. The plants of some species are very susceptible of improvement under good cultivation; the best in order of merit being V. corymbosum, var. Standleyi and V. corymbosum, var. foliosum. The bushes should be transplanted in the fall and treated much the same as currants. Any good garden soil is suitable.

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considered superior to the lamp or torch, as it is more easily handled. Each section of the lease is usually burned over every third year. In this way the birches and alders are subdued and the Blueberries spring up on old burns," i.e., on areas which will have to be burned the year following the burning.

The Blueberries have an advantage over other small fruits in that they will stand shipment better and will keep longer than the others, with the exception of currants and gooseberries. By far the largest proportion of the fruit is taken to the factories for canning. Early in the season, however, before the factories are opened, the 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 in the "blueberry barrens," 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 composed of stiff parallel wire rods. See Fig. 2628. The fruit may be gathered much more quickly and more cheaply by means of the rake. The bushes are, however, seriously injured by the treatment. In no case should the rake be used in gathering the High-bush Blueberries, as the berries are gathered they are passed through a funneling mill to eliminate leaves and twigs before being sent to the canning 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 industry 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 500 barrels and the average annual output is 8,300 cases of 2-dozen cans each, representing 6,250 barrels 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 "Blueberry barrens" in 1890 was about 50,000 cases and the price per case was $2.20, making the value of the Blueberries and the Blueberry barrens over $100,000. In northern Michigan the annual ship-
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-Idsea*).

B. Stamens long-exserted.
   c. Filaments villosus ........... 5. erythrocarpon
   cc. Filaments puberulent.
   D. Stems very slender, creeping .......... 1. Oxycoccus
   DD. Stems stout, with ascending branches ..... 2. macrocarpon

BB. Stamens included.
   c. Filaments glabrous or pubescent.
   D. Corolla commonly 4-lobed; stamens 8-10. 21. uliginosum
   DD. Corolla commonly 5-lobed; stamens 10. 22. erythrocarpon

EE. Plants taller, 1-2 ft. high.
   F. Margin of leaves sharply serrulate. 13. myrtilloides
   FF. Margin of leaves entire (except in *V. ostrolinum*).
   g. Length of leaf, 1-2 inches .......... 16. ovalifolium
   GG. Length of leaf, 1-2 inches .......... 4 parvifolium

CC. Filaments pilose.
   D. Twigs red. Here probably belongs .......... 22. erhythrum
   DD. Twigs not red.
   E. Stamens 10; ovary 5-loculed.
   F. Branchlets pubescent .......... 23. ovatum
   FF. Branchlets glabrous ......... 29. crassifolium
   EE. Stamens 5; ovary 2-loculed ......... 9. Myrtillus

AA. Ovary 10-loculed (sometimes imperfectly so).
   B. Anthers with 2 awns on the back.
   C. Stamens included .......... 24. arboremen
   CC. Stamens exerted .......... 23. stamineum

BB. Anthers awnless.
   c. Foliage evergreen, coriaceous.
   D. Calyx-teeth roundish and very dense .......... 6. nitidum
   DD. Calyx-teeth neate ............. 7. Myrsinites
   CC. Foliage deciduous (sometimes tardily so in southern forms).
   D. Corolla cylindrical ......... 17. virgatum
   DD. Corolla short and usually broad.
   E. Branchlets hirsute ..... 14. hirsutum
   EE. Branchlets glabrous or glaucous (except in *V. Canadensis*).
   F. Les. glaucous and pale beneath.
   a. Fruit blue ........ 8. vacillans
   gg. Fruit black ........ 12. nigrum
   FF. Les. strongly pubescent both sides ..... 13. Canadense
   FFF. Les. glabrous, often hairy on midrib beneath.

BB. VACCINIUM  

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.
   v. Stems slender, trailing; leaves evergreen.
   d. Apex of leaves acute .......... 1. Oxycoccus
   DD. Apex of leaves obtuse or retuse ............. 24. macrocarpon
   CC. Stems stout, creeping; branches erect, tufted ............. 3. Vitis-Idsea
   CCC. Stems erect, much taller, 2-10 ft.
   d. Les. small, 2-7/8 in. long. 4. parvifolium
   DD. Les. larger, 1-2 in. long ............. 5. erythrocarpon

BB. Color of fruit blue or black.
   C. Plant low, ½-2 ft. high.
   D. Foliage evergreen.
   E. Les. small, ¼-½ in. long ............. 6. nitidum
   EE. Les. larger, 2-7/8 in. long ......... 7. Myrsinites
   DD. Foliage deciduous.
   E. Surface of les. glabrous.
   F. Les. pale beneath, not shining above.
   (See also No. 12. Here might be sought *V. corymbosum*, var. pubidum, No. 28.)
   8. vacillans
   FF. Les. not paler beneath, shining at least above. (Exceptions: No. 12 always paler beneath; No. 11 rarely paler beneath.)
   G. Fils. solitary in the axils.
   H. Branches not angled .......... 9. Myrtillus
   HH. Branches not angled .......... 10. cæspitosa
   GG. Fils. in fascicles or short racemes.
   H. The les. not paler beneath. 11. Pennsylvanicum
   HH. The les. paler beneath ......... 12. nigrum

EE. Surface of the les. hairy.
   F. Oracy and fr. glaucous ............. 13. Canadense
   FF. Oracy and fr. hirsute ............. 14. hirsutum
   FFF. Oracy and fr. glaucous (except in *V. Canadensis*).
   G. Fruit blue .......... 8. vacillans
   GG. Fruit black .......... 12. nigrum
   FF. Les. strongly pubescent both sides ..... 13. Canadense
   FFF. Les. glabrous, often hairy on midrib beneath.

cc. Plant taller, 3-12 ft spreading.
   D. Fils. solitary in axils.
   E. Les. sharply serrate. 15. myrtilloides
   EE. Les. entire or slightly serrulate .......... 16. ovalifolium
   DD. Fils. in racemes or corymbas.
   E. Racemes elongated on naked branches ......... 17. virgatum
1. Oxycoccus, Linn. Small Cranberry. Cranberry of the Old World. Slender creeping plants with short, filiform stems 4-10 in. long; lvs. ovate or acuminate, ½ in. long, with revolute margins; pedicels 1-4, terminal: corolla deeply 4-petalled, the lobes reflexed; anthers inserted, with very long, terminal tubes; berry red, globose, ½-1 in. in diam., 4-seeded. Sphagnum swamps in subarctic and alpine regions.—Though smaller, its fruit is by many considered superior to that of the next.

2. macrocarpon, Ait. Larger American Cranberry. Stems slender, creeping, elongated (1-4 ft.), the flowering branches ascending; lvs. oblong or oval, obtuse or retuse, ½-2 in. long, whitened beneath; pedicels several, axillary and lateral: berry red or reddish, globose or pyriform, ½-1 in. long. N. America. B.M. 2586. Em. 2:456. See Cranberry.

293. Cowberry or Mountain Cranberry — Vaccinium

Vitis-Idaea (S. about ½ in.)

3. Vitis-Idaea, Linn. Cowberry. Mountain Cranberry. Foxberry. Fig. 2629. Plants low (6-10 in.): lvs. coriaceous, persistent, obovate or oval, ½-3 in. long, dark green and shining above, with blackish bristly points beneath: lfs. in short, terminal racemes; corolla white or rose-colored, 4-cleft: berries dark red, acid, rather bitter. Arctic regions, south to coast of New England, Minn. and Brit. Col. B.B. 2:550. L.B.C. 7:616 (as var. major); 11:1023 (var. minor).—The fruits, which are rather larger than currents, acid and somewhat bitter when unsoaked, are largely used in the more northern regions for tarts, jellies and preserves, as a substitute for the common cranberry. According to Macoun, the fishermen's families along the Gaspe coast and the north shore of the Gulf of St. Lawrence gather the fruit of this species in large quantities for their own use and for sale, calling it "Low-bush Cranberry." Throughout the whole of northern Canada hunters and trappers, as well as the native Indians, have frequently been forced to depend upon it for food. It is valuable for the shrubbery border, where the strong contrast of the dark green foliage and the bright-colored persistent fruit is very striking.

4. parvifolium, Smith. Shrub, 5-12 ft. high, straggling, with slender, green, sharply angled branches: lvs. oblong or oval, obtuse, entire, dull or pale, ½-3½ in. long; lfs. solitary in the axils: corolla globular, nearly white: calyx 5-lobed; berry light red, rather dry. Northern Calif. to Alaska.—Offered by only one nurseman. T. J. Howell, of Oregon, characterizes the fruit as "of good flavor, excellent for tarts," while Gray says: "rather dry, hardly edible." 5. erythrocarpon, Michx. Shrub, erect, divergently branching, 1-4 ft. high: lvs. oblong-lanceolate, acuminate, serrate, thin, ½-3½ in. long; pedicels solitary, axillary, bracteate: corolla flesh-colored, ½ in. long, 4-cleft, reflexed: berries black, ½-1 in. in diam., 4-seeded. Sphagnum swamps in subarctic and alpine regions.—Though smaller, its fruit is by many considered superior to that of the next.

6. nitidum, Andr. A diffusely much branched shrub, with smooth branches, lvs. thick, coriaceous, shining above, oburate or oblong: lfs. in fascicles on short racemes, the almost persistent bracts as well as the roundish or obulate calyx-teeth redish; corolla short-campanulate, 5-toothed; berry "somewhat pear-shaped, black." Fla. and Ga.—Near to or passing into V. Myrsinites.

7. Myrsinites, Lam. Low, evergreen shrub erect or decumbent: lvs. excedingly variable, ½-1 in. long, entire or serrulate, sometimes dentate, mostly shining above: bracts and calyx-teeth acute or acutish; berries "globose, blue," Sandy pine-barrens N.C. to Fla. and La. B.M. 1530 (as V. nitidum, var. dentatum).—The difference between this species and the preceding is obscure. The chief points of distinction seem to be that V. Myrsinites has puberulent branches, prominently veined lvs. and acute calyx-teeth and bracts, while V. nitidum has smooth branches, smaller and faintly veined lvs., with oburate or roundish calyx-teeth and bracts. Grown as a pot-plant in coolhouses in England under the name of V. angustifolia.

8. vacillans, Kalm. Low Blueberry. Blue Huckleberry. Erect, glabrous: lvs. oburate or oval, entire or sparingly serrulate: lfs. in rather loose clusters, generally on leafless summits of twigs: corolla campanulate or cylindraceous, contracted at the mouth; berries large, blue, with much bloom, of excellent flavor, ripening with V. angustifolia. Dry, sandy, or rocky places, N. Amer. B.B. 2:336. Em. 1:154.—One of the most common species of the northern and central states, particularly west of the Alleghenies. The lfs. are quite showy, while the fruit is particularly valuable.

9. Myrtillus, Linn. Whortleberry. Bilberry. Low shrubs, glabrous: lvs. ovate or oval, serrate, conspicuously veined, ½-2 in. long; calyx almost entire; berries black, nodding. Mountainous regions, N. Amer., E. Asia.—The most widely distributed species and very generally used as an article of diet and in the making of drinks, particularly in the Old World. It is from this species that the common name Whortleberry is derived. Not of special importance in America.

10. capitusum, Michx. Dwarf Huckleberry. A dwarf tufted shrub, 3-12 in. high, nearly glabrous throughout: lvs. oburate, obtuse or acutish, nearly ½ in. long, on both sides: lfs. solitary; corolla obvolute, pink or white, slightly 5-toothed (rarely 4-toothed): berries large, globose, blue with bloom, sweet. N. Amer. B.B. 2:576
VACCINIUM

B.M. 3429—It is doubtful if varieties can be distinguished. Var. arbuscula, Gray, passes into the ordinary form; while vars. angustifolium, Gray, and cuneifolium, Nutt., are found to be simply forms produced by shade. The last form, particularly, is common in New England, and in early and in the season the 1vs. are of the ordinary obovate type, while later they become elongated. Recommended by Warren H. Manning for the rock garden.

11. Pennsylvanicum, Lam. Low Blueberry. Fig. 2430. A dwarf shrub, 6-15 in. high; Ivs. membranous, oblong-lanceolate or oblong, distinctly serrulate with bristle-pointed teeth, mostly shining on both sides but often hairy on midrib beneath; fls. on short pedicels; corolla campanulate-cylindrical, short; berries large, globose, bluish black with bloom, sweet, the earliest to ripen north. N. Amer. B.M. 3434. B.B. 2:578. Em. 2:450. Rep. Me. Exp. Sta. 1898:171.—Var. angustifolium, Gray. A dwarf form, with more decidedly lanceolate Ivs. Lake Superior and northward.—This species is extremely variable in size and shape of fruit and flowers, but with the exception of the variety noted and the black-fruiting form often associated with it, which is set off as V. virgatum, the variations do not appear sufficiently constant to warrant making separations. In general, the plant is of low, semi-prostrate habit, is extremely prolific and thrives 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 handpicks. Because of its character and early-ripening habit, it is known on character of its foliage and the somewhat acid fruit, usually grows in rather moist, rocky, not swampy, localities. The fruit is larger and more acid than the other low forms and main crop later. It is not so popular in the general market as the sweeter kinds, but it is very prolific and its lateness in ripening is a point in its favor.

13. Canadense, Richards. Canada Blueberry. Erect shrub, 1-2 ft. high; stems green, grooved, obscurely 4-angled, those of the current year covered with stout, spreading white hairs; Ivs. ovate, entire, and, together with the pure white campanulate corolla, the calyx and the dark blue chloido fruit, hirsute. Very local in N. C. (t. i) and Tenn. B.F. 2:365.—This species, discovered about 1840 was last sight of for half a century until rediscovered by Nargent and transferred to the Arnold Arboretum. It is distinguished by the hairy flower and fruit. The fruit is described as fully as large as that of Gaylussacia baccata, shining black, and of an agreeable flavor. Under cultivation not so densely hairy as in the wild state. Of the use of being valuable under cultivation as one of the latest of its kind to ripen,—at the Arnold Arboretum the best period of fruitage being the middle of August, berries remaining into September.

14. hirsutum, Buckel. 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: Ivs. ovate, entire, and, together with the pure white campanulate corolla, the calyx and the dark blue chloido fruit, hirsute. Very local in N. C. (t. i) and Tenn. B.F. 2:365.—This species, discovered about 1840 was last sight of for half a century until rediscovered by Nargent and transferred to the Arnold Arboretum. It is distinguished by the hairy flower and fruit. The fruit is described as fully as large as that of Gaylussacia baccata, shining black, and of an agreeable flavor. Under cultivation not so densely hairy as in the wild state. Of the use of being valuable under cultivation as one of the latest of its kind to ripen,—at the Arnold Arboretum the best period of fruitage being the middle of August, berries remaining into September.

15. myrtilloides, Hook. An erect, branching shrub, mostly glabrous throughout, the twigs slightly angled; the Ivs. oval, oblong or ovate, acute, serrate, membranous, green on both sides but not shining, 1-2 in. long; calyx entire; corolla depressed-globose, yellowish or greenish white; berries large, oblate, black, rather acid. Lake Superior westward. B.M. 3447.—The berries are large, 1-2 in. 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; Ivs. oval, obtuse, glabrous, green above, glaucous beneath; fls. solitary, on short, recurved pedicels; corolla glabrous-ovoid; berry large, 1/2-1 in., bluish purple, with bloom. Woods, Quebec to Mich., Ore. and Alaska. B.B. 2:577.—This species is very abundant in the northeast, forming 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 dry them for winter use. The especially 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: Ivs. narrowly oval-oblong, acute, often mucronate, entire or minutely serrulate, green and glabrous above, pale or glaucous beneath, 1/2-1 in. long; fls. in short racemes or corymbs, appearing before the Ivs.: corolla nearly cylindrical, white or pink: bracts small, deciduous: berry black, with or without bloom. Swamps, southern Va. to Fla. and L. B. B. B.B. 2:577.—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. coryphoecum and should be reduced to varietal rank.

Var. tenellum, Gray (V. tenellum, Alt., not Pursh). A low form, mostly less than 2 ft., with smaller Ivs. and nearly white fls. in short, close clusters. Southern Va. to Ark., Fla. and Ala.—Probably a distinct species.

18. corymbosum, Linn. High-bush Blueberry. Swamp Blueberry. Fig. 2431. A tall, straggling shrub, 4-12 ft. high, with yellowish green warty branch-
VAR. amienum, Gray (V. amienum, 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.B. 5:406. B.M. 3433 (as V. corymbosum).


Var. luscamum, Gray (V. luscamum, Alt.). A tall form with the mature and entire leaves for about 1 inch beneath: its, virgate, somewhat more acute on the flowering twigs. Also and Florida. And Ark.

19. atrocoecum, Heller (V. corymbosum, var. atrocoecum, Gray). Black Blueberry. A branching shrub with shreddy bark, similar to V. corymbosum: its, oval or oblong, dark green above, densely pubescent beneath, entire, acute, often mucronate: its, in short racemes, appearing with the its.: berry black, without bloom, sweet. Moist woods and swamps, northeastern North America. B.B. 2:578.

20. crassifolium, Andr. Stubby, trailing shrub: stems 2-3 ft. long; glabrous; its, small, ½-1 in. long, oval or narrowly oblong, sparsely serrulate or entire, shining: its, few, almost sessile, in small, axillary clusters, nearly white or tinged with red: berries black. Sandy bogs, N. C. to Ga. B.M. 1832. Used for the shrubbery border south.

21. uliginosum, Lindl. Bog Blueberry. A stiff, much-branched shrub ½-2 ft. high: its, thick, elevate or oval, obtuse or retuse, ½-1 in. long, nearly sessile: its, 2-4 together, or sometimes solitary; calyx 4-parted, sometimes 5-parted; corolla urn-shaped, 4-5 lobed, pink; stamens 8-10; berries bluish black, with bloom. N. Amer., Eu., Asia. B.B. 2:576. The plant is useful for the shrubbery border in cold, wet locations, and it's fruit, though of poor quality, is used for food by the natives of the northwest.


23. ovatum, Pursh. An erect, rigid, evergreen shrub, 2-8 ft. high, with pubescent branchlets: its, very numerous, thick, shining, ovate or oblong, acute, serrate: its, numerous, in short, axillary clusters, followed by dark purple fruit of agreeable flavor. Vanderhoof's 14 by 8 in. Monterey, Calif. B.R. 18:1551. A distinctly western species, and one of California's most beautiful hedge plants, but not well known. V. ovatum is very tenacious of life and bears suckers, cuttings and seeds, which last it bears freely.

24. arboreum, Marshall. FISKEBLUEBERRY. SPARKLEBERRY. Spreading shrub or small tree, 6-25 ft. high, with glabrous or somewhat pubescent branchlets: its, thinish, coriaceous, smooth and shining above, abaxial to oblong, entire or obscurely dentate: its, profuse, axillary and leafy mecones: corolla white, 5-lobed: berry small, globose, rather astringent. Sandy soil along river banks, Fla. and Tex. to N. C. and III. L.B. 19:1885. B.M. 1607 (as F. theissianum). B.B. 2:586. It forms an irregular shrub too diffuse and struggling to be of value except in masses, for which purpose it is useful at the north.

25. stamineum, Linn. DEERFURZEBERRY. SQUAW HUCKLEBERRY. A divergently branched shrub, 2-5 ft. high, with pubescent or glabrous twigs: its, oval to oblong-lanceolate, acute, entire, pubescent: berries slightly pubescent beneath, 1-1½ in. long, 1-1½ wide: its, very numerous, in large leafy-bracted racemes: corolla green, 5-5½: anthers and style exserted: fr. large, globose or purplish, greenish or yellowish, few-seeded, almost inedible. Dry woods and thickets, N. Amer. B.B. 2:588.

26. melanospermum, Mohr. SOUTHERN GOOSEBERRY. Shrub, 2-5 ft. high, branched from near the base: its, ovate in the type; its, in loosely 4-5-ed, elongated racemes: berries twice the size of the typical form, shining black, with a juicy purple pulp, sweetish, with slightly tart flavor. S. States. Probably a distinct species. Well suited to any good, well-drained soil and is a valuable shade-enduring ornamental shrub.

W. M. NYSON.

VAGARIA (meaning obscure). Amorrhigliaenia: 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 ft. mounds on naked scapes about 1 ft. high; perianth-tube short, funnel-shaped at the apex, segments equal, lanceolate; stamens inserted on throat of tube; filaments quadrate: ovary globose, 3-lobed, with 2-3 ovules in each locule.

parviflora, Herb. Bulb globose, about 1½ in. in length; its, white. Offered by European bulb-growers.

F. W. BARCLAY.

VAR. Valeriana, Greek V. in Poelwami. Red V. in Centauriwm.

VARLEIANA (Latin valis, to be strong, in allusion to medicinal uses). Valerianum, A large genus (probably more than 150 species) of widespread herbs, mostly of the northern hemisphere. Leavens. It includes a dozen species are North American. The Valerians are erect-growing, mostly tall perennials, with strong-stemmed roots, and bearing many small white, pink or rose-colored flowers in terminal cymes or axillary panicle clusters. Corolla tubular or trumpet-shaped, the limb nearly equally 5-toothed or lobed, the tube usually swollen at the base; stamens 3; ovary 3-lobed (by abortion), bearing an entire or crenate, somewhat 2-3-lobed style, ripening into an aken; calyx of bristle-form lobes: its, opposite, various.

The Valerians in the American trade are hardy perennials of easiest culture. Only V. officinalis is well known. This is one of the characteristic plants of old gardens, being prized for the spicy fragrance of its numerous flowers in spring. It spreads rapidly from
The roots are eaten by Indians. The leaves are thickish and strongly veined.

The African or Algerian Valerian is *Fedia Corniculata*, (Linn., *Valeriana Corniculata*, L.) It is an African annual used for salad, after the manner of corn salad. It does not appear to be in the American trade. Glabrous, branching, 6-18 ft. or less high, branched-oblong, thickish, simple, somewhat toothed, those of the stem are twice as long as the leaves, long and pinkish, in terminal clusters. Cultivated as for corn salad, although it requires less cold. It thrives well in warm weather when not allowed to suffer for water. B.S. 2:33—T. tripartita, Linn., of Europe, appears to have been offered in this country, although little known here. About 1 ft. tall, glabrous, radially 3- or 5-lobed, dentate, stems, with 3 leaves or lobes, the terminal one larger; fls. rose-colored, polygamous.

L. H. B.

**VALENIANELLA** (diminutive of *Valeriana*). *Valeriana.* Including *Corn Salad* or *Fetticus*. A genus of nearly 50 species of annual, dichotomously branched herbs, with a basal rosette of entire lvs. and small, bluish or pinkish lvs. borne in terminal cyms, which form compact glabular or flat-topped clusters. Corolla nearly regular, 3-lobed; stamens 3; fr. 3-loculed, 2 of the locules empty. Those plants are mostly native to the Mediterranean region. *V. olitoria* is the common Corn Salad and *V. Ericoarpa* the Italian Corn Salad. To the account given in this work at pages 376, 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 plants grow 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. A small bed is planted in April or May, and the leaves are gathered throughout the summer. 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 to 3,000 lvs. The following description of the varieties is derived from Vilmarin's *Vegetable Garden*.

*olitoria*. *Mench*. *Corn Salad*. *Lamb's Lettuce*. *Fettes*. Fig. 2633. An *autumnal annual* herb, the seed of which ripens in April or May, soon falls to the ground, and germinates in August. The plant makes its growth in the fall and flowers the following spring. In cultivation the seed is generally sown in early spring or late summer. The plant forms a dense rosette of spoon-shaped lvs., which grow in a decorative fashion, and has an angular, forked stem bearing small bluish white lvs. in terminal clusters. *Eu., Orient.* The Round-Leaved variety has much shorter lvs. than the common type and they are half-eaten instead of spreading and less prominently veined. This kind is the one grown almost exclusively for the Paris market. The Large-Headed variety is more robust than the common type and the seed is nearly twice as large. Lvs. marked with numerous secondary veins. Much grown in Holland and Germany. The Etonnee variety has very dark-colored lvs., which are often undulate or folded back at the margins. Lvs. narrow, prominently veined, thicker and more fleshy than the other
kinds and specially suited to cold weather and long distance shipment. The cabbaging variety differs from the others in forming a heart or head of fine flavor. Unfortunately it is the least productive type, but it bears shipment well.

eriocarpus, Desv. ITALIAN CORN SALAD. Distinguished from the common species by the lighter color of the lvs., which are slightly hairy and somewhat toothed on the edges towards the base. The plant is native to the south of Europe, where it is highly esteemed because it does not run to seed as quickly in a warm climate. It is undesirable for northern climates.

VALLISNERIA (Antonio Vallisneri, 1661–1736, Italian naturalist). Hydrocharidaceae. About 4 species of aquatic plants, including the well-known Eel-grass or Tape-grass. This is found in fresh water all over the world. It is a submerged plant with linear lvs. 5–6 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-grass is readily collected, or can be procured from dealers in aquarium supplies or from collectors of native plants. The plant is sometimes called “wild celery,” because it is said to impart a celery-like flavor to wild ducks that feed on it. For generic characters, see Lindley’s Manual or Britton and Brown’s Illustrated Flora spiralis, Lind. Eel-grass. Tape Grass. Fig. 2634. Hardly submerged aquatic plant; lvs. thin, linear, preserved, sometimes serrate near the apex: fls. white. Aug., Sept. B. B. 1803. R.B. 20, p. 191. V. 4:137.

WM. TRICKER AND W. M.

VALLOTA (Pierre Vallot, French botanist; wrote an account of the garden of Louis XIII in 1623). Amaryllidaceae. The Scarborough Lily, Valota 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 with over 150 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 only one species and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the flower is longer than in the typical Hippeastrum. It is a house bulb, but it is not easy to grow and must be propagated by means of seeds. The flowers are produced in the fall and are large and showy. 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 plant is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health

Other generic characters: Perianth tube broadly funnel-shaped, 6-lobed, spreading, greenish, convolute; 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 Hippeastrum. The latter is a group of about 20 species of plants with fls. of various colors and naked at the throat. Cyranthus proper and 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 Cyranthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus C. stenophyllus is in the trade now. The best form of Vallota seems to be variety magnifica. For seed information, see Bulba, 1826:241. W. M.

purpurea, Herb. SCARBOROUGH LILY. Fig. 2635. Bulb large; lvs. appearing with the fls., strap-shaped, 1½–2 ft. long, dying down in autumn; peduncle hollow, slightly 2-edged, 2–3 fls. long; fls. scarlet. Gn. 30, p. 245; p. 273. R.H. 1530:54 (F. grandiflora). A.F. 9:211. Gn. 2:361. A.N. 1896:81. The typical form has scapes about 1½ ft. high and blood-red fls. ca. 2 in. across. Var. major, Hort., is 3 ft. high and has fls. over 3 in. across. B.M. 1650 (Amaryllis purpurea). Var. minor, Hort., is smaller than the type in all parts. B.K. 1552 (Amaryllis purpurea, var. minor). Var. eximia, Bull., has fls. 4 in. across, with whitish, feather-like blotches on the base of the perianth-segments. Var. magnifica, Hort., is probably the best and most robust form: fls. 5 in. across, with a white eye. Colors said to be brighter and more uniform than in any other kind. Gn. 30:244. G.C. III. 3:240.

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 Valota is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health

2635. Scarborough Lily — Vallota purpurea. (From a specimen 2 feet high)
VALLOTA

for three or four years without repotting, simply by applying liquid manure to the roots occasionally during the flowering period. Use the greatest care in handling. The care of Vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A Vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance below the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when shifting to a larger pot.

The final potting is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is essential that the potting soil be of a strong, permanent nature and rich in plant-food. A good compost consists of turfy loam, fibrous peat and old cow manure in equal parts. Add a little sand and charcoal. Avoid repotting until it is strictly necessary, and do so only when it is necessary to increase the number of plants or when there is danger of the roots breaking the pot. For amateurs the best time to repot the plants is directly after the flowering period. Use the greatest care in handling the roots. Allow the bulbs to project a little beyond the surface.

Some gardeners prefer to repot Vallota in June or July when root action has started, but before the flower stems have pushed up. Vallota likes full sunshine at all times of the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. Amateurs sometimes raise Vallotas in the window-garden, one bulb in a 6-inch pot with 1 or 2 flower-stalks, but a large specimen is well worth years of care. The Scarborough Lily has been cultivated by rich and poor for over a century. Its popular name is supposed to be derived in the same way as the Guernsey Lily,—a Dutch bark having been wreacked off the coast of England, some bulbs washed ashore and become established as garden plants. Vallota is considerably grown for the London market, and it is said that some growers succeed in blooming their plants twice the same year, in winter and summer. At the Cape, the species is said to be native to peat bogs, which fact would account for the special winter treatment which it needs. In California the plant blooms at various times of the year.

MICHAEL BARKER.

VANCOUVERIA (after Capt. George Vancouver, commander 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 Pacific slope. Shade-loving plants, with slender creeping rootstocks and radical 2-ternate compound lvs. somewhat like maidenhair or rue and rather small white or yellow flowers in an open paniculate raceme. Stems 6, in 2 series, obovate, petal-like, reflexed, soon falling; petals 6, linear - spatulate; stamina 6; follicle oblong, membranous, unequally 2-valved; seeds arillate. Vancouveria demand a rich soil in rather shady positions. They are not showy plants, but have foliage of an elegant and refined type.

A. Lvs. thin, membranous; fls. whitish.

hexandra, Morr. & Deane. About 1 foot high; rootstock woody, slender; lfs. roundish, mostly angulate 3-lobed and coriaceous; scape naked or 1-lved.; panicule simple or loose-branched; fls. white or cream-colored. May, June. Coniferous woods, Brit. Col. to N. Calif. near the coast. Gn. 30, p. 263.

VANDA

1897

AA. Lvs. rather thick; fls. yellow.

chrysandra, Greene (V. hexandra, var. aurea, Rattan). About 1 ft. high; lfs. evergreen, sub-3-lobed, usually whitened and pubescent beneath; inflorescence sub-racemose; fls. somewhat larger than in V. hexandra. 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 well clothed with 2 opposite rows of lvs. Species like V. teres have a loose, straggling habit. Lvs. flat or channelled and keeled or terete, sometimes fleshy and deeply channelled; apex pointed, lobed or toothed; fls. in racemes from the axis of the lvs.; 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 in a house of east and west exposure will be found best suited to the wants of Vandas. The plants require plenty of light and do not need any shade from November until the middle of February. A house of east and west aspect will require less shading during late fall and early spring than one of southern exposure, and there will be fewer ill effects from direct solar heat at all times. From February until November shading will be necessary, but it should never be too heavy or black spot is likely to appear. The winter temperature should range from 60° to 65° F. by night and 70° to 75° by day, with a gradual increase of 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-
vex-surface when dried. 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. trigon 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, can ramble among the foliage and thereby retain moisture a long time after syringing. A few species, such as V. Amesiana, V. corallifera 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 the new 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 suspending the plants with a 20 per cent solution of alcohol.

R. M. Grey.

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| 1. corallifera, Griff. Stem 1-2 ft. high; lvs. 5-7 in. long, deeply channeled, truncate and 2-lobed at the apex: 
| 2. parviflora, Reichb. f. Stem 4-6 in. high; lvs. strap-shaped, 4-8 in. long, unequally obtusely 2-lobed: racemes erect, many-fl.: fls. 1/2 in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum longer than the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-ornicular, obscurely 3-d. | 3. spathulata, Spreng. Stem 2 ft. high; lvs. 2-4 in. long, obtusely 2-lobed; peduncle robust, 12-18 in. tall, few-fld.; fls. 1/4 in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum longer than the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-ornicular, obscurely 3-d. |

| 4. spathulata, Spreng. Stem 2 ft. high; lvs. 2-4 in. long, obtusely 2-lobed; peduncle robust, 12-18 in. tall, few-fld.; fls. 1/4 in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum longer than the sepals, clawed, side lobes very small, broadly ovate, middle lobe sub-ornicular, obscurely 3-d. |

| 5. Buxallii, Reichb. f. (V. lamellata, var. Buxallii, 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 sepals-brown; petals white, with violet sepals which are also found on the sepals, pandurate with large lamellae and square auricles, mostly blue. |

| 6. ceraulea, Griff. Fig. 2636. Stem 1-2 ft. high; lvs. rigid, linear, 6-10 in. long, obliquely truncate and toothed at the tip: raceme 1-4 ft. long; fls. 3-4 in. across, pale blue; lateral sepals obvate; petals broadly ovate, clawed; labellum less than one-third the length of the sepals, dark blue, linear-oblong, side lobes small, rounded, middle lobe with 2 thickened ridges. | 7. Denisoniana, Bux. & Reichb. D. Stem 1-2 ft. high; lvs. linear, 6-10 in. long, obliquely truncate and toothed at the apex: peduncles short, stout, bearing 4-6 fls.; racemes: fls. white, 2 in. across; sepals and petals waved and twisted, the lateral sepals broadly ovate, falcate; petals clamped, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe pandurate, with 2 orbicular, diverging, terminal lobes. |

| 8. Bux. & Reichb. Stem about 1 ft. high, very leafy: lvs. linear, 6-10 in. long, obliquely truncate and toothed at the apex: peduncles short, stout, bearing 4-6 fls.; racemes: fls. white, 2 in. across; sepals and petals waved and twisted, the lateral sepals broadly ovate, falcate; petals clamped, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe pandurate, with 2 orbicular, diverging, terminal lobes. | 9. Denisoniana, Bux. & Reichb. Stem about 1 ft. high, very leafy: lvs. linear, 6-8 in. long, obliquely toothed at the apex: peduncles short, stout, bearing 4-6 fls.; racemes: fls. white, 2 in. across; sepals and petals waved and twisted, the lateral sepals broadly ovate, falcate; petals clamped, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe pandurate, with 2 orbicular, diverging, terminal lobes. | 10. Roxburghii, 10. |


| 15. Amesiana, 10. |
| 17. Veitchii, 10. |

| 19. Cathcartii, 10. |
| 20. Sanderiana, 10. |


12. limbata, Blume. Stem about 3 ft. high; lvs. linear, keeled, 6-8 in. long, unequally bilobed at the apex; racemes 10-12-fl., 6-8 in. long on peduncles of equal length; fls. 2 in. across; sepals and petals spathulate, bright crimson, 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. 6:675.

2638. Vanda teres (detached flower X 1.5).

Marriottiana, Reichb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum white at base, with yellow spots and mauve lines.

14. densiflora, Lindl. (Saccobium giganteum, 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 narrower, 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. illustre, Reichb. f. Raceme and fls. larger; sepals and petals spotted with purple; labellum bright purple. I.H. 31:517.

15. Amesiana, Reichb. f. Stem very short and stout; lvs. flabby, rigid, almost terete, with a groove down the center, 6-12 in. long; raceme simple or branched, erect, 1-2 ft. long and bearing 20-80 fls.; fl. 1½ in. across, white, with rose-colored ridges on the labellum, sepals and petals ovate-oblong; 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. 7:139. J.H. 11, p. 29491; 12, p. 271. A.F. 6:441.

16. Kimballianna, Reichb. f. Fig. 2637. Stem 6 in. high, probably climbing to a great height; lvs. 6-10 in. long, terete, with a deep, narrow furrow; peduncle slender, 6-10 in. long, bearing a drooping raceme 8-10 in. long; fls. 2-3 in. across; petals and dorsal sepal obvate-spatheulate, lateral sepals very much larger, oblong, falcate, all pure white; labellum smaller than the lateral sepals, middle lobe orbicular, notched, rose-purple with darker veins, margin crenate-toothed, lateral lobes small, yellow; spur 1 in. long, curved. Autumn. Burma. B.M. 7:112. Gn. 37:474. R.H. 1897:352. Gt. 45:1428 and p. 338. J.H. 11, p. 41; 29, p. 33. G.C. III. 6:335; 17:69. A.G. 1:1891:89.

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-
1900 VANDA


18. Hookeriánà, Reichb. f. Stem and lvs. terete, as in V. boisé, but the latter only 2-3 in. long, and slender; fls. 3-4 in. across; dorsal sepals and petals white, dotted with purple; lateral sepals narrow, oblong or somewhat obovate, white; labelleum as large as the rest of the flower, side lobes incurved, white or yellow, middle lobe fan-shaped, with 3 large lobes, white, spotted with purple. Sept. Burman. B.M. 30:44. G.R. 42:570. G.C.H. 40:615. — In cultivation the races are usually 2 ft.

19. Cathcarti, Lindl. Stem 1-2 ft; lvs. linear-oblong, 6-8 in. long, unequally bilaterally at the tips; racemes longer than the lvs., 2-4 ft.; 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; labelleum shorter than the sepals; lateral lobes quadrate, incurved, white with red streaks; middle lobes reniform, margin white, slightly crenate, center thick, yellow with a crenate border. Spring. Himalaya. B.M. 58:55. F. S. 12:153. G.R. 15:149. G.R. 35:51; 33; 222; 42; 226. — Found near waterfalls, where it is always kept damp.


HEINRICH HASSELEBERG

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 labelleum, which is freely united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble Vanda, with which they are usually classed for horticultural purposes. Treatment the same as for Vanda.


gigantea, Pfitz. (Vanda gigantea, Lindl.) Stem pendulous; lvs. 1-2 ft. long, thick, flat, obtusely notched; raceme 10-15 in. long, decurved, many-flowered; fls. 3 in. across, golden yellow, blotched with crimson; sepals and petals spathulate-obovate; labelleum white. Burman. B.M. 51:89. F.S. 327. R.H. 1843:290.

HEINRICH HASSELEBERG

VANGUEIRA: Ván Gué, Madagascar name of V. Madagascanica, Lindl. (Vanda tenuifolia, L.) Bland. The Ván Gué 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 aiburciousberry, 6 in. thick, but in Mauritius it becomes 1½ in. thick. It is a globose drupe, shaped 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. J. Bidwell, of Orlando, Fla. In 1887 Van Den man 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.

Vangueria is a genus of 29 species native to tropical parts of Asia and Africa. Shrubs or trees, sometimes spiny or somewhat climbing in habit; lvs. opposite or rarely pseudo-verticillate in axils of leafy branches, 1½-3 ft. long; calyx 5-6 lobed, lobes deciduous or rarely persistent; corolla hairy or not, usually furnished inside with a ring of deflexed pilose hairs; lobes spreading or reflexed; stamens 4-5, rarely 4, or 5, ovary 5-loculed; stigma capitulate; ovolves solitary; fr. drupaceous; pyrenes 5-3 in number or putamen 5-3-loculed.

Madagascariensis, J. F. Gmel. (V. édulis, Vahl.) Glabrous shrub, 10-15 ft. high; lvs. very large, oblong, obtuse or acute, membranous, short-petioled; fls. in copious, peduncled, axillary dichotomous cymes; corolla funnel-shaped, ¾ in. long, with 5 spreading deltoid teeth. Madagascar.

W. M.
VANILLA (Spanish, little sheath or pod). Orchidaceae. Vanilla. Climbing orchids whose branched stems ascend to a height of many feet. The new leafy sheaves or sheaths are in alternate or ventral arrangements. Fls., in axillary racemes or spikes, without an involucre at the top of the ovary; sepals and petals similar, spreading; labellum united with the column, the lip developing the upper portion of the latter; column not winged. About 20 species in the tropics.

The most important species is *V. planifolia*, the Vanilla of commerce. It is a native of Mexico, but is now widely cultivated in the West Indies, Java, Bourbon, Mauritius and other islands of the tropics, its chief requirement being a hot, damp climate. The plants are propagated by cuttings varying in length from 2 to about 12 ft., the longer ones being the more satisfactory. These are either planted in the ground or merely tied to a tree so that they are not in direct connection with the earth. They soon send out aerial roots, by which connection with the soil is established. They are usually trained on trees so that the stems are supported by the forked branches, but pods and trellises are also used as supports. In most places where Vanilla culture is carried on pollinating insects are lacking and the flowers must be pollinated by hand. Plants bear their first fruit about three years after setting. They then continue to fruit for 20 or 40 years, bearing up to 50 pods annually. The Vanilla pods are picked before they are ripe, and dried. The vanilla crystalizes on the outside. For a full description of Vanilla culture and methods of cooking the pods, see Bull. No. 21, U. S. Dept. of Agriculture, Div. of Botany, by S. J. Galbraith. Vanilla is also made from other sources by chemical means. The genus was monographed in 1895 by R. A. Rein in Journ. Linn. Soc., vol. 22.

*planifolia*, Andrews (V. aromatica, Willd. in part). Fig. 2643. Common Vanilla. Vanilla bean (from the pods). Tall climbing herbs with stout stems: lvs., thick, oblong-lanceolate, acuminate, with short, stout pedicels; fls., yellow, large, in axillary racemes of 20 or more blossoms; sepals and petals oblong-lanceolate; labellum trumpet-shaped, with small, reflexed, crenulate lobes. Winter. A native of Mexico but widely cultivated throughout the tropics and in greenhouses. F.M. 7167.


*aromatica*, Sw. Stem angular: lvs. broadly ovate, with a bluntest point, contracted at the base: fls., greenish and white. Jamaica, Colombia, Trinidad.

Heinrich Hassebrink.

VANILLA PLANT. Trilis: odoratissima: see, also, Vanilla, above.

VARIEGATION. This term is usually applied to a class of variations, especially in leaf coloration, in which the leaves become striped, banded, spotted, blotched, etc., with yellow, white, red and various other colors in connection with the normal green of other portions of the leaves. In the case of yellow and white variegation, the term albism is sometimes used, especially when the plants are largely marked with white or yellow, as in Abutilon, yellowish, Pterogonium, Zantedeschia, and variegated forms of Eucalyptus, horridus, Heuchiera, Peas in Victoria and others. Among the dracenas, caladiums and colchiums, beside the white variegation, there are developed beautiful reds, pinks, yellow, etc. As a rule, the term variegation is not used in cases of color variation in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (S. Glaucescens and S. Zeylanica), Aloes, Crinum, Cyanae, and others. Fig. 2641. In many such plants the markings are in part to hairs, scales, or air in the cuticle or epidermal cells, as in Sansevieria and Begonia. In some begonias, many varieties of Calathea (as C. ornata, var. atro-ivinata, etc.), the epidermal cells develop decided and definite color, variation, though the changes do not usually make the chosen body the color body of the leaf, but rather occur in the cuticle. In some genera, however, especially Calathea, we find all gradations between purely epidermal variegation and changes involving the deeper layers of the leaf, as in C. Veitchii and C. Mokoyana. The same is true of many other genera. Different kinds of variegation are shown in Figs. 2640-1.

True variegations may be distinguished from ordinary colorations, bleaching, chlorosis, etc., by the fact that the colored areas are usually quite sharply defined. They do not gradually blend into each other, but have definite boundaries. Cells in the variegated areas are found, as a rule, to contain the same chlorophyll bodies (chromatophores) as the ordinary green cells of the plant. However, in the variegated parts, the green color is not developed, and the chromatophores are often smaller or are somewhat swollen and vacuolated. In the case of chlorosis, due to the lack of iron, or yellowing due to the lack of light, a leaf will quickly develop its normal color if given the proper conditions. This is not the case, however, in variegated leaves. While the intensity of whatever color the chromatophores may have can be varied by light and food, a variegated cell can never be changed by these means to a normal cell. The chlorophyll granules (chromatophores) appear to have lost entirely, in many cases, the power to convert sugar into starch and sugar from the carbonic acid gas in the air, and in other cases this power is greatly reduced. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and they thus store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

White or 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 entirely the power of making chlorophyll. These albiant 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. Needlings 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 albiant parts. In other cases, as in colchiums, 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 dracaenas 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 variations 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 dracaenas, caladiums, codiaeums, 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 the rare cases such transmission certainly takes place. This has been thought to indicate the presence of some micro-organism living either parasitically or symbiotically in the plant, and causing the changes known as variegation.

Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by microorganisms, but is due to a changed condition of the nutrition of the cells. Without going into the details of the matter, it may be said that the condition is characterized physiologically by a marked increase in the oxidation processes in the cells, caused by the presence of an abnormal amount, or an abnormal activity, of oxidizing ferments in the protoplasm. This ferment prevents the movement of food-substances, especially starches and nitrogenous materials. The decrease of the latter is especially marked, and it is probably on account of the lack of sufficient nitrogenous food that the leaves do not develop normally. The young growing buds and dividing cells require highly organized albuminous foods. They do not require, to any extent, during the process of growth and cell division, 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 excessive, the use of 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 how such changes could be transmitted by budding and grafting, 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 of many other plants, especially the potato, tomato, nasturtium, etc. In fact, it appears that a plant is likely to show variegation whenever it is so treated that the growing buds or the forming leaves, 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

2041. Kinds of variegation. Sansevieria above and Caladium below.
VIGOR

The vigor of the plants is 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 leaves with variegated characters, especially a lack of elaborated nitrogen; rapid growth in very moist soil; severe injury to the roots during a period of rapid growth of the upper parts of the plant; severe cutting back, etc.

Though started at first through the influence of environment, variegation, when of value horticulturally, has in many cases been increased and fixed by selection till it becomes almost a specific character in some groups of plants.

Autumnal Coloration.—A word might be said in this connection regarding autumn coloration. The production of autumnal coloration, as is well known, is in part to the gradual destruction of the chlorophyll when the leaves have reached maturity and approach the period of death, and in part to the action of acids on anthocyanin as described below. Many of the destructive changes which take place in the chlorophyll are oxidation processes, the same as occur in the cells of highly colored variegated plants, and physiologically they are not very different from the changes occurring in Calathea, Caladium, Codium, etc. The approach of maturity in the leaf, and the coming on of cool weather in autumn, stimulates the production of oxidizing ferments, and the action of these and the acids of the cell-sap upon the chlorophyll, or color contents of the leaves, especially the chlorophyll and anthocyanin, causes many of the brilliant colors of autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while autumn foliage.

In practically all deciduous trees, bushes, etc., before the maturing and falling of the leaves, all of the valuable food materials, such as sugars, albuminoids, etc., pass from the leaves through the vascular bundles into the twigs and branches so that they are not lost to the plant. When the leaves finally fall they are therefore nothing but more skeletons, containing waste materials. In the passage, especially of albuminoid materials, from the leaves to the stems, it is necessary that the material be changed 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 chloromeron, known as anthocyanin, is present in such cases, and develops beautiful reds when the cell-sap is acid. blue when no acids are present, and violet when there is only slight acidity. This, in connection with the disorganizing effect of the frost, 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 anthocyanin is developed as a protection to the albuminoid materials traveling to the young cells. Such protective colorations have to be distinctly separated from variegation. In the case of variegated leaves, during the winter, the chlorophyll granules are protected by the development of anthocyanin, forming a brownish or reddish tinge in the cell-sap. This is especially prominent in many evergreens.

While, as stated above, these protective and in some cases transitory colorations should be clearly distinguished from variegation, it is an interesting fact that they may be used in gardens to advantage. There is a condition for fruit that these unfavorable, and may in many cases be produced in maturing leaves by startling the plants or permitting them to become sufficiently dry to check growth.

\[ \text{VASES} \]

Vases. Such vases as are shown in Fig. 2642 are common features of formal gardening. All matters concerning their manufacture or beauty are clearly outside the province of this work, but every gardener who purchases such a vase is interested in certain practical horticultural features of its construction. It is imperative that the vase have a hole at the bottom for drainage, otherwise the soil will become sour. It is desirable that the rim of a vase be rounded, as a sharp edge cuts the vines that trail over it and are swayed by the passing wind. Many of the old-fashioned stone vases 4 or 5 ft. high were made with a bowl too shallow for the good of the plants. Vases are generally stationed in conspicuous positions near buildings, where they receive daily attention from all, including the gardener. It is necessary to water the plants early every morning during hot weather, and it is therefore desirable to have the water supply available near at hand. A watering cart is often used in taking care of vases. Vases are often placed in the sunniest situations, but they can also be used in partially shaded spots. The north side of a building in a shady place sheltered from the high winds small palms may be used in vases, together with Rex begonias and Pandanus fitchi.

The plants used in vases should be of a firm texture, and resistant to drought, dust and occasional high winds. Canna, ferns and foliage plants that are likely to be cut or whipped by the winds are necessarily excluded. The first thought should be given to a center-piece. This should usually be a plant of such a rather stiff, formal or architectural nature. Cordon figs and C. australis are excellent for the purpose. They should stand well above the other plants. Around the edges vines are used, especially periwinkles, green and variegated, nasturtiums and Senecio cineraria. Another choice plant for this purpose is Helichrysum

2642. Stone flower vase 4 or 5 feet high, used in formal gardening.
petiolatum, known to gardeners as Gnaphalium lanatum. This is an “everlasting” plant which is not truly a vine; it does not flower in vases but is valued for its evergreen and pendulous habit. Between the center piece and the rim of drooping vines are used such standard plants of medium height as geraniums, dusty millers, petunias and the common bedding mums. Lobelia, Frenesia, coleus, and the hybrid geraniums are also useful plants for vases.

These may vary from 6 to 8 inches in depth. It should be a strong, solid compost, about 3 parts of loam to one of manure. If the bowl seems too shallow and becomes filled with roots add a top-dressing of dry compost, 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 maintain the “Greensward” plan, during the stormy winter 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 in Amhurst and New Haven, and in the gathering artists and for all who are laboring in the cause of culture and changing policies of municipal governments, the life-work of Calvert Vaux is a shining example.

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 once made him the darling of the young artists, and for all public-spirited citizens in America who are laboring in the cause of culture and changing policies of municipal governments, the life-work of Calvert Vaux is a shining example.

W. M.

VEGETABLE FIRE-CRACKER. See Brevoortia Phila. 

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 an obituary notice by Wm. A. Stiles 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 of young artists and for all who are laboring in the cause of culture and changing policies of municipal governments, the life-work of Calvert Vaux is a shining example.
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 plots. Now the tendency is towards the development of what is called market-gardening. It is for profit. The custom of growing crops in small plots and among the houses is giving place to the large market gardens in the city. The most recent published statistics of vegetable-gardening show that the investment in commercial markets was over $100,000,000,000. 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 freights and commissions, the establishments brought to their owners more than $75,000,000,000.

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 productivity 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 development of transportation facilities has made this enterprise possible. The southern Mississippi valley region is also developing a large vegetable-garden- ing 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, 1900. 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 $100,000,000,000. 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 freights and commissions, the establishments brought to their owners more than $75,000,000,000.

2643. Onion-growing on flat lands in southern New York, the houses being the homes of the workmen.
den were placed between the farm buildings and the
outlying parts of the farm, the cultivator could be run
between the rows when going and coming. In this way
nearly all finger-work could be avoided and a greater
quantity and better quality of vegetables could be
secured. Compare Figs. 1526, 2645.

Vegetable-gardeners are usually large users of stable
manure. Near the large cities the manure is bought in
reason for

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 pros-
culated on rented lands; therefore it may not
be profitable to invest in such permanent
structures as forcing-houses. The first cost
of hotbeds is also less than that of forcing-
houses, and this is often a very important
item. Fig. 2646. For management of glass
structures, see Hotbeds, Greenhouse, Forcing.
There are great numbers of insect and
fungous pests that attack the vegetable-gar-
den crops. General remarks under Insects,
Fungi, Insecticides, Fungicides and Spray-
ing will apply to these difficulties. The spray
pump has now come to be a necessary ad-
 junct 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

car-load lots, and it is used every year. The reason for
this is the necessity of improving the physical texture
of the soil so that it will be loose, open and mellow, be
early or “quick,” and hold an abundant supply of mois-
ture. In intensive vegetable-gardening there is no
"resting" of the land and no green crops to be plowed
under. The vegetable matter, therefore, has to be sup-
plied almost entirely by barn manures. In the larger
and less intensive vegetable-growing farther removed
from large cities, general agricultural practices can be
employed to better advantage, such as rotation and
green-manuring. Vegetable-gardeners generally use
largely, also, of concentrated fertilizers. These mate-
rials may be employed for either or both of two pur-
poses: to start off the plants quickly in the spring, or to
add plant food for the sustenance of the plants during the
entire growing season. Ordinarily the former use is the
more important in vegetable-gardening, since it is neces-
sary that the plants start quickly in order that early
crops may be secured. Many times fertilizer is used in
amounts far in excess of the
needs of the plant in more plant-
food, in order to give the plants
a strong and vigorous start and
thereby enable them to make
the most of themselves. If the
plants are not well established
when hot and dry weather comes
there is likely to be lit-
tle profit in them.

In intensive vegetable-gardening it is important to start
many of the crops under glass and to transplant the young
plants to the open as soon as
settled weather comes. This is
particularly true of tomatoes,
very early lettuce, sweet pota-
toes, egg plants, peppers and
the early crops of celery, cabb-
age and cauliflower. In
the northern states muskmelons
and sometimes watermelons
and cucumbers are started un-
der glass, being grown in pots,
boxes or upon inverted sods,
whereby they are more readily
transferred to the open. For-
merly the plants were started
under hotbed or coldframe
structures, but of late years
there has been a great increase
in the extent of glass houses

next year in the manure. Even the club-root of cabbage
can be starved out in a few years if cabbages or related
plants are not grown on the area. Any treatment that
conduces to the general vigor and well-being of the plant
also tends to overcome the injuries by insects and fungi.

In its best development vegetable-gardening is essen-
tially an intensive cultivation of the land. Often it is
conducted on property that is too high-priced for ordi-
nary farming. Land that demands a rent on one thou-
sand dollars an acre is often used for vegetable-gardens
with profit. There is also intense competition near the
large cities. These circumstances force the gardener to
utilize his land to the utmost. Therefore, he must keep
the land under crop every day in the year when it is
possible for plants to live or grow. This results in va-
cious systems of double-cropping and companion-crop-
ing, whereby two or more crops are grown on the land
the same season or even at the same time. Market-
gardening is usually a business that demands enter-
prise, close attention to details and much physical labor.
If, with his knowledge of vegetable-growing, the gardener combines good business and executive ability, and an intimate knowledge of market conditions, he should be able, however, to make it a profitable and attractive business. Although the returns are likely to be large, the returns are direct and quick. Fig. 2644.

There is a large literature devoted to vegetable-growing, although the greater part of it applies chiefly to amateur or home-growing. Leading current books on the general subject of vegetable-growing are those by Greiner, Green, Henderson, Robinson, Landreth and F. W. R. California one should consult Wickersham's "California Vegetables in Garden and Field," and for the Atlantic south, Roll'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 work is Fearing Burr's "Field and Garden Vegetables of America," Boston, 1863, and the abridgment of it in 1866, called "Garden Vegetables and How to Cultivate Them." A full list of the American vegetable-gardening literature may be found in Bailey's "Principles of Vegetable-Gardening" (1901).

Persons who desire a cyclopedic account of vegetables should consult Vilmorin's "Les Plantes Potagères," the first edition of which is published in London as "The Vegetable Garden." L. H. B.

Vegetable-Growing in California. It is an interesting fact that though California's horticultural prominence 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 standards, but the statements were so fully authenticated that many were drawn to California by the prospect of horticultural pioneer work. However, soon found that immigrants from Asia and the Mediterranean region, by their cheap living 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 Asians and South Europeans are thriving on it. There has been a reflection of the same disfavor upon fruits and other crops 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 vegetables, which would be cheaper and inexpressibly better than canned or transported supplies.

Fortunately there are indications that this state of affairs is changing. The upsurge during the last decade of large-scale operations for external shipment and for cannery seems to have clothed the plant-cultures involved in this trade with new dignity and importance which is attractive to American growers. Cabbage, cauliflower, broccoli, and lettuce for eastern shipment, peas and asparagus for canning and for shipment, tomatoes for canning, etc., have all become large special crops, while some other plants, like Lima beans, which are chiefly grown in gardens elsewhere, have become field crops in California covering very large acreage. Such enterprises attract American citizens and are changing the popular conception of the dignity and opportunity of vegetable-growing. Although this influence has been less as of the extent of the product, may be had in the statistics of the year 1900. In that year there were shipped out of the state by rail and sea 31,400 tons of green vegetables. The product of canned vegetables in 1899 was: tomatoes, 583,061 cases; peas, 25,666 cases; asparagus, 105,881 cases; beans and other vegetables, 38,523 cases. Nearly all the vegetables included in the above trade are of the higher classes, potatoes and onions only moving in considerable quantities when exceptionally high prices prevail in the East. In addition to the foregoing there is the bean shipment to eastern markets, which reached a total of 73,150,000 pounds in 1895, but has been less each year since then because of partial drought in the chief bean districts.

California conditions affecting vegetable-growing are wide and various. Nowhere else perhaps is it more essential that certain things should be done just at the right time and in the right way. If these requirements are fairly met the product is large and fine; if they are neglected the failure is sharp and complete. This fact has given rise to the impression that California is a hard place to grow vegetables, which is not true unless one lacks local knowledge or the nerve to apply it. One of the chief causes of failure is in following seasons and methods which have yielded success under conditions prevailing in the states east of the Sierra Nevada mountains. If one begins garden-making in the spring, the plants do not secure deep rootage, which is necessary to carry them to success in the dry season, and the garden is likely to be a disappointment. If, on the other hand, all the hardier vegetables are sown in succession from September until February or March, there will be continuous produce through the winter and into the early summer. The chief shipments of vegetables from California are made during the late fall and winter and are taken right from the ground to the cars without protection or storage. Tender vegetables, like corn, beans, tomatoes, etc., can, however, be grown in the winter only in a few frostless places. They must either be pushed to a finish in the fall or sown early in the spring and carried into the dry summer as far as necessary either by natural moist land or by irrigation. There are, however, a few localities where tomatoes will fruit early in the spring from fall plantings, and peppers will live through the winter and bear a second season's crop on the old plants.

The possession of an irrigation supply is the secret of...
full satisfaction in California vegetable-growing, but a small amount 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 not, however, that the garden can be done without irrigation by beginning at the opening of the rainy season in September, growing the harder vegetables while moisture is ample even on the drier lands during the late fall and winter, and keeping the lower lands well plowed and cultivated to prevent evaporation until the tender vegetables can be trusted in the open air, and continuing cultivation assiduously afterwards so that moisture can be retained as long as possible for them. That this is thoroughly practicable is seen in the fact that the large Lima bean product is 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 winter growth is made by rainfall, summer growth can be had on the same land by irrigation. In this way irrigation is almost desirably 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 winter months; the tender plants in spring and summer. Of course the adjustment of all these means to desired ends requires good perception and prompt action, and explains why those who have been accustomed to plant at a fixed date and do little but cut weeds afterwards may find it hard to get freedom from diseases which thrive in a humid atmosphere and in an exceedingly long growing season.

Local adaptations for different vegetables are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to 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; asparagus and 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 local soil, exposure and climate are chief considerations.

There is prospect of great increase in all the vegetable products of California. Fresh and dried vegetables enter largely into ocean traffic with distant Pacific ports. Interisland trade is constantly increasing and cannery vegetables are contracted in advance to European distributors as well as to dealers in all the Americas.

E. J. WICKSON.

VEGETABLE MARROW. See page 1733.


VEITHIA (James Veitch, of Chelsea, famous English nurseryman). Palmaceae. About 4 species of palmate palms native to the Fiji Islands and New Hebrides. The genus belongs to that portion of the Arecn tribe characterized by a pachial ovule which is more or less pendulous and fls. spirally disposed in the branches of the spadix, and is distinguished from Hedyscepe and allied genera by the following characters: sepals of the male fls. chartaceous, connate at base: female fls. much larger, ovary on a peduncle. It is supposed that the species is now in cultivation. V. Joannis, H. Wendt., was cult. in the early-eighties. The leaf segments have a wide and rather shallow notch at the apex and are oblique. The sheath is dark red color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales. Fr. 2¼ x ½ in., ovoid, ellipsoid, orange, with a red base. G. C. H. 26:295. R. B. 1893, p. 344. It has been conjectured that Kongting Van Houttia, advertised in 1880 by American dealers may be a species of Veithia.

VELTHIUM (after the Count of Veltheim, 1741-1801, Hanoverian promoter of botany). Lilidaceae. Three species of tender bulbs native to South Africa with dense clusters of pendulous, tubular flowers ½ in. long, resembling those of the Poker Plant (Kniphofia), though not in color. The plants grow about 1½ ft. high and have long, slender, bright green leaves. The 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: perennial, anther pentagonal and persistent; tube long, cylindrical; segments 8, very short, ovate; stamens inserted in the tube; anthers divide iridescently; ovules 2, collateral, placed near the middle of the locules; capsule large, membranous, top-shaped, acutely 3-corned, loculically 3-valved. These plants have a large tunicked bulb 2½ in. thick. The genus is monographed in Flora Capensis, vol. 6. For culture, see Bulbs.

a. Lvs. green, 2½ in. broad.

viridibibon. Jacq. Lvs. oblong-lorate, very-margined, finely toothed about 1 ft. long, 1½ ft. wide, the motley coloration becoming eminently desirable in securing all-the-year growth, which cannot be had by rainfall. With very dense, 3½ in. long, 25-30-fl.; frs. 1½-1½ in. long, yellow or reddish, with greenish tips. L.B.C. 13:1245. B.M. 501 (Aletris Capensis).

b. Lvs. glaucous, ½ in. broad.

glaucis, Jacq. Lvs. obovate-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 SUMACK. Rhus Cotinus.

VENIDUM (name not explained by its author). Compositae. The plant listed in one of the largest American catalogues of flower seeds as V. ciliatulatum is so little known in America that the following account of it as a garden plant is adapted from Gn. 21, 1862. It is a graceful single-flowered composite which flourishes under the ordinary treatment accorded half-hardy annuals, making a compact, rounded mass 2½ ft. high and 3 ft. wide, clothed with leaves and flowers from May to October. The flowers are tubular, 3½-in., in a terminal capitulum, often 2 or 3 in. across. The flowers and seeds are red as regularly as when on the plant. This species has also been treated as a greenhouse perennial, continuing to bloom until near midwinter. The flower heads are fully 2 in. across. Venidum is a genus of 18 species of South African herbs, 7 of which are annual, the others perennial. Generic characters: rays female; receptacle honeycombed, mostly naked, involucral scales in several rows, the outer narrower and ligulate, the inner broader, glabrous, dorsally 2-3-winged or ridged, the lateral ridges indented, the medial straight, narrower; no hairs from the base of the scales; pappus either none or of 4 or 8 very minute, membranous scales. Monographed in Flora Capensis, vol. 3 (1864-65).

decumbens, Less. Diffuse, canescen perennial, 1½ ft. long; lvs. mostly lyrate, the terminal lobe ovate or roundish, sinuate-lobe or repand, at first cobwebbed, glabrous and rather acute above, white-tinged beneath; petiole 2½-in. long, amply eared at base, the ear decurrent along the stem.
VENIDIUM

Var. calendulaceum, Harvey (V. calendulaceum, Less.), differs in having the petioles not caved at the base or with only a small ear. R.H. ISoT p. 123. Win. 21, p. 405. — Opinions differ as to its merits. Some consider it coarse and weedy.

W. M.

VENTILATION. See Greenhouse Management, p. 694.

VENUS' FLY-TRAP. Dionaea muscipula

VENUS' LOOKING-GLASS. Specularia Speculum

VENUS' or VENICE SUMACH. Cohnus

VENUSIS. See Toddalia.

VEERATRUM (ancient name of Hellebore) Lindlceir

False 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; stamens 6, attached at the base of the segments: capsule ovoid, 3-lobed, 3-loculed: seeds flat, broadly winged.

Veeras are striking foliage plants, of easy culture in moist shady positions. In the open sunlight or in dry ground the foliage is liable to burn and decay prematurely. They may be propagated by division or seeds.

a. Fls. whitish or greenish.

b. Perianth-segments crisped dentate.


Viride, Linn. AMERICAN WHITE HELLEBORE. Indian Poke. Fig. 2647. A hardy perennial, 2-7 ft. high: rootstock 2-3 in. long: Ivs. plicate, acute, the lower oval, about 1 ft. long; the upper gradually smaller: Fls. yellowish green; segments oblong or oblanceolate, ciliate, serrulate: pedicels 1-3 lines long. July. North America. B.B. 1:408. B.M. 109G (Helonias viride).

Californicum, Durand. Stem very stout, 3-7 ft. high: Ivs. ovate-acute, the upper ones lanceolate but rarely acuminate: perianth-segments broader than in V. viride, obtuse, whitish with a greener base. Colo. and Wyo. to N. Calif. and Ore. — Int. 1883 by Pringle and Horsford. The long panicle of whitish, bell-shaped, drooping Fls. is followed by ornamental fruits or capsules.

aa. Fls. blackish purple.


J. B. Keller and F. W. Barclay.

2647. False Hellebore—Veratrum viride

Showing the handsome foliage of early spring when the leaves are about a foot high.

VERBASCUM (old Latin name of the Mullein 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 Mullein (V. Thapsus) is everywhere known and despised in America, the popularity of the genus in English wild gardens is highly surprising. Over 30 kinds are cultivated, and some of them have been pictured many times. A little study of the group shows how much pleasure can be missed by any one who persists in one point of view. The English farmer has no dread of the Mullein. The Mullein is actually a favorite border plant in England, especially for the back row and for shrubberies. One connoisseur after growing many kinds of Verbascums discarded them all except the common species. The plant probably came to America from England, certainly from Europe, but not long ago it was sold in England under the name of "American Velvet Plant." The "Soldierly Mullein" has often been praised by Ameri-
smaller than in *V. phlomoides*. The plant has the disadvantage of being sensitive to wetness, its soft, woolly lvs. damping off in wet situations over winter. *V. phlomoides*, though less popular than the preceding, is probably the best of all the yellow-flowered species.

It has the advantage over *V. Olympicum* of being a true biennial of easier culture with larger fls. and a longer season of bloom, 8–10 weeks, and even then if cut half way down it will throw out lateral bloom in late autumn.

Generic description: biennial herbs, rarely perennial or suffrutescent, more or less woolly; racemes or spikes terminal, simple or branched; pedicels clustered or solitary; calyx 5-sect or 5-parted; corolla with almost no tube, rotate, rarely concave, with 5 broad lobes; stamens 5, adnate at base of corolla; style entire; ovules numerous; capsule globose or ovoid or oblong. DC. Prod., vol. 10. Boissier *Flora Orientalis*, vol. 4. Garden 27, p. 172; 41, p. 553.


1. **Thapsus**, Linn. **Common Mullein**. *Fig. 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.B. 3:413. Ga., 28, p. 145.—Natural varieties have been observed with pale yellow and white fls. and hybrids with *V. sinuatum*, *Lychnitis*, nigricum, etc. Other variations are: inflorescence dense or lax, simple or branched; fls. large or small; wool dense or loose; filaments glabrous or pilose. The following European trade names are said to be referable to this species: *V. conica*, *Linniari*, *Chamaesium*, *Schweineri*, and *Thapsis*, all nearly synonyms: *V. collinum*, *Lamottii*, *Thapsis-tuberosa*, and *Thapsis-nigrum*.


4. **longifolium**, Ten. (*V. pamnusum*, Vis. & Pane.). Italian species known by its very long root-lvs., long interrupted racemes which are somewhat branched, the lower clusters of fls. spicate.

5. **crassifolium**, Hoffm. & Link. Spanish plant, with long-decurrent lvs., spicate raceme, clustered lvs., flattened corolla and glabrous filaments.—One of the few species that thrives in a light, sandy soil.

6. **densiflora**, 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. glabrum*, Pers., represents its glabrous and sticky-pilose variations. Cosmopolite.

9. **Blattaria**, Linn. **Moth Mullein**. *Blattaria* is from blattar, cockroach, which the plant is said to repel. Plant is frequented by moths, whence popular name. Native of Europe and N. Asia; naturalized in America. One of the few green-leaved Verbascums, distinguished from *V. virgatum* by solitary pedicels. Fls. rarely white.

10. **nivum**, Ten. Imperfectly known Italian species with white wool, very dense raceme of solitary, subsessile fls. and a 5-parted woody calyx having ovate lobes.

12. phoenicinum, Linn. (V. terrigenum, And.,) FR. Planta regularis aedem desirable species, being practically the only purple-fld. species in cultivation and parent of nearly all varieties and hybrids having shades of purple, violet, rose, pink and lilac. The white-fld. forms are rare. It is a native of Greece, Syria, and Asia. The name phoenicinum was doubtless suggested by the Phoenician purple and not by the nativity of the plant. The species grows about 5 ft. high, and is one of the few green species, the lvs. being nearly glabrous or only pubescent. Lvs. ovate: fls. long-stalked, solitary, about 1 in. across, which open poorly in sunshine, preferring damp weather. The species should, therefore, be placed where only the morning and evening sun strike the flowers. L.B.C. 7:637. Gn. 22, p. 377; 27:481: 46, p. 519. A.G. 1892:630.— Var. cupreum. Benth. (V. cupreum, Sims), is a garden hy-

13. mirrum, Linn. A common European species, with several nearly glabrous above, long white-woolly beneath. It is a native of Greece, Syria, and Asia. The name mirrum was doubtless suggested by the Phoenician purple and not by the nativity of the plant. The species grows about 5 ft. high, and is one of the few green species, the lvs. being nearly glabrous or only pubescent. Lvs. ovate: fls. long-stalked, solitary, about 1 in. across, which open poorly in sunshine, preferring damp weather. The species should, therefore, be placed where only the morning and evening sun strike the flowers. L.B.C. 7:637. Gn. 22, p. 377; 27:481: 46, p. 519. A.G. 1892:630.— Var. sinatum. Linn. Mediterranean species 2-3 ft. high, with sinuate-pinnatifid root-lvs., divericate, pyramidal panicles and lax, remote, many-fld. clusters. The flowers are inclined to rose or purple rather than to scarlet,

14. pyramidatum, Bieb. Tall and beautiful species, with doubly crenate lvs. nearly glabrous above, pyramidal, cuneate paniculate, violet-woolly and a very distinct calyx. Caucasus.

15. pyramidatum, Bieb. Tall and beautiful species, with doubly crenate lvs. nearly glabrous above, pyramidal, cuneate paniculate, violet-woolly and a very distinct calyx. Caucasus.

16. rubiginosum, Waldst. & Kit. Stem glabrous or pubescent above: lvs. green, crenate; racemes lax, branched: pedicels 2-3, rarely solitary, twice or many times as long as the calyx. It is a native of Greece, Syria, and Asia. The name rubiginosum was doubtless suggested by the Phoenician purple and not by the nativity of the plant. The species grows about 5 ft. high, and is one of the few green species, the lvs. being nearly glabrous or only pubescent. Lvs. ovate: fls. 1 in. across, filaments 1-2 nut-white. The gar-

17. Olympicum, Boiss. Tall Grecian species, 3-5 ft. white-woolly: lvs. tomentose on both sides: panicles with a few very long, erect branches: clusters many-fld.: fls. 1 in. across, filaments white-woolly. The gar-


19. Châixii, Vill. (V. orientâle, Bieb.) Lvs. green or tomentose beneath, crenate, lower ones cuneate at base, truncate or incised; racemes paniculât: filaments purple-woolly. V. vreule of the trade belongs under V. ni-

20. VERBENA

21. VERBENA

22. VERBENA

23. VERBENA
VERBENA was doubtless used in hybridizing, but its distinctive characters are now practically obliterated in the forms of *V. hybrida*.

*Verbena tenerrima* is a species of strikingly different characters from the three preceding and one which has exerted a 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 jasamine fragrance, its recurved, coarsely-crenate, sessile leaves, and its stiff upright habit of growth. The characters of *V. tenerrima* are apparent in many forms of our *V. hybrida*, notably so in many of the blue "enlatas." Of the four species thus far mentioned, *V. tenerrima* 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. tenerrima* and *V. Abelia* 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. tenerrima* 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. chamadryfolia* provided one of the richest scarlet natures, *V. abelii* and *V. tenerrima* provided various tints of rose and purple. *V. tenerrima* gave white with a rather elusive suggestion of yellow. *V. chamadryfolia* was of prostrate habit; *V. tenerrima* was stiff and upright; the other two species were intermediate. *V. tenerrima* was possessed of a rich perfume. Early Period of Hybridizing and Selection, 1838-1858. 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. tenerrima*, 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 1838 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 1853 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, 1845-1860. The Verbena was fast winning favor as one of the most popular of bedding plants. It has its history as an exhibition plant begun about 1830 and reached its zenith in 1856, 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 1846, 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, 1860-1870. 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 caprices
admiration of flower-lovers. A host of showy-flowered and zonal pelargoniums were offered to the public. Henderson says that in 1870 he sold 20,000 pelargoniums and that in 1875 he sold 100,000. In many hybridizing arrangements the Verbena was wholly superseded by the pelargonium. The tuberous-rooted begonias and Phlox Drummondii likewise contributed to the neglect of the Verbena, the latter of the two largely superseding an exhibition plant. In the west of England, however, the Verbena continued to be used to a slight extent as an exhibition plant up to 1889.

(2) About this time (1870) the Verbena was best with unusually destructive insects and diseases. Those 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 generally, but the reward was sufficient compensation for the required vigilance. It is probable that the highly artificial conditions and "coiling" to which the Verbena was subjected during the winter, as well as any other artificial conditions, 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, toward the evolution of a more of "compactas" and by the fixing of the various colors so that they will come true from seed, the Verbena has gained a new lease on present and future popularity.

The form and size of the individual flowers 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 Verbenae hybridae the individual flowers are irregular, the upper lobes of the corolla being narrow, large vacant spaces occurring between the lobes, and the flowers are relatively small. V. chamadryfolia is the most irregular, V. incisa and V. teucridioides 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 the flower-cluster of V. chamadryfolia was likewise considerable portions of the space were unoccupied, very defective, from the florist's standpoint, in that giving to his eye a ragged, "fluffy," toward which he constantly selected, this conception doubtless changed from decade to decade, while in V. teucridioides the flowers were unsatisfactorily scattered along a sparse spike. The Verbena fancier soon established in his mind an ideal of "clear," and "trues," toward which he constantly selected. This conception doubtless changed from decade to decade, but the essential features remained fairly constant. This ideal type is admirably exemplified in Fig. 2650, which is a reproduction of an apparently idealized lithograph of 1872. The individual flowers are over an inch in diameter, the lobes are geometrically symmetrical and fill the space perfectly, but do not crowd. The flower-cluster is of graceful, oblate-oval form, with no unoccupied spaces and yet not overcrowded.

Though the Verbena breeder probably never completely realized the ideal flower and cluster, this idea has had a most significant influence. The greatest progress in improving the size and form of the individual flower and of the flower-cluster was made during the fifties and sixties, especially during the period in which the Verbena was used as an exhibition plant. This is quite natural, because exhibition plants are seen at close range, and the English gardeners of this period were very fond of large flowers. On the other hand, some high degrees of symmetry is not sought in flowers used for bedding and for borders. They are seen at greater distances. Abundance of bloom and depth of color are of great importance. It is probable that the best Verbena of to-day would hardly come up to the standard of those grown by the English gardeners of 1866 if judged by formal symmetry.
Blues and Purples. — It seems that different shades of purple were occasionally represented in the wild forms of *V. incisa* and *phlogiflora*; however, there were no distinctly blue-ones, and in the early history of the Verbena there is a dearth of blue varieties. We find in the Florist of 1854, that "Bluebeard" is "really blue" and that "a good blue has long been wanted, most of the so-called blues being of a blue-purple color." Subsequent to the fifties the number of blue varieties recorded in lists appreciably increase, but they by no means equal the reds, being little if at all in excess of the number of whites. Our best blues of to-day (for example Blue Boy) are of a deep, royal purple (per Ridgeway's color plates) rather than really blue. A great variety of tones and shades of purple are represented. In the blue varieties which the writer has grown, especially the ones from European seed, there has been a striking resemblance to *V. tenerridae* in foliage, pubescence, habit of growth, etc. They also resemble this species in having many that are very fragrant.

Yellow. — A good yellow has been the dream of many a Verbena lover, but it is doubtful whether the dream will ever be fully realized. Gartenborn of 1890 reports *V. hybridas lutens*, but it is not common and the yellow is dim. Gartenborn of 1890 reports that *V. tenerridae lutens*, Vilm., was produced from *V. tenerridae*, that it is "bright yellow," and that it will be "joyfully received by Verbena lovers."

### The Striped Varieties.

Two classes of so-called striped Verbenas have arisen: one sort having the median portion of each lobe of the corolla of a dark color, usually red or rose, and the previous to 1849, 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 with 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 of Italian Verbenas were 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 derivatives in part of *V. tenerridae*. Surely the foliage of the Italian varieties portrayed in Flora des Serres and of striped varieties now grown shows no "pinnatifid lacinial" foliage of *V. tenerridae*. Neither has the undersigned been able to find any evidence of the anther appendages of *V. tenerridae*. However, it is impossible to determine with certainty the parentage of hybrids on structural characters alone. The true explanation may be that the *V. punctella* which is said to have been used, was not *V. tenerridae*, Spreng., but some form of *V. hybridas*, Hort. The striped varieties are unstable and have a strong tendency to revert to "selfs," whether propagated by seed or by cuttings. In the writer's own experience, a seedling with blue and white striped corolla reverted in four generations of cuttings, so that some of the plants produced only flowers that were solid blue; others, flowers 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 Variegation (yellow foliage).

Comparatively little attention has been given to leaf variation among the Verbenas. However, a number of varieties having leaves variegated with yellow were introduced about 1865, during the period when variegated plants were so popular. At present we have a strain of yellowish leaved Verbenas which come true to this character from seed.

### Development of the Compactas.

Early in the history of the Verbenas their "straggling and uncontrollable" habit of growth was lamented. Considerable pegging was necessary in order to keep the plants in any desired position and repeated efforts were made to secure bedding varieties of closer, more upright habit. Considerable progress was made by British florists during the sixties. Most of the progress, however, has been made subsequent to 1870 and the German Verbena 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 Verbena again to popularity. Compactas have been fixed and repeated efforts have been made to secure they will come true from seed. In most botanical characters they resemble *V. chamerionfolia* and *phlogiflora*.

### Development of Treatment as Annuals. Seed Fizing.

When the Verbenas were first introduced they were...
VERBENA

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 1880, 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 aphids. Soon efforts were made to fix strains that would come true to color and habit from seed. This has been most successfully accomplished, and the Verbena is gaining much of its popularity through treatment as an annual. Seeds are sown in March. The plants are hardened off in a coldframe and set out in the latter part of May. They flower profusely from June to October. Striped varieties are not easily fixed.

**Summary of Present Horticultural Types**

(_V._ *hybrida*).—It is impossible to satisfactorily classify the hybrid garden Verbenas according to their botanical derivation. They are conveniently classed according to color of flowers into: (1) Selfs, or one-colored varieties; (2) Ocellated, or eye-colored varieties; and (3) Italians, or striped varieties. As to habit they may be divided into: (1) Standards, those of the ordinary loose, spreading growth; and (2) Compacts, which are much reduced in stature and of more compacted form. Verbenas now in cult. are shown in Figs. 2652-4.

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A. Connective of the upper anther not appended.
B. Clusters not panicked.

**Proto-types of the Garden Verbenas**

(F. *hybrida_, Hert., Fig. 2652).

C. Fls. scarlet

**cc.** Fls. rose or purple.

D. Clusters annual to oblong:

**cc.** Fls. white or violet.

E. Clusters paniculata.

**cc.** Clusters panicked.

**cc.** Clusters paniculata with anthers furnished with a gladioloid appendage.

**cc.** Fls. violet or rose-purple.

**cc.** Bracts half as long as calyxes

**cc.** Bracts about as long as calyxes or a little shorter; plant annual

**cc.** Les. twice bipinnatifida

**cc.** Les. once bipinnatifida 9. _Aubletia_

1. _chamädryfolia_, Juss. (V. _melindroïdes_, Gill. _V. melindroïdes_, Cham.). Fig. 2649. Characterized by red or violet fls. in oblong or oval clusters; resembles No. 1, but has more upright habit, softer pubescence and larger, longer-pointed, distinctly petioled lvs. Stems ascending; branches rather erect, much subdivided, angled, retrorsely hirsute; lvs. oblong or lanceolate-triangular, acute, base entire, cuneately long-attenuate into the evident petiole, unequally subincised saccate, somewhat venosely rugose, stigmate above, below hairy or strigillose pubescent; spikes terminal, pedunculate, many-fl., oval to oblong:

2. _phlogiflorâ_, Cham. (V. _Tevediâna_, Niven). Fig. 2649. Characterized by red or purple fls. in oblong or oval clusters; resembles No. 1, but has more upright habit, softer pubescence and larger, longer-pointed, distinctly petioled lvs. Stems ascending; branches rather erect, much subdivided, angled, retrorsely hirsute; lvs. oblong or lanceolate-triangular, acute, base entire, cuneately long-attenuate into the evident petiole, unequally subincised saccate, somewhat venosely rugose, stigmate above, below hairy or strigillose pubescent; spikes terminal, pedunculate, many-fl., oval to oblong:
bracts short-ovate to subulate-lanceolate; calyx twice as long as bracts, covered with short pubescence interspersed with short capitate glandular hairs. Southern Brazil and Uruguay. B. M. 341. P. M. 415. B. 2651.

3. incisa, Hook. Fig. 2649. Rose or purple-flowered species with lvs. more deeply cut than in the two preceding. Whole plant hairy-pubescent; stems ascending; branches ciliate; lvs. oblong-triangular, base cuneately truncate or subcordately attenuate into the evident petiole; pinnatifid, lobed or deeply serrate and incised, upper lvs. subdeltate, sessile, incisely pinnatifid; spikes terminal, pedunculate, subternate, flat or convex; bracts ovate; calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs; corolla-tube glandular-pubescent, three as long as calyx; limb large, rose-purple, paler beneath, ovate lobes deeply emarginate. Southern Brazil, Paraguay and northern Argentine Republic. B. M. 3628.

4. teucrioides, Gill. & Hook. Figs. 2649, 2553. Characterized by fragrant white fls. in very long clusters. Stems cespitose, rooting at base, ascending, terete, margins revolute, veiny-rugose, glandular-pubescent above, submentosely hispidulous on veins below; spikes terminal, solitary, glabrous, hairy, lax, 5-9 in. long; bracts subulate-lanceolate, ciliate; calyx nerved, twice as long as bracts; corolla yellowish white or pink, long exserted, twisting in age, fragrant. Southern Brazil, Uruguay, Argentinian Republic, Chile and Peru. B. M. 3541. B.M. 2654.

5. venosa, Gill. & Hook. Fig. 2654. Differs from all other cultivated kinds by panicled inflorescence and tuberous roots. Herbaceous perennial. 1 foot high; stems simple, ruiz-matic, creeping at base, ascending, 4-angled, hairy; lvs. rich, oblong to oblong-lanceolate, the sub-acute base entire and half-clasping, acute at apex, unequally subincised dentate, the teeth openly acuminate, nerves prominent, hirsute below; spikes in a close terminal panicle, subternate, lateral ones pedunculate, fasciiglate 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, three as long as calyx: fr. 1-2 in. long, seeds round, ovate or in outline, bipinnately parted or 3-parted into numerous oblong, rather acute lobes 1-3 lines broad: spikes solitary, dense to rather lax, at first capitate, becoming 2-4 in. long in fr.: corolla 5-8 lines long, purple or lilac, limb 4-5 lines broad, lobes emarginate to obovate; throat of corolla provided with a piloscle of short hairs; upper stamens bearing each a small oval to oblong purplish gland. Texas to Nebr. and Col.—Flowers become bluish purple in drying.

2653. Verbenae teucrioides, as cultivated to this day (X 14).

The spike elongates still further.

2654. Young plant of Verbena venosa, too young to show the characteristic panicled arrangement of clusters (X 1/5).

2655. Verbena Aubletia (X 3/4).

...3-sided, their margins winged or not; pappus of 2 (1-3) awns, sometimes with 2 or 3 intermediate scales.

...tropical species shrubby, with alternate or opposite, yellow fls. %-! in. across in flattish clusters.

...of the hardy border. It is doubtless of the easiest culture. It blooms from Aug. to Oct., and has numerous 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.

...yellow-fld. autumn-blooming composites is so great that Verbesinas have little chance. The following species is

...there is not one important fruit or vegetable crop of the temperate zone, not even excepting apricots and peaches, which cannot be grown to perfection here.

...non-development of Vermont's horticultural resources is the fact that the possibilities are not appreciated by many landowners. Vermont farmers are extremely conservative and slow to make a change in their methods of farming, so that the signal success of the few experimenters who have taken up fruit growing has made little impression on the many who are still busy making butter and growing hay, potatoes, and little patches of grain.

...The home markets for fruit and vegetables are unusually good. Strawberries are eagerly called for, but less than 12½ cents a quart, and the average price for good fruit is probably nearer 15 cents. Blackberries usually bring 10 cents and raspberries 10-12½ cents. Cherries are hardly to be bought, though sour cherries thrive and cherry pie is popular. The price for cherries is always $1 to $1.50 a bushel. Good vegetables sell equally well. With such favorable markets, supported by numerous small manufacturing villages and a large summer border, horticultural industries certainly ought to thrive.

...The horticultural regions of Vermont are, roughly, three. The first and most important is the Champlain valley district, including several large islands in Lake Champlain. This region reaches off toward Montreal on the north; and the general character of its horticulture is much like that in the St. Lawrence valley between Montreal and Lake Ontario. Winter apples are the most important crop in this section. The second region lies in the southwestern part of the state and belongs to the upper Hudson valley. It is largely neglected, as it is when attended, but they are seldom cared for. Greater success is secured with small fruits, the growing of which is greatly encouraged by the large annual immigration. The third region comprises the valley of the Connecticut. It is the least developed of the three, horticulturally. The reason for this fact is not plain. Soil and climate are admirably adapted to all sorts of fruits. Every pear, apple, and plum is a success in orchards. The few men who are growing plums, cherries, strawberries, etc., are proving every year that the Connecticut valley in Vermont is equally as much a fruit region as any other.

...The apple crop offers the single semi exception to the statement that Vermont has no horticultural reputation at home. There are a few commercial apple orchards in the Champlain valley which grow as fine apples and yield as handsome cash profits as any orchards in America. Grand Isle county, made up of land lying in Lake Champlain, has the principal reputation for apples. The best orchards and the best orchardists are found there; but Addison county ships about double the quantity of apples.

...The varieties of apples grown for market are principally Greening, Spy, Baldwin and Fanumise. Next to these come McIntosh, King, Ben Davis, Spitzenburgh, Seek-no-further and Arctic. A few old orchards contain many of the old-time favorites, such as Fall Harvest, Dutch Mignonne, Gilpin, Grimes Golden, and the like. But such collections are few and uncherished.

...The modern commercial varieties are the only ones in representation. Vermont has had some experience with the Russian varieties. In fact, Dr. T. H. Hoskins, of Newport, on the northern boundary of the state, has been one of the most famous experimenters with the Russian importations. Nevertheless, the Russian varieties have made small impression on the pomology of the state.

...Plums are grown just enough to prove that they will succeed admirably. Lombard, Green Gage, Brathshaw, the Damsons and other old-fashioned sorts still retain the preference of conservative Vermonters, though other growers are planting chiefly of the Japanese varieties, especially Burbank and Abundance. In the northern and mountain towns only the Americana and Nigra types are hardy enough; but even these are seldom grown.

...Seek-no-further and Arctic. A few old orchards contain many of the old-time favorites, such as Fall Harvest, Dutch Mignonne, Gilpin, Grimes Golden, and the like. But such collections are few and uncherished.

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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, salami and parsnips. Those which cannot be grown, or which, as a rule, unsuccessfuily, 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, greenhouses are operated 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. Waugh.

**Vernonia** (after Wm. Vernon, an English botanist who traveled in North America). *Compositae*. **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 hardly 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; involucre of dry or partly herbaceous, much-imbricated bracts; corolla regularly 5-cleft into narrow lobes; akenes mostly 10-costate, with a truncate apex and a cartilaginous, callous base; pappus double (at least in American species). Vernonia are of easy culture in any good, rich border, being easily propagated by division.

**A. Heads 50-70-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-flowered.**

**Lindheimeri**, Gray & Engelm. Stem excessively leafy up to the inflorescence; lvs. 1½-3 in. long by 1-2 lines wide, with revolute margins; fls. in a corymbiform cyme. July-Sept. Rocky hills, W. Texas.

**c. Plant about 1 ft. high.**

**Lettmani**, Engelm. Stem festucently and cymosely much branched at the summit; lvs. 2-4 in. long, only 1 line wide, margins not revolute; fls.-heads numerous, ½ in. long, 10-14-fld. July-Sept. Sandy soil, Arkansas.

**bb. Lvs. not narrowly linear.**

**Vernonias, Willd.** Fig. 2657. Stem 3-6 ft.; lvs. oblong to oblanceolate, 3-9 in. long; heads in an open cyme; involucre 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.**

**Baldwini**, Torr. Stem 2-5 ft. high; lvs. lanceolate to ovate-lanceolate, 4-8 in. long; bracts greenish acule 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.**

**altissima**, Nutt. Stem 5-10 ft. high; lvs. vein, lanceolate or lanceolate-oblong, 4-12 in. long; bracts obtuse or merely mucronate-11ipped, closely appressed. July-Sept. Western Pa. to Ill. La. and Fla. B. B. 3:303.

**e. Lvs. thickish.**

**fasciculata**, Michx. Stem 2-5 ft. high; lvs. somewhat obscurely veined, linear to oblanceolate, 3-6 in. long; heads numerous and crowded on the branches of the cyme; bracts obtuse or some of the upper mucronate-acute, closely appressed. July-Sept. Ohio and Ky. to the Dakotas and south to Texas. B. B. 3:303.

P. W. Barclay.

2656. Outline of Vermont.

2657. Isolated specimen clump of Ironweed—Vernonia Noveboracensis.
VERONICA (after St. Veronica). Scrophulariaceae. Speedwells. The Speedwells are mostly herbs, with a few exotic shrubs, best known by their usually long racemes of small blue flowers. About 200 species, mostly in the northern hemisphere, a few species in the tropics and southern hemisphere, and in New Zealand they are a dominant feature of the country. Plants in cultivation are mostly hardy at the North, usually low-growing and occasionally prostrate. Lvs. opposite, rarely verticillate or alternate; fls. in axillary or terminal racemes and bracted; calyx 4-5-parted; corolla usually blue, rarely pink or white, wheel-shaped or saucer-shaped, the lateral lobes or the lowest one commonly narrower than the others; stamens 2, exerted, one on each side of the upper lobe of the corolla; style entire, subapiculate: capsule flattened, obtuse or notched at apex, 2-furrowed: seeds few or many.

All are showy, free-flowering plants, used, except the shrubs, as garden perennials or annuals, and are propagated by seeds, the perennials also by division, the shrubs by cuttings in spring or summer. They succeed in any good garden soil in a sunny situation. The lower-growing forms are good rock-plants; the taller are adapted to the herbaceous border. The 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 received in The Garden 43, p. 506, and 26, p. 292. Some of them have enjoyed a considerable popularity in England, where they are generally seen in cool conservatories, but they survive the winter 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, sCONDITIONS, and elliptica. His work was continued by others, and most of the hybrid Veronicas of to-day have the parentage above indicated, with the blood of V. speciosa generally much in evidence. If a collective name for Veroncia hybrids is desired, V. speciosa var. hybridica is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but a hardier race will probably be secured by using V. Traversii and its allies, which have been introduced more recently. Some of these are V. Colensoi, Rakieenis, anoma, monticola and pinseleoides,—all unknown to the American trade. A third and still harderier group of the New Zealand Speedwells is the truly alpine group known as Whippoorwill Veronicas. These should be quite hardy in northern rockeries. They are unknown in America now. The best of the group is said to be V. capensis, var. variabilis, known to English trade as V. salicoides. Others in cultivation are V. Hectori, Armatogia, and Lysicarpus.

Veronica was monographed by Bentham in Latin in DC. Prod. 10:458-491 (1846), 158 species being then known. An excellent account of cultivated Veronicas is found in Vilmorin’s Blumengartnerie.

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A. Plants shrubby, all from New Zealand and all with opposite leaves; tender in the North.
B. Margin of lvs. coarsely serrate.... 1. Hulkeana
BB. Margin of lvs. entire.
C. Poira of lvs. erect.
D. Racemes subterminal... 2. Traversii

VERONICA 1919

DD. Racemes axillary............. 3. elliptica
CC. Pairs of lvs. rather distant... 4. speciosa
DD. Height 3-6 ft.; lvs. I-1½ in. wide.
EE. Calyx 4-parted
EE. Calyx twice as long as calyx
EE. Calyx about three times as long as calyx

AA. Plants hardly herbs.
B. Duration annual.
C. Height a foot or less; lvs. blue.
D. Racemes axillary
DD. Racemes terminal
DD. Height less than 15 ft., or more; lvs. I-3 ft. wide.
EE. Calyx 4-parted
EE. Calyx nearly glabrous: lvs. large, dentate.
EE. Calyx capitate: lvs. small, entire
EE. Calyx large, finely serrate or crenate
EE. Calyx very small

CC. Lvs. usually opposite, occasionally alternate.
D. Racemes terminal.
E. Habit creeping; plants 3-12 in. high.
F. Capsule roundish or broader than long.
G. Apex of capsule not notched.... 12. gentianoides
GG. Apex of capsule deeply notched

EE. Habit upright; plants stronger growing and taller.
F. Foliose and stem whitish

FF. Foliage and stem whitish

GG. The racemes many-fid.

H. Racemes paniculated... 16. spuria
HH. Racemes solitary or few.

I. Lvs. lanceolate... 17. longifolia
II. Lvs. ovate-oblong... 18. spicata

DD. Racemes axillary.
E. Habit low and creeping.
F. Lvs. narrow.
FF. Lvs. broader.

GG. Apex of capsule strongly obtuse

H. Fls. pale blue

II. Apices of capsule deeply notched

EE. Habit taller, more vigorous.
F. Calyx 5-parted.

GG. Calyx 6-parted.

H. Lvs. more or less dentate

II. Plants of erect growth

GG. Lvs. deeply pinnatifid, 25. Austriaca

1. Hulkeana, F. Mueller. Showy lilac-flåd, species readily distinguished by its serrate lvs. and terminal racemes. Slender, erect, sparingly leafy, straggling shrub, 1-3 ft. high, with branching stems: lvs. 1-1¾ 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, lilac: capsule small, longer than broad, twice exceeding the sepals. Summer. Mts. and rocky places, New Zealand. B.M. 5484.


Var. *imperialis*, Ronchierlat (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. *Hudsonsonii* 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. *Hud-sonsonii* and V. *subessilis* are said to be synonymous, but this is a gross error.


7. *Busbaumii*, Tenore. Prostrate annual, with elongated slender pubescent stems, the lower branching and-peduncled: lvs. ovate, sub-dentate, coarsely crenate-serrate, pubescent, slightly petioiled, ¼ in. long, the lower opposite, the upper alternate and similar: racemes axillary: fls. small, blue, scattering, on long peduncles: calyx long, spur 1½ in. long, very widely notched, exceeded by the sepals. Aprili-Sept. Fields, middle and S. Europe, Asia and natural-ized in N. Amer. F. 1846, p. 112.


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, sub- sessile, elliptic or oblong, entire or dentate, subacute: capsules, of varying size, the lowest-small, orbicular: ra-ceme short, spiciform, dense: fls. small, blue or violet: capsule 1¼ in. long, oblong, longer than broad, hairy. Growing on the tops of mountains in cold and wet regions and alpine and arctic regions in America. B.M. 2976.—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. obo-vate or oblong, some lanceolate or linear, thickish enti- ral or entire small, create, smooth, 1½–3 in. long; root-lvs. more or less in rosettes; upper lvs. bract-like, narrow and narrower: raceme elongated, leafy, many-fl.: hairy: fls. pale blue, with darker streaks on long pedicels: capsule nearly round, slightly notched, exceeding the calyx. Wet alpine fields. S. Bohemia, with other species, a hardy species in any soil or location, shade-enduring though not necessarily shade-loving, blooming early. May. Forests of Carpathia. 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. *candidum*, Hort.). Hoary Speed- well. Strong, upright or ascending, with lvs. nearly sessile, plant 12–18 in. high, with many sterile matted branches and fewer fertile erect branchlets: lvs. opposite, acute, lower oblong, upper lanceolate, 1–3 in. long, white-to-moment: racemes erect, numerous, 3–6 in. long, many, blue, short-pedicelled, capsule longer than broad, thick, exceeding the woolly calyx. July–Sept. Fields and mountain regions. N. Asia, and southeastern 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 cut, the lower pinnate with spreading or erect racemes; the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fl.; fls. blue. June-July. Open mountain lands, Russia.

16. **spuria**, Linn. (1. paniculata, Linn. 1. awethyris, Wuth.). Bastard Speedwell. Upright, slender, densely pubescent species 2 ft. high: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrate-crenate toward the apex, entire below, smooth, narrowed at the base, thickish: racemes numerous, panicled, long, densely many-fl.; fls. blue, pedicled: capsule nearly round, thick, exceeding the sepals. May, June. Woods, southeastern Eu. and southern Russian Asia.—Becomes weedy late in the season. Var. *elegans*, Voss. Lvs. pubescent on both sides: habit much branched and more slender than the type. A form with variegated lvs. and flesh-colored fls. is known to the trade as *V. elegans* var. *rugosa* Poir.

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, spiciform, dense: fls. lilac, 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 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, acute, the pubescence of the spines of the spike longer and fls. larger than of the type and of an intense lustrous blue. Aug.-Oct. Japan. B.M. 6407. R.H. 1881:270. G.C. II. 16:788. A good border plant and considered the best Speedwell. Best in deep, rich soil in an open position.


Var. *villosa* (V. *villosa*, Schrad. V. *crumblozo*, Hoffm.). A Siberian form with narrower lvs. than the type and large blue fls. Lvs. serrate or doubly notched or incised.

18. **spicata**, Linn. Assembling or erect, slender stems 2-4 ft. high, growing from a short creeping, almost woody rootstock: lvs. lanceolate, lance-oblong or the lower ovate, opposite or verticillate, crenate, downy, 1½-2 in. long, thick: racemes long, upright, densely many-fl.; fls. small, dark blue or sometimes blue with a white center; capsules large, longer than broad, notched, pubescent, thick, exceeding the sepals. May, June. Dry, shady hills. July-Sept.-Suitable to dry spots in a rock-garden. Grows in almost any soil and position.

19. **circumdies**, G. Don. Low, trailing perennial, growing in a dense mass: lvs. lanceolate, crenate toward the apex, smooth, dark green, numerous: racemes many, 6 in. high: lvs. 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.


21. **officinalis**, Linn. Common Speedwell. *Flcellen*. Ground-Herb: Prostrate, leafy native with a pubescent stem rooting at the nodes, slender, 6-18 in. long: lvs. elliptic, oblong or broadly oblong, ¾-1 in. long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fl.; fls. pale blue, rarely pink, sessile: capsule broader than long, wedge-shaped, broadly notched, hairy, exceeding the hairy sepals. May-July. Forests and mountains of Eu. and N. Amer.—Grows under trees and in shade where no grass will grow, covering the ground with a permanent sod. Spreads rapidly and is easily grown. Prop. by cuttings.

22. **pectinata**, Linn. Scallop-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, sessile, pubescent, ½ in. long: racemes elongated, many-fl.: lower bracts like lvs.; fls. deep blue with a white center: capsule large, longer than broad, notched, pubescent, thick, exceeding the sepals. May, June. Dry, shady hills. July-Sept.—Suitable to dry spots in a rock-garden. Grows in almost any soil and position.


24. **Tencium**, Linn. Hungarian Speedwell. Saw-leaved Speedwell. Stems produced from rhizomes, the sterile prostrate, the floral ascending or erect, white-pubescent, 1 ft. high: lvs. lanceolate or oblong, crenate, sometimes somewhat pinnate, sessile: racemes several, elongated: fls. large, blue, numerous: capsule longer than broad, slightly notched, thick, exceeding the sepals. June. Middle and S. Eu. and Middle Asia.—*V. prostrata*, Linn., formerly considered a separate species by reason of its narrow lvs. and prostrate sterile stems, is connected with *V. Tencium* by intermediate forms. *V. prostrata* is still used in the trade for a plant with light blue fls. B.M. 3683 (*V. prostrata* var. *satureolata*).
VERONICA

25. Austriaca, Linn. Strong, upright perennial 18-24 in. high, leaves, mostly deeply pinnatifid, rarely entire or dentate, 2 1/2 in. long, linear to ovate, the lobes linear or suboblong, narrow at the base; racemes elongated, loosely many-fl., spreading; fls. large, blue and white, the petals obtuse, long peduncled, 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 writers on palms, viz. Caudex, Caudata, latifolius, bright green, 60-80 ft. high, while F. acerifolium hardly reaches 5 ft. The most decorative in fruit are V. Opulus, dentatum, and Weightii, with scarlet or red berries which remain a long time on the branches. Besides the Snowball forms, V. dilatatum, tomentosum, Nieboldi, prunifolium, radicula, and Opulus, are very handsome in bloom. Varieties with all the flowers of the cymes sterile and enlarged are known in the case of Opultis, 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 aequidens being especially brilliant. V. dilatata and philibriticum assume a dull yellow color. V. macrocephalum and Nieboldi keep their 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. aequidens, Lantana, dilatatum, Timia, pubescens and prunifolium, grow well in drier places, while V. nitidum and pauciflorum require shade and a porous soil of constant moisture. V. aequidens does well under the shade of trees in rocky and rather dry soil. V. Timia is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not in-}

VERONICA

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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 about as big as oranges and pure white. They are негоed. 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.

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VIBURNUM

1. Sieboldi, Miq. Fig. 2661. Deciduous shrub, attaining 10 ft., with stout branches; pubescent when young; lvs. ovate to oblong-obovate, coarsely crenate-serrate except toward the base, acute, dark green and shining above, paler and subpubescent beneath, 1-4 in. long; lvs. white, rotate-campanulate, in panicles 2½-4 in. broad; fr. oblong, changing from pink to bluish black. May, June. Japan. G.F. 2:559.-Hardy shrub of vigorous growth with handsome dark green foliage, large for the genus; exhausting a disagreeable odor when bruised. The fruits drop soon after ripening. It is known in some nurseries as V. Japonicum, V. latifolium or V. Japonicum latifolium. Var. reticulatum, Rehd. (V. reticulatum, Hort.). Smaller in every part.

2. Sandankwa, Hassk. (V. suspensum, Hort.). Evergreen shrub, attaining 6 ft., with slender branches: lvs. ovate to oblong-obovate, acute or obtuse, usually remotely crenate-serrate toward the apex, shining and dark green above, paler beneath, glabrous, 2-4 in. long; lvs. white, tinged pink; in dense oblong-obovate panicles becoming ½ in. high; corolla ½ in. long, with cylindrical tube twice as long as limb: fr. red, subglobose. June, July. Lostooch Is. B.M. 6172.-Tender.

3. odoratissimum, Ker. (V. odoratissimum, Hort.). Evergreen upright shrub, attaining 10 ft., with stout warty branches, glabrous; lvs. elliptic to elliptic-oblong, acute, remotely serrate toward the apex or entire, shining and bright green above, paler beneath, glabrous, 3-6 in. long; lvs. pure white, fragrant, in broadly pyramidal panicles 4 in. high; corolla rotate-campanulate; fr. red, changing to black. May, June. India to S. China and Japan. B.R. 6:426.-Tender.

4. Thun., Linn. (V. thunbergii, Hort.). Thunbergia ferox, Borkh. L. thunbergiana (thunbergiana, Hort.). Busby, 10 ft., with glabrous or somewhat hairy branches; lvs. ovate-oblong or oblong, acute, dark green, shining and glabrous above, pubescent beneath usually of the veins, 2-3 in. long; lvs. white or pinkish white, slightly fragrant; cymes somewhat convex, 2-3 in. broad; fr. ovoid, black, rather dry. May-Aug., or in the greenhouse in early spring and winter. B.M. 38.-Handsome free-flowering shrub, often cult as a pot-plant north. Var. Fruebii, Nichols. Compact form with light green lvs. and purplish white fls. Var. hirtum, Hort. Lvs. pubescent beneath and ciliate. Var. Incidum, Ait. (V. incidum, Mill. V. grandiflorum, Hort.). Lvs. and cymes larger, more tender and not adapted for forcing, Gu. 15, p. 196. Var. Pumpyrum, Hort. Lvs. suffused with a dull purple tinge. Var. strictum, Loud. not Ait. Of erect and fastigate habit. Var. Virgatum, Ait. Lvs. oblong-lanceolate, pubescent on the margin and on the veins beneath. Var. variegatum, Hort.


6. obovatum, Watt. (V. levis, Hort.). Shrub, attaining 8 ft., with spreading branches: lvs. almost sessile, subjected to oblong, obtuse or retuse, somewhat concave, glossy, entire or obscurely crenate toward the apex, ½-1½ in. long; lvs. white, in sessile cymes 1-2 in. broad; fr. ovate, black. April-June. Va. to Fla. L.B.C. 15:1186.-Tender.


8. cassinooides, Linn. (V. nudum, var. cassinooides, Torr. & Gray. V. aquamatum, Willd.). White Rod. Appalachian Tea. Upright shrub, 2-6, occasionally 12 ft. high; lvs. oval to ovate to oblong, acute or bluntly acuminate, usually obscurely dentate, almost glabrous, rather thick, dull green above, 1-3 in. long; lfs. and fr. almost like those of the preceding species, but peduncle shorter, usually shorter than cyne; blooming a little earlier. June, July. New York and Minn., south to N. C. G.F. 9:365. Em. 2:411 (as V.,...
9. Lentago, Linn. SHEEP-BERRY. NANNY-BERRY. Fig. 2662. Shrub or small tree, attaining 30 ft., with slender branches: winter-buds long-pointed; petals mostly with wavy margin; lvs. ovate, acuminate, glabrous or scutate beneath, 2-4 in. long; fs. white; cymes sessile, 2-5 in. broad; fr. oval, blue-black, with bloom. May, June. Hudson Bay to Manitoba, south to (a) and Miss. S.S. 1:223, 224. — Hardy, large, often arborose shrubs, occurring at shrub height until 2 feet tall. Fruits ripen late. There are times as V. prunifolium and V. rufidul- tum in gardens. A garden hybrid, originated in Germany, is V. 'Felder,' Zabel (V. Lentago × V. nudum), similar in habit to this species but the cymes on short peduncles over 1/2 in. long.

10. rufidul- tum, Raf. (V. prunifolium, var. nervosum, Torr. & Gray. V. ferrugineum and V. rufidul-tosum, Small). Large shrub or small tree, attaining 25 ft., with rather stout branches: winter-buds narrowly oblong, obtuse, rusty-pubescent; petals often with narrow margin, rusty tomentose; lvs. elliptic to obovate, usually obtuse, glabrous and shining above, pubescent beneath, 2-4 in. long; fs. pure white; cymes 3-5 in. broad; fr. oval, dark blue, glaucous, 1/2 in. long. April-June, later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 1:225 (as V. prunifolium, partly).—Handsome arborose shrub with dark green foliage, showy fs. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.

11. prunifolium, Linn. (V. prunifolium, Poir.). BLACK HAW. SNAZZ. Shrub or small tree, attaining 15 ft., with spreading, rather stout branches: winter-buds short-pointed, glabrous or reddish, pubescent; lvs. broadly oval to ovate, acute or obtuse, glabrous or nearly so, 1-3 in. long; petals often with narrow margin, glabrous: fs. pure white; cymes 3-5 in. broad; fr. oval to subglobose, bluish and glaucous, little over 1/2 in. long. April-June. Conn. to Fla., west to Mich. and Tex. A.F. 12:1160. G. C. 5:310.


13. alnifolium, Marsh. (V. lanatoloides, Michx.). HORSE-BUSH. AMERICAN WAYFARING TREE. Low shrub, sometimes 10 ft. high, with wide-spreading, often pro- cumbent branches, scurfy-pubescent when young; lvs. orbicular or broadly ovate, cordate at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous above, scurfy-pubescent beneath, 2-4 in. long; fs. white, in pubescent cymes, 3-5 in. across, with the marginal lvs. sterile and long-pedicelled; fr. ovoid-oblong, dark purple. May, June. New Brunswick and Mich. to N. C.—Handsome shrub, with very large lvs., assuming a deep claret-red in fall.

14. Lentana, Linn. WAYFARING TREE. Upright shrub or sometimes small tree, attaining 20 ft.: young branches scurfy-pubescent: lvs. ovate or oblong-ovate, usually cordate at base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, dentate, 2-4 in. long; fs. white; cymes dense, 2-3 in. broad, with usually 7 rays; fr. ovoid-oblong, bright red, changing to almost black. May, June. Eu., W. Asia. A. G. 18:453 and F. E. 9:593 (as V. tana).—Hardy shrub, especially for drier situations and limestone soil. Var. rugosum, Hort. With larger and very wrinkled lvs. and larger cymes. There are a number of other vars., including some with variegated leaves.

15. cotinifolium, D. Don (V. multratum, C. Koch). Shrub, attaining 6 ft., with spreading branches, tomentose when young; lvs. orbicular-ovate to ovate, cordate or almost entire, wrinkled above and nearly glabrous at length, tomentose beneath, 2-5 in. long: fs. white, tinged with pink, in cymes 2-3 in. broad, with slender branches; winter-buds long, pubescent, tube longer than limbs; fr. ovoid-oblong, red, changing to black. May, June. Northwest Himalayas. B. R. 19:1650. G. F. 5:245.—Not quite hardy north, requiring protection near Boston.


20. phlebococcus, Sieb. & Zucc. Upright shrub, attaining 5 ft., with glabrous branches: lvs. ovate to oblong, acuminate, dentate except at the base, glabrous above, with long-appressed hairs on the veins beneath, 2-3 in. long; fls. white, with purple calyx, mostly slender pedicelled and nodding, in few-flowered long-peduncled cymes: fr. globose. May, June, 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 on the axils of the veins beneath, 1½-3 in. long; fls. in long-peduncled glabrous cymes, 2-3 in. broad: fr. sub-globose, blue-black, glaucous. May, June, New Brunswick to Minn., south to Ga. G.F. 10:332. Em 2:411.— Handsome shrub, thriving best in moist soil. V. latifolium of some nurseries, not Alt., has somewhat larger lvs. and seems to bloom later.

22. mollis, Michx. (V. sabulatum, Champl. V. nepalense, Hort.). Similar to the preceding, but branches, cymes, and under side of lvs. stellate-pubescent: lvs. larger, with stouter petioles, dark green: pedicels stouter: teeth of calyx more prominent: fr. large and more pointed: blooms 2-3 weeks later. Mass. to Fl. and Tex. G.F. 4:30.— Handsomer than the preceding on account of its larger darker green foliage and more robust habit. In gardens sometimes confused with V. pubescens and sometimes found under the erroneous name of V. latifolium. See supplementary list.

23. Demestrionis, Deane & Benth. Shrub, attaining 12 ft.: lvs. orbicular or broadly ovate, acute, shortly acuminate, coarsely dentate, pubescent beneath or almost glabrous, 2½-4½ in. long; cymes long-peduncled, puberulous, about 2½ in. broad: fr. oblong, almost ½ in. long. Mo. B.B. 3:251.


25. erosum, Thunb. Upright shrub, attaining 6 ft., with slender, much-forked branches: lvs. oblong-ovate or obovate, narrowed toward the base, acuminate, dentate-serrate, pubescent beneath at least on the veins, 2-3½ in. long; cymes 2½-3 in. broad, rather loose, long-peduncled: stamens little or not exceeding the corolla: fr. subglobose, red. May, Japan, China. G.F. 9:85.

26. aceratifolium, 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

2644. Viburnum Opulus (× 1/4).

Single form of the common Snowball as it grows in the wild.

27. pauciflorum, Raf. Straggling shrub, attaining 5 ft.; Ivs. 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 Mt. 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. (F. Americana, Mill. F. trilobum, Marsh. F. opulus, Mühl. F. degli, Pursh. F. Ozycoccus, Pursh.). CRANE-BERRY-BUSH. High Craneberry. Figs. 2664, 2665. Shrub, attaining 12 ft., with rather smooth light gray branches and stems; Ivs. broadly ovate, 3-lobed, with coarsely dentate-serrate, acuminate lobes, pubescent or almost glabrous beneath, 2-4 in. long; fls. white, in peduncled cymes, 3-4 in. broad; fr. subglobose to oval, scarlet. May, June. New Brunswick to Brit. Col., south to N. J. and Ore., also in Eu. and 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. stellare, DC. (F. riverinum, and radiceum, Hort.). GUDELDER ROSE. SNOW-BALL. Fig. 2666. All fls. sterile, forming large, globose heads. Gm. 1:9. Gn. 56, p. 83.—This is a very showy var., but it lacks the decorative fruits. There are also variegated forms of the type and of the sterile variety. The American Cranberry-bush is considered by some botanists a distinct species under the name F. Americana, Mill., but differs little from the European form, chiefly by the more vigorous growth, by the petioles having a shallow rather broad channel and small glands, and by the shorter peduncles and shorter stamens.

29. Sargentii, Koehne. Similar to the preceding, of more upright, denser habit; bark of stems darker, fissured and somewhat corky, young branchlets with prominent lenticels; Ivs. of thicker texture, pubescent or glabrous beneath, the upper Ivs. with much elongated and usually entire middle lobe and small, short, spreading lateral lobes; petioles with large glands; sterile fls. larger, sometimes to 1½ in. across; anthers purple; fr. globose, in usually upright cymes. N. China, Japan.

—Introduced under the name Viburnum Opulus from Peking. Under this name it does not seem to fruit as profusely as V. Opulus.

V. Buergerianum, Herb. & Regel (V. Burejaenum, Herb.). Similar to V. Laniana. Ivs. narrower toward the base, cymes with 5 rays; fr. pinkish or yellowish. May, June. New Siberia, Amurland, Gt. 11:1314.—F. cardiculatum, Wall. Similar to V. sinifolium, but cymes without radiant fls.; Ivs. narrow: blooming before the Ivs. Himalayas.—V. Dukhuricum, Pall. Shrub, attaining 6 ft.; Ivs. broadly ovate to oval, 1½-2½ in. fls. funniform, in short, small panicul.: fr. finally black. Dalur to W. China.


ALFRED REIDER.

VICIA (classical Latin name). Vetch. Tare. More than 100 species of herbs, mostly climbing, with pinnate foliage, closely allied to Lathyrus, Plum and Lens, but differing in minute floral characters: wings adhering to the keel; style very slender, with beards or hairs all around the upper part or only at the apex; pod flat, 2-many-seeded, 2-valved and dehiscent, the seeds either globular or flatish; stamens diadelphous (9 and 1). Flowers mostly blue or violet, sometimes yellowish or white. The Vicias 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 Vicias are weedy or insignificant looking plants, but a few are grown for the bright flowers, others of late for green-manure crops (see Cover-Crops), and one (V. Faba) is a garden bean. The species are mostly cool-season plants of easy culture.

The interest in the Vetches in this country is mostly for their value as soil covers and for foliage. V. sativa and V. villosa are the important species here at present.

2665. Fruits of Viburnum Opulus (× 1/4).
A. Plant stiff and erect, usually bearing no tendrils, cultivated for the beans (Fabæ).

Faba, Linn. (Fabæ vulgaris, Moench. F. sativa, Rothl.). Broad 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 dry summers prevent its cultivation in most parts of the U.S. It is grown successfully in parts of Canada, particularly in the maritime provinces. The plant is grown mostly for cattle-feeding, although the beans may be used, both full grown and immature, for human food. This bean has been cult. from prehistoric times and its nativity is in doubt. The plant is hardy and seeds should be sown early, when the season is cool.

A. Plant weak, usually climbing by means of tendrils that represent leaflets.

B. Fls. about 2 in the axils, sessile or nearly so.

sativa, Linn. String Vetch or Tare. Annual or biennial, not surviving the winter in the North, more or less pubescent, 2-6 ft. high: fls. 5-7 pairs or less, elliptic, oblong or oblanceolate, mostly truncate and apiculate at the top, the tendril part of the leaf extended: fls. usually 2 in each axil, about 1 in. long, purplish; pods 2-3 in. long when mature. Eu., and naturalized in some parts of the U.S. — 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

BB. Fls. several to many in peduncled clusters.

1. Blossoms small and usually not very showy, mostly bluish, in loose 1-sided clusters: plants grown mostly for forage or in wild gardens.

villiosa, Roth. Hairy or Winter Vetch. Fig. 2667. Annual or biennial (sometimes perennial?), enduring the winters in the North, villous-pubescent: fls. 5-7 or more pairs, elliptic-oblong, rounded at the tip but usually ending in a very minute point: fls. violet-blue, in long 1-sided axillary racemes. Eu., Asia.—Now considerably used as a cover-crop.

Americana, Muhl. Perennial, nearly or quite glabrous: fls. elliptic to oblong, obtuse or sometimes emarginate at the apex: pods 2-3 in. long, in few-fl. loose racemes. Moist lands across the continent and 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-fl. loose racemes. Minn. and Kan. eastward.—Has been offered.

orobolus, Wulf. (Orobus lathyroides, Sibth. & Sm.). Perennial, 2-5 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.


C. Blossoms red and showy, in dense spikes or spike-like racemes: flower-garden subject.

Cracea, Linn. Perennial, usually pubescent: lvs. 9-12 pairs, thin, linear or lance-oblong, very obtuse based with a short mucro: fls. violet, small, in short racemes. S. Eu.—Offered by seedsmen as a flower-garden subject.

fulgens, Batt. Annual, 3-5 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.

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 "Gennesee Farmer," then published at Rochester by Luther Tucker and subsequently absorbed by "The Cultivator." In 1855 he purchased Downey's "The Horticulturist," and a year later, at a time when the editor was Patrick Barry. In 1860 Vick entered 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 1878 he founded "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.

VICTORIA (in honor of Queen Victoria). Nymphaea, 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 margin turned up at right angles to the water surface to a height of 3-8 inches, making a basin-like object. The fls. (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 ovary, which the floral lvs. syn-extend widely at the apex; the second evening the floral lvs. spread widely open, and the color changes to pink or even a deep red. The ovary is inferior, densely prickly, and surmounted by a short, broad tube, on the sides and summit of which the floral lvs. are situated. Sepals 4; petals 36-50 white, oblong to sub-elliptic, rather thin and delicate in texture; stamens about 20; stamens 150-200, linear-lanceolate; paracarpels about 25, forming a ring of thick, fleshy bodies between the stamens and...
the styles; carpels 30-40; stigma forming a broad, basin-like depression, 2-2½ 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 the style in the lace part, produced upward to a fleshy, subulate, incurved process about ¼ 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 tereete, 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; these veins 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 "stomatodes" (P.S. 6:249). He considered them to be useful as air-holes to let out the 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.

A single leaf, by its buoyancy, may sustain a weight of 150 or 200 pounds. Not the least remarkable feature of these leaves is their rate of growth. Caspary found the maximum growth in length to be about 1 inch per hour when the leaf is just expanding; the surface increases 4 or 5 sq. ft. in 24 hours, and a plant will produce in 21 to 25 weeks 600 or 700 sq. ft. of leaf-surface. A great development of heat has been observed in the opening flowers of Victoria. About 8 p.m., when the anthers are shedding their pollen (to second-day flowers), the stamens may reach and maintain a temperature 10° F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionaries, and certainly of use to savages as food in quite early times, Victoria was first noticed botanically by Haenke in Bolivia about 1801; but he died in the Philippines without recording his discovery. Bouchard, the companion of Humboldt, also saw it, near Corrientes, Argentina, in 1819, but still it was neglected. In 1832 Poeppig found it on the Amazon, and described it as Euryale Amazonica. D’Orbigny saw the plant in 1827 at Corrientes, and in 1833 in Bolivia, and several years later published accounts of his find. Robert H. Schomburgk, finding it again in 1836 on the Berbice river in British Guiana, sent home specimens and figures from which Lindley in 1837 (published in 1838) established the genus Victoria and described the species V. regia. This name has settled upon the northern species, while the one found at Corrientes was named in 1846, by E. R. Cheeseman, V. amazonica 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 one of the Bolivian bulbs from Dr. Meehan, of Mexico, and sent them in a jar of wet clay to England. On Dec. 10, 22 seeds obtained at Kew, three germinated and grew vigorously as small seedlings until October, but died in December. Eleven more seeds were sent to Freycinet from the Essequibo river, along with rhizomes, the latter in Wardian cases; the rhizomes rotted, and the seeds refused to germinate. In 1849 an expedition from Dumbarton, in Scotland, 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 two English physicians, Rodie and Lockhart; these first seedlings survived, however, 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 Meahan. 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. Sturtevant, then at Bordentown, N. J. The resulting plants 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 Plancho as V. Amazoniensis, and retained with grave uncertainty 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 habitat (97° S.) explains its hardness. The large starchy seeds of this species are used as food in Para-guay under the name of Maiz del Agua, "water-corn." For much interesting information on Victoria, see Hooker, B. M. 4275-78; Plancho, in F. S. 6:187-224; Caspary, in Flora Brasiliensis, 4, part 2, p. 143 et seq. In 1854 John Frick Allen published in Boston a quarto work (pages 21 x 27 in.) with colored plates, entitled: "Victoria regia, var. Trickeri; it is much more amenable to out-of-door culture than the older type, and has received a well-deserved popularity. Specimens grown from seeds sent by Mr. Tricker to Kew were regarded simply as garden forms of 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 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 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 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."

VICTORIA

regia, Lindl. (including V. regia, var. Randii). Fig. 2668. Lvs. sparingly subsessile beneath, upturned margins reddish, 3-8 in. high: fls. becoming dull crimson the second evening; sepals 2, pi. 38, fig. 15 (seed). The results of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender nymphs, that is, when the pond is not artificially heated. Where it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, earliness or lateness of the season, locality, etc., must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pits in the pond specially constructed to start the Victorias, these pits to be heated by hot water or steam and covered with frames and sashes. By this method plants may be set in their summer quarters early in May and heat applied until the middle of June, or rather a temperature of 85° maintained until the advent of summer weather.

Victoria regia is 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 in America, in tropical Alluguheny Park; also at "Grey's Garden," the estate of Samuel F. B. Morse, in New York, N. Y.; and also at many notable gardens in Europe. Plants grown under glass usually attain to larger dimensions, as they are protected against climatic changes and the currents, besides enjoying more of a tropical atmosphere. There is, however, more than one disadvantage.
Setting aside the costly construction, labor, etc., it is by no means inviting even on a warm day to spend many
minutes in such a structure. Compare this with a nat-
ural pond and its surroundings and a cool shady seat
where flowers and birds add at least something of a
serenity.

Whether grown indoors or out, these plants are only
annuals, and seedlings are of necessity raised every
spring. They form no tubers as do the tender
nymphæas, or rootstock as do the hardy nymphæas.
Few, if any, insects are troublesome on these plants.
The worst is the black fly or aphid. The use of insecti-
cides should not be resorted to, as they are most
likely to destroy the lady bugs. They and their larvæ
will soon clear of all the aphides without any injury to
the plant.

W. M. TRICKER.

VIGNA (Dominie Vigni, Paduan commentator on Theo-
phrastus 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. Catjang, Walpers, and V. Sini^nsis, Endlicher. The former name, however, dates from 1839 and the latter from 1848, and the former should be used.

Cowpea was restricted to the buff-colored or clay pea, but now it is commonly used generically. The word
peas is almost hopelessly confused. Formerly the name
Cowpea was written by Edmund RufiSn (Essays and
Notes on Agriculture, Richmond, 1855).

The nomenclature of the cultivated varieties of Cow-
pea is almost hopelessly confused. Formerly the name
Cowpea was restricted to the buff-colored or clay pea,
but now it is commonly used generically. The word
Cowpea is an Americanism. Common generic terms now
in use in the South are “black-eye pea” and “cornfield
pea.”

While the Cowpea is now used mostly for animal food
and green-manuring, the pea itself is also a good human
food and has been so used for many years. For table use
the peas are usually gathered when the pods begin to
color of the bean. It is possible that more than one spe-
cies is concerned in these horticultural forms.

3-5 in. long; heads corymbose; akenes villous, with 2 long awns and many small scales. W. M.

VICTORIA

A few, if any, grasses are troublesome on these plants.
The worst is the black fly or aphid. The use of insecti-
cides should not be resorted to, as they are most
likely to destroy the lady bugs. They and their larvæ
will soon clear of all the aphides without any injury to
the plant.

W. M. TRICKER.

VIGNEA (Dr. A. Viguier, botanist of Montpellier,
France) is about 14 species, either herbs, or
somewhat shrubby plants, found in the warmer parts of
the world, especially America. The following is a
native of Lower Calif, and is offered in S. Calif. It is a
shrub, usually planted with small yellow
flats, like single sunflowers, but borne in many corymb.
The plant blooms both winter and summer. For generic
genres see Gray’s Synoptical Flora or Bot. Calif.

tomentosa, Gray. Shrub or branching subshrub; lvs.
oppositely subulate, 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 IMPROVE-
MENT An improvement association is an organiza-
tion of persons who band themselves together in or-
der 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 af-
flecting the general welfare. The secret of their suc-
cess in the long run is in educating public opinion to
demand good officials, and then in cooperating with the
officials. Good associations are composed entirely of women. Those of Hones-
dale, Pa., and Petaluma, Cal., are good examples. Other
associations, usually male, are composed of both sexes,
Bar Harbor, Me., and Stockbridge, Mass., having
classes of the best type of mixed associations. The
Merchants Association of San Francisco, with a mem-
bership of more than a thousand, is an excellent ex-
ample of an effective society composed wholly of men.
Experience has taught the older organizations that a
juvenile auxiliary is a valuable adjunct. These juvenile
branches are worked through the public schools, and
their promotion is the most practical way known of
the 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 inter-
est of the entire membership.

In large cities it has been found best to have section
or ward organizations, which work for the special
needs of their ward or section, while delegates from
these sections are elected to the central body, which
works for the general good of the whole city. Denver,
Col., Oakland and San Francisco, Cal., and the famous
Woman’s Civic Club of St. Paul, Minn., work upon
these lines. The standing committees are never quite
alike in any two associations. They necessarily vary
with the needs of the community.

While the avowed object of these associations is the
improvement and ornamentation of public streets and
highways, the cleaning and beautifying of premises,
school yards, library grounds, 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 Mountclair,
N. J., association has ten standing committees and the
constitutioonal 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, pre-
vvention of cruelty to children, prevention of cruelty to
animals.

The work of committees may be well set forth by
specifie examples from the Montclair society. Under
the supervision of the street committee, galvanized
iron barrels were placed at intervals along the main

2669. Glimpse of a village street in a community where the
idea of village improvement flourishes, showing that a
central lawn with border planting is adapted even
to small areas.

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specifie examples from the Montclair society. Under
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iron barrels were placed at intervals along the main
thoroughfares for the reception of rubbish, such as paper, and fruit rinds. Shopkeepers are asked to keep their premises in good order. If they do not comply with the request, the Town Improvement Association sends a man to make the inspection, and the amount is placed on the assessment. 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 health department, where it may be seen by any householder who cares to examine it. The farmer committee looks after the funds. Annual dues are fifty cents a member. The work of the humane committee is to inspect the police station, see that it is kept in sanitary condition, and the prisoners properly treated. The railroad committee keeps a watchful eye upon the stations and sees that they are as neat as possible and the surroundings made attractive. The children's auxiliary is formed of eleven hundred school children, who have pledged themselves to "work together to make Montclair a happier place in which to live, by doing everything we can to make the town more healthful and beautiful." The different classes from the school take charge of the flower-beds around the buildings, attend to the planting and keep them in order. All this fosters early the love of attractive surroundings, engenders habits of neatness, and develops local pride and patriotism.

The committee for the preservation of natural beauties has much to keep it busy. Its members watch the fine trees of the town, and if any are splitting, the owners are notified to mend them. Dead trees are cut down, and the owners of unsightly fences are requested to remove them. The burning of hedge-rows is forbidden, as it destroys the wild flowers and leads to forest fires. The duties of the committees for prevention of cruelty to animals and animals are self-explanatory. They are sentary to the state association, and have full power to act. The park committee takes charge of any waste pieces of ground, generally at the intersection of roads, keeps them in order, and plants shrubbery or makes flower-beds, as the case may be.

Montclair boasts of the most humanely equipped jail in the state, with a separate apartment for women, and a sanitary and padded cell for the insane. The committee for the prevention of cruelty to animals has placed the sign posts, "Please uncheck your horses going up this hill," at the top and bottom of the mountain road. The paving of the plaza in front of the railway station is due to the efforts of the railway committee, which visited the officials at least once a month for three years before the work was undertaken.

Newton Center and Stockbridge, Mass., contend for the honor of forming the first improvement association. Newton Center's association claims to be older by a year than the Laurel Hill Association of Stockbridge. The latter organization was founded in 1856 through the efforts of Daniel Hale and Mrs. J. Z. Goodrich. Newton Center boasts of the most humanely equipped jail in the state, with a separate apartment for women, and a sanitary and padded cell for the insane. The committee for the prevention of cruelty to animals has placed the sign posts, "Please uncheck your horses going up this hill," at the top and bottom of the mountain road. The paving of the plaza in front of the railway station is due to the efforts of the railway committee, which visited the officials at least once a month for three years before the work was undertaken.

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Civic Improvement." The object of the organization, as stated in the constitution, "shall be to bring into communication for acquaintance and mutual helpfulness the organizations interested in the promotion of outdoor art, public beauty, town, village and neighborhood improvement." The headquarters of the national organization are at Springfield, Ohio. The commercial possibilities of the work are beginning to appeal to the American business man. Large owners of real estate and tenant houses are adopting as business methods some of the special features of improvement associations. Commercial clubs and boards of trade are awakening to the fact that a cleanly and beautiful city containing fine boulevards, riverside drives and parks, public baths and swimming pools, is as much of an inducement to new firms desiring to locate as is a cash bonus or good shipping facilities. Firms and good citizens seeking new locations and finding these advantages are assured without further search that the schools will be good, the residence district fine, and that a minimum of undesirable residents will be found. Nurserymen, florists and dealers in paint are the first to reap material benefit from the success of these associations. Usually the first step in improving property is the planting of trees and flowers, then the house receives a coat of paint. It is an excellent idea for the improvement association in encouraging the municipal authorities to give prizes, in connection with the festivals or school fairs, for the best display of flowers to schools and school children, for the latter the medium the infection of beautifying is carried into homes that can be reached no other way.

These associations in no way interfere with the work of the city officers. Rather they supplement it by doing the things for which the town laws make no provision. The officers of townshaving 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 which many of the societies devoted to the interests of towns having one or more of these societies 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.

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VILLARSLA symphoides is the plant described at p. 923 of this work as Limnanthemum symphoides. The plant is probably to be referred to Limnanthemum pelatum, however. To the list of pictures add Gt. 48:1036 and 48, p. 300.

VINCA (pericinca, old Latin name of Periwinkle, used by Pliny). Apocynacea. A genus of 10 species including the common Periwinkle or Trailing Myrtle, Vinca minor. This is one of the commonest and best plants for covering the ground in deep shade, especially under trees and in cemeteries. It is a hardy trailing plant with shining evergreen foliage and blue, salver-shaped, 3 lobed fls. about an inch across, appearing in early spring or early summer. It forms a carpet like carpeting groves. It can be planted successively on a large scale any time from spring to fall during mild or rainy weather. It is propagated by division or by cuttings, as seed—very rarely mature. The Periwinkle will live in city yards under trees where grass will not thrive. V. minor is the commonest and perhaps most variable species. Varieties with white, purple and double fls. are kept 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 variegated form 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 often 2 in. across. The plants bloom continuously from the time they are set out until frost. It can be grown in large masses for public parks with somewhat less expense than geraniums. Mr. Stromback, head gardener of Lincoln Park, Chicago, 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 sand or a mixture of sand and table milk from just below the surface. The seedlings show the second leaf, they are pricked out about an inch apart in trays of the same soil, and when the little plants have 5 or 6 fls. they are potted in 4 in. pots, later shifted to 6 in. pots. The majority are bedded out from the 3-in. pots. The soil of the bed should be a sandy loam if possible, and the plants will not do well in a very heavy soil. In bedding, set the plants about a foot apart. They require more water than a geranium, and when the bed is watered it should be given a good soaking and then left alone for a few days. The plants require no trimming.

The amateur will find Vinca rosea a satisfactory window plant that can be grown with little trouble from seeds started as late as April, but of course such plants will not bloom as early as the bedding stock propagated in Jan. or Feb. V. rosea is the largest flowered Vinca, and it seeds freely.

W. M.
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

dark purple fls.; aurea variegata, with golden variegation; carules, with single blue fls.; plena, with double blue fls.; rosea, with single rosy fls.; purpurea plena, with purple double fls. Gn. 50:1678. Some of these are

William Scott.

Vinca is a genus of herbs or sub-shrubs, erect or procumbent: lvs. opposite; fls. rather large, axillary, solitary; corolla salver-shaped, with a narrow throat which is pilose inside or thickened-colliculose; stamens included above the middle of the tube; carpels 2, distinct; stigma annular, thick, viscid; ovaries 6-many in each carpel, in 2 series: foliicles 2, erect or divergent. The genus may be divided into 2 sections: 1. Periwinkle, in which the anther-cells are short and divided by a wide connective; 2. Lachenalia, in which the anther-cells are normal. V. minor belongs to Section 2; the others mentioned below are included in Section 1.

INDEX.

a. Trailing herbs, barely 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. 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 ½ 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; argentes variegata, with silvery variegation; atropurpurea compacta, with single

advertised without reference to V. minor, as if they were good species, thus V. corulea and purpurea. V. elegansima alba belongs here, also "The Bride," a white variety with a pink center.

c. Lvs. subcordate-ovate; corolla-lobes obovate; calyx ciliate.

2. maior, 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 blotched with yellow, others are margined. Here seem to belong V. aurea maculata and V. aurea marginata, Hort. V. major, vars. variegata and reticulata, are also advertised. Var. elegansima, Hort., is a handsome form with lvs. bordered and blotched with yellowish white. It seems to be common with the florists, although it is rarely, if ever, advertised in American trade catalogues. It is one of the best forms for vases for baskets and for decoration indoors. The sprays should be struck early in the fall and if kept growing steadily will make satisfactory specimens in five-inch pots. It is a good idea to plant this variety in the front part of a sunny greenhouse bench where the long sprays may reach down to the walk. As a window-box plant it has the merit of withstanding considerable neglect.
Plate XLVII. Vines.

Akebia-quinata on a porch  Lantana in the basket  A bush of Caryopteris  Mastacanthus in the foreground
VINE-CACTUS. *Fouquieria splendens.*

VINE, GLORY. *Catharanthus.*

VINE PEACH. See under *Cucumis Melo.*

VINE, PIPE. *Aristolochia Siphon.*

VINE, SILK. See *Periploca Gracca.*

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 eucarbitaceous 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 discoreas; others are true annual herbs, as morning-glories and certain cucumbers. Vines represent all degrees of hardiness or tenderness; they are 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 clinging over other plants without any special devices for aiding them in the ascent; by twining about the support; by ascending by means of special organs, as roots or tendrils. The larger number of cultivated climbing plants belong to the last two categories. However, there are many useful climbers amongst the scramblers, as, for example, some of the long-stemmed roses. These plants usually have to be tied to a support unless they are allowed to ramble at will over some expanded surface, as the top of a bush or a broad stone wall.

Each species of twining plant has its own direction of winding about the support, and the species follows this direction under all ordinary circumstances. Some of them, as the hops, wind about the support in the direct-

2673. Hop (Humulus Japonicus), twining from the observer's right to his left, or with the sun.

2674. Morning glory, twining from the observer's left to his right, or against the sun.
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 can be seen in Fig. 2675, which represents the tendril 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, 1866. The best single vine for covering buildings and arbors, since it is perfectly hardy and thrives under many conditions. Plants should be selected from vines of known habit, as some individuals cling much better than others.

_Ampelopsis tricuspidata_ (A. Veitchi). Fig. 2676; also Fig. 81, Vol. I. A neat and handsome vine of 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.

_Wisteria Sinensis_ and _W. speciosa_. Figs. 2475, 2476. Hardy in mid-late states, and often does well on the north side of buildings farther north.

Acantus arguta. Fig. 29. One of the best arbor vines.

_Akebia quinata_. Figs. 56, 57. Graceful and pretty. _Lonicera sempervirens, L. flava_ and other honey-suckles. _L. Japonica_ (or _L. sempervirens_) 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. speciosa_. Figs. 2475, 2476.

AA. Top dying to the ground, or nearly so in winter. Some are annuals.

_Menispermum Canadense_, moonseed. A small but attractive native twiner useful for wild gardens.

_Humulus Lupulus_ and _H. Japonicus_. The former is the common perennial hop; the latter is a sturdy and useful annual.

_Dioscorea divaricata_, yam, Chinese potato, cinnamon vine. The large, deep-pitted tuberous root withstands freezing. Climbs high, but does not produce foliage enough to cover unsightly objects. _Dioscorea villosa_ is a small but handsome native species.

_Pueraria Thunbergiana_ (known also as _Dolichos Japonicus_), while not yet common, deserves to be better known. It is an herbaceous perennial in the North, but makes a woody top in the South. Very vigorous grower.


_Ipomoea_, various species. Moonflowers and morning-glories belong here. Some are perennials for south; all useful and interesting. Tender.

_Tropaeolum majus_, nasturtium. Tender annual.

_T. peregrinum_, canary-bird flower. Tender annual.

_Lathyrus odoratus_, sweet pea. Hardy annual.

_Thunbergia alata_. Tender annual.

_Dolichos Lablab_, hyacinth bean. Tender annual.

_Cardiospermum Halicacabum_, balloon vine. Tender annual.

_Adlamia cirrhosa_, Allegheny vine. Tender perennial.

_Cobea scandens_. Tender.

L. H. B.

Vines for the South. I. Deciduous. _Ampelopsis tri- cuspidata_ 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. _Berechisia 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. _Centrosena Virginianum_, a twining herb, is a very desirable small vine. The large, pea-shaped lavender flowers are produced from May until autumn. _Olema_ (the best native species are _O. crispus_, with dark bluish purple campanulate flowers, _O. coccinea_ with scarlet campanulate flowers, and _O. holosericea_, conspicuous for the silky plumose tails of the akenes. All these are herbaceous and lose their stems during winter. Of the hybrid garden varieties

2675. _The coiling of tendrils; a shows the tendril hooks ready to grasp a support; b, shows the coiling of the tendril-branches and the straight or not-coiled spaces where the direction of the coil is reversed._ Cassabanana (Sicana).
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, Henry, laugnainus, Otto Freidel, Duchess of Edinburgh, etc. These 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. — Lonicera Eberwein 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 edible, the seeds being coated with a mucilaginous acidulated pulp. P. lathe has very small greenish-yellow flowers and also a very small, purple-colored fruit. — Periploca Green is of exceedingly rapid growth, and when covered in spring with myriads of flowers is an attractive plant for trellises or rustic summer-houses. — Pycnantha Thunbergiana is a most vigorous climber, a single plant frequently covering an enormous space. The peashaped 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 for support for a few years. Several forms differ only in the size and color of the flowers, as coccineum, deeper red; spectabilis, yellow; hybrida, blood red. The native species, P. obtusata, 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. — Winteriana. 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. spectabilis, is surpassed by an improved European form, which has flowers of a light lavender-blue, which are produced at intervals during the summer. Its growth is unusually vigorous.

II. EVERGREEN. Akebia Fo- lata, 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. — Clematis paniculata is almost an evergreen, as it retains its foliage nearly all winter. Fibrous are produced in the greatest profusion during midsummer and are very fragrant. One of the most desirable climbers. — Cocinea Caroliana 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, it is more graceful. Once known, in higher latitudes it would prove to be one of the most attractive greenhouse plants. — Elaeagnus pungens, var. reflexa, or Fraser. Fibrous are produced in the greatest profusion during midsummer and are very fragrant. One of the most desirable climbers. — 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. — Jasminium 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. officinalis has white flowers during April and May. J. Reevesi and J. humile, with yellow flowers, borne in summer and autumn, are great favorites. — Kudzu japonica is valued chiefly for the reddish tint of its autumn foliage. The small white flowers are rather inconspicuous. — Lonicer.
The following native species are all desirable, viz., L. cernua, with scarlet and yellow flowers, and L. flour., with bluish-buff-yellow flowers. In many sections of the South are found large patches of the exotic species, L. japonica, var. bicolor, Cheiranthus and Helianthus. These are frequently thickly tufted and consequently spread out surrounding plants. In Var., Commelina, with its attractive foliage, and L. brachyceros, var. Belgica, which yields a continuous crop of pink and buff flowers, are the most valuable of the exotic sorts. - Ipomoea, L. Bonariensis (Yellow), and L. reclina are the best of the tuberous section, the roots remaining sound during winter if slightly covered with litter. I. pandurata, known south as Indian bread, is frequently found in large quantities in newly cleared oakwood lands, the tubers often weighing 10 to 15 pounds. It is very showy with its large white flowers and purple inner tubes. Both Arilium and Passiflora, with flower colors grading from bining white, citron and blue, and Constance Elliot, with pure white flowers, are perfectly hardy and produce bloomers.—Reses. Of the climbing varieties there is a great popularity, both for evergreens or evergreen or annual, to retain their foliage nearly all winter. The White and Yellow Banksias are wonderfully attractive in early spring when laden with innumerable small violet-scented flowers, while the climbing Tea. Naissette and Bourbon yield a profusion of variously colored flowers from early spring until winter. The Wimenruana section will hardly become popular, as plants bloom in the winter, while the Cherokee and Maryland are still used for making evergreen hedges. - Souches. Of the many species growing south, the S. laevis is highly valued for its large, shiny leaves: it is of great decorative value for ornamenting ball-rooms. Other kinds are desirable both for leaves and berries.—Trachelospermum jasminoides is an excellent white-flowering climber. The variegated form does it, and it 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 are the same 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, Ga. Antigonon leptopus. Flowers in long racemes of a beautiful pink color and produced from June to December. This blooms profusely from July until frost. The flowers are tubular, but the limb is perfectly flat and curiously marked and faced with purplish maroon.—Bigmonia. B. venusta is at home north of Savannah. It is a semi-hardy climber. In early spring or even as early as February it is covered with large bunches of bright orange-colored flowers. B. scariosa will stand the winters of southern Georgia and produces its purplish-colored flowers in early spring.—Bougainvillea Glaucha, 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 brilliance of the climber is beyond description. Hardy south of Jacksonville. - Tecoma Capensis. Flowers in clusters of a beautiful orange-red color. Hardy as far as Savannah. P. J. Berckmans.

Vines for Conservatories or Greenhouses. Flowering vines and climbers, when 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 aspect, as well as for flowering at all seasons. Annual, bulbous and tuberous-rooted vines may be grown in pots or small tubs, but permanent hardy-wooleding vines must have ample root room. Hardy woody vines, as the strong-growing Thunbergias and Thunbergias and Thunbergias, the root space must be limited, or there will be an immense growth at the expense of flowers.

When possible, the strongest growing vines may be planted under the greenhouse stages and the stems and branches trained up from the back to the sides and roof. In most modern greenhouses, however, the space underneath the plant stages is taken up by the heating pipes. To overcome this difficulty boxes made of one-inch Expires 3 feet long, 1 1/2 feet wide and 1 foot deep are very suitable. These should be well drained, painted olive-green, and placed in convenient positions on the plant stages. In planting young vines the soil should be broken and not sifted; neither should the boxes be filled with soil at the time of planting, but the vine should be planted in a central mound and the box gradually filled as the plant grows. This practice is stimulating to the vines and tends to maintain the desirable qualities of the soil. Most vines may be trained on wires, which should be either galvanized or copper and of sufficient strength to support heavy vines. The wires should be spaced not more than 1 foot apart, and fastened in a horizontal position. The space between the wires and glass should be not less than 18 inches or the vines may freeze in winter.

Some judicious thinning of the growth is generally necessary in order that the vines may receive sufficient light and air. The vines should not be tied too closely, but allowed their natural habit of growth as far as possible in order to obtain the best effects. A few of the most desirable kinds for conservatory and cool greenhouse follow, detailed culture of which may be found under their respective headings in this work. Lagenaria siceraria and Passive, 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. Leucania gracillima makes one of the most beautiful evergreen twills of the plants. The cymes of rose-colored or pink flowers are produced in the greatest profusion during the early winter months. Its worst enemy is mealy bug. Dipladenia are excellent summer flowering, tuberous rooted vines, and their gorgeous flowers well repay the attention given them. Vigna mungo is an excellent subject for covering walls, either in cool or warm houses. Solanum jasminoides is a strong-growing vine producing clusters of jasmine-like flowers of white or lime colors. The well-known Mare-

6278. Vines — Ipomoea Leari (X 1/2).
Vines for Southern California.  The following list of vines for this section places them very nearly in their proper order as far as popular demand is concerned. One much-used vine, the ivy geranium, is purposely omitted for lack of knowledge as to its proper place in the list, the demand for this vine being somewhat spasmodic. The ivy geranium, being hardy here, is used for a great variety of purposes, as hanging baskets, hedges, and for climbing up the sides and on the roof of a house. Passifloras are unpopular here by reason of the numerous caterpillars that infest them at certain times of the year. Of this list Solanum Wendlandii is probably the most tender, with the bougainvilleas a close second. For the covering of unsightly objects in the least possible time, Ipomoea Leuvi (Fig. 263) easily takes first place and the loniceras will rank next. Several species of jasmines are worthy of mention, but space forbids, as the list could easily be extended to 100 or more. Vines occupy an important place in the horticulture of southern California, as in other warm and sunny countries.

Bougainvillea, all species; Bignonia venusta; Solanum Wendlandii; Lonicera, several species; Ipomoea Leuvi, Fig. 2628; Tecoma Ricsoniana; Jasminum grandiflorum; Bignonia Treculiana; Solanum Nortonianum, var. aureum; Wisteria Sinensis; Wisteria Sinensis, var. albida; Solanum jasminoides; Tecoma grandiflora; Tecoma jasminoides; Phaselus Carduncula; Tecoma lilacina; Hardenbergia monophylla; Hardenbergia Comptoniana; Mandevilla sraeoeolens, Fig. 2679; Rosa carnea; Clivinae pyneicra; Akebia quinata; Kenneve nigricans; Muehlenbeckia complexa; Physiophyllum albus; Various tacements; Figs. 2635, 2636, 2638.

Vines for Southern California.

Edward J. Canning.

Vines for Middle California. — The number of species of climbing plants cultivated in California for ornamental planting in city and country houses 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 neighborhood and country houses) the following list is most extensively grown as a covering for porches, arbors, and houses; (1) Ampelopsis texensis, (2) Rosa Banksia and other species, (3) Clematis Jackmani and other varieties; (5) tacements and passifloras; (6) Lonicera Japanese, var. Halicula.

For house adornment the tacements are not so recommended, on account of their rampant and dense growth. The following vines are among the chosen: the building damp 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. Wisteria Chinensis is an old and well-tried friend. In spite of a somewhat untidy habit of growth and need of yearly training and trimming, it is probably as much loved in California as in its native land, Japan, on account of the exuberant, lavish freedom with which it shows its wealth upon us in the form of immense trusses of fragrant flowers. Hall's Honeysuckle has such fragrant blossoms, is so easily reproduced by cuttings and blooms so freely and for such a long period, that it is more commonly grown in country places than perhaps any other vine.

The following 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.

Section 1. — For houses and places where dense growth would be objectionable. This list does not include all the species at present grown in such places, as several that are frequently so grown have proved unsatisfactory.
Autigonon leptopus, Clianthus puniceus, Asparagus medeoloides. Fig. Lathyrus latifolius. Pig. 1213.

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 medooloides.  Feb. 152.

B. Tender.

Asparagus lucidus. Asparagus plumosus. Asparagus plumosus, var. tenuissimus.  Fig. 153, 154.


Section 2. For arbors, porches and trellises where a dense and rapid growth is desirable.

A. Hardy.

Cobaea scandens. Fig. 502.
Ipomea Leuca. Fig. 267.
Passiflora caerulea. Fig. 1633.

B. Evergreen.

Cobaea scandens. Fig. 502.
Ipomea Leuca. Fig. 267.
Passiflora caerulea. Fig. 1633.

Pelargonium peltatum. Fig. 1529.

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 eucalypts, 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 Ceanothus scoparium or Cheesemps. Latessa nova, against the dark foliage of which the white flowers of the Clematis contrast beautifully. Roses are often treated in the same manner. Ampelopsis quinquefolia is sometimes made to climb a rugged old specimen of Cordyline australis, and, often reaching the tufts of leaves which crown the short branches of the latter, the young lianas of the creeper hang down in beautiful festoons. In Golden Gate Park T. Eroniensis 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. Heinsilis. 249.

4. For slopes, retaining walls and banks of creeks.

—For long, sloping banks nothing has yet been found more effective than English ivy, which withstands the dryness of a warm southern exposure without irrigation. Pelargonium peltatum, Tropaeolum majus, Ipoineus Chinensis, var. procumbens, and J. nobilis, var. prostrata, are also used satisfactorily.

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 lac把她, Muchchleka complera, Lycium Richii, Pelargonium peltatum, the hardy Teconias and Solanum jasmindoides. Convulvulus 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 treecree Pyracomorpus scaber and the mammadias; Tropaeolum camerianum may also be used, but is less satisfactory because of its annual and requiring a shady place. Ipomoea purpurea and I. quamoclit may also be used for this purpose.

Joseph Burnett Davy.

VINICULTURE. Wine-making and the subjects associated therewith. The subject is not primarily horticultural. It is essentially manufacture. The growing of the grapes is Viticulture. See Grape and Vitis.
VIOLA (classical name). *Viola cæsia*. VIOLET. There are probably 150 species of Violets. They are widely distributed perennial or rarely annual herbs (or even shrubs) with interesting irregular flowers on 1- or 2-flowered axillary peduncles. They are plants of the northern and southern temperate zones. About 40 species are native to North America north of Mexico. The flowers are 5-merous as to envelopes and stamens; sepals all similar, persistent with the fruit; corolla irregular, the lower petal spurred, the others similar but usually not alike; stamens short and included, the anthers more or less coherent and two of them with an appendage projecting into the spur; fr. a capsule, 3-valved, with several to many globular seeds. Some of the species (particularly the common eastern *V. palmata*) have cleistogamous flowers, which are borne at the base of the plant (often under the mold) and are pollinated in the bud. The structure of the corolla of the Violet is shown in Fig. 2681. In Fig. 2682, representing the same species, the cleistogamous flowers are shown at *a*. 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, Greene and others, and, moreover, the kinds are so many, they are not described in this account; but a list of those which are or have been offered in the trade is given below as a matter of record. In the nomenclature of this list, the monograph of Gray has been followed (Gray's *Syn. Flora*, vol. 1, pp. 195-204).

Violets are easy to grow, particularly if an effort is made to imitate the conditions under which they naturally occur. Some of them are woods species, others swamp species, and others inhabit dry plains. They are propagated readily by means of division and in some species by runners. Sometimes seeds are used, but not commonly. Many species that grow mostly to single stems in the wild make large full clumps when given good opportunity in the garden. Fig. 2683.

Wild violets are characteristic of meadows, edges of woods, damp fields, and other places where the ground is slightly moist. They are propagated by means of division, and are easily grown when given the best possible soil and care. They are propagated by seed, but seed is not reliable. The seeds are usually collected from the wild violets and sown in the fall. Wild violets are good ground cover for garden plots that are not in flower at that time. They are hardy and easily grown in any good garden soil. They prefer a location in the sun or light shade. Wild violets are propagated by division in the spring or fall. Wild violets are easy to grow in most gardens. They require little care and are hardy in most parts of the United States. They are suitable for most types of soil and can be grown in full sun or light shade. Wild violets are often used as ground cover in gardens and are attractive for their wild, untamed appearance. They are generally low-growing plants that spread by runners. Wild violets are often used as a ground cover in gardens and parks, and they are attractive for their wild, untamed appearance. They are generally low-growing plants that spread by runners.

2681. The structure of the corolla of Viola palmata var. cucullata. Somewhat enlarged.
date-ovate and usually acuminate, obtusely serrate, the
stipules large and laciniate; stylo large, pale blue, the
ovate-obtuse petals standing well apart, the spur
half or more as long as the petals and acute. S. Eu.
B. M. 791. — Frequenty seen in gardens and much prized
for its large, bright flowers. Good for spring bloom.
Hardy. There are several colors, represented in Alba,
Furfura, Mauve 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; lvs. cordate or round-cordate, those of
the stem becoming lanceolate, all stalked and crenate-
dentate, the stipules large and laciniate; stylos large,
usually about three colors represented (except in highbred self
varieties), the spur short and inconspicuous.
Eu. — When
transplanted, 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-
oblets that have been
offered to the trade:

a. Blue Violets
(sometimes growing into white
and striped forms).

Beckowi, T. & Gray. NV. Neva da, Calif.,
Oregon.

C. verna, Linn. Very pale violet or
almost white. Generally distributed.

canina, Linn., var. Muhlenbergii, Trautv. (V. canina,
var. sylvestris, Rehd.). Minn., east. Var. adamsia,

cognata, Greene. Offered in Colorado.

Hallii, Gray. Calif. and Oregon.

formosa, Linn. (V. cacculata, var. palmata, Hort.).
Eastern states.

Var. cacculata, Gray (V. cacculata, Ait. V. obliqua,
Hill). Figs. 2681, 2682. On the Atlantic-slope, by Brit-
ton & Brown regarded as a distinct species for which
Hall's name V. obliqua (1769) is used rather than
Alston's V. cacculata (1768). The commonest Violet in
the northeastern states. V. obliqua, var. striata, is
a striped form now in the trade, and not uncommon wild.
There are forms known as var. picta and variegata.
One of the most variable species in stature, form of
leaves, and color of flowers. It is easily colonized in
the garden.

pedata, Linn., Bird's-foot Violet, and one of the hand-
somest species. Sandy soil, Atlantic states and west to
Ind. Terr. and Minn. It runs into very distinct forms.

Var. bicolor, Bentham. Two upper petals much darker.

Var. alba, Hort. Flowers nearly white.

vostrata, Mech. Michigan, east.

saugatuck, Ait. Minn. and Texas, east. Var. picta,
Hort. has striped flowers.

Selkirkii, Pursh. Northeastern states and Canada.


blanda, Willd. Fig. 2686. Low places, across the
continent. Pretty little species, fragrant. Var. veni-
tolia, Gray. Northeastern states and Canada.

lanceolata, Linn. Nova Scotia to Florida and Texas.

prunifolia, Linn. Canada to Florida and Louisiana.


AAA. Yellow Violets.

glabella, Nutt. Rocky Mt. to Calif. and Alaska.

lobata, Bent. Calif., Oregon.

Nuttallii, Pursh. Calif. to Calif. and north.

pedunculata, Gray. California seeds are gathered for
export.

pubescens, Ait. Fig. 2687. Dakota, east and south.

rotundifolia, Michx. Nova Scotia to N. Car.

Scoamena, Doug. Idaho to British Columbia and
Calif.


VIOLET. Commer-
cial Cultivation. —
The Violet probably
ranks third in com-
mercial importance
among florists' flow-
ers in America. It
has risen greatly in
horticultural impor-
tance within recent
years. The Violet
season is only about
seven months, while
the season of roses
carnations is fully
nine months. As
with the other
leading flower crops,
— roses, carnations
and chrysanthemums,— the
Violet requires very close
attention, the year
round. Though Vi-
oblets require no stak-
ing, tying or disbudd-
ing, other laborious
practices are neces-
sary. The status of
Violet culture has
been so low that of
the other important
florists' flowers as
regards general care and efficiency of management,
and consequent 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 a
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 diseases have
been below that of
talked of by the scientists, especially those of the Divi-
sion of Vegetable Physiology and Pathology, in the C. 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 awak-
ened 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 Dorsey, based upon a knowl-
edge 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. 2690), and King of Violets, dark blue flowers; Lady Hume Campbell, Neapolitan (Fig. 2689) and De Parme, light blue; Swanley White (Fig. 2691), Queen of Violets and Belle de 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, Princesse de Galles, Laxoume, 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 crown 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-rooted 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-rooted 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.

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. 2692). - There is probably little choice between any of the standard styles of greenhouses, provided certain features are observed in their construction. Provision should be made for supplying an abundance of fresh air, either from the sides or top, whenever it is needed, the ventilators being so arranged as to be easily operated either from within the house or from the outside, the inside arrangement to be used in general ventilation of the houses, the outside whenever fumigation with hydrocyanic acid gas is necessary. The arrangement and location of the house should be such as to secure the maximum amount of sunshine during December and January, and the minimum amount during the growing season, when it is necessary to maintain as low a temperature as possible so as to insure good, vigorous, healthy-growing plants. The location of the house and the direction in which it should run depend largely on the section of the country, the character of the ground on which it is to be erected, and the style of house selected. Generally speaking, the even-span house should run north and south, the three-quarter span and the lean-to east and west. The best site for the house is a level piece of land or one sloping gently to the south. Three kinds of greenhouse framework are in common use in this country: viz., wood, wood and iron, and iron. On account of its comparative cheapness and durability the wood and iron framework is coming into general use.
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 of 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 of the flowers, size, shape and arrangement of the bunch, and should at all times exercise the utmost care in picking, packing and shipping, so that the flowers may reach the customer in the best and most attractive condition. The kind of bunch varies from year to year, and each large city is likely to have its own style. The various styles are wonderfully exact in their requirements and great skill is required to bunch the flowers properly.

Diseases. The cultivated Violets are subject to a number of diseases, each of which is characterized by one or more distinct symptoms. The principal diseases are as follows, their destructive power 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 circular whitish spots, frequently with concentric rings, of a darker shade; very often with a light central portion resembling the bite or sting of an insect. Cercospora violae, Phyllasticta violae, Sclerotinia violae.
VIOLET

Attatch each package to a string or wire so arranged as to allow it to be lowered from the outside of 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 fifteen minutes before entering the house. The plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of 20 to 30 pounds per square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

Eel worms, or nematodes (*Anguilla 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 eradicating these pests, but their injurious effects may be reduced to a minimum by adopting the methods recommended for controlling fungal diseases.

Red spider (*Tetranychus telarius*).—This pest lives on the under surface of the leaves, and when present in sufficient numbers causes considerable damage. It is widely distributed on a great variety of plants, and when established in the greenhouse is most difficult to combat. It can be held in check, and often the plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of 20 to 30 pounds per square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

VIRGINIA CREEPER is *Ampelopsis quinquefoliata*.

VIRGINIA COWSLIP or *Primula veris*.

VIRGINIA CREEPER. *Ampelopsis quinquefolia.*

VIRGINIA COWSLIP. *Primula vernata.*

VIRGINIA HORTICULTURE IN. Fig. 2693. Historically Virginia horticulture began with the earliest settlers, plantings being made at Jamestown in 1607. The London Company sent vines in 1619 and scions and trees in 1622 which were rapidly disseminated, so that before 1700, orchards of considerable size had been planted. As the settlers pushed westward into the Piedmont section, favorable results with the tree fruits became more common. In this section Thomas Jefferson took an active interest in horticulture, and from the vicinity of "Monticello," apples first won their supremacy in the markets of the world.

Virginia is separated into six main physical divisions known as Tidewater, Middle Virginia, Piedmont, The Valley, Blue Ridge and Appalachian. These are sections of varying width, extending northeast and southwest through the state, with marked variations in soil, altitude and climate.
Astrachan, Maiden's Blush, Summer Queen and Penneck, followed by Bonum, Smoke House, Fall Pippin, Fallwater. Sweet Winter Paradise, and Virginia Beauty as leading fall apples, and concluded by York Imperial, Albright, Ben Davis and Winesap, which extend the season through winter.

The planting of pears for commercial purposes has largely increased with the introduction of Kieffer, Le Conte and others of this type, while Seekil, Bartlett, and Duchess remain the favorites for garden purposes. In peaches the varieties largely planted are Sneed, Alexander, Greensboro, Mountain Rose, Early Rivers, Bishop Early, Crawford Early, Fast Pippin and Late Ellerta. Stump the World, Heath Cling, Levy Late, Blyleu October and Albright Winter. It is the general experience that in early peaches white-flushed varieties do best. Sweet cherries probably grow to greater perfection in Virginia than elsewhere east of the Rocky Mountains, $80 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 observer growers that Malahide is a failure as a stock for sweet cherries for orchard purposes; it is a successful stamens Mazzard, which grows with such luxuriance as to often become a striking feature of a Virginia landscape.

With the advent of the Japanese types, the plum industry becomes the predominant orchard industry of considerable size are being planted. Red June, Abundance, Yellow Japan, Burbank, and Wickson have professed popularity but in order of disappearance Satsuki serves. The Damson and a blue plum of the "Horse" plum type are very commonly disseminated throughout the state. The latter reproduces itself in the Damson, the Damson plum is large, the damson to being exempt from black knot. Only a few of the trees are known to place any one place, but the aggregate of fruit is considerable. Nearly all the pome and stone fruits are here to this climate growing in the state, but few on a commercial scale except as noted. Vineyards.—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 as to gooseberries and currants, with Houghton and Downing popular varieties of the former and Cherry and Folly of the latter. They are grown extensively in a number of localities both for local and distant markets, with the vicinity of Norfolk the center of production. From Norfolk they are shipped by boat and railroad, and the market prices to number 100 and 200 in each box. 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 most and increased plantings.

Tobacco.—Tidewater type. First in its tracking and small fruit interest. With its mild climate, tractable soil, abundance of labor, thorough transportation facilities and local Almshouses, and nearness to great eastern markets, it has in the last 56 years become the "Market Garden of the World," the section adjacent to Norfolk producing over six million dollars worth of truck produce in 1897. Garnet Grapes.—The 50 or more nurseries in the state are well distributed, with the largest establishments at the junction of the Tidewater and Middle Virginia sections. The best fruit nurseries and plum nurseries from 350 acres down. The apple is their leading specialty. Floriculture and landscape gardening have been principally confined to the larger cities of the state, where there has been a rapid increase of glass aereage in recent years devoted mainly to the production of roses, carnations, violets, and chrysanthemums as cut-flowers. The soil and climate of Middle Virginia have been found especially favorable to violet production and for rambling out counties, 25 or more growers are devoting especial effort to violet culture. The interest in landscape gardening is gradually on the increase. Geo. E. Murrell.

VIRGINIA STOCK. Matthiola.

VIRGIN'S BOWER. Clematis.

VISCARIA. See Lychnis.

VISCUM is mentioned under Phoradendron.

VITEX (after a Lisbon merchant). Vernoniae. 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 Mocanera was given by the younger Linnaeus because the fruit was supposed to be the "mocan" of the aborigines, which was made into a kind of syrup and used to a considerable extent. The fls. are only three-eighths of an inch across, not very numerous and much shorter than the lvs., but they are very sweet-scented. It has recently been offered in S. California.

Seals 5, imbricate; petals 5, imbricate, connate at base; stamens indeterminate; ovary 3-loculed, slightly imbricated in the terminal extremity; style short, hairy; fr. an indehiscent berry included by the enlarged and fleshy calyx, which is adherent to the base. Mocanera, Linn. f. Tender evergreen shrub, 6-9 ft. high, of compact habit and with dark green, shining leathery foliage; lvs. short-petioled, ova-lanceolate, serrate: fls. solitary, white, pendulous. Canaries.

W. M.

VITEX (ancient Latin name for this or a similar shrub). Verbeneae. Ornamental deciduous or evergreen trees or shrubs with opposite or 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 only a few can be cultivated outdoors in temperate regions. The hardest seems to be V. ivenia, which stands most ordinary winters as far north as Massachusetts. V. agnus-castus is hardy in sheltered positions, in sheltered positions. These species are particularly valuable for their late-appearing flowers. They grow in almost any kind of soil and prefer dry, sunny situations. None of the V. agnus-castus kinds seem to be cold hardy in this country. They thrive in a sandy compost of peat and loam. Propagated by seeds sown in spring and by hardwood cuttings under glass; also by layers.

About 60 species are known, distributed through the subtropical and tropical regions of both hemispheres, 5 in the temperate regions. Lvs. opposite, digitate, with 3-7, rarely with one leaflet; fls. in open panicles, few- to many-flowered; cymes: calyx campanulate, usually 5-toothed: corolla tubular-funnel-form, with 5 lobed, oblique and slightly 2-lipped; stamens 4, longer and shorter ones; fr. a small drupe, pendulous. Some. Species particularly V. alismoides and V. lanceolata in S. Asia are important timber trees.

Agamnus-castus, Linn. Chaste-tree. Hemp-tree. Mokos's Pepper-tree. Shrub or small tree, with a strong aromatic odor, grayish outside; lvs. in opposite pairs, pointed; Hfs. 5-7, lanceolate, acuminate, narrowed at the base into a short stalk, entire or with few crenate teeth, grayish-tomentose beneath, the middle one 3-4 in. long, the fls. in dense, sessile clusters, forming terminal, often panicked racemes 5-7 in. long: corolla usually pale or blue, grayish outside, 15 in. long; stamens and style exerted. July-Sept. N. Eu., W. Asia. Mn. 2, p. 44. —Var. alba, Hort. (V. alismoides, Hort.). Fls. white. Var. aurea, Hort. Fls. blue.

Incisa, Linn. (V. incisa, Hort.). Fig. 2694. Similar to the preceding; lfs. incisely serrate or almost
pinnatifid, grayish-tomentulose beneath, the middle one 2'3 in. long, the smallest ones often entire: 9s, smaller, scarcely 4' in. long, in more slender and looser terminal panicles; stamens shorter than limbs; throat villous.

V. ilicifolia, A. Rich. Lvs. simple, short-stalked, oval, spiny-toothed; lfts. in long-stalked, axillary, many-lid. cymes. Cuba. V. Llndeni, Hook. f. Lfts. elliptic to elliptic obovate, glabrous: fls. pale violet, in f. with black streaked heads. Colombia. B.M. allied to V. incisa, but lfts. entire: fls. purple, somewhat larger: seeds pyriform, the petals in anthesis cast off from the base while cohering to their tips (Fig. 2695): hypancyous disk of 5 nectariferous glands alternate with stamens; style short and thick, or conical; berry pulpy; seeds pyriform, with contracted beak-like base.

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**2694. Vitex incisa (X^3).**

grandiflora. Less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.

**2695. Grape flowers, enlarged.**

1, shows the bud; 2, shows the petals or "sep" falling; 3, shows the flower in full bloom, the petals having been cast off. In all the flowers the minute calyx is seen, and in 2 and 3 the disk is shown inside the base of the stamens.
The structure of the key to the following species, when standing alone, is as follows:

A. Species grown wholly for ornament:

B. Lvs. simple, ovis-cus-like.

C. Bark bearing prominent lenticels, never shredding: seeds oval or oblong, without a distinct slip-like beak. (Muscadinia.)

D. Lvs. with 3-5 leaflets.

3. hypoglauca, F. Mull. (Cissus hypoglauca, Gray). Foliage handsomely and persistently dark green above and glaucous beneath; leaflets usually 5, obtuse to elliptic, acuminate, stalked, entire or toothed towards the apex: fls. yellowish: fr. rather small and nearly globular. Australia.—Offered in S. Calif.

4. perophora, Baker (V. gongyloides, Lynch, not Baker). A most remarkable species, the branches bearing cylindrical or club-shaped tubers at their ends, which fall and produce new plants: tall, climbing by means of long forking disciferous tendrils, the stem winged and hairy: lvs. large, of 3 fls., which may be again lobed, the stipule large and purple on one side, the petiole winged: cyme pedunculate: floral envelopes of a thickened calyx and 4 minute petals. Brazil. U.C. H. 19:53. B.M. 6803. Gm. 35. p. 170.—Offered in S. Calif.

5. rotundifolia, Michx. (V. taurina, Bartram. V. vulpina, Authors, not Lind. V. muscadinia, angulata, var. rucoa, pettia, Floridiana, Raf.). MUSCADINE, SOUTHERN FOX GRAPE, BULLACE OR BULLIIT OR BULL GRAPE. Fig. 2696. Vine with hard, warty wood, running rampantly 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 bearing: 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 (1/2-1 in. in diameter), with very thick and tough skin and a tough musky flesh, dull purple in color without bloom (in the Scuppernong variety silvery amber-green), ripe in summer and early autumn: seeds 1/4-1/2 in. long, shaped something like a coffee berry. River banks, swamps, and rich woodlands and thickets, S. Delaware to N. Fla. and west to Kans. and Texas.

2696. Vitis rotundifolia, the Muscadine grape of the South (X 3/4).
VITIS

6. Munsoniana, Simpson. Mustang Grape of Florida. Bird or Everbearing Grape. Very slender grower, preferring to run on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously; lvs. smaller, thinner, and more shining, more nearly circular in outline and less prominently pointed, the teeth broader in proportion to the blade and more open or spreading; clusters larger and more thyrse-like; berries a half smaller than in the last and often more numerous, shining black, with a more tender pulp, acid juice, no muskiness, and thinner skin; seeds half smaller than in the last. Dry woods and swamps, Florida, at Jacksonville, Lake City, and southwards, apparently the only Grape on the red keys; also in the Bahamas. - Difficult to distinguish from V. reductifolia in herbarium specimens, but distinct in the field.

1950

VITIS

9. vulpina, Linna. V. riparia, Michx. V. adovatilis, Dunn. V. lilianus, and V. Muscaria, Prince (V. reductifolia, Le Conte) V. cordifolia, var. riparia, Gray). Riverbank or Frost Grape. Figs. 2697, 2698. A slender trailing or climbing plant (reaching 20 to 30 ft. in height, with very long and slender branches, the young growth angled and floccose (sometimes glabrous), the phragmata plane and rather thin; lvs. bright green with a bronzy tint, large stipules, plane very thin 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 N. Pa. to Tenn., Indiana, Mo., and S. W. Texas.

Var. dissecta, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency towards irregular lobing. Mo.

Fv. Les. ovate in outline, with a mostly well-marked sinus.

8. monticola, Buckley (V. Terzina, Munson. V. Forzéholin, Planch). Sweet Mountain Grape. Fig. 2697. A slender trailing or climbing plant (reaching 20 to 30 ft. in height, with very long and slender branches, the young growth angled and floccose (sometimes glabrous), the phragmata plane and rather thin; lvs. bright green with a bronzy tint, large stipules, plane very thin 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 N. Pa. to Tenn., Indiana, Mo., and S. W. Texas.

Var. dissecta, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency towards irregular lobing. Mo.

Fv. Les. ovate in outline, with a mostly well-marked sinus.

2697. Vitis monticola (on the left) and V. vulpina (X ½).

cc. Bark without distinct tenticles, on the old wood separating in long thin strips and fibers; nodes provided with diaphragms; tendrils forked; flowers clusters mostly large and elongated; seeds pyriform. (Rexita.)

d. Green-bearing Grapes, mostly marked at maturity by absence of prominent white, rusty, or blue tomentum or scar or conspicuous bloom on the lvs. beneath under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even velvety; foliage mostly thin; tendrils integumented, i.e., every third point bearing no tendrils (or inflorescence). V. crenatum and V. Asarinae have partial exceptions and might be looked for in 16 (Nos. 7-19).

e. Vulpina-like Grapes, characterized by thin light or bright green mostly glossy lvs. (which are generally glabrous below at maturity except perhaps in the axils of the veins and in V. Champini), with a long or at least a prominent point and usually long and large sharp teeth or the edges even milled (Nos. 7-19).

f. Lvs. broader than long, with truncate-oblique base. (V. Treleasei might be sought here.)

7. repestris, Scheele. Sand, Sugar, Rock, Bush, or Mountain Grape. Subway, 2 to 24 ft. high, or sometimes slightly climbing, the tendrils few or even none, phragmata plane and rather thin; lvs. renewed in conform to the foliage, generally glabrous and thick, sometimes deciduous above, the margins irregularly notched with smaller teeth than in V. repestris; clusters short and broad, much branched; berries medium or small (averaging about ½ in. in diam.), black or light-colored, seedy, sweet; seeds large (about ½ in. long) and broad. Limestone hills in S. W. Texas. - This species has been the subject of much misunderstanding.

9. vulpina, Linna. (V. riparia, Michx. V. adovatilis, Dunn. V. lilianus, and V. Muscaria, Prince (V. reductifolia, Le Conte) V. cordifolia, var. riparia, Gray). Riverbank or Frost Grape. Figs. 2697, 2698. A vigorous tall-climbing plant, with a bright green cast to the foliage, generally glabrous young shoots, large stipules, and plane very thin phragmata; lvs. thin, medium to large, cordate-ovate, with a broad but usually an evident sinus, mostly showing a tendency (which is sometimes pronounced) to lobes, generally glabrous and bright green below, but the veins and their angles often pubescent, the margins variously deeply and irregularly toothed and sometimes cut, the teeth and the long point prominently acute; fertile lvs. bearing reclining or curved stamens, and the sterile ones long and erect or ascending stamens; clusters medium to large, on short peduncles, branched (often very compound), the lvs. sweet-scented; berries small (less than ½ in. in diam.), purple-black with a heavy blue bloom, sour and usually austere, generally ripening late (even after frost); seeds rather small and distinctly pyriform. New Brunswick, according to
Macoun, 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. V. labrusca in the flavor and maturity of the fruit. Forms with petioles and under-surfaced of leaves, pubescent sometimes occur. Occasionally hybridizes with V. labrusca eastward, the hybrid being known by the tomentose young shoots and unfolding leaves, and the darker foliage, which is marked with rusty tomentum along the veins of the less jagged leaves.

Var. præcox, Bailey, is the June Grape of Missouri, the little sweet fruits ripening in July.

10. Treelasci, Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the lvs.) ten-dril deciduous the first year useless finding support, internodes short, the diaphragm twice thicker (about one-sixteenth in.) than in V. vulpina and shallow-branched; stipules less than one-fourth as large as in V. vulpina; lvs. large and green, very broad-ovate or even reniform-oval (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 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 half in, 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. Arizona, var. glabrum, from which it is distinguished, among other things, by its earlier flowering and larger leaves with coarser teeth and less pointed apex.

11. Longiss, Prince (V. Salicaria, Planch. V. Nuevo-Mexicana, Lem.). Differes from vigorous forms of V. vulpina in having floccose or pubescent young growth; lvs. deciduus more stellate 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, was very likely originally a hybrid between V. rupestris (which it sometimes closely resembles in herbarium specimens except for its wooliness) and some tomentose...
species (possibly with V. Arizonica or V. Pacionis), 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 its baptism 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. Naco-Mexicana. This 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 "Longis." It is probable that the plant was sent to European gardens as Vitis Longii—very likely from Prince’s nursery—and the name was misread on the label. The original name, which was duly published by Prince with description, may now be restored.

Var. microspérama, Bailey (V. Solonis, var. microspérama, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

12. Champini, Planch. Probably a hybrid of V. rupestris or V. Berlandieri and V. cavinicns, bearing medium to large reniform or reniform-cordate Ivs. which are variously pubescent or cobwebby but become glabrous, the growing tips mostly white-homentose: berries very large and excellent. S. W. Texas. A. G. 1891, 579. In some places associated with V. cavinicns. Berlandieri and monticola only, and in others with the above and V. rupestris. Often composing dense thickets in the wild.

2699. Vitis cinerea (above) and V. Berlandieri. (1:1.)

13. rubra, Michx. (V. monospérama, Michx.). Red or Cash Grape. A slender but strong-growing vine, with small, long-jointed angled red glabrous herb-like shoots and red pedicellate Ivs. small to medium, ovate-acuminate, dark green and glossy, sometimes minutely pubescent on the nerves below: the sinuses 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 (1½-2½ in. in diam.), black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Illinois and Missouri to Louisiana and Texas. G.F. 2844.

A handsome plant. V. politana, Vahl, found on Virginian specimens, is probably V. rubra, although it is sometimes made to replace the name V. rubra.

EE. Cordilatula—like Grapes, with blackish and all-rose or all-magenta berries, often bearing some close, dull pubescence below at maturity and the shoots and Ivs. merely always more or less pubescent when young, the teeth mostly short, the point mostly reflexing: odor and aphrodisiacous (Nos. 24-28).

F. Plant strong and climbing, with stout, persistent tendrils.

6. Young shoots terete, and glabrous; shoots very soon becoming so.

14. cordifolia, Michx. (V. pubicarea, L. Conr.). True Frost Grape, Chicken, Raison, 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.: diaphragms thick and strong: Ivs. long-cordate, triangular-cordate with rounded base, or cordate-ovate, undivided but sometimes very indistinctly 3- or 5-fid or 3- or 5-angled, the basal sinus rather deep and narrow, the margin with large, acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower bright green and either becoming perfectly glabrous or bearing some close and fine inconspicuous greyish-pubescent on the veins; petioles long: stamens erect on the sterile fls. and short-recurved in the fertile ones: clusters long and very many-flowered, most of the pedicelled-branched or at least bearing a cluster of fls.: berries numerous and small (about 6 in. in diam.), in a loose bunch, black and only very slightly glossy, late and persistent, with a thick skin and little pulp, becoming edible after frost: seeds medium and broad. In thickets and along streams from Pa. (and probably S. New York) to E. Kan., Fla. and Texas.

Var. latifolia, Engelm., has feebly aromatic berries, and grows in the Mississippi valley.

Var. sempervirens, Munson. A glossy-leaved form holding its foliage very late in the season: Ivs. somewhat suggesting forms of V. rubra. S. Fla.
Vitis Var. Helleri, Bailey. Lvs. more circular (i.e., lacking the long point) and the teeth round-ovate and ending in a short mucro. Kerr county, S. Texas, 1,600 to 2,000 feet.

20. Young shoots angled, and covered the first year with tomentum or wool.

15. Baileyana, Munson (V. Virginia, Munson, not Lam.). "Possum Grape. Less vigorous climber than V. cordifolia, rather slender, with short internodes and very many short side shoots; lvs. frequently smaller, the larger ones short but distinctly 3-lobed (lobes mostly pointed and much spreading), bright green but not shining above, gray below and pubescent at maturity only on the veins, the point only rarely prolonged and often naucous, the teeth comparatively small and not-like and not prominently acute, sinus more open; pedicels short and often pubescent; floral organs very small, the stamens reflexed in the fertile fls.; pedicels short, making the bunch very compact; berries about the size of V. cordifolia, black and nearly or quite bloomless, late; seed small and notched on top. Mountain valleys, 2,000 to 3,000 ft. altitude, southwestern Va. and adjacent W. Va. and W. N. C. Tenn. and N. Ga.; also at common levels in the uplands of west-central Ga.—The eastern counterpart of V. Berlandieri.

16. Berlandieri, Planch. Mountain, Spanish, Fall or Winter Grape. Fig. 2699. A stocky, moderately climbing vine, with mostly short internodes and rather thick diaphragms; lvs. medium large, broadly cordate-ovate or cordate-ovarilic (frequently as broad as long), glabrous and glossy above, covered at first with gray pubescence below but becoming glabrous and even glossy except on the veins, the sinus mostly inverted-U-shaped in outline but often acute at the point of insertion of the petiole, the margin distinctly angled above or shortly 3-lobed and marked by rather large, open, notch-like acute teeth of varying size, the apex mostly pointed and triangular-pointed shape of the type. St. Louis, Mo., and Arizona, mostly south of the 35th parallel, to S. Calif. and northern Mex.

Var. glabra, 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. monticola by its triangular-pointed and small-toothed lvs. Probably a form of V. Tenensis.

EEE. Orbicular-scallop-ovate species of the Pacific coast.

19. Californica, Benth. Fig. 2700. A vigorous species, tall-climbing upon trees but making bushy clumps when not finding support, the nodes large and diaphragms rather thin; lvs. mostly round-reiniform (the broader ones the shape of a horse’s hoof-print), rather thin, either glabrous and usually (more commonly) cottony-canescent until half grown and usually remaining plainly pubescent below, the sinus ranging from very narrow and deep to broad and open, the margins varying (on the same vine) from finely blunt-toothed (the latter a characteristic feature), the upper portion of the blade either continuous or sometimes indistinctly 3-lobed and terminating in a very short apex; bunches medium, mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor: seed large (5/4 to 6-1/2 in. long), prominently pyramidal. Along streams in central and N. Calif. and S. Ore. —Lvs. becoming handsomely colored and mottled in fall.
20. **Girdiana**, Munson. VALLEY GRAPE. Strong, climbing vine, with thick diaphragms; lvs. medium to large and rather thin, broadly-cordate-ovate, with a rather deep and narrow sinus and nearly continuous or obscurely 3-lobed outline (sometimes markedly 3-lobed on young shoots).

21. **Doaniana**, Munson. Plant vigorous, climbing high or remaining bushy if failing to find support, with short internodes and rather thin diaphrags; lvs. bluish-green in cast, mostly large, thick and firm, cordate-ovate or round-ovate in outline, bearing a prominent triangular apex, the sinus either deep or shallow, the margins with very large, angular, notched-like teeth and small and minute teeth, felt-like tomentose, except sometimes in V. Bourquiniana). (Nos. 20-24.)

22. **Russet-leaved Grapes**, comprising species with the ends of the growing shoots and the under-surface of the leaves, which are close and glaucous-blue.

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**VITIS**

DD. Colored-leaved Grapes, marked by thick or at least firm foliage, the lvs., prominently rusty or white-tomentose or glaucous-blue. **V. cineria**, V. Arizonae, and possibly V. Californica might be sought here; and inter-gathered terms of V. bicolor might be looked for in it (p. 1594).

E. Lvs. only floccose or cobwebby or glaucous below when fully grown (i.e., not covered with a thick, dense, felt-like tomentum, except sometimes in V. Doniiana). (Nos. 20-24.)

F. White-tipped Grapes, comprising species with the ends of the growing shoots and the under-surface of the leaves, which are close and glaucous-blue in color.

22. **aestivalis**, Michx. (V. aestivalis, occidentalis and Americana, Bartram. V. Morton, Prince, V. labruscana, Regel. V. aestivalis, var. aestivalis, var. aestivalis, LeConte, SEMMER, BUNCH, or PINEGRAPE. Strong, tall-climbing vine, with medium-short internodes, thick diaphrags, and often pubescent pedicels; lvs., mostly large, thinnish at first but becoming rather thick, 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 usually notched 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 retaining a covering of copious rusty or red-brown pubescence which clings to the veins and draws together in many small, tufty masses; stamens in fertile fls. reflexed and laterally bent; clusters mostly long and long-peduncled, not greatly branched or even nearly simple (mostly interrupted when in flower), bearing small (½ in. or less 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 (½ in. or less long), two to four. Southern New York to central Fla. and westward to the Mississippi and Missouri. — A marked type among American Grapes, being readily distinguished from other species by the reddish fuzz of the under sides of the leaves.

Var. **glauca**, Bailey (V. Linsecomii, var. glauca, Munson). Lvs. and mature wood glaucous-blue on the body beneath, but the veins rusty; berries and seeds larger. S. W. Missouri to N. Texas. — Much like V. bicolor, but lvs. thicker and more pubescent below, and tips of shoots rusty-tomentose.

Var. **Linsecomii**, Munson (V. diversifolia, Prince. V. Linsecomii, Buckley). Post oak, Pine, or Turkey Grape. More sticky than V. aestivalis, excreting high upon trees but forming a bushy clump when not finding support; lvs. densely tomentose or velvety below; berries large (½ in. in diameter), black and glaucous, mostly palatable; seeds mostly much larger than in V. aestivalis (often 3, in length). High post oak (Quercus stellata) lands, S. W. Missouri to N. Texas and N. La. — Very likely derived from the aestivalis type through adaptation to dry soils and climates. Perhaps worth recognition as a geographical species. The name of this Grape was spelled Linseeomi by Buckley, with whom the name originated. The name of the person whom he commemorated was spelled Linecemu, and Munson has therefore changed the spelling of the name of the Grape. However, Buckley’s spelling should persist, as a matter of priority.

Var. **Bourquiniana**, Bailey (V. Bourquiniana, Munson). A domestic offshoot, represented in such cultivated varieties as Herbiton and Le Noir, differing from V. aestivalis in its mostly thinner leaves (like the young shoots) are only slightly red-brown below, the pubescence mostly cinerous or dun-colored or the under surface sometimes blue-green; berries larger and juicier, black or purple. A mixture of some of it probably a direct amendment of V. aestivalis, and some hybridized with the wine Grape (V. vini- fera). Much cultivated south.
and thick diaphragms, the young growth and canes generally perfectly glabrous and mostly (but not always) glaucous-blue, tendrils and petioles very long:

Tendrils intermit-

and becoming dull green very late in the season, those on the young growth deeply 3-6-lobed and on the older growths shallowly 3-lobed, the basal sinus generally remaining rufous-tomentose (especially beneath), the petioles strongly veined and usually large and very compound: berry small and globose, purple: seed obovate, grooved on the dorsal side. A widely distributed and variable species in the American tropics, running into white-leaved forms (as in V. Blancoi, Munson) little known in the United States: La., Lake City, N. Fla., swamp near Jacksonville, Fla.

24. Caribbea, DC. Fig. 2702. Climbing, with flocculent-toothed (or only angled on the normal growths, the margins mostly shallow-toothed or sinuate-toothed (at least not so prominently notched-toothed as in V. aristata): cluster mostly long and nearly simple (sometimes forked, generally with a long or prominent peduncle): the purple or light-colored or even whitish berries, which have a thick skin and a very disagreeable fiery flavor; seeds large, pyriform. E. Texas, mostly on limestone soils.

Var. coriacea, Bailey (V. coriacea, Shutt.). LEATHER-LEAF or CALLED-LEAF GRAPE, Fig. 2703. Distinguished from the species chiefly in bearing much smaller (about 2 in. in diam.) thinner-skinned and more edible Grapes with mostly smaller seeds, and perhaps a less tendency to very deep lobing in the Ivvs. on young shoots and possibly rather more marked rustiness on the young growths. Florida, chiefly southward, in which range various Texan plants reappear. —The more agreeable quality of the fr. is probably the result of a more equable and moister climate.

26. Simpsoni, Munson. Distinguished by mostly much-cut Ivvs. 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 Ivvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fla. —This is likely a hybrid of V. (estivalis and V. candida, var. coriacea. Some forms of it are very like V. Labrusca, and might be mistaken for that species.

FF. Tendrils mostiy continuous (a tendril or inflorescence at every node).

27. Labrusca, Linn. (V. Bléndi, 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 scurfy down: Ivvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly obscurely 3-lobed towards the top (on strong growths the sinuses sometimes extending to 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 the length of the petiole), the margins shallowly scallop-toothed with micro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny-white, dun-colored or red-brown tomentum: stamens long and erect in the sterile fls. and (in wild forms) short and recurved in the fertile ones: raceme short (berries usually less than 20 in wild types), generally
simple or very nearly so, in anthesis about the length of the pedicel; 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 and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. New England and southwards in the Alleghany region and highlands of 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. labrusca, the more felt-like leaves, which are not floccose, and especially by the small-toothed leaves, very short clusters and large berries and seeds.

Vitis vinifera Linn. Wise Grape. European Grape. Piq. 2701. Wise Grape. Probably from Cau- casus region and westwards in Georgia. V. laciniosa, Hort., has much-cut foliage; handsome. (Gn. 54, p. 427.)—Cult. from the earliest times, and the Grape of history. Now greatly varied. The hothouse Grapes, as Black Hamburg, Barbarossa, are of this species; also the vineyard Grapes of California. Not hardy in the northern states and very subject to phylloxera (root-louse) and mildew. Regel, 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. T. Amursis, Rupr., is much like V. vinifera, sometimes grown abroad for the purple tint of its young growth. Gn. 54, p. 425.—V. Bairdenii, Hook. (Clusia Bairdii.) Planch., and by
VOLKAMERIA. Consult Clerodendron.

VRIÉSIA (named for Dr. W. de Vries, of Amsterdam.) —Consult Vriesea, but not so spelled by Lindley, who founded the genus. According to Mez (DC. Monogr. Phaner. 9), 84 species are to be referred to this genus. They are very like Tillandsias, with which they are united by Bentham & Hooker and others. The chief technical difference is the presence in Vriesia of 2 ligules or a single cleft or emarginate ligule on the inside of the base of petals. Culturally Vriesias are like Tillandsias. They run to forms with or 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. Stamen longer than the petals.
B. Inflorescence branched.


BB. Inflorescence simple.

v. Bracts of inflorescence strongly imbricate.

splendens, Lem. (V. speciosa, Hook. Tillandsia splendens, Bronn. T. pitu, Hort. T. zebrina, Hort., in part.) Fig. 2706. Strong-growing plant, with broad, strong, arching-asending lvs. 1 ft. or more long, which are bright green and marked with dark brown transverse bands: spike with densely imbricate bright red-acuminated bracts, the scape spotted: fls. exerted, yellowish white. Guiana. B.M. 4:92. F.S. 2:167; 6. p. 162. R.H. 1848:41. 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, Warra (V. brachystachys, Regel. Tillandsia carrinata, Baker.) Fig. 2707. Lvs. rosetulate, about 6 in. long, the base sheathing, mucronate at the tip, somewhat glaucous, not spotted: spike with wide-spreading nearly daricinate acuminate bracts which are scarlet at the base and yellowish green at the end: fls. protruding, pale yellow. Brazil. B.M. 6014.

cc. Bracts of inflorescence remote, not imbricate.


2706. Vriésia splendens.

psittacina. Lindl. (Tillandsia psittacina, Hook.). About 1 ft. high when in bloom; lvs. rosetulate, 6-10 in. long, dilated at the base, yellowish green; fls. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. B.R. 29:10, where the genus is founded. B.M. 2841. R.H. 1855:221.—A showy species when in bloom.

AA. Stamen shorter than the petals.
B. Lvs. not barred, mottled or tessellated.

heliconioides, Lindl. (V. heliconioides, Hook.) Dwarf and tufted, with many rosetulate recurving or arching lanceolate lvs. (about 12 in. long), which are bright green above and purple tinged beneath. Spike 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. 30:496. G.C. H. 21:140.

BB. Lvs. tessellated (marked in small checker-work) or minutely variegated.


2705. Erigeron macronatus, known in the trade as Wittadinia triloba. (x ¼.)
Lvs. marked with strong transverse bands.

hieroglyphica, Morr. (Tillandsia hieroglyphica, Bull.). Lvs. many, rosulate, 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. Brasil. I.H. 31:514; 42, p. 318. K.H. 1891:42. A very striking and showy plant. Sometimes known as a Massanthes.

V. fulgida, Hort., has been catalogued in this country. It is a garden hybrid (V. mengenata x Brazil). It has short green lvs. and an exserted simple spike with distichous bright red imbricated bracts. I.H. 33:57. — V. glaucophylla, Hook., is referred to Tillandsia fasciculata.— V. massanthes, Cogn., is Guzmánia, for which see Tillandsia. It is also known as a Massanthes or p. 992. — V. zehntneri, Hort., is sometimes V. splendens, and sometimes Cryptantha zonata. For the latter, see discussion under Tillandsia and Fig. 2515.

VULNERARIA. V. Anthyllis, Scop., is Anthyllis Vulneraria, which see in Vol. I. The other Vulnerarias are referred to the same genus.

VYÉNOMUS is another spelling for Eunomus.
WAHOO, WAHOO, or BURNING BUSH is Euonymus atropurpureus. Clausa alata, the Winged Elm, is also called Wahoo or Wahoo.

WAFFER ASH. Ptelea trifoliata. See Platycodon.

WAITZIA grandiflora. See Platycodon.

WALENBERGIA grandiflora. See Platycodon.

WAITSIA (F. A. C. Winitz, born 1788, state physician to the Dutch at Samarang; Java; wrote on Japanese plants). Compositae. Includes one of the racer "everlast- ing 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; fls.-heads in terminal corymbs or rarely in oblong, leafy racemes; involucres various in outline, the bracts overlapping in many rows, all colored and petal-like; receptacle flat, without scales; authors provided with tails of microscopic size: achenes somewhat compressed, glabrous or papillose, terminat- ing in a slender beak; pappus of capillary bristles usually coiling at the base, simple, barbellate or plum- bene. The genus is distinguished from Helipterum and Heliichrysum by the beaked achenes. Flora Australiensis, vol. 3.

grandiflora, W. Thompson. (The authorship of this species is credited to Naudin by Index Kewensis.) Half-hardy everlasting or "immortelle," annual, ex- ceeding 18 in. in height: lvs. lanceolate, long-acumi- nate, sessile, green above, slightly villous beneath, prominent midrib beneath: fls., yellow, in terminal corymbs, F. 1823-24, where it was originally described. Probably the most desirable of the genus. It seems to have replaced W. aurea, the favorite of the previous generation, being larger and more robust and rather easier of cultivation.

W. M.

WALDSTEINIA (Franz Adam, Count of Waldstein-Wartenburg, born 1759 at Vienna; wrote with Kitaibel an illustrated work on rare plants of Hungary; died 1823). Rosaceae. The YELLOW or BARREN STRAW- BERRY, Waldsteinia fragaroides, 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 ½ in. across. It comes with the first rush of spring and continues to bloom until summer. There is no satisfaction in growing on 1 plant 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 bracted, bearing 2-5 yellow fls.; petals 5, obo- vate, about as long as the calyx-lobes; stamens in- dediate; carpels 2-4; achenes oblong-obovoid, dry or slightly fleshy. Natives of north temperate zone.

fragaroides, Tratt. Fig. 2786. Popular description above. Pubescent or nearly glabrous: lfts. dentate or crenate except at the base, 1-2 in. long; scapes corymbose 3-6-fl., lfts. 1-2½ ft. long. In 1889, p. 116, 121, 207, 208, 1890, p. 510, B.M. 1667 and L.B.C. 5:408 (both as Disticha fragaroides). W. M.

(W 2706. Yellow, or Barren Strawberry—Waldsteinia fragaroides (X ½).

WAKE ROBIN. In England Arum maederatum. In America, Trillium.

WALLMEISTER is Asperula odorata.

WALKING-LEAF FERN is Compsopus.

WALL CRESS or ROCK CRESS is Arabis.

WALL FERN. POLYPODIUM vulgare.

WALLFLOWER. Consult Cheiranthus Cheiri.

WALLISCHIA (Nathaniel Wallich, 1786-1854, Danish botanist; wrote on plants of India). Petasites. 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 advertised in America, is believed to be in a few northern greenhouses. Low palms, eophotis, with short branching caudices, or in 1 species tall: lvs. densely fasciculate, terminal, distichous, scaly, unequally pinnatisect; segments soli- tary or the lowest in groups, cuneate at the base, ob- long-obovate or oblong-elliptic, erect-ascending, the terminal one cuneate; midrib distinct; nerves flabellate; marcescences very numerous, slender, coriaceous, the lower ones the narrower, 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)
WALLICHLIA

apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy. Lvs. disposed in a ½ spiral; fls. in many spiral series. Himalaya.
W. porphyrocera, Mart. See Dolympo-perma.

WALL PEPPER. Sedum acre.

WALNUT is a name applied to any species of the genus Juglans. The Walnut of history is Juglans regia (Fig. 2709), a native of southeastern Europe and regions beyond. Etymologically, the word Walnut signifies a nut that comes from a foreign source. It is interesting to note that in this country Juglans regia is known as English Walnut, apparently because the imported nuts are likely to reach us by way of England. In eastern North America, the word Walnut usually applies to the native Juglans nigra (Figs. 2710, 1830), although it sometimes, but erroneously, designates the large-fruited hickories. A related species, the butternut (J. cinerea, Figs. 2711, 1841) 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 Juglanis Californica (Fig. 2712), which makes a fine large tree and often bears excellent nuts. The eastern J. nigra was early introduced into Califor-

2709. Juglans regia, the Walnut of commerce (X 1/4). Often known as the "English" Walnut.

nia and it seems now to be common. In fact, it is sometimes difficult to distinguish the two species. The Californian species attains a height of 50 ft., making a broad-topped handsome tree. Commercial Walnut culture is concerned with J. regia, and this culture is practically confined to California. The species is hardy even as far north as parts of New York, and in the Middle and Southern states it often bears well, but its culture is not attempted on a large scale in the East. The Japanese Walnut, J. Sieboldiana (Figs. 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 from $3 to $4 California more than one million dollars.

Commercial Walnut culture is confined to four southern coast counties of California—Santa Barbara, Ventura, Los Angeles and Orange. For this there are good and sufficient reasons. Although called the "English" Walnut in this country, the climate of England is not very well suited to its production, and the greater part of the product in that country is used in the manufacture of pickled Walnuts. The Walnut is fairly hardy when dormant, but very tender when growing. Therefore, no place subject to late spring frosts can grow Walnuts with success. The extension of Walnut culture into the more northern coast counties of California must be done by planting varieties which lie dormant until the time of the spring frosts is past. The immature nut is also very tender, and cannot endure very hot weather. Even in the coast counties a small percentage of the crop is often destroyed by hot weather, and the hot interior valleys of southern California, or places very distant from the ocean, do not produce Walnuts. The area of successful production is still further limited by the requirement of well-drained and deep alluvial soil for the tender rootlets. Any soil of a clayey nature or underlain with a hard clay subsoil will produce only stunted trees, while on soil where the water comes nearer than twenty feet of the surface the trees will grow only a few years, hardly long enough to produce a full and profitable crop.

In nursery practice the nuts are scattered at a distance of about 1 ft. in drills 4 ft. apart, late in the fall, in soil that has been deeply plowed. As soon as a sufficient number of the plants break through to distinguish the rows, the cultivator is run through to kill the weeds. The young seedlings are irrigated and cultivated frequently during midsummer, the object being to force them as much as possible and yet harden them before winter. During the first year the seedlings reach a height of 1½-2 ft. The taproot, however, grows down from 5-8 ft. If grown in the nursery the second year, they are treated in the same manner, and usually reach a height of 8-12 ft. Of late years the practice of grafting has been growing in favor. The 1-year-old seedlings are root-grafted, just as they stand in the row. The grafts will grow about 8 feet in one year. Grafting is much more successful than budding. When trees are budded, ring-buds are used, and the tie is a strip of waxed cloth.

The trees are planted in orchard form at either 1 or 2 years of age, preferably the latter. They are usually set in squares 50 ft. apart. The trees make very little
growth the first year, many of them not more than 6 inches. After this the growth is rapid. The trees are tied to stakes with strips of cloth, since they are very tender when growing, and the swaying of the tree by the wind quickly causes the stiffer ties to cut through the bark. Walnut trees are pruned very little. At first small limbs are allowed to start from 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. Pecocity 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 itself. Hard-shell trees do not bear as young, and they are not regular bearers.

Walnut orchards in California receive thorough tillage. They are heavily irrigated in winter, and plowed about 8 in. deep in the spring. After this they are irrigated and cultivated until the nuts begin to fall, about the 1st of September. Late irrigation fills out the nuts and causes the hull to open readily. Heavy fogs are also desirable during harvesting. The nuts are shaken down and picked up. They are then spread in trays about 5 in. deep until dry, when they are bleached and shipped to market. Walnuts were formerly bleached with fumes of sulfur, but this was found injurious to the nut. They are now usually dipped in a solution of chloride of lime (chlorinated lime) and sal-soda, to which a sufficient amount of sulfuric acid has been added to set free the chlorine.

The majority of Walnut-growers are organized into local associations. Representatives of these associations form the executive committee of the Southern California Walnut-Growers' Association. This executive committee provides the form of contract which fixes the price. The local associations are managed in several ways.

In some the growers bleach their own crop, while in others the association performs this work at its own packing house.

The Walnut tree has very few pests. The red spider sometimes attacks the trees, but it is not considered a serious pest. Of late years a bacterial growth has developed to a considerable extent which is more serious. This attack destroys the immature nut and the small limbs of the tree.

2711. Juglans cinerea of the eastern states. (× 2.)

Sometimes known as White Walnut.

2712. The California Wild Walnut — Juglans californica (× 1/4.)

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. Infection enters near the growing point of branches, in the openings of 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 infestation of the branch will largely depend on the tenderness of the latter at the time and point of infection. If the tissue is tender a canker-like spot will be eaten through to the pith, or the entire end of the shoot may be destroyed. If the nut is infected while small, its complete destruction usually follows, the digestive action of the germ involving hull, shell and kernel. Nuts infected early in the season mostly fall when small, while later infections frequently result only in the destruction of the hull and the blackening of the outer layers of the shell, the tissues having become too hard for the further progress of the disease. As in the case of pear blight, rapidly growing trees are more subject to injury than those making a slower and harrier 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 infecion. 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...
Walnut, Indian. *Ailanthus triloba.*

Wand Plant. *Galax aphylla.*

Wandering Jew. *Zephyra pendula and Tradescantia fluminensis.* Also *Sarcandra sarmentosa.*

Waratah. *Telopea speciosissima.*

Warber, John Aston, physician, author, horticulturist and forester, was born at Philadelphia, January 19, 1842. His early life was spent in a suburban home, where he evinced a love of nature which he cherished through life. Bartram and Darlington were among his neighbors and he met in his father’s house men like Audubon, Michaux and Nuttall. In 1863 his parents moved to Springfield, Ohio, where he helped clear up a farm and first became interested in agricultural sciences and comparative anatomy. He was graduated at Jefferson Medical College, Philadelphia, in 1866. He settled in Cincinnati in 1887 and began the active practice of medicine. He was early elected a member of the school board and did faithful service for many years, making it his business to travel through the cities to study systems of teaching in order to introduce improved plans into the Cincinnati schools. He was actively interested in and a prominent member of the Cincinnati Asylum for the Blind. He was also a member of the American Forestry Association, the Cincinnati Society of Natural History. He was one of the founders of the Cincinnati Horticultural Society and the Wine-Growers’ Association.

Wardian Cases are nearly air-tight glass cases used for transporting growing plants on long sea voyages. For this purpose they furnish the best and safest means of transportation. They maintain nearly uniform conditions of temperature 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 grafted of nursery stock from these resistant trees is contemplated for new orchards. As no species of Walnut except *J. regia* has thus far shown this disease under natural conditions, many hybridizations have been undertaken in hope of obtaining resistant and satisfactory trees by this means.

*Newton B. Pierce.*

Walnut orchard in Southern California.
WARDIAN CASES

WARCWIEWICELLA. See Zygoptetum.

WARREA (named for Frederick Warre, who discovered the first species in Brazil). *Dendrochilum.* Lvs. few, long, pleate; scape-tall, bract-ted, bearing a raceme of terminal-shawly fls.; sepals and petals subsquar, 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-dact.,* Hef.). 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. 6:255.

W. cyanca, Lindl. — Agania cyanca

HEINRICH HANSELBRING.

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, 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 Jefferson county and of Island county are comparatively dry, even though on what is known as the wet side of the mountains. The whole of western Washington is a vast forest; yet there are numerous valleys in which trees do not grow. The natural forest growth is coniferous, except along the watercourses, where there is a considerable growth of deciduous trees, such as alder, poplar, willow, etc. In a few places scattering specimens of oak, ash and maple are found. Vast areas of land have been reclaimed from the sea, or at least from Puget Sound, and these tide-lands are amongst the best in the state. The summers are comparatively bright and dry, the winters wet and almost sunless.

Fruits.—The Italian prune (Fellenberg plum) is planted in great numbers on both sides of the state. Clark county has not less than 5,000 acres planted to fruits, mostly apples and prunes. Clark county, on the west of the range, is the greatest prune producer. The Puyallup valley, close to the Puget Sound, is the leading small-fruit section, but the whole state is adapted to many of the fruits. The islands of Whidbey and Orcas are famous for their fruits. Of the 80,000 acres in fruit now planted in the state, 25,000 acres are in prunes, mostly Italian, 46,000 in apples, and the remainder in plums, cherries and grapes.

Western Washington a wholly different condition exists. The summers are bright and the temperature high, and during the months of June, July and August pratically rainless. Eastern Washington has a varying rainfall. Those portions immediately east 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 crops. Altitude has a marked influence on the climate of eastern Washington. In the valleys of the Columbia and Snake rivers, from 400 to 600 feet above sealevel, the summers are long and hot, and in these portions severe frosts are not felt. In those low valleys the tenderer fruits grow to perfection, but of these there are only a few thousand acres. There are two large valleys: viz., the Walla Walla and the Yakima, each having an altitude of about 1,000 feet, where the winters are more severe, 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 1,500 feet must be irrigated to produce crops. The larger portion of eastern Washington, and especially that bordering on Idaho, is high, ranging from 1,800 to 2,600 feet above 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 basalt clay loams to the volcanic ash, and to the sand and silica soils of the river bottoms. The higher lands grow the hard fruit crops to perfection; the river bottoms grow the peach, apricot and the grape, while midway between these is grown a great variety of fruits, garden products and alfalfa.

The best wheat lands are the heavy clay soils at an altitude of about 2,000 feet.

In eastern Washington a wholly different condition exists. The winters are not cold. In some parts, run in deep canions, and the table-lands are anything but level. The soil varies from the deep basalt clay loams to the volcanic ash, and to the sand and silica soils of the river bottoms. The higher lands grow the hard fruit crops to perfection; the river bottoms grow the peach, apricot and the grape, while midway between these is grown a great variety of fruits, garden products and alfalfa. This is the species producing the largest amount of fruit are Walla Walla, Yakima, Whittman, Clark, Spokane and Kittitas. The islands of Whidbey and Orcas are famous for their fruits. Of the 80,000 acres in fruit now planted in the state, 25,000 acres are in prunes, mostly Italian, 46,000 in apples, and the remainder in plums, cherries and grapes.

The Italian prune (Fellenberg plum) is planted in great numbers on both sides of the state. Clark county has not less than 5,000 acres planted to

2714. Bacteriosis of the Walnut, as shown on fruit and leaves. See page 1961.
this fruit, and is still planting more. There is no other portion of the United States, and perhaps not in the world, where this variety is so largely planted. There is a demand for a large, somewhat acid prune, and the Italian 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 work their silver prunes over to Italians.

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.

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There are numerous varieties of prune planted on the coast, but none in 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.

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 Neatow and Baldwin. The lower warm valleys grow the long season apples, like Yellow Neatow 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 well, 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.

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 Neatow and Baldwin. The lower warm valleys grow the long season apples, like Yellow Neatow 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 well, 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
Plate XLVIII. Washingtonia filifera, the most characteristic palm in California.
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.

WASHINGTON (named for George Washington). Paludiceae. Tall palms, with the robust trunks clothed above with short, spreading, orbicular, flabellately plicate lobed nearly to the middle; segments induplicate; laminae on the margins: racemes short; ligule large, glabrous, late, blade circular, tomentous on the margins of the 40-60 segments, 3-5 ft. in diam., cleft on the upper side nearly to the middle, gray-green; segments margined with numerous fibers 6-12 cm. long; S. Calif., W. Ariz. 591 G. C. III. 12:591. R. H. 1876, p. 372; 1895, pp. 153-155. G. F. 6:535. Gt. 1896: 3.-W. filifera is perhaps the most characteristic palm of California. Its immense straight bole and shaggy collar of deflexed dead leaves make a striking and picturesque object. This collar of old leaves usually burn fiercely in the dry season.

robusa, H. Wendl. (Washingtonia Souber, Hort. in part). Stem thick, robust; petioles shorter, more densely spiny, the young plants with yellow spines and black-violet sheaths and petioles, at length brown; blade light green, 3 ft. long by 3 ft. wide; segments 60. Western Mex. G. F. 58:19. R. H. 1885, p. 463.

Sonora, Wats. Stem 25 ft. high, 1 ft. in diam.: leaves 3-4 ft. in diam., somewhat glaucous, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, 2 in. at apex, floccose-hairy along the margins and with stout curved spines: fr. 1/4 in. long, edible. Mex.

JARED G. SMITH

FURTHER NOTES ON WASHINGTON.- 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 filiform deeply cleft leaves, long (3-5 ft.) petioles with yellow margins and spines, which is the Colorado Desert species, W. filifera, Wendel.; (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 filiform leaf-blades, which is the one from Mexico and Lower California, W. robusta, Wendel. (W. Sonora, Hort. Calif. in part). This dark color of the petiole margins and spines is equally noticeable in the young as well as in the old. Comparative study of the inflorescence may perhaps establish this palm as a mere geographical variety of W. filifera, but we have not been able to study flowering specimens. It is certain that a part of the material offered by nurserymen under the name of Washingtonia Sonora is really W. robusta. Its greater 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. Stessnovitch, 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 R. Bolton (formerly Mrs. Estrada) by friends who brought them from Mazatlan. These specimens are now in Mr. Abraham's possession. A third importation of seed was made by Mr. John Rock, manager of the California Nursery Co. at Niles, but we do not know whence it came.

Washingtonia Sonora is rarely seen in cultivation, though frequently mentioned in nurserymen's catalogues, and it is certain that much of the material offered under this name is really W. robusta. In his "Flora of the Cape Region of Baja California," in Proc. Calif. Acad. Sci., series 2, vol. 3, pp. 109-112, 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 handed to a gardener in San Francisco for propagation; some of the seedlings were obtained by Mr. Abraham, but only one survived; this specimen shows the characteristic slender petiole and glaucous leaf of the true W. Sonora. This species appears to be much less hardy under cultivation than W. robusta.

From the above notes it would appear that both W.
specimens in cultivation have come from the peninsula, and though the type locality of the latter is unknown, most of the specimens in the trade apparently came from Guaymas and Mazatlan on the mainland. In cultivation in California Washingtonias respond gratefully to abundance of water during the dry season. It is a mistake to suppose that because they are desert plants they will thrive without moisture; in Palm valley, in the San Jacinto mountains, where they grow luxuriantly, they are said to be found only in the vicinity of springs.

OS. BERTT DAVY.


WATERING. An abundant and convenient supply of pure, fresh water should always be a first consideration in locating a garden or greenhouse. Having this, the next matter is knowing how to use it, for here, good gardeners say, lies nine-tenths of the elements of success. Certain it is, especially in the indoor cultivation of plants, that more depends upon knowing when to give or withhold water than upon any other single matter. The art of watering is unteachable; it requires experience, judgment, skill. Some knowledge of the commoner facts of vegetable physiology, physics and soil physics will be helpful, but even then experience will be necessary. Two common types of watering cans are shown in Fig. 2718. In American gardens, however, watering is usually performed with a hose from a stored water supply.

General Rules.—A fairly safe guide is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough soaking. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, the most useful test is to thump the jar. If it rings the soil is dry; if the sound is muffled the soil is sufficiently moist. Such rules, however, are only for the novice. They presuppose activity of growth, and take into account only one consideration aside from this, and that is the condition of the soil as regards moisture. The experienced gardener reads his practice in his plants and the conditions under which they are being kept. The following suggestions are based upon the most important considerations.

Actively growing plants may be watered very freely, as a rule, whereas in a dormant or semidormant state the same plants will require only occasional waterings.

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 be flag somewhat for want of water, and recover without permanent injury when a fresh supply is given. Hard-wooded plants, as camellias, azaleas and heaths, on the other hand, suffer permanent injury from becoming too dry. It is safest to allow no plant in active growth to flag.

The amount of foliage affects the plant's capacity for using water. Plants which have been cut back, or which from disease, insects or other causes, have lost most of their foliage, must be kept drier until they have regained their foliage.

Unhealthy plants are benefited, as a rule, by being kept rather dry until they begin to show signs of renewed vigor.

Small cuttings, or any plants freshly potted or newly transplanted, are not in condition to use much water until the root-hairs have attached themselves to the soil-particles and growth has begun. A thorough watering at the time of potting or repotting the plants, especially if they are subsequently shaded for a few days, is usually sufficient until they have become established.

The character and bulk of soil should be kept in mind. Porous and warm soils dry out much sooner, while the heavier clay soils are in danger of becoming waterlogged and sour, unless watered with care. When there is a large mass of soil in proportion to root development, as in the case of greenhouse plants 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 suitable for their development. Excessive humidity on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is caused by the air of the house drier. During summer, when there is free ventilation, the watering may advantageously be done late in the day. Midday watering at seasons when
the sunshine is very bright is often followed by scalding
of the foliage unless the plants are well shaded. Ferns, Rex begonias, Chinese primroses and richardias are among plants easily injured in this way.

Consider the temperature. The temperature at which the plants are kept, the position of the heating pipes, the amount of light, and the freedom of ventilation permissible, need to be kept in mind in watering plants in glasshouses. It is better, as a rule, to water 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 house where the plants are growing, or about 10° F. below.

Watering may be indirect. Shading the glass of greenhouses in summer with some suitable material is much practiced by florists for the purpose of sheltering plants from too great intensity of light, and for the purpose of reducing evaporation and transpiration. Certain kinds of plants, as palms, and some kinds of ferns, require this; also newly potted plants. Sprinkling of walks, by reducing the temperature and increasing the humidity of the air, also tends to reduce transpiration and save watering. Watchfulness and attention to ventilation are necessary, however, to avoid excessive humidity, which tends toward a soft watery growth and extreme sensitiveness and susceptibility to disease.

Vessels to contain plants should always be provided with openings at the bottom for perfect drainage. This, in a measure, is a safeguard against overwatering. Investigation has shown that a soil which is kept continuously wet through bad drainage or otherwise is rapidly impoverished through loss of nitrogen. A fermentation is also set up in the roots, which through the formation of alcohol and other products, results in their destruction.

While a constantly wet soil is always very objectionable, thoroughness in watering as often as the plants need water is of the greatest importance. When enough water has been supplied there will be more or less dripping from the bottom of the pot. It is a good plan to leave a space of 1/2-2 in. or more at the top of the pot for the reception of water. This space should be so large that when filled, the supply of water in soaking downward will penetrate to the bottom of the vessel.

See also, Greenhouse Management, p. 696.

2718. Watering-cans.

The can on the left, flattened on the sides, is generally preferable and can be carried in greenhouse walks and in narrow rows. The long spout enables the operator to apply the water directly to the roots; eased 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, of the Ohio Experiment Station, was one of the first in this country to point out, as the result of experi-
**WATERMELON**

There is probably no country in which the Watermelon is grown to such a large extent as in the United States. All the climatic regions which are suitable to grow Watermelons to perfection, and there are some of the short-season varieties that thrive well as far north as Ontario. It is found that the best results that have been obtained 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 seasons. It is probable that a well-matured Watermelon raised in the North has as good quality as one grown in the South. Some persons believe that seeds from melons grown for southern distribution in the North give earlier and better results in the North than southern-grown seeds; but the subject yet needs further experiment. However, the Watermelon is generally not so adaptable to the northern parts of the country as the muskmelon is, and is not so largely grown. The Watermelon can be so cheaply grown in the South and the West, and it transports so readily, that there is practically no Watermelon growing for profit in the northern states. Nearly every home garden can grow its own supply. The seeds may be sown directly in the open ground; or, in the northern sections, it is better to start them indoors in transplanting pans, as explained in the book on Propagation and Transplanting. It is well, also, in the northern states, to use rather freely of some quickly available fertilizer in the hill, in order to start the plants off early. In the South, the lands are loose and leachy and likely to dry out quickly, or, on the other hand, if they are hard and tend to become lumpy, it is well to make "hills" by mixing one or two large shovelfuls of manure with the earth and well rotted and then very thoroughly mixed with the soil. If the manure is coarse and not well incorporated with the soil, the hill is likely to dry out and the feeding plants 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 it is customary not to plant them closer than 8 feet either way. In the South, where general field practice is employed, the melons are usually planted about 10 feet apart. The 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 the melon with satisfaction. Lately very large melon industries have developed in Colorado. A very large part of the United States is really well adapted to the commercial growing of the Watermelon.

The common Watermelon are used as dessert fruits. However, there is a race of hard-fleshed very firm melons for drying, the so-called cantaloupe, which come true from seed. They come true from seed.

L. H. B.

**Watermelon Culture in Georgia.**—The Watermelon is the only important fruit or vegetable that has so many valuable by-products. Its saccharine matter cannot be profitably converted into sugar. Its enormous reservoir of juice or sap refuses to be turned into vinegar or wine, as putrificactive instead of acetie 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 fertile region of the Atlantic and Gulf states, from the seacoast to a curved line marked by the Piedmont Escarpment which sweeps diagonally southwest from Richmond to Vicksburg on the Mississippi—throughout this limit, as the limit of the cultivation of the pepper tree (the wiregrass)—the Watermelon flourishes unmixed, attaining there its serenest, fullest perfection. And of this area Georgia in particular is noted as producing many of the bulk of the crop shipped to northern trade centers, and the choicest selection as well. To a certain limit perfection in the melon is found in a truly parallel latitude—regulated and modified, of course, and as correctly dosed by isotherms, geological formation and local conditions and environment. Every mile traveled southward from New England brings a new speed and a new kind of flavor refinement. In this direction—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 Lee-dealer's door in all of the Middle States; while Virginia Sweetheart and Hoosier King; Cuban Queen, Delaware Lord Bacon and others, have finally brought the melon up to its highest perfection, though the Girardian innovations from Florida, such as Florida Favorite, New Favorite and Triumph, still contest their supremacy, while the older standards, as Rattlesnake, Sugarloaf, Sheephead, Scalbk 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 points combine to form the ideal melon. The scale of excellence for the southern type is probably about as follows:

<table>
<thead>
<tr>
<th></th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shipping capacity</strong></td>
<td>100</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Productiveness</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Earliness</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
<td>4</td>
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<tr>
<td><strong>Color of flesh</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Color of rind, or marking</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

**Total** 100

**Color of rind, or marking**

### Table: Watermelon Culture in Georgia

<table>
<thead>
<tr>
<th>Color of rind, or marking</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>1</td>
</tr>
</tbody>
</table>

**Color**
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 keeper.

Unfortunately, quality, which is based mainly upon a high sugar content, is generally inseparable from a thin rind and tender flesh—contradictory features to those requisite for a good shipper. This accounts for the relatively inferior quality of such melons as Rattlesnake, Kolb Gem and Jones, which are grown, of course, for distant markets. The metropolitan seldom realizes the supreme lusciousness which it is possible for some of the best local varieties in the South to attain unless he has been lucky enough to test them in the field. Even a Lord Bacon, the best of the shipping melons, cannot stand table comparison with Ramsay, Dixie, Jordan Gray Monarch, Kleckley Sweets, Melver Sugar, Pinney Early or Mountain Sweet.

Shape is of minor consideration, if only ordinary symmetry or freedom from distinct deformity is preserved, as preference appears to be divided between the round or ovoid and elongated forms, while the marking or color of rind is of still less moment; although of late a solid green tint seems to find a ready market than either the striped or "gray" marking, while an irregular, blotched surface, as with Scalybark or Mountain Sprout, though attuned to good quality and size, is distinctly objected to.

With regard to color of flesh, the public is united in demanding a deep red or crimson heart, with few seeds; for white or golden-fleshed varieties have never found favor. They are generally regarded as wanting in character or insipid, although some melons of this type unquestionably attain superior quality.

Little difference is observable between varieties in their capacity to resist disease and insect depredation. Vigor of growth depends mainly upon individual cultural conditions, and the peculiarities of soil and climate have much marked difference in time of maturity between the different strains.

Of all the physical features enumerated, size and shipping capacity are by far the most important—together aggregating 60 per cent of the requisites for an ideal type. Size is almost as necessary as resistant rind, and it is fatal to attempt to ship small melons. Results would be far better if stricter culling should be universally followed.

To summarize: For shipping purposes the following varieties may be confidently listed as superior, in the order named: Lord Bacon, Kolb Gem, and Georgia (preferably Augusta) Rattlesnake.

For table or family: Jordan Gray Monarch, Sibley Triumph and Seminole.

For early melons: Memphis, Augusta Sugarloaf and Augusta Rattlesnake.

For late melons: Boss, Scalybark and Sweetheart.

Cultivation.—While the Watermelon is extremely cosmopolitan and will readily accommodate itself to a variety of soils, and, particularly in its own best region—the "Wiregrass"—will submit to an infinity of rough and unScientific treatment without rebelling, yet a warm, light, gray, sandy soil is its delight, especially when supplemented by a strong clay subsoil that will daily yield its modicum of moisture, little by little, when called on. Like the cat and the grape, the melon cannot bear "wet feet." Still, sufficient capillarity must exist to keep the roots of the plants well supplied with their proper amount of moisture—though not too much to deprive the entire reservoir of water in the subsoil 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 supply of lime and but little, if any, produces 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 an old garden spot. "Second bottoms"—the accumulated detritus of hillside—serve admirably, but creek bottoms or heavy muck of any sort would be no more admissible for the melon than for grapes or peaches.

Rotation of crop area is all-important. Never should two crops of melons occupy the same plat with an interval of less than three years between them. In that time, insect depredators, attracted by the first melon crop, will probably have become exterminated, and the drain from the soil of specific plant-food (especially phosphorus) will also have been, to a great extent at least, made good.

Preparation of the land should be thorough, but not necessarily deep. The roots of the melon extend quite a distance under ground laterally, but close to the surface. The deeper the land is broken, the deeper the roots will be induced to penetrate, disturbing their normal habit and producing surplus vines at the expense of the melon. But because shallow plowing is the rule, and the fertilizer is drilled into the soil, the soil at the surface is so well enriched that very reason the surface pulverization should be thorough and effective. What is saved on the subsoiler should be expended on the harrow. After breaking, two harrowings—one with a cutaway—thrower with an Acme harrow, should follow. This leaves the plat 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 even on poor land. It is entirely a matter for individual control. Probably 10 x 10 feet is the distance most frequently employed, and in no case should it be less than 8x8, and this very rarely. Whatever the distance, the land should be checked in squares, locating the hills equidistant in both directions. This is probably the distance adopted, after its final "freshening up" with the harrow, is "laid off" with cross furrows made by a light "scooter" plow. Then, in one direction, with a white "narrow" plow, an ending furrow is run in which the fertilizer is drilled and thoroughly mixed with a scooter—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 "middle" 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 cross-furrowing is used, this may be excusable; but it is not only preferable, but on a large scale necessary, to drill commercial fertilizers.

A drop of cow-peas the previous year is the best preparation that can be given an area intended for melons. It leaves the soil well stored with nitrogen, light, porous and easily worked. In midwinter or early spring, according to latitude, the manure is applied, and so疏 should be put in: compost or stable droppings sooner, to insure partial decomposition by planting time. Stable manure, however, is much more variable in its content of plant-food; fore more reliable results commercial fertilizers are preferable, particularly when operations are conducted
WATERMELON

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>1 lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>High grade superphosphate</td>
<td>2 lb.</td>
</tr>
<tr>
<td>Sulfate of potash (or nitrate of potash)</td>
<td>3 lb.</td>
</tr>
</tbody>
</table>

This is a rather high grade formula and will analyze:

<table>
<thead>
<tr>
<th>Phosphoric acid</th>
<th>8.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potash (K₂O)</td>
<td>7.5</td>
</tr>
</tbody>
</table>

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—say a thimbleful per hill—applied just after the plants are well up, will give them a good start.

Planting is performed by hand and the seed put in quite shallow. Seeds should not be spaired. Field mice, pigeons, poultry, crows, cockroaches and other depredators frequently prevent a perfect stand where but few 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 be no account be placed deeper. This forces 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, as soon as the packet was found the seed would all be scattered or devoured at once. The process of planting as described seems slow and laborious, but it really takes much less time than

2720. The Preserving Watermelon, commonly known as "Citron."

its details indicate. On dry soil, during a time of drought, it is sometimes necessary to put a "hoe-dab" of earth cm each hill, after planting, to serve as a mulch and to aid in germination. This is removed before the cutelillos of the young plants appear.

In addition to starting under glass and transferring to paper (Neponez) 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 seed 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.

A "shinny" melon—should any one care for as cold cheer at that season—may be had by selecting a thick-rinded variety, as Kolb Gem, planting late in June, handling carefully when pulled, and storing in some dry, yielding substance, like cottonseed hulls, in a cool cellar where the temperature is uniform and can never drop below freezing.

After the plants are up they are at first thinned down to three or four to the hill, and subsequently to one, or at most two. One vigorous root system, well attended to, will usually succeed in extracting from the soil as much plant food as will give a better account of it, also, on "setting day."

Cultivation is commenced early and should cease early. It is effected with either the five-toothed or eighteen-toothed cultivator and with "scorcher" and "heel-scraper," 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," afterwards by," or the cutelillos will 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."

It 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 boasted directly on some line of railroad— if possible, with a spur or side-track attached, and the heaviest services attached to melon culture is the initial haul, which should invariably be by spring. A mile's foot in a springless vehicle discounts profits severely than a few miles. Consequently, in a ventilator car— the mode of shipment now almost exclusively employed where a water route is not convenient. Profits also largely depend on two other considerations: judicious and severe culling, and proper selection of a market. The first measure cannot be practiced too severely. Under-sized fruit is undesirable, 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 now common to meet with monsters of sixty, seventy or even eighty pounds, while occasionally a phenominal big one tops the hundred mark. It is believed that the largest melon on record (officially) attained the weight of 124 pounds. This was grown near Decatur, Ga., some twenty years ago—outside the established "Melon Belt."

In shipping, the smaller melons should occupy the floor of the car, with the larger forming the upper tiers—not for the purpose of deception or for the sake of appearance, but because the smaller sizes better withstand jolting and pressure and there is also less loss if they are injured.

As the importance of avoiding glutted markets is so 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 the season's crop over the country in such manner as to leave a living profit to the planter. Yet the industry is now by no means so remunerative as formerly. Supply seems to more than equal demand, and great complaint is made by the grower of excessive freight charges, while the transportation lines insist that their rates at present figures are not profitable. And yet the grower still continues to plant his melons, the railroads to haul, and the public to purchase them.

Attentions and Remedies.—After a stand is once obtained—spontaneously and promptly—and this, when all is said, is perhaps the main problem underlying successful melon culture—its affections are comparatively few and simple. Individually they are to be free from any vital disease, and its maladies are almost entirely confined to those resulting from the attacks of a few insect pests, as follows:

1. The melon worm (Margaronia hyalinata).—A
Plate XLIX. Watermelons.—The Orange variety.
small moth, the larva of which, light yellowish green, elongated, about an inch long, destroys only the foliage of the Watermelon, but both the foliage and the fruits of the cantaloupe or muskmelon. They are "chewers," not "suckers."

3. The striped cucumber beetle (Diabrotica cucurbitae).—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.

4. The flea beetle (Crepidodera cucumeris). Diminutive, like all of its kind, but very active, feeding on the young plants in spring, after maturing under rubbish and stones. The adult insect eats the upper part of the plant at one stroke, and the larva at the same time destroying the roots.

4. For the melon worm, striped cucumber beetle and flea beetle, apply Paris green—a very active remedy, but somewhat troublesome, and only justifiable when the commercial grower is fighting desperately for his crop and livelihood. A sample 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. STAKNES.

WATSONIA (Sir Wm. Watson, M.D., 1715-1787, elec-
trician and professor of botany at Chelsea). Iridaceae. A genus of 16 species of tender bulbous plants, one of which is, therefore, a great mistake to suppose that they are suited only to greenhouse cultivation. The main differences between Watsonia and Gladiolus, from the horticultural as well as botanical points of view, are the larger size, the shorter perianth-segments of Watsonia; three of the six perianth-segments in Gladiolus being usually different in size, shape and direction of spread. An important botanical difference is that the style of Watsonia is inserted below the throat of the tube, while those of Gladiolus are bifid. Great interest has been aroused in Watsonias recently by the introduction of the "White Watsonia," known to the trade as W. Ardernei. The plant might be roughly described as a white Gladiolus, it is likely to receive considerable attention within the next few years. It grows 3 or 4 ft. high, strong specimens being branched, and bears about a dozen fls., each 2½-3 in. long and about 1 in. broad. It is likely to be a valuable addition to the borders and of its value for cutting it makes of exceptional interest to florists. There are other white-flowered 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 advisable. All the stock in the trade at present is supposed to be descended from plants cultivated by H. W. Arderne, of Cape Town. The original bulb was found 80 miles away in a plant bank amongst thousands of the common pink-flowered kind. In Oct., 1892, Mr. Arderne had 400 spikes in bloom on the Common of Sandwich, and in March, 1893, some of his plants were pictured in The Garden under the name of Watsonia alba. However, a pure white-flowered form had been previously found near Fort Elizabeth and a bulb sent to J. O'Brien, of Harrow, flowered in England in 1899 and was then fully described as W. iridifolia, var. O'Brienii, the name adopted in this work. In the recent discussions of the plant the fact has been overlooked that T. S. Ware, of Tottenham, cultivated a white variety in 1890, it being figured in The Garden for that year as Watsonia alba. A nearly white form was cultivated in England as early as 1801, but the tube was pinkish outside and there was a rosy spot at the base of each perianth-segment.

William Watson, of Kew, was the first to emphasize the close horticultural parallel between Watsonia and Gladiolus and to urge the whole group upon the attention of the plant-breeders. This suggestion, coming from the man who may be said to have created the modern Cape Primrose or Streptocarpus, should result in another fine race of hybrids before many years. However, the Watsonia "bulb" is not so easily and safely stored as that of Gladiolus.

Generic characters: perianth with long, curved tube, the lowest and narrowest part ascending a short distance above the calyx; the tube is then dilated into a cylindrical or funnel-shaped portion which bends down, usually at a sharp angle; segments equal, oblong, spreading; stamens unilateral, arcuate, inserted below the throat of the tube. Baker, Handbook of the Irideae. Flora Capensis, vol. 6.

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<table>
<thead>
<tr>
<th>Species</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>alba</td>
<td>White</td>
</tr>
<tr>
<td>angusta</td>
<td>Scarlet</td>
</tr>
<tr>
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<td>Golden</td>
</tr>
<tr>
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<td>Bi-colored</td>
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<tr>
<td>densa</td>
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<td>splendens</td>
<td>Splendid</td>
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<tr>
<td>variegata</td>
<td>Variegated</td>
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3. Meriana, Mill. This seems to be the dominant species, as the other, so-called pigweed, is not the most interesting to the plant-breeders. In its widest sense it includes W. iridiflora, but for horticultural purposes it will be convenient to consider the latter as distinct. W. M. is best restricted to the commonest type at the Cape, which is a rose-fld. species 3-4 ft. high, the stem usually branched, lvs. 1.5-4 in. wide and the spikes 12-20 ft. This is the plant which Baker describes as W. Meriana, Sm. Var. M., var. alba, Hort., etc. White Watsonia. A variety with pure white lvs. discussed above. Gen. 17:239; 45, p. 229; 51, p. 284. J. H. I. 29:219. G. C. III. 11:306; 19:145. A. G. 20:573.

4. iridiflora, Ker. This is treated by Baker as a variety of W. Meriana characterized by broader lvs., than the type: lvs. closer and more numerous, white or pinkish. For horticultural purposes it will be convenient to treat it as a distinct species and restrict the name to the pink or rose-colored type.


5. densiflora, Ker. This is a most variable and handsome rose-colored species more nearly resembles a gladiolus than any other by reason of the density and regularity of its pyramidal inflorescences. Stems unbranched, 2-3 ft. high, with small 1-ft. long, bright red B. M. 6190. — There is a choice variety with pure white lvs. Var. alba, Hort., was introduced as early as 1891.

6. cocceia, Herb. This shows scarlet-fld. species differs from W. Meriana in its stem being shorter and unbranched, the spikes fewer-fld. and the styles a trifle shorter. Stem 1 ft. high: spikes 4-6 ft. B. M. 1194 (W. Meriana variety).

7. humilis, Mill. This species has rose-red lvs. apparently the same size and color as W. densiflora but only 4-6 in a spike and the stem only a foot or so high. B. M. 631. — A variegated form figured in B. M. 1193 as W. roseo-alba has a spike of 8 flesh-colored lvs. with broad bands and splashes of scarlet.

8. rosea, Ker. Robust rose-colored species, growing 4-6 ft. high and the lvs. smaller than those of W. densiflora, are perhaps capable of greater size. Spikes about 15-ft. B. M. 1072.

W. argentea, Hort. John Soul, 1803. is presumably a catalogue error, as no such name appears in Baker's latest monograph.

WATTLE. See Acacia.


WAXFARING TREE. Viburnum Landiana.

WEATHER PLANT. See Abrus.

WEEDS. It would have been a sorry thing for agriculture if there had been no weeds. They have made the soil, and stirring the soil is the foundation of good farming. Even after we have learned that crops are benefited by the stirring of the soil, we are likely to forget the lesson or to be negligent of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are amongst the chief.

A weed is a plant that is not wanted. There are, therefore, no species of weeds, for a plant that is a weed in one place may not be in another. There are, of course, species that are habitual weeds; but in their wild state, when 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 amongst 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 soil 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 good tillage. If one cannot do so, it may be necessary to plow the land and reseed. In some cases, however, it is only necessary to give the land a light surface tillage, to add clean and quickly available fertilizers and to sow more grass seeds. This is the fundamental remedy for weeds on lawns. If such weeds are perennial, as dandelion and plantain, it is advisable to pull them out; but in order to keep them out, a stifler soil should be secured. The annual weeds that come in the lawn the first year are usually destroyed by frequent use of the lawn mower.

Foul lands may usually be cleared of weeds by a short and sharp system of rotation of crops, combined with good tillage in some of the crops of the series. When the land for any reason is fallow, — as when it is waiting for a crop, — surface tillage with harrows or cultivators will serve to keep down the weeds and to make the land clean for the coming crop. Often lands that are perfectly clean in spring and early summer become foul in the fall after the crops are removed. Cleaning the land late in the season, therefore, may be one of the most efficient means of ridding the land of weeds. Coarse and rough stable manure, which is not well rotted, may also be a conveyer of weed seeds. The seeds of weeds are sometimes carried in the seed with which the land is sown, particularly in grass and grain seeds.

Does not follow that weeds are always an evil, even when they are abundant. In the fall a good covering of weeds may serve as an efficient cover-crop for the orchard. They are likely to entail some extra care the next year in order to prevent them from gaining a mastery, but this extra care benefits the orchard at the same time. It is, of course, far better to sow the cover-crop oneself, for then the orchardist secures what he wants and of the proper quantity and at the right season; but a winter cover of weeds is usually better than bare earth.

From the above remarks it will be seen that weeds are scarcely to be regarded as fundamental difficulties in farming, but rather as incidents. In the most intensive and careful farming the weeds bother the least. There should be a careful oversight of all waste areas, as roadsides and vacant lots. Experience has shown that the greatest difficulty arises on commons and waste land, not on farms.

Weeds are often troublesome in walks, particularly in those made of gravel. If the walk is covered with a foot or two of pebbles or crushed ashes, weeds cannot secure a foothold. It is particularly important that gutters be not laid directly on the soil, else they become weeds. There are various materials that can be applied to walks to keep the weeds, although of course, they also kill the grass edgings if carefully applied. Strong brine, applied hot, is one of the best (1 lb. of salt to 1 gal. of water). There are also preparations of arsenic, vitriol, lime and sulfur.

L. H. B.

WEEPING TREES. Consult Trees.

WEIGELA. Referred to Diesrilla.

WEST INDIA RATTLE BOX. Crotalaria retusa.

WESTERN CENTURAY. Hesperochiron.

WESTRINGIA (J. C. Westring, physician and author). Lathyrus. An Australian genus of 11 species of shrubs with entire whitened leaves and solitary, 2-lipped, white or purple-potted flowers in the leaf-axils or rarely in terminal heads. Cultivated species, like the lesser W. retusa, with a short tube and dilated throat: the upper lip flat and broadly 2-lobed, the lower 3-lobed: fertile stamens 2: staminodia 2, short.

rosamarinifolium, 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,
that of most other states, had its issue of the usual operations of the farm. In fact, even
to-day it is considered as a sort of complement to grain-
growing or stock-raising in most sections of the state.
In some towns, by extension of old barns, in
result of coal, oil or railroad operations, the demand for
vegetables and small fruits has been largely met by
local producers. The market-garden work, aside from
the growing of water-melons, peas, and tomatoes,
as well 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-growing which seeks markets outside the
state. What has been said of vegetable-gardening ap-
plies equally well to small-fruit 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 north-
erth 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 Astrachan
and Pomme Royal predominating; these are followed
by Maiden Blush, Grimes Golden and Rome Beauty. Because of the favorable climate in this region, the pro-
duction of this class of fruits has grown to be a pro-
fitable, although not a large industry. The northern Ohio
river valley counties, including what is known as the
Northern Panhandle, and the counties in the eastern part
of the state, bordering on the Potomac, form the present
areas for the commercial growing of winter apples.

The Hancock county orchards (northern end of Pan-
handle) are unique in storage facilities. Here nearly
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 1896
all the houses were constructed of stone and provided
with ice chambers for maintaining artificial cold. In
1896 one house was built of wood on the principle of
confined air between walls constructed of wood and
paper. In this house, which has been used two years,
much promise lies at the extreme southern border of
the state. Another apple belt in which young orchards give
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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 pro-
portions. The orchards under the control of the Alle-
gheny Orchard Company aggregate nearly 150,000 trees.
Besides this there are numerous private enterprises
with orchards ranging from 500 to 5,000 trees. The
most successful orchards are situated upon the first
terrace of the mountain, usually three to five miles
from the Potomac, and at an elevation of from 900 to
1,500 feet above tide. The soil is gravely in nature,
resulting from the breaking down of shale and sandy
rocks. The methods of the Orchard Company above
mentioned mark a new era in the manner of handling
the peach crop. Instead of sending their product to
some commission house to be again scattered over the
country to the small towns, this company has a head
office in the city of Cumberland, and from there, as a
distributing point, peaches go direct to the dealers in
the small towns where the commission house used to
be; in this way 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 can-
ping factories where large quantities of cucumbers,
tomatoes and onions, as well as various fruits, are pre-
pared for winter consumption. In Martinsburg, in con-
nection with the cold storage house already mentioned,
a modern cannery of large capacity is operated over
the country to the small towns, this company has a head
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better article.
It becomes evident that a state with the limited terri-
ory of West Virginia must have some other compensat-
ing feature to render it capable of such varied produc-
tions. A glance at its geographical location, at the varied alti-
itudes and exposures, is sufficient to account for the va-
riety of crops and fruits with which it contributes to the na-
thrive on the 1" i: i i : i'■ ':' :.■ '■'.
A glance at its geogra-
phical position, at the varied altitude. Certain i... ■...■
glades, and in the higher altitudes the huckleberry finds
a congenial home. Huckleberries are annually gathered
in great quantities both for domestic use and for ship-
ment. 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 fur-
nishes ideal conditions for the blackberry and dewberry
- the Lauretia dewberry being a native.

The mountainous character of the state has been a
barrier to cheap railroad construction, and as a result
large bracts are all colon. The species has been considered a desirable si-
WHEAT. See Triticum.
WHEAT, INDIA. Fagopyrum Tataricum.
WHIN. See Urtic.
WHITFIELDIA (Lieut. [afterward General] A. W.
Whipple, commander of the Pacific Railroad Expedi-
tion from the Mississippi to Los Angeles in 1853-54).

WHITMORE. See Triticum.
WHITLOW-WORT. See Parnassia.
WHITLOW-GRASS. Orotora.
WHITLOW-WORT. See Parnassia.

WHORTLEBERRY. See Vaccinium.

WIDDRINGTONIA (Capt. Widdrington, formerly
cook, who traveled in Spain). Couto. W. Whyte;
M. Wood, is a coniferous tree from southeastern Afric,
probably not hardy. It grows at an altitude of
2,500 to 7,000 ft. on Mt. Milanj in Nyassa-land and is
known as the Milanj Cypress or Cedar. Seedlings of it
were first cultivated in 1874 at Kew, and plants have
recently been offered in Calif. According to Ivory, it is
proving to be quite hardy near San Francisco. The
wood is dull reddish white, strongly aromatic, and locally
valued as foliage plants for indoor use and for doors and windows. The tree
attains a maximum height of 140 ft., with a girth of
5 ft. at a point 6 ft. above the ground, the trunk being
clear for 90 ft. The species has glorious, linear, jupi-
ter-like foliage and a cone smaller than a chestnut and longer
than broad. Widdringtonia is considered by Bentham and
Hooker as a subgenus of Callitris. Fries, however,
reports that it has proved quite delicate to raise
in S. Calif.

WIGANDIA (Johannes Wigand, Pomeranian bishop;
whom wrote on plants in 1590). Hydrophyllaceae. About 7
tones of tall, coarse perennial herbs or subshrubs
native to mountainous regions from Mexico to the
Whiteweed. Tulip-

WIGAN

See 1

WIGANDIA

WIGAN

WIGANDIA

WIGANDIA

WIGANDIA

WIGANDIA

See 1

WIGANDIA
The species of Wigandia are endlessly confused in current reference books, as well as in the trade, and Index Kewensis reflects the general perplexity. The following account is based on André’s revision of the genus in R.H. 1861:371, with an important change in the name of one species which requires a somewhat tedious explanation. In respect to W. nrens, André follows Kunth’s previous revision in Choisy in DC. Prod. 10:184. The name Wigandia nrens was first used by Kunth, who applied it to a Mexican plant. Before this, however, another plant of the same family but a native of Peru had been called Hydroca ureas. Now when Choisy came to monograph the whole family he transferred Hydroca ureas to the genus Wigandia and called it Wigandia ureas, Choisy. He, therefore, had to introduce a new genus. His conception of the genus was approved by the radical school of American botanists, but not by the international rules of nomenclature known as the Code of 1867. Hence it is necessary to call the Peruvian plant a new genus, and it is here called W. Peruiana. The “common” or English names suggested below may be convenient in explaining the difficulties of the genus. (Kunth—HBk.)

a. Color of fls. lilac or violet.

b. Spikes 1-sided but 2-ranked, the flowers in two dimensions.

c. Plant with rusty hairs............ macrophylla

d. Plant without rusty hairs........... Peruiana

WWILDERS, Marshall Pinckney (Plate XLI), distinguished amateur pomologist and patron of horticulture, died at his home near Boston, Dec. 16, 1886, in his eighty-ninth year. He was born at Rindge, N. H., Sept. 22, 1798. His inherited love of country life showed itself, and at the age of sixteen he chose farm work in preference to a college course. At twenty-seven he moved to Boston, where he lived for more than half a century. His pear orchard at one time contained 2,500 trees, representing 600 varieties. During his life he tested 1,200 kinds of pears and in 1873 he exhibited 404 varieties. He produced a new amberling, 1864:184. He introduced the Anjou. He imported many fruits and flowers new to America, and from 1853 to the end of his life he was constantly contributing to the society exhibitions the products of his garden. He carried a camel’s hair brush in his pocket and was always hybridizing plants.

VIGILIER, Carr. Imperfectly described species of unknown nativity. imperfectly described species of unknown nativity. Scabious-like plant instead of somber and gluttonous “like W. caracasana” (by which he perhaps meant W. macrophylla). Nicholson says the fls. are lilac-blue, passing through violet-red to fawn color before fading. In the American trade the red color of the fls. is considered distinctive. N. 4:209.

WILDER was an organizer. He is counted one of the founders of the American Pomological Society, and with the exception of a single term was its president from its organization in 1848 until his death in 1886.
In 1883 Marshall P. Wilder urged upon the American Pomological Society the necessity of a reform in the nomenclature of fruits. He took an active part in the great work that followed.

Wilder’s personality was most engaging, being characterized by geniality, dignity, tact and 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 lifelong 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 Horticultural Society $1,000, to encourage the production of new American varieties of pears and grapes. Wilder wrote no book, but his occasional contributions and presidential addresses made a notable body of writings which gathered together into the bound volume presented by him to the library of the Massachusetts Horticultural Society. "The Proceedings at a Banquet given by his Friends to the Hon. Marshall Pinckney Wilder... to Commemorate the Completion of his Eighty-fifth Year," is a stately memorial of 116 pages published in 1883. The best account of him seems to be that by the secretary (Robert Manning) of the society, in Trans. Mass. Hort. Soc. 1887: 20-39, from which the present article has been chiefly compiled.

W. M.
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 estates. 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 fall 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, certainilies, Oxwego 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 moist or bog garden, though that is merely a department of the wild garden. Then there are the vines; and what wonders can be accomplished in a wild garden with wild grape, clematis, Virginia creeper, perennial pea, trumpet creeper and bitter-sweet! Think, too, of all the spring flowers and delicate woodsy things,—anemones, columbines, moss pink, Jack-in-the-pulpit, bloodroot, hepatica, Solomon's seal, dutchman's breeches, ferns, trilliums and violets! Evidently there is sufficient material for a wild garden composed exclusively of American plants, and naturally such material is least expensive. But the wild garden spirit is essentially cosmopolitan. Many of the exotics can be raised from seed, for it is not necessary that all the subjects be perennial. Some of the exotic maladies, 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 lusty colony of any of these species may be self-supporting. All the leading border favorites can be used in the wild garden—peony, poppy, phlox, larkspur, iris, columbine and the rest. The tall-growing plants that are used in the back row of borders are nearly all suit-

2726. Jerusalem Artichoke, one of the perennial sunflowers.
A nuisance in cultivated ground, but often useful in the wild garden.

WIND-BREAKS

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 seacoasts. 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 nearest value of the wind-break for orchard plantations is to protect from the mechanical injuries that result from high winds and to enable workmen to pursue their labors with greater ease. The lessening of windfall fruit is often sufficient reason for the establishment of a windbreak. Usually very cold and very dry winds should be turned from the orchard; very strong winds should be checked; temperate winds should nearly always be allowed to pass through the orchard, if their velocity is not too great; care must be taken to allow of adequate atmospheric drainage.

Wind-breaks for orchards require much land, and crops near them are likely to suffer for lack of food and moisture, and also from shade. In small places, therefore, it may be impossible to establish large wind-breaks. It is well to plant the wind-break at some distance from
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 ovali-
folium,* a Japanese plant. In parts of California, one of
the mallow tribe (*Lavatera assurgentiflora,* Fig. 2730)
is used for this purpose. Farms in the open windy
country may be efficiently protected by belts of wood-
land, 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 (*Cypressus
domestica*), 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 exten-
sively 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
cost of southern California and, probably, was intro-
duced into the San Francisco peninsula by the Mission
Fathers, as the pioneers of 1851 and 52 report that it was
then growing spontaneously and in great abundance on
the sand dunes where the city now stands. This Lava-
tera proves to be well adapted to the peculiar conditions
under which it is cultivated; it stands long seasons of

Fig. 2730. *Lavatera assurgentiflora.*

2730. *Lavatera assurgentiflora.*

2729. *Lavatera assurgentiflora.*

2728. A small wild garden at the rear of a building.
When larger wind-breaks are required, to resist the force of heavy and steady winds sweeping over the interior plains through mountain passes, the manna gum, *Eucalyptus viminalis*, is used with advantage; this species suffers much less from strong wind than the more tender blue gum, *Eucalyptus Globulus*, which is used for the same purpose in the more equable climate of the Coast Range hills. Both the red gum, *Eucalyptus rostrata*, and the Lombardy poplar, *Populus nigra*, var. *Italica*, are used in the vineyard region near Fresno, to check the force of the periodic north-winds. *Arundo Domay* 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 Domay* makes a charming shelter-hedge for a suburban garden, being light and graceful in appearance and not too exclusive, while answering all necessary purposes by providing a certain amount of privacy.

Joseph Burtt Davy.

**WINDFLOWER.** *Anemone.*

**WINTER PROTECTION**

**WINDMILL FINGER GRASS.** See *Chloris.*

**WINDOW GARDENING.** See *House Plants.*

**WINEBERRY.** *Rubus phallicolusius.*

**WINTER ACONITE.** *Ranunculus hyemalis.*

**WINTER BERRY.** *Hedera helix.*

**WINTER CHERRY.** *Physalis Alkekengi.*

**WINTER CHESS.** *Barbara.*

**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 for transplanting 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 paniculata.*

**WINTER PROTECTION, or preparing plants to withstand the winter (Figs. 2739-2742).** 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. Gaillardias will winter safely in light, well-drained soils with ordinary protection, but perish if wet and heavy. The remarks in this paper are meant to apply in the vicinity of Chicago. Winter covering intercepts the sun's rays and retards premature activity. It is an essential "to keep in the cold" during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but anything of an herbaceous nature may be covered much earlier. Where field mice are troublesome it is well to defer covering until after a good freeze, so that these nighers may seek other winter quarters. Rabbits are fond of the Japan quince, *Spiraea Van Houttii*, *Eucalyptus globulus* and many others, and often damage newly planted material the first winter. When the...
branches are beyond their reach, protect the trunk with straw, tar paper or burlaps, which will also prevent sun-blistering. If the shrubs are in groups or low-branched, run wire netting around them. Fall-planted material should be better protected against frost than established plants of the same species. All the Japanese flowering forms of the plum, peach and cherry tribes should have their roots mulched four or more inches deep. The fatal damage in the winter of 1898-99 was at the roots, not overhead. Figs. 2731, 2732 show protection by means of straw and boughs; 2733-35, protection inside of boxes, barrels and wire netting.

Plants with evergreen foliage like 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 perennials like our native asters, or coarse straw 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.

2731. Straw overcoats for roses.

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. Bryothamnium macrostachyum requires similar conditions and treatment. All lilies except the hardiest, such as L. tigrinum, elegans, Candidum, superbum, Philadelphiaum, spectabile, tenuifolium, etc., are best covered by a mound of ashes—wood 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 aconitifolia, require a deep box of leaves and the surrounding soil well mulched. An inverted V-shaped trough placed over such low edging plants as Veronica cirnosa and Thymus Serpyllum, var. montana, 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 evergreens, buildings or solid fences, do not exist, temporary ones should be made of boards, evergreen boughs, ever-stalks, etc., to protect arboricole plants that are not quite hardy. E.g. in this climate Helianthus annuus, 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 browns. 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. spectabilis and plants of similar degrees of hardiness may have their branches tied in and empty boxes 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 hardly climbing roses, such as the Seven Sisters and Prairie Queen, which are hardly without protection but are benefited by it, Wichuriana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Ponsonby Sweetbriar hybrids, if against a wall, may have clematis or

2732. A tender tree bound with branches of hemlock.
The protected tree is a specimen of Gordinia about 10 feet high, at Arnold Arboretum, Boston.

2733. One way of protecting young rhododendrons.
The space inside the wire netting is filled with autumn leaves.
2734. Protecting plants by covering with a box, inside which are placed leaves or straw.

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 encase around it 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 pre

2735. Plants protected in a barrel covered with burials.

beard 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 sustain both the tree and the grass.

Place short stakes around groups of planticyclons, As- cension tubers, Agapanthus, Actinotus, etc., which are liable to injury in the spring. Otherwise they may be overlooked in the spring and injured by digging. Examine all labels and see that none are cutting into the limbs of trees. Replace all rotten or defaced ones in the borders, using heavy labels, as thin ones often break off and are carried away when the surplus manure is removed. Cypress is a good material for labels. A good label for young trees and shrubs is made of a thin sheet of copper. The name is written with a stylus. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the trunk and allowed to lie on the ground. Such a label is durable, unsubtrusive 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. 2730-2742) 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 kept well filled with earth and protected from windings 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 for the pit is the best possible one. They are more expensive than the coldframe (see Frame) used by market-gardeners for wintering cabbage and lettuce for spring planting, or by the florists for pansies, primroses, forget-me-nots, etc., is really a simple pit. Such shallow pits, with proper protection, are useful for many other small plants which would be injured by severe weather. A deep pit, like a coldframe, is shown in Fig. 2736. A pit of this size is shown in Fig. 2741, in which the entries are numbered for convenience Nos. 1, 2, 3 and 4, Nos. 1, 2 and 3 show inexpensive and convenient pits for small and medium-sized plants. They may be built 4 ft. or less below the level of the ground, the height and width as shown up, the roof arched and sides solid, the shape of the ground, the height and width as shown up, the roof arched and sides solid, the length should be some multiple of 3, any thing between 9 and 30 ft., so that the glass roof may be made of hothed sash and also protected by the straw mats and wooden shutters in common use. See Hotheds.

These pits are useful for storage in winter and also for carrying some of the hardier greenhouse plants in autumn until the house is relieved of this heavy and laborious duty. 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 euphorbias during the remainder of the winter. They are really new, too deep for dung hotbeds. Nos. 1 and 2 are planned to run east and west. If No. 3 is thus placed, the roof on the north side may be made of plank in stead of glass, but if it runs north and south, it may be used to the 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 appear much more than a half of a 20 ft. We have not made these. The illustration on the opposite page shows a hothed with a made up foundation, excellently ventilated, large use is made of planticyclons, As-
Cytisus Conariensis, 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 invited and cannot be maintained owing to lack of light.

Construction of the Pits.—Owing to their position, pits cannot well be made of wood, plank and cedar posts lasting from 4-6 years only. For large pits, stone and brick are most economical for walls and ceilings; for small ones concrete probably makes the cheapest and best wall. At the Bussey Institution the concrete walls of several small pits have stood 10 or 12 years without showing any sign of deterioration. It is not necessary to use high-priced Portland cements, because the structures are secured against frost by the winter protection required for their contents. An excavation of the required dimensions is made, with due allowance for the walls. Inside the excavation a plank molding frame is built at the proper distance; viz., the thickness of the walls, from the walls of earth which should have been cut as true as possible. This frame, which should also be true and plumb, is carried to the required height for the inside face of wall and another frame is made at the proper distance on the surface of the ground, the 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 one part of cement (a good brand can be obtained at about $1.20 per barrel) to two parts of clean sharp sand. After a thorough mixture, add enough water to make a thick paste. Add to this paste three parts (sometimes four are used) of clean gravel. Broken stone is better but more expensive. No stones larger than a goose egg should be used. The whole should be completely and quite carefully blended with hoe or shovel until each stone is coated. Throw this mass into the space between the molding frame and earth wall and settle compactly with a rammer. It is not advisable to mix more than a barrel at once, nor so much as this unless at least six men are employed. Continuous batches are made until the work is finished. When the top layers are going in, insert ¼-inch iron bolts 6-8 inches long at intervals of six feet. These secure the wooden sills. In warm dry weather the frames can be removed within twenty-four hours or less, but first examine carefully the condition of the cement. After removal, smooth off any roughness and grout in with a whitewash brush a coat of Portland cement mixed with water, but without sand, thus obtaining a good color and a more homogeneous surface. For several days the work should be shaded.
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, depending on what is 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. Concrete could also be used. A good grade hotbed sash makes the best glass roof. All sills, crossbars, etc., should be made of cypress and painted. The woodwork must be made strong to endure the continual exposure. It is false economy to stint in quantity or quality. In early autumn they hold chrysanthemums, carnations, stervas, etc.; next the Azalea Indica, Cistus, Ceanothus, heaths, etc., some of which remain for the winter, while others are replaced by hardy shrubs, hedges and other plants for forcing. For spring and summer use, see above. If eastern Massachusetts gardeners begin to use them in September, but the final storage some times is not finished until Christmas. The longer the plants can be kept in the open air the better they fit 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 farther water is required for plants in tubs and large boxes (10 in. or more). This also is true of heeled-in stock. Everything, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the 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 great difficulty in keeping plants in good condition is owing to the condensation of moisture within the pits at times when it is impossible to open them on account of severe weather; therefore no more water should be given than is absolutely needed. As long as the weather permits, keep the sashes off or the windows open night and day, and afterwards open up whenever possible. On sunny days ventilate whenever the thermometer registers over 20° F. Never begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the mercury above freezing, remove the sashes entirely. This is the best way to get rid of the moisture-laden air, and is essential for keeping evergreen plants with soft foliage in good condition. To change the air in large cellars is more troublesome; here it is advisable to build an open fireplace, in which a brisk fire may be kindled on mild days when all windows can be unclosed, thus obtaining a better circulation than is otherwise possible. Large cellars have a line of hot-water pipes or other means of heating, by which not only is better ventilation secured but also additional protection in severe weather. Occasionally in heavy snows the pits must remain closed for a week or more. This is undesirable but unavoidable. At such times there is special danger from field mice and other vermin. Concrete walls give them a poor harbor, but they must also be poisoned or poisoned if the plants are clean when housed, there is nothing to be feared from ordinary greenhouse pests, either insect or fungus except the moults. For related discussions, see "Nursery and Storage."

The following is a list of plants that may be wintered in pits and frames with satisfactory results. The list is made for the neighborhood of Boston.

**LIST OF PLANTS THAT CAN BE WINTERED IN PITS.**

**A. Hardy plants.**

1. Nursery stock of every description that may be required for shipment in winter and early spring.

2. Stocks, cuttings and cuttings for working during the winter.

3. Young nursery stock, — seedlings, cuttings or grafts too delicate for planting in autumn.

4. Hardy plants of all kinds for forcing in winter or winter decoration.

The temperature of pit or cellar for the above plants should be 32° F. or even lower occasionally. The larger plants should be heeled-in on the floor in sand or in bank-like shelves or loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock should be in flat in which it has been grown. Particular care must be given to ventilation when evergreen plants are handled. For forcing stock, see "Forcing," pages 600-602.
WINTER PROTECTION

AA. Tender and half hardy-plants.

Those marked with a star (*) are tender and should not be exposed to frost. They should also be kept in the driest part of the pit.

1. Alstroemeria, canna, dahlias, gladiolus, Milla bilforra, monbretia, oxalis for summer bedding, tuberose, tigridia, Zephyranthes Almaviva, Z. candida. Keep the above in dry house-cells, where no frost penetrates, temperature 35-40° F. Dahlias and canna can be used, with dry sand, if prone to wilt. Tigridias should be hung up in bags to avoid mice.

2. Agave, aloc, Lappia incude, Datura saucereus, some of the hardier cauli, e.g., Cerous grandiflora and Opunui Ficus Indica, Cordyline indivisa, fuchsia, Ereca gloriosa and probably other genera and species of succulent plants. Keep at temperature 35-40° F. In a dry house-cellar, with as much light as possible; too much moisture is destructive.


The above plants are commonly handled in pits for various reasons. In eastern Massachusetts, with the possible exception of those marked with (*), 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 grapery 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. *Anemonapeninsulae and A. coromandelica, Helix perennis, *Dianthus Caryophyllus (clove pinks and European carnations from seeds), *Galax aphylla, *myosotis sorts, *primula (tender sorts), parsley, lettuce, cabbage, cauliflower and parsnip. These plants are advantageously wintered in coldframes, which should vary in depth with the size of the plant; sometimes the plants are grown and flowered in the frame, at others they are bedded out when the season permits.

5. *Arisema, arum, calochortus (different species), *freezina in variety, iris (tender species), *ixia, *sparaxis. The above plants can be potted, November to December, and carried in a pit until wanted in the greenhouse.

B. M. WATSON.

WISCONSIN, HORT-CULTURE IN. Fig. 2743. The surface of Wisconsin mostly varies between gently rolling plains and hills of moderate height. Small lakes are numerous, particularly in the west. The soil presents all variations, and with the exception of some rather large sandy and marshy tracts, is mostly very fer-
crops, and to fruits that are readily protected in winter. In the usual severity, a disastro
ous result, the first orchards were mainly short-lived. 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 par- donable 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 Minnesota 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 hardiest varieties of the apple succeed in southern and eastern Wisconsin, when planted on sites some-

what higher than the surrounding country, especially those inclining to the north or northeast. The principal orchards are found in 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 4,000 trees of the same stock. These orchards are supposed to be the largest in the state.

The older orchards of Wisconsin are the outcome of a long process of climatic selection. But the farmers who have been pioneers in planting 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 under fence corners and elsewhere, from chance 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, McMillan, 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 Americanas are the only plums that can be depended upon to bear fruit regularly in all parts of Wisconsin. The hardier sorts of the European plum, Prunus domestica, and of the Japanese plum, Prunus triloba, and Morello, are fairly fruitful in the eastern part, notably in Door and Waupaca counties. The trees of the last two species, as of those of Prunus domestica and Prunus americana, endure the winters without harm throughout the state, but the flower-buds are destroyed whenever the thermometer registers much lower than 20° below zero. Few plum orchards have been planted in Wisconsin, and these are mainly of the European class. A plum orchard of 14 acres at Sturgeon Bay is supposed to be the largest in the state.

The early Richmond and Morello cherries are fairly successful in Wisconsin, in localities suitable to the apple. The flower-buds of these cherries appear to be somewhat more hardy than those of the European and Japanese plums. The trees are, however, subject to sunscald, and unless protected are usually short-lived. Several varieties of Prunus Cerasus, introduced from Russia, have been planted. But Prunus domestica, the flower-buds of these do not appear to be harder than those of the above-named sorts, their fruit matures over a longer period, which will give them value. Sweet cherries (Prunus Avium) are not successful in Wisconsin.
The peach and apricot are not fruitful in any part of Wisconsin except after unusually mild winters. The trees are frequently grown in gardens, and sometimes attain considerable size, but unless the average winter. Trees of the apricot imported from Russia have been frequently planted in Wisconsin, by way of experiment, but are nowhere fruitful. Even if the flower-buds escape destruction, the fruit almost invariably falls soon after setting.

The grape, with winter protection, is successfully grown throughout southern and eastern Wisconsin when planted on light soil, with southern exposure. The later varieties are, however, liable to be caught by frost, unless the site is chosen with special care.

The small fruits are grown with marked success, on favorable soils, throughout Wisconsin. Winter protection is generally given to all but the currant and gooseberry, but in the southern and eastern counties this precaution is not absolutely necessary. The strawberry and raspberry are grown in excess of home demands, and many thousand cases of these fruits are annually shipped to other states. Blackberries were largely destroyed by the severe freeze of 1889. Huckleberries and blueberries are extensively gathered from wild plants in certain parts of west-central Wisconsin, and are shipped in large quantities to cities of the northeast. Wisconsin is one of the chief cranberry producing states. In parts of Wood, Adams and Juneau counties, and in less degree in Waupaca and Green counties, the cranberry plant was native over very large areas, and before the settlement of the country, the Indians gathered the fruit extensively in bearing years. Laterly, the wild marshes have been largely improved by clearing and providing flooding facilities. In some seasons the total output of cranberries from Wisconsin has aggregated nearly 100,000 barrels. The varieties grown are mostly native, and the quality and keeping of the fruit are excellent. During the years 1894 and 1895 the cranberry industry of Wisconsin suffered a serious check by the destruction of many marshes by fire during an exceptionally dry period. But the business is rallying, and may, in a few years, recover its former magnitude.

Market-gardening is carried on in the neighborhood of cities and towns in a sufficient extent to supply local demands, except in the extreme northern part of the state. The ordinary garden crops of the temperate zone are all successful. Melons are grown rather extensively for shipment in a few localities. Peas are extensively grown for seed. Market gardening is most remunerative in the Kewaunee and Door counties, this section being free from the pea weevil. Lentils are considerably grown in Kewaunee and Manitowoc counties. Several vegetable canning factories are in operation in Wisconsin, pease, sweet corn and tomatoes being chiefly consumed. Kitchen-gardening is less practiced in Wisconsin than it should be. The farmers generally employ little hand labor, and the hot season is wasted in gathering more or less unsatisfactory. For the same reason the private growing of flowers receives less attention than in the eastern states.

Horticulture is taught at the agricultural college connected with the University of Wisconsin, at Madison.

Openings are good for commercial culture of apples, cherries, native plums and cranberries in the parts of Wisconsin best suited to these crops, and in the neighborhood of northern cities the growing of vegetables for market is at present remunerative.

E. S. Goff.

2743. Map of Wisconsin.

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 Krawantia. For a more radical point of view see B.M. 7322 and B.D. 2:294. Beside those mentioned below, there are three species, but they are all of doubtful botanical status. Lvs. odd-pinnate; bts. entire; racemes terminal; calyx with the 2 upper teeth short and subentire; standard large; wings oblong-obovate, free from the keel, often coherent at the apex; keel incurved, obtuse. Wisteria Chinensis is one of the best and commonest of hardy climbers. It has pale green, pinnate foliage and
bears profusely dense, drooping clusters of purplish pea-shaped flowers. The clusters are about a foot long. This is the commonest and best form. The others furnish the connoisseur with variety in habit, color and season of bloom, but they are not as prolific, and doubling adds nothing to the beauty of the flowers. Moreover, the double flowers decay quickly in wet weather.

The Chinese Wistaria was introduced into England about 1816. Twenty-five years later there was a specimen in England with branches attaining 100 ft. on each side of the main stem, and another specimen that covered 365 square feet of wall space.

The Chinese Wistaria blooms in May and usually gives a smaller crop of flowers in August or September. The spring crop is borne on spurs, while the autumn crop is borne on terminal shoots of the season. There are several ideas about training a Wistaria. A good way is to let it alone. This produces rugged, twisted and lifeless vigorous and productive in America and Europe than Japan. Wistarias will live in rather dry and sandy soil, but they prefer a deep and rich earth. Cutting root with difficulty and the cuttings will root in a small shoot on a piece of root. The roots are long and few and go down deep, making few fibers. They resemble loowire root. Wistarias are hard to transplant, unless they have been pot-grown for the purpose or frequently transplanted in the nursery row. Unless massed heavily when transplanted, they are very slow in starting into vigorous growth. The most satisfactory method of propagation for the amateur is by cuttings.

Those who wish to give a young Wistaria an extra good start may sink a bottomless tub in the ground and fill it with good hard core and the Wistaria is to be trained to a tree, select an old tree, if possible, which is past the height of its vigor.

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1. albiflora, 1.
2. rubra, 4.
3. speciosa, 3.
4. brachybotrys, 2.


2. multijuga, Van Houtte. W. CHINESE WISTARIA, var. multijuga, Hook.1 Loosely-GILLED WISTARIA. Fig. 2746. Distinguished from W. CHINESE WISTARIA by the longer and looser raceme and smaller fls. which appear a week later. Lifits. 17-21, silky when young, nearly glabrous when older; racemes 2-5 ft. long, twice as long as in W. CHINESE WISTARIA, looser and sometimes 100-fld.: fls. about half as large as in W. CHINESE WISTARIA; pods glabrous, flattened, with rigid, flat, thinly woody in long. Supposed to be native to Japan, but probably native to north China. F.S. 19:2062. R.H. 1891, pp. 176, 177. B.M. 7522. Gn. 2:161. G.C. III. 13:233 and S.H.

2744. Wistaria CHINESE.
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.

2745. Wistaria Chinensis.

3. speciosa, Nutt. (W. frutescens, Poir.). AMERICAN WISTARIA. KIDNEY BEAN TREE. Not as vigorous as the Chinese Wistaria but climbing over trees and bushes to a length of 30-40 ft., with dark green foliage and short racemes of lilac-purple fls. borne about 3 weeks after W. Chinensis. Lfts. 9-15, glabrous and dark green above, pale and sometimes slightly pubescent beneath; racemes 2-7 in. long, about 14-fl.; fls. 3/8-3/4 in. long; pods long, torulose, hardly coriaceous, with convex valves; seeds reniform, freely produced. June. Low grounds, Va. to Kans., south Pla. to La. B.M. 2103 (as Glycine frutescens). B.B. 2:294. -Var. alba, Hort., has white flowers. Var. magnifica, Hort. (W. magnifica, Hort.), has racemes 6-8 in. long and 50-60-fl., with fls. 1 in. across. The fls. are lilac with a yellow spot, and borne earlier than the type. The clusters are larger and denser. A great improvement. F.S. 11:1151.

4. brachybotrys, Sieb. & Zucc. SHORT-CLUSTERED WISTARIA. Japanese species, distinguished from all others by its low growth. It is said to attain only 3-5 ft. and should therefore be particularly desirable for standards and bushy specimens. Lfts. 9-13, silky; racemes about 6 in. long, about 25-fl.; fls. purple, 1 in. across; pods tomentose. Late bloomer. Japan. S.Z. 1:45. F.S. 9:880.—Var. alba and rubra, are offered.

W. alba has been used in trade catalogues for W. speciosa, var. alba. W. japonica, Sieb. & Zucc. See Millettia.—W. nivea. Hort. John Saul, was doubtless a white-fld. variety of some common species.

WITHEL. Ulmus acaju.

WITCH HAZEL. Hamamelis.

WITHANIA. Consult Salpichroa.

2746. Wistaria multiflora, often called Japanese Wistaria. (X 3/4)

WITLOOF. A form of Chicory (which see).

WOAD. See Isatis.

WOLFBERRY. Symphoricarpos occidentalis.

WOLFSBANE. See Aconitum.

WONGA WONGA VINE. Tecoma australis.
WOOD BETONY.  Stachys Betonica.

WOODBINE. In England, Lonicerâ Periclimenenum; in America, Ampelopsis quinquefolia.

WOODLARK. See Asperula.

WOOD LILY. Trillium.

WOODSIA (Joseph Woods, an English botanist). Poly podiaceae. A genus of mainly rock-loving ferns characterized by their inferior indusium, which is attached beneath the sorus, inclosing it at first but soon splitting into star-like lobes, and later hidden beneath the sorus. Some fifteen species are known, of which seven grow wild in this country. The following native species are sometimes cultivated in borders. Treatment given other hardy ferns will suit them well. Both grow best amongst rocks.

WOODSIA, R.Br. Fig. 2747. Lvs. growing in rosettes or tufts, 2-8 in. long, 1 in. or more wide, bipinnatifid; segments crowded, obscurely crenate; sori confluent when old. En. 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 acetosella.

WOODWORT. See Osmunda, the veins everywhere forming arches.

WOODWORT (Thomas J. Woodward, an English botanist). Poly podiaceae. A genus of rather coarse-folious ferns of diverse habit and structure, but all bearing the sori in rows arranged parallel to the midrib like links of sausages. Commonly known as the Chain Fern. See Fern.

WOODWORT. Woodwardia Virginica (× 1/2).

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WOODWORT. Woodwardia Virginica (× 1/2).

WOODWORTH. 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 Scorpiporus vermiculatus, Linn., S. suberifolius, Linn., S. morio, Linn., S. sulpica, Linn., Medicago scutellata, Mill., and Astragus hawoensis. Linn. The last is the one usually known as "Worms." The picture, Fig. 2749, shows species of Scorpiporus, chiefly S. vermiculatus (beneath) and S. suberifolius (above). All these various plants are annuals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See Caterpillars. L. H. B.

WORMSEED. See Chenopodium.

WORMWOOD. (Artemisia Absinthium). Fig. 2750. An erect, hardy herbaceous perennial, native of middle and western Europe and the countries that bound the Mediterranean, and sometimes found in waste places as an escape from American gardens, having angular, rather shrubby stems 2-4 ft. tall, which bear abundant, much divided, hoary leaves of intensely and persistently bitter flavor, and pinnicles of greenish or yellowish fl. heads. The seed, grayish and very small, retains its vitality for about four years, but is usually sown soon after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and,
as its name implies, anthelmintic properties, although now, for no apparent reason other than caprice of practice, they are less popular with the profession than formerly. In domestic medicine they are employed as a diuretic; locally as a fomentation or as a decoction with vinegar to ulcers, sprains and bruises. In the dry state they are occasionally placed among clothing as a moth repellent. Formerly Wormwood was used by brewers to embitter and preserve liquors, but at the present time it finds its most extensive use as the principal ingredient in absinthe, in the manufacture of which peppermint, angelica, anise, cloves and cinna-
mom are also ingredients. According to Blythe, the green color of this liquor is due not to Wormwood but to the chlorophyll of spinach, parsley or nettles. The plant may be grown without trouble in light, dry, rather

poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out the few specimens necessary to furnish a family supply should be placed not closer than 15 in. each way the first year. If alternate plants be removed with a good ball of earth early in the following spring and planted 30 in. apart, they will be sufficiently close together and the transplanted ones should suffer from no check. Ripened cuttings taken in March or October may be used for propagation. Clean cultivation and slight annual dressings of manure are the only other requisites. In the middle western states there are several localities where Wormwood is grown for export. M. G. Kains.


WYCH ELM. Ulmus serra. 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 al-
nual temperature varies from less than 40° F. to about 50° F. The rainfall is as little as 4 or 6 inches per annum in the Red Desert and reaches a maximum of 30 inches or more on the high mountains. The average for the agricultural regions is about 12 inches. With the exception of a very small area in the northeastern part of the state, and small valleys at high altitudes in the mountains, where some quickly growing plants will mature without being artificially watered, no crops can be raised without irrigation. It has been estimated that there is sufficient water supply to reclaim about 12,000,-000 acres of agricultural land, and about 2,000,000 acres are already covered by irrigation canals.

The natural conditions make live-stock husbandry of paramount importance. The soil is cultivated principally to increase the amount of stock 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 be-

between the time of the nomadic stockman, or the large stock ranch and range business, and the time of perma-
nent 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.
In the last decade the sentiment of the people in regard to cultivating the soil has changed in a marked degree. They are turning their attention to a better agriculture and the production of horticultural crops, both for profit and for greater home comfort.

The state will not reach great commercial importance through her horticultural products, but the people are beginning to appreciate the value of the home-garden and some are raising hardy apples, cherries, grapes, small fruits and vegetables to supply local markets. At the present rate of increase the production of fruits for home consumption will soon be of great importance.

The agricultural land lies along the watercourses, and naturally the first areas to be brought under cultivation were the bottom-lands along the smaller streams where the canals necessary to bring water to the soil could be easily and cheaply constructed. The bench areas, or uplands, have better drainage both for water and air, and are more likely to be free from injurious late and early frosts, than the lowlands near the streams. With the extension of agriculture to the higher bench lands horticultural plants can be raised with more success. The modifying influence of wind-breaks makes it possible to grow fruits in a way that was not dreamed of when the country was first settled. Many early plantings of fruit trees failed because of drying winds or late frosts, and in some instances because the plants were drowned by over-irrigating the lowlands where first attempts were made.

Because of the varying conditions, the kinds and varieties of fruits which can be successfully produced vary in different parts of the state. The high plateaus are characterized by frost every month in the year except July, and only such crops can be grown as will stand a degree of frost in the spring months. In the warmer valleys, even up to 5,000 feet altitude, such tender vegetables as tomatoes, melons, sweet potatoes and peanuts have been successfully raised. Where the season is short because of the altitude, plants grow very rapidly, reach maturity in a short time and do not seem to be so seriously affected by light frost as they do where the season of growth is long.

In those portions of the state which are below 6,000 feet in altitude (see map) many varieties of apples, Morello and Rocky Mountain dwarf cherries and plums (varieties from Prunus americana) are fruiting, and harder kinds are successful at much higher altitudes in protected locations. The Wealthy apple has been successfully fruited on the Laramie Plains at an altitude of 7,100 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 fruited in the state, arranged as nearly as possible in the order of their apparent hardiness and present abundance: Standard—Wealthy, Oldenburg, Antonovka, Gideon, Pemiscus, 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 *Centauridium Drummondii*. In cultivation this plant is treated as 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 one half shorter, and usually 5 still smaller and shorter external ones.

**Texanum**, DC. (Centauridium Drummondii, Torr. & Gray). Fig. 2752. Nearly glabrous biennial or annual, 1–4 ft. high: Ivs. narrowly oblong to lanceolate; stem Ivs. entire or with a few teeth towards the apex fls at containing a diam. of 2 in. even in the wild.

**XANTHOCRAS** (Greek, xanthos, yellow, and keras, horn, alluding to the yellow horn-like processes of the disc). *Sapindaceae*. Ornamental deciduous shrub or small tree with alternate, odd-pinnate hs showy white fls. in terminal and axillary racemes, ippcaring with the leaves in spring on last year's branches. The large greenish fruits are similar to those of the buckeyes. *A. sorbilis*, the only species, is hardy as far north as Mass., and is a very handsome shrub well suited for solitary planting on the lawn. The dark green, glossy foliage is not attacked by insects and retains its bright color until frost sets in. The flowers are very showy and appear even on small plants. Xanthoceras is also sometimes used for forcing. It is not very particular as to soil. A porous, loamy soil and a sunny position seem to suit it best. Prop, by seeds, stratifaed and sown in spring, and by root-cuttings, which succeed best with moderate bottom-heat. A monotypic genus from N. China, allied to Ungnadia and Koireuteria: fls. polyga- mous, the upper ones of the terminal raceme pistillate, the lower ones stamine, those of the lateral racemes stamine, with rarely a few pistillate ones at the apex; sepals and petals 5; disc with 4 suberect cylindrie horns about half as long as stamens; stamens 8: ovary su- perior. 3-loculed, with a rather short, thick style: fr. a capsule, with thick walls dehiscent into 3 valves, each locale with several globose, dark brown seeds.


**XANTHORRHEA** (Greek, yellow flow, referring to the resin which exudes from the trunks). *Juncaceae*. The "Grass Trees," "Grass Gums," or "Black Boys," which form a conspicuous feature of the Australian landscape, are among those strange members of the rush family that have a decided trunk or caudex. The "Grass Trees" often have a trunk 2 or 3 feet high, surmounted by a dense, symmetrical crown of foliage, composed of a multitude of brittle, linear leaves 2–4 ft. long which spread or curve gracefully in all directions. From the center of this tuft of leaves arises a solitary, scepter-like flower-stalk, terminating in a dense cylindrical spike of numerous, closely packed greenish flowers. These picturesque desert plants are well worth trial in the 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.

Xanthorrhoea is a genus of 11 species of Australian (1993)
plants of the general appearance described above: perianth persistent, of 6 distinct segments, the 3 outer glume-like, erect, concave or almost hooded, 3 or 5-nerved, the 3 inner much thinner, usually 5-nerved, erect, but more or less protruded beyond the outer segments into a short, hyaline or white, petal-like, spreading limbus. Flora Australiensis 7:112.

**XANTHORRHIZA**

**A.** Spike becoming 5 or 6, or even 15 ft. long.

**B.** Spike 1½–2 ft. long.

**Bátilis, R.Br.** Lvs. 3–4 ft. long, 2–3 lines broad; scape often 6–8 ft. long; not counting the spike. Readily distinguished by the dense, rusty tomentum covering the ends of the bracts and outer perianth-segments. B.M. 4722. G.C. III. 17:196. F.S. 9:888.

**AA.** Trunk becoming 5 or 6, or even 15 ft. long.

**Preissii, Endl.** Lvs. 2–4 ft. long, 1–2 lines broad, rigid, very brittle when young; scape 2–6 ft. long, including the spike, which occupies one-half to nearly all its length. B.M. 6935.

W. M.

**XANTHORRHIZA** (Greek, yellow root). Often spelled Xanthorrhiza. Xylenaceae. A genus of one species, native in the eastern United States from New York to Florida. Plant shrubby; lvs. pinnate or bipinnate; fls. in drooping racemes or panicles; sepals 5, petal-like, deciduous; petals 5, smaller than the sepals, and 2-lobed; stamens 5–10; carpels 5–10, sessile, forming only one-seeded follicles, one ovule of each usually not maturing.

The plants are cult. mostly for their handsome foliage, which is much like that of Actaea, and which changes to a beautiful golden color in the autumn. The plants will grow readily in any good soil but usually prefer damp and shady places, although it often thrives in loose, sandy soil. Propagated both by seed and root division in fall or early spring. Often not hardy in Massachusetts.

**apifixilis, L’Herit.** Shrub Yellow Root. Fig. 2755. Stems of bright yellow wood, 1–20 ft. high: roots yel-
XANTHOXYLUM (Greek, xanthos, yellow, and xylon, wood). Sometimes spelled Zanthoxylum. Including Fagara. Rutaceae. Prickly 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. Americanum 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. altanoides is called by Sargent one of the most beautiful trees of Japan. They seem to be not

"Caudex a short, thick, erect rhizome. Sagittifolium, Schott (Arum sagittifolium, Lindl.). Malanga. A tropical vegetable, "Young plants of this are stemless, but in age, from the decay of the old lvs., an annulated caudex is formed some inches in height, each throwing out stout lvs. 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. 4989). 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. 4989. - In northern hot-houses said to bloom in winter.

2756. Xanthosoma Lindeni. Leaves a foot or so long.

AA. Caudex tuberosus.

Xanthosoma (Greek, yellow body, referring to the stigma, Arum). This genus is interesting to the horticulturist as containing the handsome variegated store foliage plant known to the trade as Phytolacca 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 acrid and more or less poisonous properties are dispersed by the expression of the juice, or by its dissipation through heat" (B. M. 4989). Of this class the best known is the Elephant's Ear, or Colocasia esculenta. The Malanga is said to be "little, if at all, inferior to Caladium esculentum; in wholesomeness and delicacy far superior to spinach; and in this respect it may vie with any European vegetable whatever." - Bot. Mag. The "Yautia Malanga" of Porto Rico is, according to Cook, Colocasia antiquorum, var. esculenta. Other Yantas are species of Xanthosoma. The botany of them is confused.

Xanthosoma is a genus of 25 species, according to Eugler, who has given an account of them in L.f., in DC. on Phauer. 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 peltately cut; fbs. unisexual, naked: males with 4-6 stamens connate in an inversely pyramidal synandrium with 5 or 6 faces: ovary 2-4-beaked; ovolves anomalous.

2755. Xanthorrhiza apiololia (X 1/2).
very particular as to soil and position. Prop. by seeds and by suckers or root-cuttings.

The genus contains about 140 species in the tropical and subtropical regions of both hemispheres, and a few in temperate regions. Trees and shrubs, with mostly prickly branches: most parts, particularly the fruits, emit a strong aromatic odor when bruised: lvs. odd-pinnate, 7-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 deliquescent capsules each with 1-2 shining black seeds. Several species are used medicinally. The wood of some W. Indian species and that of the Australian X. sparganaceum is considered valuable. The fruits of X. piperitum are used like pepper in Japan.

**Americanum.** Mill. (X. florinum, Wild. X. ruminatum, Michx.). Fig. 2757. Shrub or small tree, attaining 25 ft., with prickly branches: lfts. 5-11, opposite, almost sessile, ovate, entire or crenulate, dark green above, lighter and pubescent beneath, 1-2 in. long; fls. small, greenish, in axillary sessile cymes, appearing shortly before the lvs.: seeds black. Quebec to Neb. and Va. B.B. 2:353.


**Xenia.** The immediate influence of pollen—the influence on the fruit that results directly from a given pollination.

**Xeranthemum** (Greek, dry flowers; it is one of the "everlastings"). Compositae. There are four or five species of Xeranthemum, of which X. annuum is one of the oldest and best known of the "everlastings" or immortelles. They are inhabitants of the Mediterranean region. They are annual erect herbs, densely pubescent or tomentose. The heads are rayless, but the large involucral scales are petal-like and persistent, giving the plant its value as a subject for dry bouquets. Outer flowers few and sterile, inner ones fertile; receptacle chaffy; involucral scales in many series, of various lengths, glabrous; heads solitary on long naked pedicles.

The culture of Xeranthemum is very simple. Seeds are usually sown in the open, where the plants are to stand; but they may be started indoors and the seedlings transplanted. Hardy or half-hardy annuals.

**Xeranthemum annuum**, Linn. Fig. 2758. Annual, 2-3 ft. tall, erect, white—tomentose: lvs. alternate, obovate-lanceolate, acute, entire: heads purple, 1-1½ in. across, the longer scales wide-spreading and ray-like. S. Europe.—Runs into many varieties. Var. ligulatum, Voss (X. pili- zium and X. imperati, Hort.). A double or half-

**2758. Xeranthemum annuum (× ½).** double form. Var. perligulatum, Voss (X. superbi- zium, 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. multifo- rum, Hort. (var. compactum) has a more compact and
bushy habit, with somewhat smaller heads. *X. varius*, Hort., is a trade name for mixed varieties.

*X. angustatum*, Mill. (X. erectum, Presl.) has white heads of which the scales are little or not at all open or spreading. S. Eu. to S. W. Asia. L. H. B.

**Xerophyllum** (Greek, dry leaf). Lilium. 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 lvs. each 1/4 in. across. It blooms from May to July, with delicate fragrance lasting a long time. It is a hand-somer plant than the asphodel, but, like many other native plants, its beauty was first appreciated in England and it has only lately found favor in American gardens. *X. setifolium* or *asphodeloides* as it is known to the trade, is considered one of the choicest plants for English bog gardens. The possession of several large clumps is especially to be desired, as each plant flowers so freely that it requires a year or two to recover. Unfortunately the plant does not seed freely and propagation by division is a slow process which must be performed with great care in the spring. It needs a moist and somewhat shaded situation and a peaty soil. The probability is that the Turkey’s Beard can be grown in any sandy soil that has been liberally enriched with well-rotted leaf-mold in a spot that is reasonably dry in winter. The species is a native of the dry pine barrens from southern N. J. to eastern Tenn. and Ga. The chief species of the Pacific coast, *X. tenax*, has white and violet flowers, the latter color supplied by the stamens. Each region should cultivate its own species. The forms are too much alike for the same garden. A third species, *S. Douglasii*, is a rare plant ranging from Montana to Oregon. It is distinguished by its 6-valved capsule and is said to be inferior as a garden plant to the other species.

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. opening first; perianth-segments oblong, 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.


2759. Xerophyllum setifolium growing near the margin of a pond.

A. Raceme 3-6 in. long; perianth-segments exceeding the stamens: less, one line or less wide.

XIMÉNIA (Francis Ximenes, Spanish monk, wrote on plants of Mexico in 1635). *Olivacea*. Here belongs the Hog Plum, a tropical fruit of minor importance which grows wild throughout the tropics, and in the U. S. is native to Florida south of Tampa Bay. The fruit is about an inch long, shaped like a plum, and the pulp is sweet and aromatic. The "stone" which incloses the seed is proportionately very large. The fruit is borne on a small tree, each branch of which ends in a thorn about ½ in. long. The fruits are generally eaten, but although it is fairly common in Fla. it is not cultivated. The species has been suggested by the American Pomological Society as worthy of cultivation with a view to improvement.

Ximenia is a genus of 8 species of tropical shrubs or trees, often thorny: lvs. alternate, entire, often clustered; fls. whitish, in short axillary cymes or rarely solitary; calyx small, 4-toothed; petals 4, united at the base, villous within; stamens 8; ovary 4-loculed; locules 2-4-ovuled; drupe lanceate, 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-fld., 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 *Spandias latifora*.

**XYLOSMALongifolium** 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.
**YAM.** See *Dioscorea* and *Sweet Potato.* Circular 21, Div. of Bot., U. S. Dept. Agric., has valuable cultural notes on the introduction of West Indian Yams (*Dioscoreas*) to subtropical agriculture in the U. S.

**YARROW.** Consult *Achillea.*

**YATE.** See *Eucalyptus occidentalis.*

**YELLOW ROOT SHRUB.** *Xanthorrhiza.*

**YELLOW-WOOD.** *Cladrastis* *tinctoria.*

**YERBA BUENA.** *Mieromeria douglasii.*

**JEW.** See *Taxus.*

**YOUTH-AND-OLD-AGE.** *Zinnia.*

its forms, and *glauca* are hardy in the northern states, and *Y. treculana* 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. treculana* 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.

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**YUCCA** (Indian name for the Manihot, erroneously applied by Gerarde). *Liliaceae.* About a dozen species, chiefly of the arid North American table-land and confined to the United States, Mexico and adjacent islands. Evergreens with long, narrow, usually spiny-pointed leaves and panicles of large white nocturnal flowers frequently shaded with green or purple.

*Y. filamentosa, flaccida, baccata, gloriosa* in some of the forms, and *glauca* are hardy in the northern states, and *Y. treculana* 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. treculana* 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.

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Most species may be fertilized if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. *Y. 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 (*Pomona yuccasella*) that accompanies them when cul-

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2761. *Yucca Whipplei.*
tivated in the western states, but emerges from the pupa too late to pollinate *Y. glauca* and disappears too early for *Y. gloriosa*. See *K. conica*, Engelm. *Y. conica*, Haw.1. Lvs. broadly spatulate, plicate, concave, N. C.

The great Yuccas, or "Yucca Palms," of southern California (Fig. 2760) are chiefly *Y. arborescens*. They grow in the higher lands bordering the Mojave and adjacent deserts, reaching a height of 15-20 ft. The old plants are exceedingly weird and picturesque. Occasionally this species is transferred to gardens, but it is apparently not in the trade.

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AA. Fr. erect, capsule: seeds thin and flat ........................................
BB. Stigma capitate, on a slender style ......................... 1. Whipplei 
BB. Stigma 3- or 6-lobed, terminating a stout style .... 2. filamentos a
CC. The fr. without a core, purple-ashed: lvs. rough-mar gined .................. 6. aloifolia  
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CC. Lvs. with distinct mar ginal fibers when adult 9. baccata 

1. Whipplei, Torrey (Y. angustifolia, Wood, *Y. Californica* and Y. Orthegihei, Hort.) Figs. 2762, 2763. Acaulescent: lvs. 1 in. wide, stiff, flat, strinate, glaunous, needle-pointed, rough-margined: panicle very tall, narrow, long-stalked. Coast Range, California. (G.F. 1.5; 1886. G. 23, p. 531. R. H. loc. 1, R. H. 862, Rep. Mo. Bot. Gard. 3, pl. 11, 12, 54. R. H. 1884:224 (as var. *violacea*). G.F. 8:415.—Grows everywhere in southern Calif., and is a glorious sight when in bloom. It is an easy plant to handle and has been known to flower in three years from seed. Because of its peculiar stigma, this is sometimes placed in a distinct genus, Hesperoyucca.
with median whitish stripe on the lvs. is var. medio-
striata, Planch. Among the numerous varieties and
forms into which this, the first cultivated Yucca, has
spread, the following are most worthy: Var. picata,
Engelm., (Y. recurvata, Salish, Y. recurvata, Haw. Y. pilu-
dula, Hort.). Fig. 2767. Lvs. less plicate, soon
green, gracefully recurved, occasionally with a few drooping
this are the following: Var. marginata, Carr. lvs. yellow-marginated; var. variegata, Carr. lvs. with yellow median
band; and var. elegans, Hort. Lvs. with reddish median
band. Var. nobilis, Carr. (Y. Elata, Hook.) Lvs. glaucous, not pli-
cate, less recurved. Var. flexilis, Trel. (Y. fi-
elis, Carr.). Lys. 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-fruited species have been artificially
produced in Europe.

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. Southeaster U. S. and West
Indies. B.M. 1700. Variegated forms are: Var. margi-
nata, Bonnier. Lvs. with yellow margin, and often
when young also tinged with rose. Var. quadriflora,
Hort. Lvs. with median yellow band, and also when
young with rose coloration. Var. Dracoides, Engelm. (Y. Dracoides, Lindl.). Branching above. Lvs. broad
and arching, less pungent. B. R. 22:1894. Var. conspicua,
Engelm. (Y. conspicua, Haw.). Tall, the stems clustered
at base; lvs. broad, recurved, softly green-pointed.

7. Guatemalaensis, Baker. Tall, swollen at base,
branching above in age; lvs. about 3 in. wide, flat,
glossy green, sometimes plicate, rather thin but
scarcely recurved; panicle compact, close to the lvs.
Gard. 4, pl. 1, 2, 19.

8. Treculeana, Carr. (Y. canaliculata, Hook. Y. dorippa, Regel. Y. longifolia, Buckley. Y. panduriformis,
Koch. Y. argopodita, Verlot.) Low tree, usually
broadly 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.

9. yucca gosiosa, var. recurvifolia.

9. bancata, Torrey. Spanish Bayonet. Low, from a
stout running candel. lvs. of a yellow-green, with
very thick marginal threads; panicle rather loose
within the leaf cluster; fls. and fruit very large. S.
ZALUZIANSKYA (after a Pole, who wrote Methodus Herbaria-, Pniiiin.): Including Lycterinia, selaginoides, and other species of S. African herbs and subshrubs, in three plants known as Night Bal-sams from their night-blooming habit. The flowers are saucer-shaped and 5-lobed, each lobe being deeply cupped. These plants are generally treated as half-hardy annuals, the seed being sown indoors in early spring. The plants bloom in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very satisfactory and urge that the seed be sown in the autumn and the young plants wintered in a coldframe. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night.

Zaluzianskyas are more or less viscid plants; lowest leaves opposite, upper ones alternate, usually few-toothed; flowers sessile but long-tubed, disposed in leafy spikes which are cylindrical or flattish; calyx 5-toothed, 2-lipped or 2-parted; corolla persistent, the 5 lobes entire or 2-edged, 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 E. duratii, gracilis, Pustulata and speciosa. It is probable that these are all varieties of *Erius alpinus*. In the American trade they are considered as trailing plants suitable for hanging baskets, window boxes, or to which *Erius alpinus* is eminently adapted. *E. speciosa* is said to have ultramarine blue flowers; *E. gracilis*, light blue flowers, and a spreading habit; *E. Pustulata*, pure white flowers, blue-striped; *E. duratii*, double blue flowers. *Erius gracilis* of the botanists is a true Zaluziansky, being a synonym of *Z. lychnidea*, a plant of erect habit with white flowers that are violet outside. Although Erinus and Zaluziansky are placed in different tribes of the ferny family, it is difficult to separate them by any one important botanical character unless its be the shape of the stamens, which is oblong in Zaluziansky, 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. 546, should be added the fact that the genus has only one species. The other names which appear to be good species of *Erius* 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: hearts broadly lanceolate; *E. oblongiflorus*.

C. *Lychnidea*, Walp. (*Nystertia* lychnidea, D. Don, *Erius gracilis*, Leh., not Hort.). Subshrub, 2 ft. high, with flowers 13/4 in. long, 1/2 in. across, white, violet outside. B.M. 2594. B.K. 9:54 (both as *Erius lychnidea*).

D. Duration annual: hearts oblong-lanceolate; *E. linearis* or the lower cauline lanceolate.

Capensis, Walp. (*Nystertia Capensis*, Benth.). Differ from the above, according to Bentham, in stature, duration, strict stems and smaller *lvs.* but unfortunately Bentham does not give the height of the plant or color of the flowers. According to R.H. 1851:221, the plant has white or lilac flower-clusters on the same plant, each flower having an orange cast. The spikes, according to Bentham, are commonly short and 4-8-flowered, sometimes long and 15-20-flowered. There is some evidence that this species and the next are confused in the trade. In R.H. 1851:221 the flowers are 3/4-in. long and less than 1/2 in. across.

AA. Corolla-tube glabrous.

B. Corolla-tube glabrous.

Selaginoides, Walp. (*Nystertia selaginoides*, Benth.). Dwarf annual, branched at the base, 3-5 in. high, rarely 6 in., with spathulate *lvs.* and *fls.* 3/4 to 1 in. long, color of *fls.* not stated by Bentham, but in R.H. 1896, p. 308 (same picture as *E. duratii*, p. 89) the flowers are said to range from white to lilac and darker depending upon their stage of development, with an orange-colored eye which becomes crimson later. This suggests the preceding species, and it is evident that the two must be distinguished by technical characters until the colors can be verified. The plant advertised in America as *Nystertia selaginoides* is said to be a pink-flowered, hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardy at San Francisco.

W. M.

ZAMIA (name used by Pliny, meaning loss or damage, and first applied to barren pine cones, and transferred to these plants apparently because of the cone-like fructification). *Cycadeae*. One of the nine genera of the Cycas family, as constituted by Alphonse De Candolle (Prod. 16, pt. 2, pp. 522-547). Other genera of horticultural interest and discussed in this *Cyclopediad are Ceratozamia, Cyseen, DOoss, Eunephytals and Macrozamia. The Zamias are short-stemmed, usually simple-stemmed cycad-like plants, the trunk sometimes subterranean, with long-pinnate evergreen leaves or fronds, the leaflets being thickened and usually broadened at the base, and jointed. There are about 30 species in the American tropics, and two are native to South America. The flowers of cycads are dioecious, without envelopes; the pistillate flowers are mere naked ovules inserted under scales in cones, and the staminate flowers are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not enclosed in a pericarp or ripened ovary) and are allied to the conifers. The fruit is a berry-like drupe. In Zamia the floral scales are peltate (and not horned) and form a cylindrical cone; the anthers are numerous, and the ovules pendent in pairs. Leaves nearly straight in venation. The seedling of *Zamia* has been studied by H. J. Welsher (Rull 2, Bureau of Plant Ind., U. S. Dept. Agr.). His conclusions respecting the Floridian species are accepted below.

Zamias are greenhouse plants, to be treated like species of Cycas or Eunephytals, which see. The plants are propagated by means of seeds and offsets; also by division when there is more than one crown.
ZAUSCHNERIA

A. Petiole prickly.

furfuraceae, Ait. Trunk cylindrical, 1-2 ft. tall; petioles dilated and concave at the base, with several small prickles: Ifts. about 10-12 pairs, opposite or alternate, ob lanceolate, entire or slightly serrate at the top, acute or obtuse, 4 in. or less long. Mexico. B.M. 1869.

Lindeni, Regel. Trunk cylindrical, 2-4 ft. or more tall when well grown; petioles long, cylindrical, sparingly provided with tawny wool, the prickles short and scattered; spreading: Ifts. or more pairs, glabrous or somewhat puberulous, nearly or quite opposite, sessile, long-lanceolate and acuminate, dentate or serrate towards the top. Ecuador. L.H. 22:195.

AA. Petiole not prickly.

b. Species growing beyond the limits of the U. S

integrifolia, Ait. Trunk 12-18 in. tall, erect, glohular or oblong; Ivs. glabrous; Ifts. alternate, 7-16 pairs, oblong to lanceolate, straight or slightly curved, acute or acuminate, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex. West Indies. B.M. 1851. —The Florida plants, usually referred here, are apparently all Z. Floridana and Z. pumila.

Mexicana, Miq. Distinguished by De Candolle as follows: scales of the leaf buds tomentose and also the petioles at the base, the petioles 3-cornered, unarmed, glabrous, somewhat watery; Ifts. of 9 or more pairs, sub-opposite, narrow-lanceolate, straight or slightly curved, acute or acuminate, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex. Mex. — By Index Kewensis referred to Z. Lodigessii, a species with prickly petioles.

Pseudo-parasitica, Yates (Z. Rizzii, Regel). Distinguished as follows: trunk cylindrical; Ifts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cuspidate at the apex, with 18 strong nerves which are twice bifurcate. Panama. — Grows on tree trunks.

angustifolia,Jacq. Foliation glabrous when mature; Ifts. 3 in. long, 4-20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrulate or entire, the base not narrowed. 6-several; pistillate cone oblong but cupuliform. Bahamas. Cuba.

bb. Species native to Florida.

Floridana, DC. Coonste. Compt. Figs. 2708-71. Lvs. ovate or ovate-lanceolate; petiole triangular in outline, sericeo-tomentose at base, with scattered hairs above; Ifts. mostly opposite, 14-20 pairs, glabrous-above and with scattered hairs beneath, linear, falcate and somewhat twisted, narrowed at the base and obtuse at the apex, the margin revolute and with a few obscure teeth; mature pistillate-cones oblong, 5-6 in. (12-13 cm.) long, markedly umbo-like (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. Ditters, 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 the outer end. — Abundant in central Florida, ranging from 28° 30' north for one degree of latitude, in dense moist woods.


ZANNICHELLIA palustris, Linn. (Varidates), 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 Worlds. 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 Raisins, page 1496.

ZANTHORRHIZA. See Xanthorrhiza.

ZANTHOXYLUM. See Xanthoxylum.

ZAUSCHNERIA (named for a professor of natural history at Prague). Onagra. The California Fuchsia, or Hummingbird’s Trumpet, is a half hardy perennial plant 5-2 ft. high, with drooping, trumpet-shaped Vernonii 1 ft. across and under 1 in. wide at the mouth. It is the calyx which forms the showy trumpet, and its 4 acute lobes are rather larger than the 4 petals, which are obcordate and inserted at the throat of the calyx tube. The length of the calyx distinguishes this genus from Epilobium, to which Zauschneria is closely allied by reason of its 4 petals, 8 stamens, 4-locular ovary and coneose seeds. The genus has only one species, but this varies greatly in the width of the Ivs. 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 choice plant of pendant habit for the steep sides of rockeries and for naturalizing on old walls. In light and dry soils it spreads underground like the epilobium. It is prop. by division, by cuttings made in autumn and wintered in a coldframe, or by seeds sown in early spring in mild heat. In California the plant is considered objectionable on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.

California, Presl. California Fuchsia. Hummingbird’s Trumpet. Half-hardy perennial with the flower of a Fuchsia and the fruit of an Epilobium: height
ZEA (an old Greek name for some common cereals, probably spelt Gramineae). As now limited the genus is founded upon the single polymorphous cultivated species Zea Mays, Maize or Indian Corn (Figs. 2772, 2773), whose origin is unknown but is suspected by some to be Tripsine (Iachurus luxurians). Most of the evidence points to Mexico as the region in which it originated and from which it spread. Under the head of Corn are given the botanical characters of the genus, a classification of subspecies of Zea Mays, and a discussion of Sweet Corn and Pop Corn. A picture of a staminate flower is given in connection with the article Grass (Fig. 283, p. 687). Hackel ("The True Grasses") explains the fructification of Maize as follows: "The pistillate spikes (originally by monoeious, or monogenitally developed) are grown together into a spongy, continuous, club-shaped body (the cob) upon which the 4-11 double rows (each sessile upon a low longitudinal elevation that is limited to the summit of the summit). Both the horny or cornous endosperm and the starchy endosperm extend to the summit. In drying, the flouncy portion shrinks more than the horny, and thus gives rise to the dent at the summit. Both the horny and the flouncy portion of the endosperm consist of starch, but the former is more compact. The varieties vary greatly in size of plants and appearance of the ear, but in general the plant and the ear are both larger than the Sweet or Flint Corns. The color of the kernels varies, the chief color varieties being white, yellow, and carmine; the latter mottled with red; red varieties are less common, but red ears occasionally occur in all varieties. Flint Corn (Z. induscula, 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 56°.

Soft Corn (Z. umycladica, Sturt.) Kernels without horny or cornous 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. induscula, 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. quadrifolia and Z. gracillima are seedsmen's names for other similar forms, the former being variegated and the latter dwarf.

For cultural account, see Corn. A. S. Hitchcock.
from the Teosinte (Enchilana Mexicana), a fodder grass that is much grown in Mexico. See Teosinte. This latter view has arisen from experiments in crossing Teosinte and Maize, whereby a maize-like plant has been produced, thus showing the very close affinity of the two species. Plants of this hybrid were thought by the late Sereno Watson and others to constitute a new species of Zta, and Watson named it Z. canina. This plant quickly reverts to ordinary Corn when grown in the North (see Harshberger, G. F. 9:322; Contr. Bot. Lab. Univ. Penn. 2:231. Also Bailey, Bull. 48, Cornell Exp. Sta.). Figs. 2774, 2775. Zta Mays, therefore, may be (1) a true species, of which the wild prototype is unknown; (2) a direct offspring by domestication of Enchilana Mexicana; (3) a product of crossing between Enchilana Mexicana and some unknown related species; (4) a product of crossing between Enchilana Mexicana and a domesticated race of the same species. Our knowledge is yet insufficient to enable us to offer much more than conjecture on these categories.

Maize is remarkably variable, although most of the variations intergrade in different regions and under different conditions. The most extended American study of variation and varieties in Maize has been made by the late Dr. E. Lewis Sturtevant. The summary of his study of varieties is published as Bull. 57, Office of Experiment Stations, U. S. Dept. of Agric. (“Varieties of Corn.” 1899). Sturtevant throws the varieties of Maize into seven “species groups” or “agricultural species.” The distinguishing characters of these groups are found on the kernels. Aside from these there is at least one well-marked race of ornamental maize, Zta 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 inter-
ZELKOVA (after the vernacular name Zelkova in Crete, or Selkwa in the Caucasus. Syn., Abeliae, Ulrichia, 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 hardly north and Z. crenata hardly 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 Aphaniante and are chiefly distinguished by the compound leaflets. From the elm, which they much resemble in foliage, they are easily distinguished by the drupe-like fruits.

2781. Sugar or Sweet Corn — Zea Mays, var. saccharata (X 3/4).

A green ear, with unshrunk kernels.

Trees, sometimes shrubby, with pinnate, stipulate lvs.; fls. polygamous, the perfect ones solitary in the axils of the upper lvs. the staminode clusters in the axils of lower lvs. or bracts; calyx 4-5-lobed; sta-

2782. Sweet Corn when mature and dry, showing the shrinking of the kernels (X 3/4).
mens 4-5; styles 2: fr. a 1-seeded drupe, usually broader than high, oblique, with the style eccentric. Z. acuminata is an important timber tree; the wood is very durable, and considered the best building material in Japan. The young wood is yellowish white in color; the old wood is dark brown and has a beautiful grain.

Zelkova, acuminata, Planch. (Z. Koehi, Maxim. Z. cuspidata, Hort. Platner acuminata, Lindl. Phalera Japanese, MIq.). Fig. 2786. Tree, attaining 100 ft., with broad, round-topped head: branches slender: Ivs. short-stalked, ovate to oblong-ovate, acuminate, rounded or slightly cordate at the base, sharply and coarsely serrate, with acuminate teeth, pairs of veins about 10, somewhat rough above, almost glabrous. 1-2 1/4 in. long, on fertile branches, 2-5 on sterile branches. April, May. Japan. G.F. 6:325. Gt. 37, pp. 22, 23.

Zephyranthes (Greek, tower of the west wind). About three dozen species of bulbous plants native to the warmer parts of America. Unfortunately they are not quite hardy, but some of them are very satisfactory plants for window-gardens, re-sticking somewhat in winter and blooming in summer under such treatment. They all have linear Ivs. contemporeanous with the frs., and slender scapes about 6-9 in. high, crowned by solitary 6-lobed frs. of white, rose or yellow. The frs. are 1-3 in. across. Other generic characters: perianth regular, erect or suberect: corona none; anthers dorsifixed, versatile; ovules many, superposed; seeds black, flat.

Zenobia (after Zenobia, queen of Palmyra, who lived in the third century; a fanciful allusion to her having been chained as was Andromeda, whose name is commemorated by a closely allied genus). Eriocere. Ornamental low deciduous or half-evergreen shrub, with alternate, short-petioled, simple and white, campanulate, nodding flowers arranged in clusters along the last year's branches. Hardy as far north as Mass., and a very handsome shrub for borders of shrubberies, particularly when in bloom; the glaucous form is one of the most conspicuous shrubs with light-colored foliage. Zenobia is also recommended for forcing. It thrives best in a sandy or peaty soil. Prop. by seeds sown in spring and by layers; also by greenwood cuttings from forced plants. See, also, Andromeda and Pieris for culture. Monotype genus native of N. America, closely allied to Andromeda and Pieris but chiefly distinguished by the Ivs. being somewhat smaller, more pubescent and rough above. Var. Verschaffeltii, Dipp. (Times Verschaffeltii, Hort.), has the Ivs. deeply incisely dentate and broadly cuneate at base.

Alfred Rehder.
The latest revision of Zephyranthes is found in Beker'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 Pseudobulb.** 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*, rose, 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 New England, writes in *Cin.* 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 leaves completely hiding the soil. This border was as gay with the flowers of Zephyranthes last autumn as any border of crocuses in spring. On very sunny days the flowers opened quite flat, and glistened like snow in the sunshine. Another character which distinguishes this species from the others is its evergreen foliage. It is said that the river La Plata was so called (the name meaning "silver") because of the profusion of these white flowers on its shore.

### ZEPHYRANTHES

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**Zephyranthes Proper**

**A.** Fls. white, often tinged rose outside.

**B.** Stigma 3-lobed.

**C.** Ovary stalked.

**D.** Perianth 3 in. long.

**E.** Less, channelled, bright green, shining, with acute margins...

**F.** Less, thick, semi-terete, deep green, not shining, with rounded margins...

**G.** Perianth 2 in. long...

**H.** Ovary sessile...

**I.** Ovary capitate, obscurely 3-lobed...

**AA.** Fls. bright rose-colored.

**B.** Perianth 2½-3 in. long...

**C.** Carinata...

**D.** Perianth about 1½ in. long...

**EE.** Style slightly declinate.

**F.** Podetia much shorter than spathe...

**G.** Podetia much longer than spathe...

**H.** Style strongly declinate...

**II.** Andersoni

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. **Treatise**, Wats. Closely allied to *Z. Atamasco* and best distinguished by the lvs. as indicated in the...
key. The perianth-segments are sometimes keeled with rose, but in both species the fls. turn pinkish with age. It is a Florida species, found in damper localities and blooming several weeks later than Z. Atamasco. V. 6:296. p. 11.

3. erubescens, Wats. (Amaryllis erubescens, Horsf ord). Rare white-fl., 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 perianth and fls. strongly tinged with rose outside. Bulb over 1 in. thick; neck as long; spathe flat above the tube equaling and closely embracing the pedicel (about 1 in. long).—Int. by Horsford 1889 and probably lost to cultivation.

4. verecunda, Herb. Rare spring- and summer-blooming species, distinguished from other white-fl. speeies in cult. by the sessile ovary and long-necked bulb. Bulb 1 in. or less thick; neck 1-2 in. long; fls. 1½-2 in. long, greenish white, more or less tinged outside or keeled with rose. Highlands of central Mex. B. M. 2583.—Offered by Dutch dealers.

5. candida, Herb. Fig. 2790. Most popular of white-fl. Zephyr Lilies, being distinguished from the others by its autumn-blooming habit and capitate stigma. Lvs. appearing in autumn with the fls. and lasting through the winter in favored localities, over 1 ft. long; fls. pure white or slightly tinged rose outside, 1½-2 in. long. Marshes of La Plata. Gn. 37:740. B. M. 2697. L. B. C. 15:1419.

6. carinata, Herb. (Z. grandiflora, Lindl.). Largest and choicest of the rosy-fl. species and said by Baker (1888) to be the commonest Zephyranthes in cultivation; however, the name Z. rosea is far commoner in American catalogues. It is a summer-blooming species with fls. 2½-4½ in. across, and about 3 in. long. Bulb 1 in. thick, short-necked; ovary stalked; stigma tri-fid; spathe 3-fl. only at the tip. —Int. by Horsford, 1889, and probably lost to cultivation.

7. Lindleyana, Herb. Rare summer-blooming rosy-colored species from the mountains of Mexico, inferior to Z. carinata for general culture. Bulb globose, ¾ in. thick; neck short; fls. 1½-2 in. long; ovary stalked; stigma 3-fl. only at the 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 1½ in. broad; bulb globose, ¾ in. thick; neck scarcely any; spathe 2-fl. only at the tip; ovary stalked; stigma 3-fl. Oct. 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 ovoid; neck 1½-2 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 globose; neck 1½ in. long; spathe bifid only at the tip; pedicel much longer than the spathe; fls. yellow, coppery outside, 1 in. long, 1½ in. across. B. M. 3596 (Habranthus Andersonii, var. Texana).


2790. Zephyranthes candida above and Z. Atamasco below (× ½).
Britain imported 5,600,000 pounds of Ginger valued at $620,000. Medicinal Ginger is prepared from the dried "root"; continental Ginger from the green. Candied Ginger is made from carefully selected, succulent young rhizomes which are washed and peeled and then preserved in jars of syrup. Hosewives often preserve their own Ginger; it is important to have the hands protected while scraping the roots or they will "burn" for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially even in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies Ginger may be cultivated up to an altitude of 3,500 feet.

Zingiber officinale is a Chinese species, offered for Reestock biennial, bearing many sessile tubers; stem 3-4 ft. high in tropics; lvs. 6-13 in. long, lanceolate, glabrous beneath; spike 2-3 x 1 in., oblong, produced from the rootstock on peduncles 1-1.5 ft. long, with sheathing, scarious bracts about 1 in. long; corolla-segments lanceolate, upper concave; lateral staminodes none or adnate to the lip; anther-cells continuous; crest narrow, as long as the cells. Thirty species, native to Old World tropics. Compare Curcuma and Musa officinale, Rose. Ginger, Figs. 2791-96. Reestock biennial, bearing many sessile tubers; stem 3-4 ft. high in tropics; lvs. 13-16 in. long, lanceolate, glabrous beneath; spike 2-3 x 1 in., oblong, produced from the rootstock on peduncles 1-1.5 ft. long, with sheathing, scarious bracts about 1 in. long; corolla-segments under 1 in. long; stamen dark purple.

2792. Flower of the Ginger plant (x 3/2).

2793. Commercial roots of Ginger, as seen in the stores (x 1/2).

ZINNIA (Johann Gottfried Zinn, 1727-1759, professor of botany at Göttingen). Compositae. Youth- and Old-Age. Plate L. The familiar Zinnias, Figs. 2794-96, are hardy annual plants, growing a foot or more high and covered from July until the first hard frost with double flowers 2 in. or more across. At least fifteen well-marked colors are commonly seen in Zinnias, — white, sulfur, yellow, golden yellow, orange, scarlet orange, scarlet, flore rose, crimson, violet, purple and dark purple. There are also variegated forms, but the solid colors are most popular. The Zinnia is rich in shades of purple and orange, but lacks the charming blue and pink of the China aster and is poor in reds.
compared with the dahlia. Among garden composites its only rival in point of color range are the chrysanthemum, dahila, China aster and cineraria. Among garden annuals in general the Zinnia ranks with the most useful kinds, and many persons would place it among the five or six colorors of the vegetable garden. Zinnias are formal flowers, rather stiff in habit, with exceptional depth of color, and in technical perfection a little short of the dahlia; the rays are rather rigid and overlap one another with somewhat monotonous precision, and the colors are metallic as compared with the soft hues of the China aster.

Historical Sketch.—The Zinnia (Z. elegans), with its great range of colors and perfection of form, is now so much a matter of course that the present generation is surprised to learn that it is one of the most recent of "florists' flowers." A double Zinnia probably was not seen in America before the Civil War. In the early sixties, the Zinnia was a sensation of the floral world; in the seventies it ceased to be fashionable and as early as 1882 it was spoken of as an "old-fashioned" flower. Its course was run in twenty years.

The single form of the Zinnia is now cultivated only for its scientific or amateur interest. Single Zinnias are not offered by tradesmen and occur only as degenerates from the double form. The first double forms appeared in 1858 at the nursery of M. Graau, 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 1860. Probably the earliest colored plate of double Zinnias is that in Flore des Serres published toward the end of 1860. This shows that the first double forms were much flatter and rougher (i.e., less regular) than to-day and often exhibited some remnant of the disk. The fixation of bright, distinct colors proceeded rapidly, but the 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. 2794, but the florist's ideal represents a much deeper flower of absolute fullness and regularity. Of recent years several minor varieties have appeared. Tubular forms are known to the trade as "Z. elegans robusta grandiflora planiflora." 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 Zinnias are ordinarily 20 to 30 inches high. This size and the next smaller size are the favorites for general purposes. The tall kinds are available in 12-16 colors. A robust race, which attains 28 to 30 inches under perfect conditions, is known to the trade as Z. elegans robusta grandiflora planiflora. It is also known as the Giant or Mammoth Strain. This strain was developed after many years by Herr C. Lorenz and was introduced in 1866. A maximum diameter of 6 inches is recorded for flowers of this strain. In G. C. II, 26:461 is shown a flower measuring 4½ x 4 in., with about 18 series of rays, the latter being so numerous and crowded that there is less regularity 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 culture.

2. Medium-sized Zinnias 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.

3. Dwarf Zinnias range from 9-12 inches in height and are of two sub-types, the pompoms and the Tom Thumbs. The pompoms, or "Liliputians," are taller growing and smaller flowered, generally 9 inches high with a diameter of flowers about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are available in several colors, not all of which are yet fixed in the seed. Zinnia "Haageana" is second in importance to Z. elegans. The single form was introduced to cultivation about 1861 and the double about 1871. It is dwarfer than most Zinnias, and has smaller flowers, with a color range restricted to shades of orange. It is distinct and pretty but less showy than the common Zinnias. The first race of hybrids between Haageana and elegans appeared in 1876 under the name of Z. Darwini. This group is said to resemble Z. elegans in size and color of its, and to recede from Z. elegans in habit, being more branched and forming a broader and thicker bush. However, this race has never been adequately described and it is little known in America to-day. Several varieties of the Darwini class are figured in The Florist and Pomologist 1876, pp. 28, 29. Some recent hybrids of Haageana and elegans, not yet introduced are said to be full of promise.

2794. Single Zinnia (X½).
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.

**Genus 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 leaves and terminal heads of flowers, which are peduncled or sessile. Rays pistillate, fertile: disk yellow or purple, its flowers hermaphrodite, fertile: involucre ovate-cylindric or campanulate, the scales in 3 to many series, broad, obtuse or rounded, more or less colored; achenes laterally compressed, 2-toothed at the summit and frequently 1-awned from the inner angle, 2-awned. Latest botanical revision by Robinson and Greenman in Proc. Am. Acad. Arts Sci. 32:14 (1897). There is a good summary of cultivated Zinnias by Voss in Vitmar's Brunnenzartn. Illustrated historical sketch in GH. 48, pp. 464, 465.

**Varieties.**

A. Plant annual.

1. Achenes at the disk flo. short and broad, acute, 2-awned. Long, thin.
2. Colors: recurved; bracts clasping, corolla-acuminate or acute. 
   - elegans
3. Colors: orange; bracts sessile, much narrower, truncate.
   - Haageana

B. Achenes longer, narrower, obtuse, 4-11 lines long.

1. Colors of rays yellow; disk yellow. 
   - pauciflora
2. Colors of rays red or purple.
   - pauciflora
3. Rays suberect, scarcely spreading; disk yellow. 
   - multiflora
4. Rays corolla; disk dark-colored. 
   - tenellaflora

AA. Plant perennial.

- grandiflora

**elegans**, Jaeg. **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 5 ft.; its leaves ovate or elliptic, clasping, about 1 in. wide; rays reflexed, originally purple or lilac, but now of nearly every color except blue and green; disk originally yellow or orange, but nearly or quite absent in the common double forms: fls. 3-5 in. across. July to Oct. Mexico.—Single forms ill. in B.M. 27, P.M. 1:223 and B.R. 15:1294 (the last two as *Z. elegans*). Double forms, F.S. 13:1394, R.H. 151:231. Pompons in GH. 48, p. 464 (Lilliput); 30:562 (deceptive as to size). R.B. 30, p. 152.

**Haageana**, Regel (Z. Mexicanum, 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 American. Single forms, Gr. 36, p. 270; 48, p. 464. Double, Gr. 36, p. 274; 48, p. 464. F. 1:71, 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.

**pauciflora**, Linn. An erect annual, with yellow heads about 1 in. across, with rather broad, spreading rays, Plant hisrate, with spreading hairs;
somewhat corymbose branched above; peduncles at maturity enlarged upwards and hollow. Mexico, Peruvian Andes.

**Zinnia**

*f. Linn.* This and the next are included by most writers in *Z. pauciflora*, but *Z. mulliflora* may be distinguished from *Z. pauciflora* by the pubescence of the stem being much finer, appressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B. M. 149.

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**Zizyphus**

2013

2798. *Zinnia tenuiflora.*

The rays are typically more revolute than they are shown in this figure.

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**Zizania**

(an old Greek name). Gramineae. A single species of annual swamp grass found in northern N. A. and northern Asia. Spikelets 1-fld., monoecious, 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.

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**Zizyphus**

(from Zizouf, the Arabian name of *Z. lobiosa*), Rhamnaceae. Distinguished from *Z. aurea* by the rays and by the fr., which is oval or broader, 1-1 1/2 in. long and lower lvs. 2-3-ternately compound: umbels 2-15, slender, diverging. B.B. 2:534.

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**Zizania**

(an old Greek name). Gramineae. A genus of three species of hardy perennial North American herbs 1-2 1/2 ft. high, with ternate or ternately compound leaves and compound umbels of yellow flowers. The genus has no horticultural status, the two following species being advertised only by collectors of native plants. For full account, see Britton and Brown's Illustrated Flora, Coultet and Rose's Monograph of the North American Umbelliferae, Contrib. U.S. Nat. Herb. 7:90 (1900), and Manuals. *Zizania* 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.

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**A. Rays of umbels 9-25, stout, ascending.**

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**Zizyphus**

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**B. Bays of umbels 2-12, slender, diverging.**

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**B. Bays of umbels 2-15, slender, diverging.**

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**Zizania aquatica**, 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 waterfowl. Wild Rice lakes and ponds are favorite resorts of sportsmen in the fall. Before sowing, put the seeds in coarse cotton bags and soak them in water for twenty-four hours. Now in water from 6 in. to 3 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 the margins of ponds.

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2797. *Zinnia Haageana* (C.)
and none of the species is hardy north; the hardest species, but it is tender north of Wash-
ingtion, D. C. Most kinds have handsome foliage and are well adapted for planting in shrubberies in the southern states and California. They seem to thrive in hay meadows, pastures, or woods, by greenhouse cuttings under glass and by root cuttings. A genus of about 40 species distributed through the tropical and subtropical regions of both hemispheres, allied to Po-
tonia, having frequently the, distinguishing feature of the drupe-like fruit. Shrubs with slender often procumbent branches, or trees; stipules mostly transformed into spines, often only one simple spine or one a straight and the other a hook; usually 5-merous, 5-corneous, ovary 2+1, usually loculicidum; style usually 2 parted; fr. subglobose to oblong-drupe. The fruit of Z. jujuba, vulgaris and Z. lotos are edible and the first named is much cult. in China.

**Jujuba, Lam.** Tree, 30-50 ft. high: branches usually prickly: young branches, petioles and in parte densely rusty-tomentose; lvs. broadly oval or oblong-obtuse, sometimes emarginate serrate or entire, dark green and glabrous above, tawny or nearly white tomentose beneath, 1-3 in. long: fls. in short-stalked many-flowered axillary cymes; fr. subglobose to oblong, orange-red, ⅘ in. long, on a stalk about half its length. March-June. S. Asia, Africa, Australia. Gn. 13, p. 194.

**sativa,** Garin. (Z. vulgaris, Lam.) COMMON JUJUBE. Shrub or small tree, attaining 50 ft.; prickly or unarmed: branches of the current year fasciated, shedding their leafy sheaths having frequently the appearance of pine needles; lvs. oval to ovate-linear-acuminate, acute or obtuse, oblique at the base, sometimes emarginate, serrulate, glabrous, ⅘-2 in. long, petiolate in axillary cymes; fr. subglobose to oblong, dark red or almost black, ⅘-2 in. long, short-stalked. March-June. S. China, S. and E. Asia; naturalized in Am. A. G. 1891, 73 (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 Wicken, it was introduced into California in 1876 by O. B. Ruxton, and is "fruiting regularly and freely in several parts of the state." The fruits or ber-
ries are ripe in November and December, and the plant begins to bear at three years from planting. The Jujube fruit is used in confectionery.

**Z. lotos, Lam.** Prickly shrub, 3-4 ft. high: lvs. ovate-acuminate, glabrous; fls. in few-flowered axillary cymes, fr. subglobose, yellow; S. China, N. Africa, Z. Palmaris Willd. Palmaris Spina Christi Z. Spina Christi Willd. Small prickly tree, lvs. oval to ovate-linear-acuminate, glabrous or pubescent on the veins beneath; fls. in axillary clusters, pedicellate, tomentose at the base; ovary 2-loculed. This species is sup-
posed by some to have furnished Christ's crown of thorns; see also Palmaris Spina Christi.

**Z. jujube, Lam.** Tree belonging to the genus Condalia, which is easily distinguished by its not having spiny stipules, but the branches transformed into slender thorns by its having, instead of the foot of the column, a long, fibrous, mostly arched, glabrous thorn-sharp; fr. elliptic to obovate-oblong, obtuse at the base; ½-1 in. long; fls. pedicellate, in corymbose clusters, fr. ovate to long and narrow.

This plant was once offered by a collector of native plants, but it is probably not in the trade now.

**ALFRED RENYER.**

**ZYGADENUS** (Greek, yoke and gland, some of the species having two glands in the base of the perianth). Lilinaceae. As outlined by Bentham & Hooker, the genus has 12 species, one of which is Siberian and the re-
mainder North American and Mexican. This disposition includes Alpinanthus in Zygadenus, but most au-
thors do not agree that they are smooth, rhizom-
ous or bulbous plants, with simple erect stems bear-
ing a raceme or panicle of white, yellowish or greenish flowers; lvs. mostly crowded at the base of the flower-
sicvild. J. M. R. is a much branched, glabrous thorn-sharp; fr. elliptic to obovate-oblong, obtuse at the base; ½-1 in. long; fls. pedicellate, in corymbose clusters, fr. ovate to long and narrow.

This plant was once offered by a collector of native plants, but it is probably not in the trade now.

**Alfred Renyier.**

**ZYGOPETALUM** (name referring to the united flower parts). Orchidaceae. Plants with numerous distichous lvs. sheathing a short stem which usually becomes thickened into a pseudobulb; lvs. membranaceous, ve-
nerous or plicate; fls. solitary or in racemes, showy: sepal and petals nearly alike in form and color, often united to each other at the base, the lateral sepals form-
ing a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a prominent fleshy crest on the disc: column in-
curved, wingless or with small wings; pollinia 4, not appendiculate. Includes Bollia, Huntleya, Warczeu-
tella and Bulomannia, which are often separated as distinct genera under the name of** Zygopetalum.**

**ZYGOPETALUM** is a genus of mostly epiphyllous orchids, of dry country. The Z. Mackaii group grow well un-
der pot culture. One or two species with creeping rhiz-


**A.** **Loculicidum of the capsule distichous to the base: stamens (two from perianth-segments; glands lanceolate to 2 in the base of the perianth. Zygadenus proper.**

**B.** **Glands large, covering nearly the whole base of the perianth-segments: bulb transistor.**

**C.** Fls. usually perfect, rather large.

**Zygocara, P. (Z. gladii, Nutt. Helianthus glabres-
cens, K. R.)** Three fls. on a stalk, the segments ⅘ or less broad and very glabrous: bracts purplish; fls. greenish, in simple or sparingly branched racemes, the segments ½-½ in. long, coherent to the ovary, the ovary opening about ⅘ in. across. Across the continent from New Brunswick south to New Mexico. R. M. 1980. B. K. 24:67.

**Fremontii, Torr. Lvs. an inch or less broad, less glabrous than the above: bracts green; fls. usually larger, rotate, the segments free from the ovary. Cali-
ifornia, from San Diego north, in the Coast Range.—One of the "Soap plants." Said to be the best of the genus for cultivation.

**Nuttallii, Gray. Lvs. from ⅘-½ in. wide, scarcely glaucous, lvs. long, along the sad. II. 1 in. across in a simple or branched raceme, the segments free from the ovary. Kansas to Colorado and Texas.**

**Bulb poisonous.**

**paniculatus, Wats. Usually stouter, the lvs. broader and sheathing: raceme compound: perianth-segments deltoid, acut., short-clawed. Saskatchewan to Cali-
for. 1.-Bulb poisonous.**

**G.** **Glands very obscure: bulb somewhat fibrous, narrow.**

**leimanthoides, Gray. Stem slender and leafy, 4 ft. or less tall: lvs. ⅘ in. or less wide, green on both sides; racemes panicked: fls. about ½ in. across, the segments oblong, not clawed. N. J. to Ga.**

**A.** **Locules distichous only along the middle: stamens inserted on the perianth-segments; glands none; bulbous.**

**muscitoxicus, Regel (Helianthus beta, Ker. Amian-
thum waseeaeformis, O. C. Christensen, Zygopetalum kentii, Kunze.)** P. P. Poison. 4 ft. or less tall: lvs. rather short, the basal ones varying from ⅘ in. to over 1 in. broad, not glabrous; racemes simple: fls. about ⅘ in. long, the segments ovate-oblong and obtuse. New York to Fla. and Ark. B. M. 883, 1540. L. B. C. 10:998. Gn. 57, p. 160.—Bulb and herbage poisonous. A fly poison has been made from the bulb. L. H. B.

**ZYGIA.** See Albizzia.
ZYGOPETALUM zonae, like Z. maxillare, thrive best on sections of tree fern, o-mundo rhizome or in baskets. A good compost consists of equal parts of chopped sod, peat fiber and sphagnum moss, well mixed and interspersed with pieces of rough charcoal, about one-half of the pot space being devoted to clean drainage material. After distributing the roots, the compost should be worked in carefully but not too firmly about them, leaving the base of the plant even with, or just above, the rim of the pot. Repotting should be done when the plants show new root action. The temperature should range about 60°F, by night and 65° to 70° by day in winter, and in summer as long as possible, with free ventilation during inclement weather. A cool, light location in the cattleya department is favorable. The compost should be kept in a moist condition at all times. The plants are propagated by cutting through the rhizome between the old pseudobulbs at a 45° eye, potting up the parts and removing them to a rather higher temperature until they start into new growth.

The Batemannia, Pescatoria and Wareczycziela 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 charcoal. Autumn is the best time to re-pot 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 Belbea group is closely allied and requires the same general culture but needs 56°F general 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. GREY.

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Burtii. 12  Gauthieri, 3  Patini, 10
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B. Scape not rostrate 1. rostratum.
BB. Scape not rostrate.
BB. Scape not rostrate 2.
C. Petals spotted or blotched:  Mackaili, 3
D. Labellum glabrous 1. Gauthieri
E. Labellum pubescent 1. maxillare, 4

Vv. Petals uniformly colored: 8. violaceum
Vv. Petals not uniformly colored: 9. celeste

AA. Scape shorter than the lvs. juddii.
B. Column hood-like, arching over: 7. Sedeni
C. Fls. deep violet 8. violaceum
CC. Fls. violet-purple 9. celeste
CC. Fls. rose-colored 10. Patini

DD. Column not hood-like 11. Lalindei
BB. Fls. brown, spotted 12. Burtii
BB. Fls. white or greenish white 13. discolor
BB. Fls. white or greenish white 14. Wendlandi

2. Mackaii, Hook. Fig. 2799. Pseudobulbs large, ovate: Ivs. many, linear-lanceolate, 1 ft. long; scape 18 in. long, bearing 5 or 6 large fls.: sepals and petals dingy yellowish green, with blotches of purple on the inside; lanceolate, acute, erect, spreading, all united toward the base; labellum large, rounded, emarginate, white with radiating vein-like deep blue lines, glabrous. Brazil. B.M. 2748. B.K. 11:1433 (as Eulophan Mackaii). P.M. 3: 97. L.B.C. 17: 1634. J.H. III. 33: 295.

This is distinguished from Z. intermedium and Z. crinitum by its smooth labellum and narrower lvs. Var. superbum, grandiflorum, majus are also ad\n
3. Gauthieri, Linn. Pseudobulbs oblong, acute, 4 in. high; scape 2-3 ft.: fls. 3 in. across; sepals and petals green blotched with brown; labellum broadly reflexed, deep purple at the base, white in front, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. J.H. 14: 525. Gw. 49: 1623. The lvs. are fasciculate, narrowly oblong, keeled, 12-16 in. long; inflorescence shorter than the lvs.

4. maxillare, Lodd. Pseudobulbs 2 in. long; lvs. lanceolate, 1 ft. long; scape 9 in. long, 0-5 ft.; fls. 1½ in. across; sepals and petals ovato-oblong, acute, green, with transverse brown blotches; labellum horizontal, purple, with a very large, glossy purple, notched horse shoe-shaped crest, middle lobe roundish, waved, and obscurely lobed. Winter. Brazil. B.M. 3686. L.B.C. 18: 1773. J.H. III. 33: 295. P.M. 1: 271. — Distinguished by its small fls. and very large crest

2799. Zygopetalum Mackaii (× 1/4).

5. crinitum, Lodd. Habit of Z. intermedium; lvs. broadly linear-lanceolate; fls. on long, stout scapes; sepals and petals 2 in. long, oblong-lanceolate, greenish brown with rather few brown blotches; labellum 2 in. across, spreading, wavy, scarcely emarginate, white with purple veins radiating from the thick crest, disc hairy. Fls. at various times. Brazil. L.B.C. 17: 1637. B.M. 3102 (as Z. Mackaii, var. crinitum). — This has fewer brown blotches on the sepals and petals than Z. intermedium. There are varieties with pink, blue, or almost colorless veins on the lab. lvs. Var. carnea, Hort., has the vines deep vivid blue.
6. intermedium, 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; labelllum rotund, narrowed at the base, deeply 2-lobed at the apex, pubescent, 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. 187:190 (as Z. Rivielli).—Plants of Z. Mackaii are often cultivated under this name.

7. Södenii, 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; labelllum pale purple in front, becoming deep purple toward the base. F.M. 1880:417.—A garden hybrid raised by Veitch.

8. violaceum, Reichb. f. (Hantleya violacea, Lindl.). Fig. 2800. Lvs. as in Z. Lalindei; fls. on nodding scapes 4–6 in. long, deep violet; sepals and petals ovate revolute, tipped with yellowish green; labelllum ovate, cordate, crest of thick ridges covered by the arching column. Guiana. F.S. 7:678. P.M. 8:1.

9. ecalostis, Reichb. f. (Bolbea ecalostis, Reichb. f.). Lvs. 6–10 on a shoot, oblong-lanceolate, 6 in. long, 2 in. broad, with 6 paler sheaths 3–4 in. long; fls. solitary, on stout peduncles 6 in. long; 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; labelllum short-clawed, ovate, deeply corrugated, margins recurved and tip revolute, deep violet with yellowish margins and a thick yellow crest. Fls. freely in summer. Colombia. B.M. 6458. Gn. 31. p. 121; 49:1072.

10. Pattini, Reichb. f. (Bolbea Pattini, Reichb. f.). Lvs. linear-oblong; fls. large, rose-colored, paler than those of Z. Lalindei; sepals oblong attenuate, wavy, the lower half of the lateral pair darker; petals triangular-oblong, undulate; labelllum triangular hastate at the base, yellow, tip revolute; column pink, covering the thick yellow crest. Colombia. F.M. 1875:147. G.C. II. 2:8.

11. Lalindei, Reichb. f. (Bolbea Lalindei, 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; labelllum ovate-hastate, margins and tip recurved, golden yellow, disc with a semi-circular crest of thick, radiating lamellae; column broader than the disc, arched over it. Aug. Colombia. B.M. 6331.—Color of the flower varies to bright violet.


13. discolor, Reichb. f. (Warneckia discolor. Lindl. Warneckicella discolor, Reichb. f.). Lvs. narrowly lanceolate, jointed, 9 in. long: peduncles 1-ftd, shorter than the lvs.; sepals spreading, lanceolate, white; petals shorter, ovate, white with a tinge of purple, half spreading; labelllum large, broadly ovate, somewhat convolute, white, changing to deep purple toward the disk, and having a whitish or yellowish crest. Central America. B.M. 4530.

14. Wendlandii, Reichb. f. (Warneckicella Wendlandii 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; labelllum ovate, cordate, undulate, white, streaked and spotted with violet-purple; apex revolute, crest semi-circular, violet-purple.

HEINRICH HASSELBRING.